

23-24

OCTOBER 2017

COMPENDIUM IMPACT OF AGRICULTURAL TECHNOLOGIES IN ENHANCING GROWTH AND INCOME

MSAE2017

Maharashtra Society of Agricultural Economics

Organised by Directorate of Extension

In collaboration with

Division of Agricultural Economics & ABM Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Main Campus, Chatha-Jammu, J&K, India-180009

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COMPENDIUM

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Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu, Main Campus, Chatha-Jammu, J&K, India-180009



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Acknowledgements

The organisers of the National Conference gratefully acknowledged the financial assistance provided by the National Bank for Agriculture and Rural Development (NABARD) for printing this Souvenir/Compendium of the National Conference.

Note:

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Printed by:

Bytes & Bytes Bareilly (M) 094127 38797 E.mail: sandybly@gmail.com



N.N. Vohra GOVERNOR JAMMU & KASHMIR



RAJ BHAVAN JAMMU-180001

Message

I learn that Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu is shortly organizing a National Conference of Maharashtra Society of Agricultural Economics on **"Impact of Agricultural Technologies in Enhancing Growth and Income"**.

As demonstrated by the First Green Revolution, there is a direct relationship between increasing agricultural productivity and enhancing the pace of economic growth and development of the country.

If we are to achieve success in achieving the Second Green Revolution increases in the current levels t would be imperative to speed up the pace of research and extension activities and achieve significant increases in the current level of productivity. In this context the deliberations in the projected Conference are of great importance.

I wish fruitful deliberations to the participants in this conference.

amas

12th September, 2017 Srinagar.

(N.N. Vohra)



परशोत्तम रूपाला Parshottam Rupala



कृषि एवं किसान कल्याण और पंचायती राज राज्य मंत्री भारत सरकार Minster of State for Agriculture & Farmers Welfare and Panchayati Raj Government of India D.O. No.: Message MoS (AC&FW)/PR/VIP/2016/1171

Message

Agriculture is the backbone of Indian economy and the country needs continuous efforts for development of agriculture through introduction of technological interventions. Equally important is the assessment of proven/validated introduced technologies provided to the farmers and government schemes for their impact on agriculture and allied sectors.

I appreciate the fact that Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing National Conference on **"Impact of Agricultural Technologies in Enhancing Growth and Income"** during October 23-24, 2017 in collaboration with the Maharashtra Society of Agricultural Economics at SKUAST- Jammu, Main Campus Chatha, Jammu (J&K).

I hope that the National Conference shall provide a platform to researchers, teachers, field extension specialists and students to interact constructively and gain knowledge on the subject of Impact Assessment of agricultural technologies and schemes of the Government.

I wish the National Conference a grand success and fruitful to the policy makers.

(Parshottam Rupala)

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Devendra Fadnavis Chief Minister Maharashtra



Mantralaya Mumbari-400 032

10th October, 2017

Message

I am happy to know that Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing national conference of Maharashtra Society of Agricultural Economics with the theme, Impact of Agricultural Technologies in Enhancing Growth & Income.

Involvement of sustainable agriculture technologies is important, both directly and indirectly, to enhance crop productivity, environmental sustainability, and human health.

To achieve future food security, the management of good agriculture practices is very important. Long-term investment in agriculture is the best solution for problems being faced by the agriculture sector. In order to increase the income of farmers in double, we have launched Unnat Shetkari-Samruddha Shekari Abhiyan'. Maharashtra has implemented most of the marketing reforms and it offers the best environment for doing agri-business among all the states and UTs. The State has given great impetus to food processing industry. This has given assurance to the farmers for the availability of employment opportunities, besides providing better prices to their agriculture products.

I hope that this conference will provide a springboard to the upcoming experts and give a chance to know about the latest developments in the field of research and knowledge.

I extend my best wishes to all those involved in the effort.

(Devendra Fadnavis)



Glulam Nabi Lone Hanjura Agriculture Minister J&K Government



Message

It gives me immense pleasure to know that SKUAST-Jammu is organizing a two day National Conference on **"Impact of Agricultural Technologies in Enhancing Growth and Income"**. The impact assessment technology is of prime importance and helps in focused efforts of the Agricultural fraternity in the right direction.

The theme of the conference is relevant in the present context where efforts of the government are towards increasing production and doubling the income of the farmers by 2022.

The participants in the conference will share their valuable experiences of the field and their implementation in other areas, so as to reach the desired goal.

I wish a grand success tonational conference.

(Ghulam Nabi Lone Hanjura)



Sunil Kumar Sharma



MINISTER OF STATE For Transport (Independent Charge), Revenue, Public Works (R&B), Rural Development & Panchayati Raj, Agriculture Production, Youth Services and Sports

D.O. No.PS/HMOS/1/2 (1/2) 1025

Dated 15-09-2012

Message

I feel extremely happy to know that Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing National Conference of Maharashtra Society of Agricultural Economics on **"Impact of Agricultural Technologies in Enhancing Growth and Income"** during October 23-24, 2017 at SKUAST-Jammu.

The Conference shall provide a platform for scientists to deliberate on issues pertaining to impact of Government programmes and also the latest agricultural technologies for their use on farmers' fields. The conference shall also deliberate upon the Agri-Business and micro financing etc. that has a direct impact on the welfare of farmers. The conference shall help to find the ways to fill the missing links.

I congratulate SKUAST-Jammu for organizing the National Conference on such a crucial issue. I wish the programme a grand success and a pleasant stay in Jammu to all the delegates visiting from different parts of the country for attending the Conference.

-sd-

(Sunil Kumar Sharma)

Jammu Phone No.: Office: 0191-2549306 Fax: 0191-2549408

e-mail: speaktominister@gmail.com Srinagar Office: 0194-2506181 Fax: 0194-2506111



Trilochan Mohapatra, PhD FNA, FNASc, FNAAS Secretary & Director General



भारत सरकार कृषि अनुसंधान और शिक्षा विभाग एवं भारतीय कृषि अनुसंधान परिषद् कृषि एवं किसान कल्याण मंत्रालय, कृषि भवन, नई दिल्ली-110 001 GOVERNMENT OF INDIA DEPARTMENT OF AGRICULTURAL RESEARCH INSTITUTE AND INDIAN COUNCIL OF AGRICULTURAL RESEARCH MINISTRY OF AGRICULTURE AND FARMERS WELFARE KRISHI BHAVAN, NEW DELHI-110 001 Tel.: 23382629, 23386711; Fax: 91-11-23384773 E-mail: dg.icar@nic.in

Message

I am happy to know that Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing National Conference of Maharashtra Society of Agricultural Economics on the theme "Impact of Agricultural Technologies in Enhancing Growth and Income" during 23-24 October, 2017 at SKUAST-Jammu, Main Campus, Chatha.

When the country is working towards doubling farmers' income, it is important to analyse the impact of our existing technologies on agricultural growth. The theme of the Conference is very useful in the present context and I hope that scientists, extension workers and students participating in the Conference shall share their valuable experiences on impact of agricultural technologies on farmers' economy.

I wish the national conference a great success.

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(T. MOHAPATRA)

Dated the 22nd September, 2017 New Delhi



Prof. Pradeep K. Sharma Vice-Chancellor



Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu

Message

It gives me immense pleasure to learn that Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing a twoday National Conference on **"Impact of Agricultural Technologies in Enhancing Growth and Income"** in collaboration with Maharashtra Society of Agricultural Economics from October 23rd to 24th, 2017 at SKUAST-Jammu, Main Campus, Chatha.

Impact assessment of technologies in agriculture sector is important in policy planning and reforms to be taken up by the Government in setting its priorities for improving the economic status of the farming community of the country. I hope that the National Conference will provide a valuable platform to the participating scientists, students and farmers from all over the country to share their experiences and evolve viable recommendations for future course of action.

I wish the organisers of the Conference a great success.

((Pradeep K. Sharma)



Dr. K.P. Viswanatha Vice-Chancellor



Mahatma Phule Krishi Vidyapeeth, Rahuri

Message

The agricultural universities along with development departments are working day and night for the development of agriculture and allied sectors. The impact of all these efforts needs to be assessed for bringing further improvement in the working. In this context, I am pleased to learn that Maharashtra Society of Agricultural Economics is going to organize its National Conference-2017 on the theme **"Impact of Agricultural Technologies in Enhancing Growth and Income"** at Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu during October 23-24, 2017.

The theme of Impact assessment is the burning topic today in context of understanding the pace and direction with which all the stakeholders are working. The National Conference would provide a wonderful opportunity to the teachers, researchers, extension officers and students to share the methodologies and success stories for wider dissemination of information and knowledge on useful agricultural technologies.

I congratulate Maharashtra Society of Agricultural Economics and Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu and my wishes for the great success of this conference

k.p. Cifan.

(K.P. Vishwanatha)



Dr. Vilas M. Bhale Ph.D. (Agri.) Vice-Chancellor



DR PANJABRAO DESHMUKH KRISHI VIDYAPEET, KRISHINAGAR, AKOLA-444 104 (M.S.)

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I am extremely happy to know that Maharashtra Society of Agricultural Economics is organizing a National Conference at Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu on a very relevant theme "Impact of Agricultural Technologies in Enhancing Growth and Income" during 23rd to 24th October, 2017.

I would like to congratulate Maharashtra Society of Agricultural Economics choosing the topic and theme selection of this conference perfectly in line with the State Government policy of doubling the income of farmers by 2019-20. Organizing the National Conference out of Maharashtra for the first time will certainly provide a much needed exposure to the faculty and students of Maharashtra at national level and will help them to interact and collaborate with other university scientists and excel in their relevant fields.

I extend my personal greetings to all the scientists, researchers and students participating in the Conference and heartily express all my good wishes for the successful organization of this conference.

(Dr. Vilas B



Dr. Tapas Bhattacharyya Vice-Chancellor



Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth Dapoli, Dist. Ratnagiri-415 712 (Maharashtra)

Message

Impact assessment is a very important concept to ensure that projects, programmes and policies are economically viable, socially equitable and environmentally sustainable. I learn that Maharashtra Society of Agricultural Economics is organizing a National Conference at Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu on the theme **"Impact of Agricultural Technologies in Enhancing Growth and Income"** during October 23-24, 2017. It gives me sense of satisfaction that the efforts of the scientists are in right direction. The Conference would bring out useful information on utility of latest agricultural technologies and government programmes.

I, therefore, congratulate Maharashtra Society of Agricultural Economics and Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu for organizing a National Conference on the above mentioned theme. I hope that the Conference will bring out useful recommendations and experience for the participants.

I wish the organizers a great success.

Jours Brancelon

(Tapas Bhattacharyya)

Place: Dapoli Date: 13thOctober, 2017



Dr. Rajbir Singh Director



Indian Council of Agricultural Research Agricultural Technology Application Research Institute

Zone-I, PAU Campus, Ludhiana-141 004 Tel.: (O) 2401092, 2401018; Fax: 0161-2412719 Email: Atari.ludhiana@icar.gov.in, zcu1ldh@gmail.com; Website: zpdzone1.org ISO 9001-2015

F.No. PA/ZPD/Misc./2015

Date- 04/10/2017

Message

It gives me immense pleasure to learn that Directorate of Extension, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing National Conference on "Impact of Agricultural Technologies in Enhancing Growth and Income" during October 23-24, 2017 in collaboration with the Maharashtra Society of Agricultural Economics at Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu.

I feel that impact assessment of technologies is an important aspect of agricultural research and extension. Krishi Vigyan Kendras are the major institutions in India engaged in location specific research and extension of technologies generated. The better approaches of impact assessment can help in assessing the real contribution of these institutions in agricultural growth and enhancing farmers' income in India.

I compliment SKUAST-Jammu and the Maharashtra Society of Agricultural Economics for hosting the two days National Conference on the important theme and wish the organizers and participants of the conference a great success.

(Rajbir Singh)



Dr. Prakash Mahindre President



Maharashtra Society of Agricultural Economics

Message

In the last International conference on "Agricultural production and marketing including export and import with impact analysis" on 11th and 12th February 2017 at Mahatma Phule Agriculture University Rahuri in Maharashtra State, it was decided to hold the next National Conference in the State of Jammu & Kashmir with a theme "Impact of agricultural Technologies in Enhancing Growth & Income". We are very happy that Sher-e-Kashmir University of Agricultural Sciences & technology of Jammu, J&K is organizing the same.

As has been often said that being the largest private sector 'agriculture' enjoys a very important position in Indian economy. As it is having link from various sectors like production, processing and marketing; agriculture continuously dominate to change in the India. The role of agriculture in developing an economy can be analyzed by the GDP (Gross Domestic Product) contribution made by it. The agriculture sector also contributes to the sustainable development of a country. Sustainable agricultural development depends upon the availability of the natural resources of the country. India is a country where about two third of the population lives in the rural areas and having agriculture as their livelihood

In light of above, this conference will certainly be providing a platform to express experts' views on latest technologies to help achieve our cherished goal of improving our national income and over all growth.

Wishing you all the very best at this occasion.

-sd-(Prakash Mahindre)



Dr. R.K. Arora Associate Director Extension & I/C KVKs



Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu Directorate of Extension

From the Desk of Organising Chairman

I learn that the Maharashtra Society of Agricultural Economics and Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu is organizing National Conference on "Impact of Agricultural Technologies in Enhancing Growth and Income" during October 23-24, 2017 at Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu.

It is heartwarming to note that the forthcoming Conference shall deliberate on crucial issues relating to the technologies that would help in achieving the goal of doubling the farmers' income. Impact assessment is the need of the hour for highlighting the useful research and extension interventions for their replication in similar agroecosystems. This would also provide a valuable opportunity for participating scientists from various institutions all over the country to share their experiences and evolve viable approaches for dealing with the rapidly advancing challenges in the discipline.

I compliment SKUAST-Jammu for hosting this important National Conference and trust that the scientists of the University would be benefitted by learning the latest advances in the field.

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(R.K. Arora)

Directorate of Extension Chatha, Jammu, J & K 180 009 Mob: +91-9797656065 E-mail: rkarora_003@yahoo.co.in Visit us at: www.skuast.org

"An institution for sustainable agriculture for food and nutritional security"





About SKUAST of Jammu (J&K)

S her-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-Jammu) came into existence on 20th September, 1999 following the amendment in Sher-e-Kashmir University of Agricultural Sciences and Technology Act, 1982, through the State Legislature. The establishment of SKUAST of Jammu has in its background aspirations, commitment and missionary zeal to cater the needs of Jammu Division situated between 305 m to 5000 m above mean sea level (MSL) with low altitude subtropical, mid to high altitude intermediate zone and alpine-type geo-climatic areas through advances in research, education and extension in the field of agriculture.

SKUAST-Jammu is a multi-campus university having three well established faculties, with its headquarters located at main campus, Chatha, Jammu. The Faculty of Veterinary Sciences and Animal Husbandry located at R.S. Pura has eighteen (18) divisions and offers BVSc. & A.H., M.V.Sc. and Ph.D. degree programmes in Veterinary Sciences and Animal Husbandry streams. The Faculty of Basic Sciences has four (4) divisions and runs programmes of M.Sc. and Ph.D.

The Faculty of Agriculture (FOA) located at Main Campus Chatha has thirteen (13) divisions and one (01) School of Biotechnology and offers degree programmes namely, B.Sc. (Hons.), B.Sc. (Hons.) Biotechnology, M.Sc. (Agriculture streams), MBA (Agribusiness), M.Sc. (Biotechnology), Ph.D. (Agriculture streams) and Ph.D. (Biotechnology)

There are thirteen Research Stations/Sub-Stations including Seed Processing Facility, Centre for Organic Agriculture and two Advanced Centres namely, Advanced Centre for Horticulture Research & Advanced Centre for Rainfed Agriculture etc. working with the mandate to capitulate the research programme for the University through identification of researchable issues of regional and national importance. There are seven KVKs under the administrative control of the University, located in different agro-climatic zones of Jammu region for catering the location-specific needs of the farming community.

The main Campus of the university is at Chatha, Jammu. The total land in possession of the university (including research stations/sub-stations and KVKs) is 460.98 ha. Among major infrastructural facilities, the University has a hi-tech structure for conducting research on protected cultivation, a well-furnished library with collection of quality books related to agriculture and allied subjects, periodicals, national and international journals etc., and six Experimental Learning units out of which four (Mushroom Cultivation, Plant Clinic and High Tech Nursery horticultural crops and Productive Insects) are established in the Faculty of Agriculture and two (Poultry Production and Dairy Production) are established in Faculty of Veterinary Sciences and Animal Husbandry, R.S. Pura.

The technical information and production recommendations of the faculties of the University are being disseminated through the publications and print material in form of pamphlets, leaflet and posters.

The University is committed to bring development of the region and prosperity of the farmers through the expansion of proven and profitable technologies in the field of agriculture and animal sciences.



About the Society

Maharashtra Society of Agricultural Economics

The Maharashtra Society of Agricultural Economics was established in the year 1987 among 4 State Agricultural universities of Maharashtra by Late Prof. H.B. Ulemale, Hon'ble Ex. Vice Chancellor,

Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra) with 35 life founder members. At present, there are about 370 life members of the society, covering different Agricultural Universities and institutes across the world. The Society is continuously being involved in the development of the discipline of Agricultural Economics through its Research Journal and organisation of National and International Conferences to highlight the useful research and extension interventions for their replication in similar agro-ecosystem; to share the experiences and evolve viable approaches for dealing with the rapidly advancing challenges in the discipline and to screen out the technologies that lead to the goal of doubling the farmers' income

The National Conference of Maharashtra Society of Agricultural Economics-2017 is being organized at Sher-e-Kashmir University of Agricultural Sciences & Technology of Jammu (SKUAST-Jammu), Main Campus, Chatha, Jammu-180009 (J&K), India during October 23-24, 2017. The focal theme of the Conference is "IMPACT OF AGRICULTURAL TECHNOLOGIES IN ENHANCING GROWTH AND INCOME".

PATRON

Prof. (Dr.) Pradeep K. Sharma Vice Chancellor, SKUAST-Jammu

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Lead Paper - I

Organic farming and marketing of organic products in India: An overview

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History

The history of the revival of organic farming movement began in 1940's when communities realized the disadvantages or effects of using synthetic fertilizers and pesticides had on their agricultural lands. The demerits of industrialization of agriculture have led to the beginning of an organic movement especially in Great Britain that had gathered pace in 1940's and later on spread as a global phenomenon

Background

India is one of the agricultural based country, wherein more than two third of the population depends to agricultural sector. The share of agriculture in the Gross Domestic Product (GDP) has been registered a steady decline from 50% in 1950- 51 to 12.5% in 2014-15. In India, a large number of farmers and farm labourers are migrating from this sector. This reveals clearly that there is no chance to have satisfactory growth in farming. The existing farming practice is called conventional agriculture which using synthetic and fossil-fuel based inputs like chemical fertilizers, pesticides, herbicides, with a certain extent of mechanical implements for various processes. Prior to 1965, our country followed traditional farming practice without chemical fertilizers and pesticides. Most of developed countries and some developing nations are returning to organic farming practice during the last two decades due to various problems raised in conventional farming. Organic farming is one amongst the broad spectrum of production methods that are supportive of the environment. Organic farming appears to be one of the options for sustainability. Starting of organic agriculture in India in 1900 by Sir Albert Howard, a British agronomist in North India, Development of Indore Method of aerobic compost (Howard, 1929), Bangalore method of anaerobic compost (Archarya, 1934), NADEP Compost (ND Pandari Panda, Yeotmal, 1980) initiated organic agriculture in India. Agriculture remains the key sector for the economic development for most developing countries. It is critically important for ensuring food security, alleviating poverty and conserving the vital natural resources that the world's present and future generations will be entirely dependent upon for their survival and well-being. The essential concept of the practices is "give back to nature", where the philosophy is to feed the soil rather them the crop to maintain the soil health. Therefore, for sustaining healthy ecosystem, there is need for adoption of an alternatives farming system like organic farming.

The year 2000 is very important year for India from organic point of view. The four major happenings were made during the year 2000. These are: . The Planning Commission constituted (2000) a steering group on agriculture who identified organic farming as National challenge and suggested it should be taken in the form of a project as major thrust area for 10th-plan. The group recommended organic farming in NE Region, rain fed areas and in the areas where the consumption of agro chemicals is low or negligible. The National Agricultural Policy (2000) recommended promotion of traditional knowledge of agriculture relating to organic farming and its scientific up gradation. The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture constituted (2000) a Taskforce on organic farming under the chairmanship of Shri KunwarJi Bhai Yadav and this task force recommended promotion of organic farming. The Ministry of Commerce launched the National Organic Programme in April 2000 and Agricultural and Processed Food Products Export Development Authority (APEDA) is implementing the National Programme for Organic Production (NPOP) (11). Under the NPOP, documents like National standards, accreditation criteria for accrediting inspection and certification agencies. Accreditation procedure, inspection and certification procedures have been prepared and approved by National Steering Committee (NSC). India Advantage India is endowed with various types of naturally available organic form of nutrients in different parts of the country and it will help for organic cultivation of crops substantially. There is diversity in climates- 100-10,000mmrainfall, hill, desert, strong traditional farming system- croptree animal, innovative farmers, vast dry lands (60% agriculture land), least use of chemicals. Infact, the rain fed, tribal, north east and hilly regions, of the country where negligible chemicals used are practicing subsistent agriculture for a long period.

Organic farming is being practised in 100 countries of the world. The ill-effects' of chemicals used in agriculture have changed the mindset of some consumers of different countries who are now buying



organic with high premium for health. Policy makers are also promoting organic farming for restoration of soil health and generation of rural economy apart from making efforts for creating better environment. The global organic area is 26 million hectare roughly along with 61 standards and 364 certification bodies roughly. The world organic market is now 26 billion US\$. The organic area in India is 2.5 million hectare including certified forest areas. Non-certified organic area is more than certified organic area. India has developed National Standard under NPOP programme. The National Centre of Organic Farming under Ministry of Agriculture is promoting organic farming as facilitator across the country and providing various assistance to organic entrepreneurs and farmers.

The term "organic" is best thought of as referring not to the type of inputs used, but to the concept of the farm as an organisms, in which all the components- the soil minerals, organic matter, microorganisms, insects, plants, animal and humans-interact to create coherent, self-regulating and stable whole. Reliance on external inputs, whether chemical or organic, is reduced as far as possible.

Main Principle of Organic Farming

The main principles of organic farming are the followings:

- To work as much as possible within a closed system, and draw upon local resources.
- To maintain the long-term fertility of soils.
- To avoid all forms of pollution that may result from agricultural techniques.
- To produce foodstuffs of high nutritional quality and sufficient quantity.
- To reduce the use of fossil energy in agricultural practice to a minimum.
- To give livestock conditions of life that confirm to their physiological need.
- To make it possible for agricultural producers to earn a living through their work and develop their potentialities as human being.

Organic farming methods

Organic farming methods combined with scientific knowledge and latest agricultural technology is showing good results by raising the agricultural productive without harming the environment. There are different methods of doing organic farming but the prominent or popular methods of organic farming include the below mentioned three methods

Crop rotation or diversity: Crop rotation method involves growing different or various types of crops in the same farmland or location as per the different seasons and in a sequential manner. This method helps in supporting a wide range of beneficial soil microorganisms and insects thereby adding up to overall farm health.

Biological pest control: Biological pest control or management is an important method in which living organisms are used to control the pests with limited use of chemicals. In this method, the farmers amalgamate the biological, cultural, mechanical and chemicals tactics to manage weeds and other pests without using synthetic herbicides.

Using Green manure and compost: This is another popular method of doing organic farming in which the dying plants and other dried up vegetation are stuffed or mixed into the soil to make them act as nutrients for the soil thereby increasing the quality of the soil. The compost, which is highly rich in nutrients, is also used as a fertilizer for growing corps in an organic way.

Pillars of organic farming

The four pillars of organic farming are:

1) Organic standards 2) Certification/Regulatory mechanism 3) Technology packages 4) Market network Standard and Certification.

The most important aspect in modern era of organic farming is certification programmes which consist of standards (rule), inspection (checking whether the rules are implemented) and certification (judgment). Only by this certification programme, organic farming can be distinguished from other methods of sustainable agriculture. These standards define what can be labelled 'certified organic' and sold commercially as such. Infact, certification in organic agriculture generally refers to independent third party certification. Third parts implies it is not done by either the producer (first party) or the buyer (second party). The system includes farm inspector and audit trails (checking of record). Certificate is valid only if it is done by accredited certifying agency. Certification programme vary among countries or regions



because of differences in environmental, climatic, social and cultural factors. Needless to say, from a commercial perspective it is not enough that product is produced organically, what is equally important is that it should be certified as such. Technology Packages Conventional practices cannot be followed for growing crops organically. It includes land preparation, selection of variety, organic fertilisation, biological control of pest- diseases-weed, harvest, storage etc. Some countries have developed package of practice for some selected crops but there is ample scope to reframe this package with scientific methods and practices.

Significance of organic agriculture for Indian farmers

In the Indian context, organic farming can be significant in to two distinct ways:

- To increase the efficiency and sustainability production: Organic farming can help to reduce production costs especially where labour is cheap compared to input costs and to increase or stabilised yields on marginal soils. This is especially relevant for smallholders in marginal areas where green revolution agriculture has lead to a depletion of soil fertility and to high debts because of increases in input costs.
- To increase product value: In areas where farmers have access to established organic markets within the country or abroad, products can achieve a higher price compared to the conventional market. Especially in the trend of decreasing prices for agricultural products, this can be an important way to stabilised or even increase incomes of the farmers.

Steps of Organic Farming

Organic farming approach involves following five principles:

- Conversion of land from conventional management to organic management
- Management of the entire surrounding system to ensure biodiversity and sustainability of the system.
- Crop production with the use of alternative sources of nutrients such as crop rotation, residue management, organic manures and biological inputs.
- Management of weeds and pests by better management practices, physical and cultural means and by biological control system
- Maintenance of live stock in tandem with organic concept and make them an integral part of the entire system

Countries	Area Contribution in percentage to total cultivated area
USA	0.23
UK	4.22
Germany	4,10
Argentina	1.70
Austria	8.40
Australia	2,20
Japan	0.10
Switzerland	7.94
South Africa	0.05
Italy	3.70
India	0.03
Pakistan	0.08
Srilanka	0.05

Contribution of Area under Organic farming (2015-16)

Constraints of Organic Farming

- Marketing of organic farming produce is the main problem for organic growers.
- The lack of awareness among people (customers/buyers) is the main hurdle in selling organic products.
- Further the cost of the organic products is high which only the elite and foreigners can afford. Moreover peoples should verify the organically certified produces before buying.
- Organic growers are not in a position to spend money towards the organic certification



- Lack of organic sale units.
- The organic marketing in most of the countries is still relatively small and on an average it is less than half a percent of the total agricultural sector except in Germany and Austria, where 2-3 per cent of their agriculture area is under organic production.
- There are number of firms in India, which grow vegetables, fruits, plantation crops, spices and tea organically and export to various countries. Usually farmers associated with big exporters do not have to worry about the sale of their products and their certification, small and marginal farmers are a harrowed lot.
- Several institutions and movements are making concerted efforts to promote organic agriculture in India and to bring changes in the policies favoring ecological agriculture.

Limitations of Organic farming

- Small land holding
- Poor infrastructure facilities,
- Lack of technology knowledge
- Convert organic farm
- Organic material such as animal dug and other crop waste used for fuel purposes.
- Organic material are bulky in nature very difficult store and high price.
- City garbage contain heavy metal, plastic bags, stone and needles
- Bio control agent are available only few selected inset pest
- Complicated organic certification process and high cost.
- High human population of India.

Suggestions to promote Organic farming

- Many changes are needed if India is to overcome the constraints and achieve its rich potential in organic agriculture.
- Developing appropriate and strong extension services.
- Developing strong linkage between producer and consumer
- Reducing the cost of certification and easily approachable to farmer
- Making the organic inputs available to small holder like bio-fertilizer and bio-pesticide.
- Providing subsidies and other financial support
- Improving infrastructure facilities like cold storage and transportation.
- Enhancing linkages in the supply chain promoting research on organic agricultural research and development.
- Providing regular training on organic agriculture.

Government boost to organic farming

The Government of India has implemented the National Programme for Organic Production (NPOP). The national programme involves the accreditation programme for Certification Bodies, standards for organic production, promotion of organic farming etc. The NPOP standards for production and accreditation system have been recognized by European Commission and Switzerland for unprocessed plant products as equivalent to their country standards. Similarly, USDA has recognized NPOP conformity assessment procedures of accreditation as equivalent to that of US. With these recognitions, Indian organic products duly certified by the accredited certification bodies of India are accepted by the importing countries.

To regulate the organic farming and to bring its organic food standards at par with the international norms, India has set up a certification process for export, import and domestic markets, which is regulated by National Programme on Organic Production. Currently it has 18 accredited certification agencies, which are responsible for the certification process. Besides certification, the government has also launched various initiatives to promote organic cultivation across the nation.



Market Network of Organic farming

Market Network Organic farming has a place where there is a market to accept the produce at a higher price as the growing interest in organic farming practice is due to an expectation of higher premium for organically produced farm commodities. The basic focus of Organic farming should be first to produce a farm products for the home (domestic) market and second for the export market. Global Scenario of Organic Farming In approximately 100 countries of the world, organic farming is being practiced and the area under organic management is continuously growing. As per the survey of SOEL (Foundation Ecology and Agriculture i.e SOEL-2015-16) indicates that currently more than 26million hectares of farmland are under organic management worldwide. The increase is almost 10% as compared to previous year. The maximum organic area is lying with Australia (11.3 million ha.) followed by Argentina (2.8 million ha) Standard Globally there are more than 60 standards which include IFOAM basic standards, CODEX Alimentations Commission guidelines, EU Regulation 2029/91, NOP of USA etc. The current (2015-16) world organic market is estimated at over us \$ 26 billion cultivated on a total area of around 24 million hectares worldwide. It will reach 31billion US \$ by 2016-17. Premiums on most organic products range between 35-100%. Organic products are almost entirely (over 95%) consumed in developed countries. The major producers and importers of organic products are EU, USA and Japan. Categories of major organic products include fresh fruits and vegetables (non-tropical and tropical), cereals (wheat, rice, com, maize), coffee, tea, cocoa, spices, herbs, oilseeds, pulses, milk product, honey, meat, edible nut, semi processed fruits etc.

As demand for organic food is high in the first world and India has been trying to make their presence in export markets and has doubled its export figures from INR 11.6 billion (EUR 160 million) in 2012-13 to INR 21 billion in 2014-15; however the vast domestic organic market remains largely untapped.Over the time, India has emerged as a leader in exports of organic tea, basmati rice and cotton. Its main export markets for these organic products are the US, EU, Canada, Switzerland, Australia, New Zealand with the South-East Asian countries, West Asia, South Africa also emerging as important markets. However, India's market share in the global organic market remains at 0.6 pc. But experts believe that with its huge soil, agro-climatic diversity and large areas with low fertiliser and pesticide usage, India has a huge potential for organic farming. Some states, like Sikkim and Arunachal Pradesh in the North East, have declared themselves to be completely organic and free of chemical fertilisers or pesticides in farming, thus making every farm in the state an organic farm. This trend has since been adopted by a number of other smaller states, Nagaland and Meghalaya in the North East and Uttarakhand in the central Himalayas, on the western border of Nepal.

Global market of India's organic products

Organic products are grown under a system of agriculture without the use of chemical fertilizers and pesticides with an environmentally and socially responsible approach. This is a method of farming that works at grass root level preserving the reproductive and regenerative capacity of the soil, good plant nutrition, and sound soil management, produces nutritious food rich in vitality which has resistance to diseases. India is bestowed with lot of potential to produce all varieties of organic products due to its various agro climatic regions. In several parts of the country, the inherited tradition of organic farming is an added advantage. This holds promise for the organic producers to tap the market which is growing steadily in the domestic market related to the export market. According to a report by Yes Bank, a private Indian bank, India's organic food sector is estimated at INR 27 billion (about EUR 370 million), less than one percent of the global organic food market estimated at about EUR 82 billion in 2015. The bank goes on to say that by the year 2025, Indian organic food business could reach INR 750 billion (EUR 10 billion), a manifold growth from the current level.

As per available statistics, India's ranks 15th in terms of world's organic agricultural land (Source: FIBL and IFOAM Year Book 2015). The total area under organic certification is 5.71 million hectares, which includes 26% cultivable area with 1.49 million hectares and the remaining 74% (4.22 million hectares) is forest and wild area for collection of minor forest produces. According to Yes Bank, amongst the large states, the ones with the largest acreage under organic farming including the forests are Madhya Pradesh (1.93 million hectares), Himachal Pradesh (1.37 million), Rajasthan (480,000), Maharashtra (220,000) and Uttar Pradesh (110,000). Among the crops, cotton is the single largest crop accounting for nearly 40% of total area followed by rice, pulses, oilseeds and spices. India is the largest organic cotton grower in the world and accounts for 50% share of total world organic cotton production.

India produced around 1.35 million tonnes (2015-16) of certified organic products which includes all



varieties of food as well as non-food products. The total volume of export during 2015-16 was 263687 tonnes. The organic food exports were worth around EUR 270 million.

In many ways, organic food is still a niche concept in India. Current domestic organic product sales are estimated at around EUR 180 million annually, but it is a rapidly booming segment, with an annual growth rate of almost 40%. With growth, the sector is also becoming organised, with several cooperatives such as Navdanya in Uttarakhand taking the lead in convincing farmers to go organic and then helping them in selling their produce at a relatively good price in markets all over the country. There are several other Self Help Groups (SHGs) and farmers' cooperatives that are actively involved in this initiative. Of course, the food producing companies have, too, turned to tapping this lucrative segment. The report by Yes Bank says that the Indian organic foods industry presently is metro-based, with about 95% of the brands existing in top 10 metros like Delhi, Kolkata, Mumbai, Pune, Chennai and Bengaluru. But the potential exists around the nation.

Production

India produced around 1.35 million MT (2015-16) of certified organic products which includes all varieties of food products namely Sugarcane, Oil Seeds, Cereals & Millets, Cotton, Pulses, Medicinal Plants, Tea, Fruits, Spices, Dry Fruits, Vegetables, Coffee etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc. Among all the states, Madhya Pradesh has covered largest area under organic certification followed by Himachal Pradesh and Rajasthan

Exports

Organic farm production and trade has emerged as an important sector in the world in general and India in particulars, and is seen as an important strategy of facilitating sustainable development. The organic management area in India is increased by about 26 folds in last seven years. The top organically managed commodities produced are cotton, cereals, rice, pulses, fruits and vegetables, tea, oilseeds, coffees etc. The Madhya Pradesh stood first (2.86 million ha) in organic farming registered area (including wild area) in 2015-16, while Gujarat ranked eighth. The total volume of export during 2015-16 was 263687MT. The organic food export realization was around 298 million USD. Organic products are exported to European Union, US, Canada, Switzerland, Korea, Australia, New Zealand, South East Asian countries, Middle East, South Africa etc. Oil seeds (50%) lead among the products exported followed by Processed food products (25%), Cereals & Millets (17%), Tea (2%), Pulses (2%), Spices (1%), Dry fruits (1%), and others. The export market for organic food in India is valued at Rs. 1,866 crores includes basmati rice, pulses, tea, coffee, spices and oil seeds; and is growing at compound annual growth rate of 49% in last four years ending 2016-17. The volume of organic products export was 1,47,800 metric tonnes during 2016-17.

Future prospects

Although, commercial organic agriculture with its rigorous quality assurance system is a new market controlled, consumer-centric agriculture system world over, but it has grown almost 25-30% per year during last 10 years. In spite of recession fears the growth of organic is going unaffected. The movement started with developed world is gradually picking up in developing countries. But demand is still concentrated in developed and most affluent countries. Local demand for organic food is growing. India is poised for faster growth with growing domestic market. Success of organic movement in India depends upon the growth of its own domestic markets. India has traditionally been a country of organic agriculture, but the growth of modern scientific, input intensive agriculture has pushed it to wall. But with the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only address the quality and sustainability concerns, but also ensures a debt free, profitable livelihood option.

Conclusion

Organic farming is leading concept of sustainable agriculture development and with better farming scientific techniques can improve the productivity of organic farming. Presently, chemical use in farming is creating various types of health problems and degradation in natural resources. In Indian context, organic farming development is based on export oriented products because of developed countries are a good market for organic products. The main region of the organic products emerging as export oriented products is unfriendly with use of organic products in Indian. In future the expectation of the development of the organic will increase and consume effectively in international market as well as domestic market.



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Lead Paper - II

Impact assessment of agricultural research: scope and methods

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Introduction

In view of shrinking resources and the increasing need for accountability in their uses, there is now a much greater demand not only for demonstrating the actual impacts of research but also for maximizing impacts through targeting research benefits. There has been an increasing pressure to direct agricultural research towards the needs of disadvantaged groups, small farmers and the rural poor. Hence, there is a need for greater institutionalization of research impact assessment with a better understanding of the links between agricultural technology and rural welfare. Impact refers to the broad, long-term economic, social and environmental effects resulting from research, which may be anticipated or unanticipated, positive or negative and at the level of the individual or the society. Hence, impact assessment of research has now been viewed as an important activity to ensure accountability, credibility and capacity to learn from previous experiences (Manyong et al., 2001). In other words, impact assessment should be an integral component of agricultural research process wherein in it helps to define research priorities and facilitate resource allocation among commodities, research programs, projects etc. The scope and methods of impact assessment have evolved over a period of time; and greatly influenced by research mandates and time/cost involved. The earlier impact studies were mainly centered on adoption of new crop varieties or inputs in the 1970s & 1980s. Subsequently, the focus of impact assessment activities has expanded to estimation of return to research investments to a wider range of impacts, including social and environmental benefits and costs and also the distribution of benefits and costs across different groups/gender/regions etc. The choice of impact assessment methods also demands a clarity and share (Anderson, 1997). However, much of the research products including social science research are not embodied in tangible inputs, but are in the form of natural resource management, crop protection and post-harvest recommendations. Some examples of these improvements are better information on the most suitable inputs, improved management techniques such as methods and levels of application of inputs, and improved cultural practices. As the horizon of agricultural technology development started expanding from increasing food production to the broader aims of increasing social welfare, both technology development and studies of its impact become more complex and data intensive. Hence, both qualitative and quantitative information and methods are needed to assess the diverse dimensions of impact. Moreover, it is also important to examine the context in which new technologies are adopted for a better understanding of the impact of agricultural research on broader definitions of social outcomes.

Impact assessment, being a continuous process, is better conceptualized as a cycle involving different types of impact studies at different stages of technology development. Four stages of impact assessment constitute the impact cycle, viz. priority setting (i.e., ex ante impact), on-farm technology evaluation, adoption, and *expost* impact. These different types of impact studies are though distinct in nature but play complementary roles in the technology development and dissemination process. Impact evaluation approach uses both qualitative as well as quantitative methods. Qualitative analysis not only seeks to gauge potential impacts of the research, but also the mechanisms of such impacts as well as extent of benefits and distribution of benefits among the beneficiaries based on in-depth and group-based interviews. Ouantitative methods cover ex ante and ex post approaches. *Exante* evaluation predicts research impacts before the intervention of technology, and estimates the expected returns from current research efforts. Hence, the *ex ante* analysis can help in refining programs before they are actually implemented, as well as in forecasting the potential effects of programs in different economic environments (Alston et al. 1995). After defining research priorities, researchers could conduct the on-site development of new crop varieties, crop and natural resource management practices, or pest management practices. These technologies will then undergo on-farm testing with the farmers' participation. On-farm testing is useful for evaluating technologies in a more realistic range of conditions than is available on-station. Hence, the acceptability and profitability of the technology developed may be adjudged before they are promoted at a larger scale. On-farm trials are also important for obtaining realistic input-output data for cost-benefit analysis. Once technology is released for commercial purposes, adoption studies need to be conducted to measure the extent of use of the technology, the performance of the technology, changes in farm management practices induced by the new technology etc. Farmers' perceptions of the technology regarding important constraints, desirable traits, and management practices are very useful in further refinement and mid-



course corrections. At the end, *ex post* impact evaluation is done based on actual data gathered after technology/ program intervention which measure actual impacts accrued by the beneficiaries because of the research. *Ex post* evaluations require collecting data on actual outcomes for beneficiary and non-beneficiary groups, as well as on other accompanying social and economic factors that may have determined the course of the intervention.

The impact assessment exercise is a data-intensive activity. Collecting appropriate data is the most time-consuming and costly component of conducting impact assessment. If impact assessment is to become an integral part of the research process in agricultural research, it is important that an appropriate data system be institutionalized within the research system. Institutionalizing a data system also ensures that the information generated by research is available in a systematic and timely manner and is retained for future use. This ensures that the information generated by research by research is available in a systematic and timely manner and is retained for future use. This ensures that the information generated by research is available in a systematic and timely manner and is retained for future use. Social scientists should take the lead in designing and conducting sample surveys, whereas biophysical scientists gather relevant data as they carry out the onfarm experiments with farmers through direct observations of practices and discussions with participating farmers. A key issue is the role of baseline and panel surveys to provide data on benchmark-related household variables as the basis for adoption and impact. Many types of impacts can only be adequately assessed if relevant baseline data exist, and surveys preferably of the same households, are undertaken over-time to monitor changes in farmers' practices. Having a panel of the same households allows regular monitoring of the changes in key farm practices and productivity indicators related to the most important types of research outputs.

Depending on purpose and availability of resources, impact analysis can be done from a range of methods which include scoping methods (e.g., checklists), qualitative analysis (e.g., focus groups), quantitative analysis (e.g., life-cycle assessment, modelling), comparison of options (e.g., cost-benefit analysis) etc. A number of methods are also available to address the fundamental question of the appropriate counterfactual and problem of attribution. These methods, include randomized evaluations, matching methods, specifically propensity score matching (PSM), double-difference (DD) methods, instrumental variable (IV) methods, regression discontinuity (RD) design and pipeline methods, distributional impacts, structural and other modeling approaches etc. Each of these methods carries its own assumptions about the nature of potential selection bias in program targeting and participation, and the assumptions are crucial to developing the appropriate model to determine program impacts.

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Lead Paper - III

Strategies for doubling farmers' income

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Introduction

griculture is the backbone of Indian economy contributing 14.2 per cent to the Gross Domestic Product, around 50 per cent workforce depend on agriculture for livelihood and about 70 per cent of population is still directly or indirectly dependent on agriculture despite of structural change taking place over the years (Arjun, 2013). It is also important source of raw material and demand for many industrial products, particularly fertilizers, pesticides, agricultural implements and a variety of consumer goods which contribute significantly to the exports. However, the growth of agriculture over a period of time remained lower than the growth in non-agriculture sector. Agricultural development is an essential condition of economic growth for developing countries like India, higher agricultural growth will also lead to faster increase in household incomes, giving rise to greater demand for goods and services in rural and urban areas alike, which would generate employment (Rakesh, 2006). Agricultural growth can contribute strongly to poverty reduction, mainly because of its demand linkages and because agriculture and related activities tend to be more labour intensive and less import intensive than manufacturing activities. Increasing of agricultural output through higher productivity has been an important goal in developing countries (Chavas, 2006). India's record progress in agriculture over the past four decades has been seen quite impressive. Now, new technologies are needed to push out yield frontier, utilize inputs more efficiently and diversity to more sustainable and higher value cropping patterns. At the same time there is urgency to better exploit potential of rainfed and other less endowed areas if we are to meet targets of agricultural growth, poverty alleviation and double farmers' income as target set by Prime Minister by 2022. As per the study, from the empirical evidence related to the very low proportion of gross irrigated area as compared to gross cropped area, we found that gross cropped area increased to some extent in the various areas during the previous periods but there is need for expansion of irrigation facilitates in order to increase the share of agriculture sector in the economy also to enhance farmers' income. There are also evidences in recent past that rainfall pattern had variations and was not satisfactory during the last three decades. Therefore, there is need of water shed management in the rain fed areas in order to overcome the deficiency of soil moisture and decline resource and technological constraints which will definitely increase farmers' income.

Farming System Approach

Due to the rapid increase in the population and the decrease of agricultural land, no single farm enterprise is likely to be able to sustain the small and marginal farmers without resorting to integrated farming systems for the generation of adequate income and gainful employment year round (Mahapatra, 1994). In view of the decline in per capita availability of land from 0.5 ha in 1950-51 to 0.15 ha by the turn of the century and a projected further decline to less than 0.1 ha by 2020, it is imperative to develop strategies and agricultural technologies that enable adequate employment and income generation, especially for small and marginal farmers who constitute more than 80 per cent of the farming community (Jha, 2003). To meet the multiple objectives of poverty reduction, food security, competiveness and sustainability, several researchers have recommended the farming system approach to research and development.

There are various potential enterprises which are important in farming system in the way of making a significant impact on farm by generating adequate income and employment and providing livelihood security. Dairy farming adds to the income of farmers, particularly when the land holding are small. This sector is highly livelihood intensive and provides supplementary incomes to over 70 per cent of all rural and quite a few urban households. Goat and sheep rearing can add to the income of farmers as they have the capability to sustain in different kinds of environments, including dry, hot, wet and cold, high mountains or low lying plains. In addition to the above given components, there are other ventures of great importance in the farming system that need very low investment. Poultry is one of the fastest growing food industries in the world. Poultry meat accounts for about 30 per cent of the total meat consumed worldwide and its per capita consumption has nearly quadrupled since the 1960s. (Anonymous, 2010). Apiculture is a subsidiary occupation and it is an additional source of income for farm families. It requires low



investments and so can be taken up by small, marginal and landless farmers and educated unemployed youth. An apiary with five bee boxes produces gross returns of Rs. 7500 per year (Kachroo, *et al.*, 2012). The optimization of the resources leads to the increase in the income as well as employment generation. One of the study shows that the benefit cost ratio in livestock based farming systems was greater than cereal based farming systems, while as that of fruit based farming systems had highest benefit cost ratio indicating the more economic viability of such farming systems.

Role of Technical Efficiency

Technical efficiency is the effectiveness with which a given set of inputs is used toproduce an output. A farm is said to be technically efficient if a farm is producing the maximum output from the minimum quantity of inputs, such as labour, capital and technology. For example, a farm would be technically inefficient if a farm employed too many labourersthan was necessary. We can say, technical efficiency refers to the ability of the farm to achieve the maximum possible output with available resources, whereas allocative efficiency refers to the ability to obtain optimal allocation of given resources. Astudy indicates that the comparison of yield differences of maize crop between research farms (3.7 tonnes/ha) and farmers field in the study area (2.1 tonnes/ha) was realized to be (1.6 tonnes/ha) and between demonstration field (3.4 tonnes/ha) and farmers field (2.1 tonnes/ha) was found to be 1.3 tonnes/ha. It thereby, indicate that the existing potential is yet to be realized. It is possible to exploit the potential yield by applying and rearranging the existing level of input use. For that matter, technical inefficiency may be attributed to be one of the factors responsible for low yield at farmer's field, because changes in productivity occur due to changes in technology. Thus, the identification of the factors responsible for enhancing maize productivity should receive considerable attention.

Available evidences in the last few years revealed that technological package via efficient utilization of scarce resources which have alternative uses may accelerate the pace of crop production. It is therefore, necessary to quantify current levels of technical efficiency so as to estimate losses in production that could be attributed to inefficiencies due to differences in socio-economic characteristics and management practices. A detailed examination of the farm efficiency in terms of technical, allocative and economic efficiencies for increasing productivity in a resource poor states is equally important. Thus, one way of reducing the cost of production is to increase farm output by increasing technical efficiency. Economic efficiency is the combination of both the technical and allocative efficiencies. The measurement of economic efficiency is thus not complete without a study of technical efficiency and it is the frontier production function that enables the measurement of technical efficiency of farmers (Elsamma and George, 2002). Thus, the identification of the factors responsible for enhancing crop productivity demands considerable attention. Apart from its manifold uses in terms of households and industries its production per unit input use per unit time and area needs to be increased. The technological adoption index is very poor and 49 per cent of the farmers in one of the study area of J&K state were low technology adopters. High costs involved inputs mainly, quality maize seeds, fertilizers, pesticides and micronutrients needs attention. Hence, financial assistance has to be given to farmers to purchase inputs. Furthermore, a government agency may be set up to procure the crop produce or any other institutional arrangement like contract farming may be initiated to assure the farmers about the marketability of their produce. The technical efficiency in one of the study indicated that there is about 48 per cent potential for increasing the gross income of the farmers with existing levels of farmers' resources and technology, if the gap between the actual and potential yield is narrowed, the production frontier may be pushed further outward. This will help to increase not only the national pool of crop production but also increase the farmers' income considerably.

Seed Replacement

Seed replacement is very important factor for doubling farmers' income as adoption of quality planting material and seed is a challenge. Moreover, sale of quality seeds and planting material is primarily done by private companies and are costly. So these quality material needs to b made available to farmers easily and at affordable prices. See replacement ratio needs to be increased with the replacement of superior one with traditional or local one. Government should take initiative to provide certified and foundation seed. Farmers training programme can be organized for making them aware about seed production technology and procedure. Due to huge demand supply gap, India suffers from a dismal seed Replacement Ratio. Currently, only around 15% of India's total cropped area is planted with freshly obtained quality seeds every year. A huge 85% area is sown with farm saved seeds. This ratio varies from crop to crop between 7% in staple crops to maximum 70% in some vegetables and fruits. For wheat and rice, it is between 9 to 18%. It has been noted that that enough seeds are available for fruits, vegetables, flowers and high value/



costly seed crops but not enough seeds are supplied in case of low value and high volume crops such as rice, wheat. For crops such as wheat; this ratio must be between 20-30%. For oilseeds and pulses; this ratio must be between 20-100% and for some crops such as Hybrid cotton, it must be 100%. Without achieving the optimal seed replacement ratio, any efforts to get expected yields will be futile. This in turn will create hurdle for enhancing the farmers' income. The national average of seed replacement rate has been above 25% while the J&K State is pursuing its efforts to consistently achieve the desired level of Seed Replacement Rate (SRR) in case of High Yielding Varieties of major crops. The limitation of availability of breeder and foundation seeds is also a contributory factor. The desirable SRR level 25% for self pollinated crops, 35% for cross pollinated crops and 33% for self pollinated crops. Therefore, increase in seed replacement ratio and use of certified seeds will definitely help in doubling the farmers' income.

Cropping Intensity

Cropping intensity refers to raising of a number of crops from the same field during one agricultural year. It is the ratio of gross cropped area to the net cropped area and the ratio at national level is 142 per cent with an increase of 25 per cent only since independence. This implies scope to increase cropping intensity in the different states so at national level. It is to be increased if income of the farmer is to be increased. Farmers must be encouraged to grow multiple crops during all the seasons and also cultivate whole agricultural land available with them without making even a small piece of agricultural land fallow. For that matter a team of experts can be made which will suggest the farmers about irrigation technologies and also about the crops to be grown during different seasons. Now a days number of innovative farming techniques are available without competition between crops for resources. Now the time has come to implement those techniques in farmers' field so that he will enjoy better returns for his crop and this will definitely increase his income.

Crop Diversification to Increase Farmers' Income

Crop diversification is one of the most cost effective and assured means to increase farmers' income. But the problem is that the awareness about such kind of activities is still low among farmers. Farmers should diversify to cover losses, if any, from crop failures or decrease in market prices. High value crops, short duration and less water requiring crops should be considered by the farmers to grow. Moreover, there is increasing trend for all these type of crops at national level but the important point is that we have to link the produce with the market so that better returns will be obtained from that particular crop. Nature of diversification-led growth recent research on the sources of growth in India's crop sector has shown that crop diversification in favour of High Value Crops has consistently made a significant contribution to the overall growth of the crop sector over the last three decades. Birthal et al. (2013) have decomposed the growth of the crop sector, attributing it to various factors including area, yield, price, diversification and the interaction term. They argue that the role of technology (via yield increase) was dominant in the 1980s, declined in the 1990s, and regained prominence in the first decade of the twenty-first century. The contribution of crop diversification to the growth of the crop sector over these periods has been to the extent of 26.3 per cent, 33.3 per cent and 31.2 per cent, respectively. Birthal et al. (2013) have also presented the results by region. It may be observed that crop diversification has contributed the most to the growth of the crop sector during the period 2000-01 to 2009-10 in the southern region (48.6 per cent), followed by the eastern (42.1 per cent), western (37.9 per cent) and northern (26.2 per cent) regions, in that order.Birthal, et al. (2013) have also noted that diversification into production of fruits and vegetables, in general, and vegetables, in particular, is likely to benefit the small and marginal farmers more than the medium and large farmers for the following reasons:

Marginal and small farmers tend to allocate a large proportion of their holdings (7.5 per cent and 6.3 per cent, respectively) than the medium and large farmers (3 per cent and 4.8 per cent, respectively).

ii. Small farms enjoy a greater comparative advantage in the cultivation of vegetables than medium and large farms as vegetable cultivation is more labour-intensive than fruit cultivation. The cultivation of vegetables also needs much less capital than fruit cultivation.56

The cultivators of High Value Crops (including horticultural crops) within farm size groups tend to exhibit a lower incidence of poverty than cultivators of other crops.

Relative profitability of horticultural crops Since the mere shifting of the area under horticulture may not necessarily help augment farmers' income, it is also imperative to assess the relative profitability of horticultural crops vis-à-vis the competing crops in the context of the interplay of several relevant factors such as yield, prices of competing crops, and climatic conditions, among others. The sustained promotion



of cultivation of high value fruits and other horticulture along with improvement in infrastructure can help enhance farmers' income at national level. Low elasticity of cultivation is also observed in some of the relatively high productivity areas such as Haryana and Punjab. This also does not necessarily mean that these states should not reduce the area under wheat-paddy rotation in favour of horticulture. In fact, it has been observed that wheat-paddy rotation has led to environmental degradation in the form of soil erosion, deficiency of soil nutrients, and lowering of the ground water table in these states. It is, therefore, imperative to ensure diversification into horticulture in these states by offering suitable incentives to farmer.

Role of ICT for Weather information and market information

ICT is very useful to help farmers to get the information about the location specific weather and crop advisory data so that they can prepare themselves about any uncertainty. In India, whole agricultural systems are under climate challenges viz dry spells, unexpected rainfall, flood, drought etc. Moreover net area sown in India is having very less reliable access to irrigation facilities. Moreover this problem is increasing as climate is having frequent variations. Here ICT can play a major role in tackling such type of situations which will definitely help farmers to reduce their losses and increase income. For promotion of ICT among farmers, government can organize training programmes for promotion of mobile application based information services. ICT is also useful in giving information about prevailing prices of commodities in the market. It plays a major role in price discovery and transparency of agriculture commodities and produces.

A broad vision marketing policy is essential to smooth the progress of efficient functioning of agricultural markets and their management especially for states where a single regulated market is not available. In this context, reliable mechanisms for generating vision on key points and constraints such as marketing cost, price spread, transportation facilities, retail markets, credit facilities, storage facilities, removal of malpractices, etc of important agricultural commodities forms an essential basis for marketing policy. In nut shell, the results on the above aspects obtained from the marketing analysis indicates that direct marketing i.e. from producer to consumer is always found to be efficient as producer's share in consumer's rupee has been worked out to be highest than other channels having presence of intermediaries. Thus, the efforts for establishing regulated market or providing all the help to the growers for entering into direct market by providing the market information services and establishing primary and secondary wholesale markets. The government should also encourage the policies which will check the inadequate length and undue influence of intermediaries in the distribution of agricultural commodities. As far as J&K is concerned, it is to mention that inspite of area of 222236 sq. kms in J&K; we are having only one primary wholesale market and twenty one non-regulated markets. We are having markets only notified under Sec (8) of APMR act. Moreover, there is no secondary market in J&K whereas our neighboring state Punjab with and area of 50362 sq. kms only is having 151 primary and 300 secondary wholesale markets. For the proper marketing of the produce, new cooperative marketing societies needs to be formed and old ones to be re-established, which will further ensure the marketing opportunities of the produce.

Farmers should themselves take initiative of marketing their produce by making a small group of 20 to 25 farmers. Atleast one member of the group should daily accompany the trucks with produce to market and himself watch the selling procedure in the market. This will definitely help them to get better price for their produce and moreover middleman (commission agents/ arhatiyas) will not be able to cheat them. Since the effects and encouragement of different policies will be broadcasted efficiently to all regional markets in an well integrated market system, the government could promote growth in production and guarantee price stability with lower costs of operation by correctly designing price policy and rationalizing its activities and also permitting private traders to contribute as much as possible in the markets. Consumers will also be benefited, as the well-integrated market ensures availability of food commodities and stability in prices at the regional level. The degree of market integration depends not only on agricultural policy reforms but also on the level of transaction costs determined primarily by transport facilities, storage facilities, and contract enforcement mechanisms. The government could promote agricultural growth and ensure stability in prices by limiting its direct intervention in the agricultural markets, but increasing its attention to improve physical and institutional infrastructures.For small and marginal farmers, marketing of their products is main problem apart from credit and extension. In recent years, there has been some form of contract arrangements in several agricultural crops such as tomatoes, potatoes, chillies, gherkin, baby corn, rose, onions, cotton, wheat, basmati rice, groundnut, flowers, and medicinal plants. There is a silent revolution in institutions regarding non-cereal foods. New production market linkages in the food supply chain are: spot or open market transactions, agricultural co-operatives



and contract farming (Joshi and Gulati, 2003). Contract farming in India as so in J&K is neither backed up by law nor by an efficient legal system. This has to be strengthened as legal system is the single most constraint to widespread use of contract farming in India which will definitely increase farmers' income. There is a need to revamp some of the legal hurdles for agro processing and APMC Act. Several State Governments have already amended their APMC Acts allowing varying degrees of flexibility. However, several States including J&K are yet to notify the relevant rules that would make the amendment fully operational. These steps should be speedily completed to provide a boost to promotion of direct marketing, contract farming, and setting up of markets in private and co-operative sectors (Dev, 2012).

Most important problem for the farmers is output price fluctuations. There is a big gap between producer prices and consumer prices. There are different models for marketing collectively by the small and marginal farmers. These are: self help group model, cooperative model, small producer co-operatives and contract farming. Apni Mandi in Punjab, Rythu Bazars in Andhra Pradesh, dairy co-operatives are some of the successful cases in marketing. The real challenge lies in organising the small and marginal farmers for marketing and linking them to high value agriculture. Thus, group approach is needed for getting benefits from marketing (Dev, 2012). Training of farmers and traders on Post Harvest Handling, Supply Chain Management and Marketing should be done frequently and more effectively through bodies like NIAM, MANAGE, DMI, SAMETI etc (Anonymous, 2011). Integrated approach so as to build strategic linkages between extension bodies at the grass roots like KVK and Market yards so that grading, training, market information and good marketing practices can be handled by KVK at block level and farmers have more than one reason to visit KVK to avail marketing information (Anonymous, 2011).

Storage facilities

Value chain after post-harvesting is a important part which ultimately determines the returns received by the farmers. These post-harvest methods needs to be modernized because farmer is still using traditional and unscientific processes of value addition. Storage facility available for the produce must be scientific which only will increase shelf life of the product and thereby decrease losses. Therefore, it is important to provide scientific storage facilities at post-harvest level to received better price for the products. Storage capacity needs to be increased also and utilization of the same should be 100 per cent. Cold storage facilities are to be provided also and for that matter private players can also join.

Doubling Farmers' Income: The Way Forward

Doubling of the incomes of farmers in nominal terms has already been happening in recent periods and it is no challenge. Doubling the income in six years, in real terms, however, is a formidable challenge and needs large scale revamping, reorientation and innovation in the initiatives. Farmer's income can increase through increasing total output and their prices, reducing production costs through lowering input use and/or reducing input prices, diversifying production mix towards more remunerative enterprises and providing earning opportunities in non-farm sector. Apart from the traditionally known risks to farmers climate change is an additional risk factor that can cause loss of farm income. Apart from this, access to good physical, economic/financial, social infrastructure such as marketing and processing facilities, godowns and cold storage capacity, banking network that can provide much needed capital, educational, medical facilities and training facilities for imparting skills that market demands is important. For it would enhance the productive capacity on farms, help farmers realise better prices, reduce wastage, enhance shelf life, adopt better technology, meet capital needs and improve quality and quantity of livelihoods and improve employability on better terms. Risk coping and mitigation through various mechanisms including insurance would also help cover loss of income (www.researchgate.net)

The way forward should include following steps:

- Facilitation of farm clusters
- Extension services to farmers
- Value addition
- Market Information
- Optimum use of available resources
- Use of ICT
- Knowledge of e-NAM
- Credit facilities
- Promotion of crop diversification
- Adoption of modern technologies



Possible solution for the same is evolving a clear cut future farm policy. Secondly to align technology with partner institutions and improved & innovative farm management practices. Another suggestion is to redefine agricultural business models to make agriculture and animal husbandry profitable. Public-private-partnerships in areas of contract farming, GM crops, hybrid seeds, poultry and dairy, agribusiness and farm to retail supply chain solutions, through reducing number of middlemen. Crop insurance, linked to financial inclusion, and Aadhaar, should be made user friendly and it should be practically implemented (Sabharwal, 2016).

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Oral Presentations

MSAEJMU-01 Impact of improved production technology of paddy in Maharashtra R.B. Hile, D.B. Yadav and D.J. Sanap

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The present investigation was carried out to analyze the impact of production technology of paddy in Maharashtra. The study was based on primary data collected for the year of 2013-14. State as a whole, per hectare Cost 'C' was worked out to Rs. 47,652.48 and with its B: C ratio was 1.27. Per hectare cost of production has increased with the increase in technology adoption however, per unit cost has decreased with increase in technology adoption. Further; there was a 19.07 per cent yield gap between actual yield and yield of demonstration plot. The composite index of technology adoption was 49.89 per cent, which indicated that the sample farmers adopted less than 50 per cent recommended paddy production technology and obtained 36.01 q/ha yield. The contribution of different components on impact of paddy production technology for paddy production technology. It indicates that, the farmers should adopt the improved production technology for paddy to the fuller extent for maximizing returns and minimizing per unit cost. The study revealed that the farmers were not fully aware of some of the components of improved paddy production technologies. Therefore, the efforts are required to be made to intensify extension education activity to increase awareness among the paddy growers so as to accelerate the process of adoption.

Keywords: Production function, yield gap, decomposition model, adoption index, impact

MSAEJMU-03

Adoption and impact of production technology of paddy in Marathwada region of Maharashtra

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he study revealed the adoption and impact of production technology of paddy cultivation in Marathwada region of Maharashtra for the year 2013-14. The study is based on costs and returns structure, production function analysis, resource use efficiencies, yield gap analysis, adoption index and impact of improved paddy technology have been estimated in the study. It has been found that per hectare cost 'C' was ₹ 35,801.52 and BCR is 1.14, whereas, per quintal cost of production was ₹ 1,145.57 at the overall level for improved paddy cultivation methods. Further, there was a 19.97 per cent yield gap between actual yield and demonstration plotyield. The composite index of technology adoption was worked out to 38.62 per cent indicated that the sample farmers adopted less than 61 per cent recommended paddy production technology and obtained 28.10 q/ha yield. The contribution of different components on impact of paddy production technology in Marathwada region, net returns was maximum (49.91 per cent). The added yield was 6.98q/ha over the local and improved method of adoption. Thus, for producing extra vield per hectare costs were also increased $\overline{\xi}$ 7,154 and added returns were also increased $\overline{\xi}$ 9,756.80. The ICBR ratio indicates that the high adoption of improved production technology adopter farmers were in profit with 1.36 ICBR ratio. It indicates that, the farmers should adopt the improved production technology for paddy to the fuller extent for maximizing returns and minimizing per unit cost. Keywords: Decomposition model, aoption index, impact, ICBR ratio



Impact of major cropping sequences in Pune district of Maharashtra

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he present study was based on the primary data of 90 cultivators for the year 2013-14 spread over the six randomly selected villages of three tahsils. From each selected village, 15 cultivators, 5 from each size group viz., small, medium and large were randomly selected. Thus, total sample consisted of 30 farmers each of small, medium and large size groups. Out of existing sixteen cropping sequences three major cropping sequences viz., Pearl millet-Coriander-Rabi Onion cropping sequence (CS-I) is the dominant cropping sequence which is adopted by 21 farmers followed by Pearl millet-Rabi Sorghum (CS-II) by 20 farmers and Cauliflower-Rabi Potato-Fenugreek (CS-III) by 18 farmers, were selected for present study. Total employment generated was 390.93, 351.72 and 325.10 man days in cropping sequence I, II and III, respectively. Employment generated through crop production 28.19 per cent in cropping sequence I followed by cropping sequence III i.e. 20.25 per cent. The employments generated were more in cropping sequence I, includes crop such as Pearl millet, Coriander and Rabi Onion required more labours. The results of employment function of three cropping sequences indicate that the variables included in the model were number of earner, number of milch animal, area under vegetable, area under cash crop, gross irrigated area and gross cropped area. In all, six variables included in employment function have jointly explained 78.00 per cent, 70.00 per cent and 69.00 per cent variation for cropping sequence I, II and III, respectively. Highest annual expenditure spends on cropping sequences III was $\overline{315695.60}$ per farm which have major contribution by crop production and livestock activity (31.25 and 22.56 per cent share, respectively). Expenditure spends on cropping sequences I and II are \$298761.18 and \$241850.69. respectively.

Keywords: Cropping sequence, employment function, economics

MSAEJMU-06

Impact of Production technology of cotton in Vidarbha region of Maharashtra

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he study has assessed the economic analysis and impact assessment of production technology of cotton L cultivation in Vidarbha region of Maharashtra for the year 2013-14, based on the data of cost and return of crop. Apart from benefit-cost ratio (BCR), yield gap analysis, resource use efficiencies, adoption index and impact of improved cotton technology have been estimated in the study. It has shown that, per hectare cost 'C' was ₹ 42161.58 and B: C Ratio is 1.03. Further, there was a 31.58 per cent yield gap between actual yield and yield of recommended plot, in which cultural practices (10.62) have shown a stronger effect than input use (20.96). The composite index of technology adoption was worked out to 50.93 per cent indicated that the sample farmers adopted less than 49 per cent recommended cotton production technology and obtained 10.40 g/ha yield. Among, in medium adopters, the per hectare economic impact of cotton production technology on gross return, cost of cultivation and net returns was 6.53, 4.89 and 21.67 per cent. The most important constraint in improved method of cotton cultivation has been identified as high cost of seed, fertilizers and labour charges, lack of knowledge about fertilizers application, seed treatment small fragmented holding and low price to produce. The improved cotton production technology method being more skill oriented, the study has observed that yields can be made on adoption and impact sustainable if constraints are addressed on war-footing basis. Keywords: Cotton, impact, technology, economics



Impact of improved technology adoption for wheat in Maharashtra

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study has been carried out in 16 tahsils from 10 districts. From each selected tahsil one village having the highest area under wheat was considered for the study. On the basis of operational holding, 30 wheat growers were selected randomly i.e. 10 from each of the category of small, medium and large size farms. Thus, in all, 480 samples wheat growers were selected for the study. To assess the extent of adoption of improved crop production technology, the concept of technology adoption index was used. The resource use pattern, costs and returns was analyzed by using tabular method separately for up to 50 per cent and above 51 per cent technology adoption. It observed that area under wheat crop increased by 18.41 per cent within thirteen years. Production increased by 31.80 per cent and productivity also increased by 11.33 per cent. Uttar Pradesh has highest share in wheat production of India, followed by Punjab and Madhya Pradesh. Hundred percent farmers adopt medium to heavy drained soil, harrowing and 4-5 irrigations after 21 days. In case of small, medium and large group 97.92, 98.08 and 96.92 per cent farmers were total N users followed recommended seed use (87.50, 90.38 and 96.15 per cent, respectively), Total P users was 95.38 per cent in case of large group. Interculturing was 94.23 per cent in large group and total K users were 70.83, 80.77 and 84.62 per cent in case of small, medium and large group, respectively. About 90 per cent growers expressed that bio-fertilizers was not available for seed treatment. In case of chemical fertilizers 45 per cent of wheat growers indicated that it was costly and 21 per cent growers were facing the problems of finance at the overall level. The technology adoption index, other working capital, human labour, machine hours, N and P fertilizer nutrients together explained 85 per cent yield variation of wheat for above 51 per cent technology adoption, whereas 80 per cent variation shown by these variables in case of upto 50 per cent technology adoption. Thus, there is ample scope for expanding yield through crucial management in inputs and technology for wheat production. Immediate efforts are needed for evolving a breakthrough in the production technology of wheat for optimizing the use of different inputs to increase the productivity.

Keywords: Technology, impact, adoption, fertilizers

MSAEJMU-09

Impact assessment of paddy production technology in Konkan region of Maharashtra

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he study has assessed the economic analysis and impact assessment of production technology of paddy L cultivation in Konkan region of Maharashtra for the year 2014-15, based on the data of costs and returns of crop. Apart from benefit-cost ratio (BCR), yield gap analysis, resource use efficiencies, adoption index and impact of improved paddy technology have been estimated in the study. The cost 'C' was **₹** 49,393.85 and BCR is 1.41, whereas the cost of production was ₹ 1,069.78 per quintal at the overall level for improved paddy cultivation methods. Further, there was a 16.59 per cent yield gap between actual yield and yield of demonstration plot, in which cultural practices (11.58) have shown a stronger effect than input use (5.01). The composit index of technology adoption was worked out to 67.46 per cent indicated that the sample farmers adopted less than 30 per cent recommended paddy production technology and obtained 36.65 qtls/ha yield. The contribution of different components on impact of paddy production technology in Kokan region, net returns was maximum (44.22 per cent) followed by gross returns and main produce. The most important constraint in improved method of paddy cultivation has been identified as 'high cost of seed, fertilizers and labour charges, lack of knowledge about fertilizers application, seed treatment small fragmented holding and low price to produce. The improved paddy production technology method being more skill oriented, the study has observed that yields can be made on adoption and impact sustainable if constraints are addressed on war-footing basis.

Keywords: Production function, Technological gap and resource use gap



Impact of Front Line Demonstrations (FLDs) on the yield of pulses

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The concept of front line demonstrations in India was put forth under a "Technology Mission on Pulses" in 1991-92. The main objective of front line demonstrations is to demonstrate newly released crop production technologies and its management practices in the farmers' field under different farming situations and at different agro climatic regions by the Scientists. The study was carried out during kharif and rabi seasons in ten villages of district Bhiwani, Haryana during 2016-17. All 125 demonstrations on chick pea and green gram crops were carried out in area of 50 ha by the active participation of farmers with the objective to demonstrate the improved technologies of pulses production potential. The improved technologies consisting use of latest variety (MH 421 of green gram & CSJ 515 of chickpea), seed treatment with Chlorpyriphos 20 E.C. followed by Bayistin f.b. rhizobium and PSB culture, balanced fertilizer application, mechanical weed management, disease and pest management. The yield was recorded higher under Front Line Demonstrations as compared to farmer's local practice. The improved technology recorded higher yield of 1900 kg/ha and 1230 kg/ha than farmer practice 1200 and 710 kg/ha in chick pea and green gram, respectively. The improved technology gave higher net return (Rs. 49020/ha & Rs.34311/ha) as compared to farmer's practices (10580 & 8980) in chick pea and green gram, respectively and also showed better benefit cost ratio (1.98 & 2.18) under demonstrated plots than (1.24 & 1.33) respectively under both pulse crops.

Keywords: Frontline demonstrations, pulses, impact

MSAEJMU-12

Economics of agricultural development in Satara district of Maharashtra

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he economics of agricultural development in Satara District of Maharashtra was assessed for the year 1980-81 to 2012-13. The present investigation was intended to depict the process of agricultural development by way of studying the changes in the land use and crop pattern, growth rates in area, production and productivity of major crops and to identify the factors influencing agricultural production during the period from 1980-81 to 2012-13 in Satara District. The time series data covering the above period relating to the aspect of the study were collected from the published literature as well as from relevant sources. The data were analysed by adopting suitable analytical tools to arrive at the following results. The study brought an important fact that, the new technology available during post green revolution period help to improve the productivity of crops viz., wheat, kharif jowar, maize and gram. As a result, the rate of increase in the production of food grain was more in post green revolution period as compare to that in pre-green revolution period. It is concludes from the study that the factors have shown a significant positive association with the increase in the value of aggregate crop output in Satara district. The factors viz_{i} , percentage of gross irrigated area to gross sown area (X₁), percent gross sown area to net sown area (X_3) , amount of loan (short-term and medium-term) disbursed through SDCCB per year in lakh of rupees (X_6) and number of milch animals in numbers (X_9) have shown a significant positive association with the increase in the value of aggregate crop output in Satara district. The important policy implications made on the basis of the present investigation are maintaining forest area, adoption of multiple cropping, raising commercial crops, expansion of irrigated facilities, supply of fertilizers and proper supervision on the use of credit, the area expansion of HYV's may be properly supervised for its best utilization in agriculture. The agronomical and mechanical measures can be used for harvesting rainwater for development of agriculture in Satara district.

Keywords: Agricultural development, Satara, time series



Impact of vocational training programmes on income of the rural youths/farmers of hilly areas of Jammu & Kashmir, India

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rishi Vigyan Kendras (KVKs) also called as Farm Science Centres have been established by the Krishi Vigyan Kendras (KVKS) also cance as Faint Science Control India. The major thrust areas Indian Council of Agricultural Research (ICAR) in various districts of India. The major thrust areas of KVKs are assessment, refinement, demonstration of technologies and also to train the farmers and extension functionaries. Imparting vocational trainings in agriculture and allied sectors for the rural youth is one of the most important mandates of KVKs. The present study was undertaken to assess the impact various vocational training programmes imparted by KVK, Reasi in hilly districts Reasi and Udhampur of Jammu and Kashmir. Krishi Vigyan Kendra (KVK) imparts need-based and skill oriented training to increase the agricultural production and to create the employment for the rural youths/farmers. The rural youths not only required knowledge of the technologies but also skills in various agricultural and allied operations to increase their knowledge. The training programmes are designed to impart the latest knowledge to the farmers through work experience. The KVK provides the trainings not only in agriculture and allied vocations but also in other income-generating activities that increase the income of farm families. The present study was conducted in hilly districts Reasi and Udhampur of Jammu and Kashmir which was selected purposively as the KVK is catering the needs of the farmers of both the districts.428 trained rural youths/farmers were selected for the study purpose. Impact analysis was done to find out the increased income of the participants after training. Study revealed that vocational training programmes had a positive impact on the knowledge gained by the rural youths and there was increase in the income of the respondents after training. Rural youths responded that vocational trainings played an important role in developing their skills and also benefitted for their income generation.

Keywords: Krishi Vigyan Kendras, vocational trainings, rural youth, knowledge.

MSAEJMU-15

Economic assessment of adoption of production technology of paddy in Western Maharashtra region of Maharashtra

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he study has assessed the economic analysis and impact assessment of production technology of paddy L cultivation in Western Maharashtra region of Maharashtra for the year 2013-14, based on the data of costs and returns of crop. Apart from benefit-cost ratio (BCR), yield gap analysis, resource use efficiencies, adoption index and impact of improved paddy technology have been estimated in the study. The cost 'C' per hectare was Rs. 53768.55 and BCR is 1.25, whereas the cost of production was Rs. 1302.45 at the overall level for improved paddy cultivation methods. Further, there was a 16.08 per cent yield gap between actual yield and yield of demonstration plot, in which cultural practices (7.29) have shown a stronger effect than input use (8.79). The composite index of technology adoption was worked out to 61.60 per cent indicated that the sample farmers adopted less than 30 per cent recommended paddy production technology and obtained 38.00 gtls/ha yield. The contribution of different components on impact of paddy production technology in Western Maharashtra region, net returns was maximum (43.97 per cent) followed by gross returns and main produce. The most important constraint in improved method of paddy cultivation has been identified as 'high cost of seed, fertilizers and labour charges, lack of knowledge about fertilizers application, seed treatment small fragmented holding and low price to produce. The improved paddy production technology method being more skill oriented, the study has observed that yields can be made on adoption and impact sustainable if constraints are addressed on war-footing basis. Keywords: Technology, impact, adoption, cost concept, composite index



Impact of climate change on crop production

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The proposed study was undertaken with the aim to study impact of climate change on sorghum and paddy crop, for sorghum in Akola and Washim district and for paddy in Bhandara and Gondia district of Maharashtra state. In Akola district, cotton and other pulses were major crops of the district during 2000-2001 constituting 67.50 per cent of total cropped area but during span of 15 years the area under cotton reduced by 14 per cent and soybean emerged as of major crop occupying 43.50 per cent of gross cropped area of region. In Washim district, cotton and other pulses were major crops of the District during 2000-2001 constituting 66 per cent of total cropped area. but during span of 15 years the area under cotton and kharif jowar is reduced by 15.84 and 13.07 per cent respectively and soybean emerged as of major crop occupying 66.24 per cent of gross cropped area in the year 2015. There is very little crop diversification in Gondia district. In Bhandara district, cultivation of rice is sole and major constituent of the cropping pattern. This crop occupies around 82.54 per cent of gross cropped area in 2015. Keywords: Climate change, crop production, sorghum, paddy

MSAEJMU-25

Impact assessment of production technology of paddy in Nashik district

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Paddy (*Oryza sativa L.*) is one of the important cereal crops of the world and forms the staple food for more than 62 per cent of the world people. India is one of the leading rice producing countries of the world. The data was collected for the year 2014-15. The study covered 90 Paddy farmers, 15 each form small (Upto 0.20 ha), medium (0.21 to 0.40 ha) and large (above 0.41 ha) size groups, spread over six village of the Igatpuri and Trimbakeshwar tahsil of Nasik District. In kharif season paddy and nagali are the major crop which covered 25.66 and 12.87 percent area to gross crop area. Groundnut is major crop observed in all groups of the selected farmers. In rabb season Wheat occupied 25.35 percent of gross cropped area. In small and medium size group, wheat have dominated share of 28.27 and 25.35 percent respectively, while in large group, the share is only 22.42 percent. Factor share analysis interpret that, charsutri method showed highest contribution (i.e.32.84 per cent) on yield, followed by Urea (19.76 percent). Number of manures and patash shows nearly contribution of about 12.02 and 14.84 percent respectively. Intercultural operation, Planting distance, Transplanting time contributes about 8.09 percent, 6.08 percent, 2.43 percent respectively. The major constraint faced by all adoption levels farmers was costly chemical fertilizers, which expressed by 96.88 percent of low, 91.11 percent of medium and 96.88 percent of high adoption levels farmers. Next constraints conveyed by 89.03 percent of farmers were delay in availability chemical fertilizer on proper time. The majority of the farmers experienced the problems like high cost of key inputs and their non-availability at proper time.

Keywords: Technology, paddy, impact assessment, economics



Adoption status of the pesticide as per the label claims (Including Herbicides, Insecticides and Fungicides) by the gram growers in Vidarbha

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his study was carried out as University Research Review Committee Project for the year 2016-2017 in Akola, Buldana, Washim, Amravati and Yavatmal districts of Amravati division in Vidarbha region of Maharashtra. From each district one Tahsil is selected were gram crop had been cultivated by the majority farmers during 2016-17. From each selected Tahsil 4 villages were selected randomly and from each selected village 10 farmers were selected and interviewed randomly with the help of structured interview schedule. More than half (53.00%) of the farmers had used the own seed for sowing. The average per acre yield of gram crop of selected farmers was computed 6.18 quintals. A vast majority (98.50%) of the selected gram growers have not availed/enrolled the crop insurance facility in study area. Cent per cent selected farmers have used the pesticides during 2016-17 for the gram crop out of them 50.00 per cent farmers had purchased on cash. The majority 93.00 per cent selected farmers were found in low knowledge level about the label claim of pesticides. The results regarding the adoption status of pesticides revealed that large number of the selected gram farmers using insecticides and fungicides without label claim (Have not approved by CIBRC) for gram crop. That means these pesticides were registered for other crops by CIBRC, but farmers using these for gram crops. Lack of awareness about label claim and label is not readable are the important constraints expressed by majority gram growers. Extension functionaries may organized the awareness and training programmes for the farmers about the approved uses of pesticides and to display charts/ banners in villages indicating the list of crop and pest specific pesticides approved by CIBRC for information and use by the farmers are the important suggestions expressed by the majority (80.00%) gram growers.

Keywords: Insecticides, fungicides, label claims of pesticides, etc.

MSAEJMU-27 Impact of Government packages on livelihood sources of suicide prone farmer's families

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he present investigation was carried out in Akola, Buldana, Washim, Amravati, Yavatmal and Wardha districts of Vidarbha region of Maharashtra. From each district, 10 families were interviewed who lost their family head during 2001 to 2011. Thus, totally 60 families of suicide victim farmers were selected randomly from 46 villages, covering 9 Tahsils of 6 distressed districts of Vidarbha. The study revealed that majority of the selected families were having small to medium family size, 51.67 per cent were marginal dry land holders, moderate fertile land was observed with 55.00 per cent families, crop to crop farming system was noted with 83.66 per cent families. Annual income of 46.67 per cent families was noted between Rs. 20, 001 to 40, 000. Over half (58.33%) of the families have accrued the benefits from Government (State/P.M. Package). Out of the total 60 families, 31 (51.66%) families had accrued the benefits of milch animals from government package, out of them 16 (51.61%) families had sold the milch animals for either economic or non-profitable issues. About the other benefits accrued, the results revealed that well was dug by 11.67 per cent families, followed by power spray pump (8.33%), pipes (6.67%), hoe (3.33%), bullock pair (1.67%) and water pump (1.67%) were taken by the selected families and the quality of animals and all other items were good. Further, the results revealed that among 36.67 per cent families, livelihood sources were changed due to government help/packages. The lack of remunerative prices for the farm produce, high price fluctuations, erratic rainfall over the year and lack of irrigation sources were the severe problems perceived by the families for rural livelihood sustainability in Vidarbha. Keywords: Benefits accrued, distressed districts, government package, livelihood





Adoption status of soil testing by the farmers in distress prone districts of Vidarbha

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he present study was undertaken as Research Review Committee Project for the year 2014-15 in six L distressed districts of Vidarbha region in Maharashtra State. An exploratory design of social research was used for present study. A sample of 600 farmers as respondents were drawn from these six distressed districts and information obtained was considered for tabulation and analysis of data. The findings regarding respondents profile revealed that, 40.83 per cent of the respondents were in middle aged group, nearly one third (32.84%) per cent were educated upto high school level, 31.84 per cent of the respondents possessed small category of land holding and 77.33 per cent of the respondents had 'Agriculture' as main occupation. Above half (50.16%) of the respondents having above 20 years of farming experience and about 34.33 per cent of the respondents had annual income upto Rs. 50,000 per year. About 46.34 per cent of respondents have no source of irrigation. More than half (51.66%) of the respondents possessed moderate type of soil and 43.00 per cent of them follow seasonal cropping pattern whereas 77.50 per cent follow the crop rotation. About 85.00 per cent of respondents have not done soil sample testing, 39.34 per cent of them done soil sample testing in the year 2014 and one third (33.33%) of them done soil sample testing through KVK agency. Nearly two third (65.58%) of them received soil sample report by post and half of the respondents (50.82%) done soil sample testing in laboratory at 20 to 40km distance from their village. As regard overall knowledge about 47.00 per cent of the respondents possessed medium level of knowledge about recommended soil test techniques and in overall mean adoption index (48.03%) indicates medium level of adoption of soil test techniques by the farmers. Further results related to perceived constraints revealed that non-availability of soil testing lab nearby village, lack of technical skill about soil testing technique e.g. soil sample collection, sample preparation, no technical guidance from the Govt agency about soil testing (46.33%), non-availability of required fertilizer in market, delay in soil test reports (12.96%), Soil test report not clear to them and high cost of soil sample testing. Keywords: Adoption, soil testing, farmers, distress prone districts

MSAEJMU-35

Impact assessment of adopted cotton production technology and constraints in Vidarbha region of Maharashtra state

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Notton as a cash crop is grown in more than 80 countries in the world and is mainly produced in three zones of India. Maharashtra ranks 2nd in production and 2nd in productivity amongst the major cotton growing states of the country. The study has assessed the impact of production technology of cotton cultivation in Vidarbharegion of Maharashtra for the year 2013-14, based on the data of costs and returns. Two districts from Vidarbha region viz., Yavatmal and Buldhana were selected on the basis of maximum area under cotton. The survey method was used for the collection of primary data Apart from benefit-cost ratio (BCR), yield gap analysis, resource use efficiencies, adoption index, impact of improved cotton technology and the constraints faced by the cotton growing cultivators have been estimated in the study. It has shown that the cost 'C' per hectare was Rs. 42161.58 and BCR is 1.03, whereas the cost of production per quintal was Rs. 4012.94 at the overall level for improved cotton cultivation methods. Further, there was a 31.58 per cent yield gap between actual yield and yield of demonstration plot. The composite index of technology adoption was worked out to 50.93 per cent indicated that the sample farmers adopted less than 48 per cent recommended cotton production technology and obtained 10.40 gtls/ha yield. The contribution of different components on impact of cotton production technology in Vidarbha region, net returns was maximum (19.61 per cent). The constraints faced by the cotton growing cultivators were abnormal distribution of rainfall, lack of technical knowledge, high cost of seed and fertilizers, high wage rates, high labour requirement, non-availability of seed and fertilizers, low price to produce were the major constraints in adoption of cotton production technologies.

Keywords: Technology, cotton, adoption, constraints



Recent scenario of hi-tech kiwi fruit cultivation in mid-hill Himalayas, with special reference to its impact on enhancing income of marginal farmers

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wifruit, which is of recent introduction in the Mid-Himalayan states of J&K, Himachal Pradesh and Uttarakhand in the North-West and Arunachal Pradesh and Sikkim in the North-Eastern Himalayas, has assumed tremendous popularity and preference among consumers due to its nutritional value as well as the small and marginal farmers due to its high benefit-cost ratio through Hi-Tech cultivation techniques. Kiwifruit or Chinese gooseberry (Actinidia chinensis Patch) started in China and popularized first in New Zealand, Kiwi was presented first time at Lal Bagh, Bengaluru India, however it could set up only in the semi-temperate climate of Himachal Pradesh in 1963, slowly was widely introduced in this North-West Himalayan state of Himachal Pradesh and to some extent in J&K and Uttrakhand. While it has been extensively cultivated in the North-Eastern Himalayan states viz. Arunachal Pradesh, Sikkim and recently in Nagaland, Meghalaya, Mizoram and Manipur. There is a wide scope in expanding Kiwi Fruit production in almost all states of North East barring Tripura and Assam which have warmer and tropical climate. The kiwi fruit of North-Eastern region has already attained commercial identity in local, national as well as international markets. Arunachal Pradesh has established itself as the largest producer of Kiwifruit nationwide, though other states have also prioritized the fruit for area expansion under Horticulture Technology Mission. Despite congenial climate and soil, the lack of quality planting material, package of practices, modem technology of precision farming and trained manpower are the major constraints in enhancing the productivity of temperate fruits in general and Kiwi Fruit in particular. Keeping in view these constraints, ICAR Roving Team for Temperate Fruits have recommended the road map for cultivation of temperate fruits in North Eastern Hill Region in general and Kiwi Fruit in particular. An extensive survey of Kiwi Growing areas of Arunachal Pradesh was undertaken jointly by the authors in 2014-15 which is being discussed. Adoption of modern horticultural practices for growing Kiwi Fruit in the Mid-Himalayan region of the country should benefit its rural economy comprising mainly of small and marginal farmers whose practice of subsistence agriculture is under challenge from changing climate scenario. As the kiwi fruit originated in China on the Northern front of the Eastern Sub-Himalayan ranges, the inherent potentiality for its commercial cultivation in Indian Mid-Himalavan ranges is guite evident. The paper elucidates the major technologies developed for increased productivity of Kiwi fruit, priority areas, economic estimates and organic production for precision farming of this fruit. It can be safely inferred that Kiwi is the emerging crop of Mid-Himalayan states most suitable for horticulture based integrated farming system. Keywords: Kiwi, income, marginal farmers, Himalayas

MSAEJMU-39

Pattern of crop concentration and crop diversification- an economic analysis

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Crop Concentration and Diversification in Western Vidarbha was carried out based on secondary data collected from various government publications and pertains to a period of 45 year i.e. from 1970-71 to 2014-15. The area under jowar has reduced by 77.86 per cent in western Vidarbha region during the period of 1990-91 to 2014-15. The proportion of area under cotton has reduced by 29.18 per cent in western Vidarbha region. Soybean is found to be more advantageous crop over other crops in Akola, and Buldhana district in western Vidarbha region. Cotton is noticed to be more advantageous over jowar, soybean and tur in Amravati and Yavatmal district of western Vidarbha region. Over the period of study,



crop diversification has been increased significantly in western Vidarbha region. Crop concentration analysis revealed that, sugarcane, other oil seed, other high value crop and Wheat are emerging as most concentrated crops in Yavatmal, Buldhana, and Amravati district and concentration of bajara jowar, mung, rice etc is being reduced because the farmers are gaining more profit in production of the high value crops as compared to other food grain crops like bajara jowar, mung, rice. It's indicated that, the trend move towards crop diversification of these districts in western Vidarbha region of Maharashtra state. It is also very clear from the results of crop concentration and diversification analysis that, the diversification was occurred in all most all the districts of Western Vidarbha region.

Keywords: Crop concentration, diversification indices, advantageous crop, herfindahl index.

MSAEJMU-41

Impact of investment in sorghum research and extension on sorghum productivity in Vidarbha region of Maharashtra

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Sorghum is one of the major kharif crop of Vidarbha, the area under this crop is decreased over the period of time. This might be due to non-remunerative market prices of it and the area under kharif Sorghum is diverted towards Soybean, Cotton and other crops. Therefore, the present study has undertaken to study the growth in area, production, yield, input prices and Sorghum prices in Vidarbha. The study also assessed investment trends in research and extension for sorghum research in Vidarbha and the contribution of investment in sorghum research and extension in sorghum productivity. During the period of study (1990-91 to 2014-15) the area under kharif Sorghum was decreased in Vidarbha by 7.91 per cent per annum. Due to decrease in area growth the growth rates of kharif Sorghum production were also decreased significantly. The growth rates of Sorghum yield showing stagnant picture. During all the three periods of study the majority growth rates of input prices were higher than the growth rates of MSP and actual prices received by the farmers at both current and constant prices. It indicated that the input prices were increasing at a faster rate than MSP as well as prices received by the farmers. The per hectare investment in Sorghum research and extension is increased from Rs. 0.79 to Rs. 78.84 during the period under study. The per hectare investment in Sorghum research and extension showed significant positive growth at both current and constant prices during all the three periods of study. The results of standardized regression elicited that non-conventional inputs i.e. expenditure on (Research and Extension) together accounted for 43.58 per cent of sorghum productivity in Vidarbha region. This revealed that investment in Sorghum research and extension is financially productive. Share of conventional inputs in Sorghum productivity of Vidarbha region is about 8.83 to 9.8 per cent except for plant protection. Keywords: Current price, constant price, compound growth rates, standardized regression analysis

MSAEJMU-44

Performance of Phosphorous Fertilizer Subsidy (Input Technologies) in Vidarbha

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The present study entitled performance of phosphorous fertilizer subsidy in Vidarbha was carried out in Vidarbha region of Maharashtra state with objective to know the growth rates and variability in phosphorous fertilizer subsidy. The data pertained to the period of 11 years i.e. from 2004-05 to 2014-15. From study it was observed that, in period-I (2004-05 to 2009-10) positive and significant growth was observed in all districts of Vidarbha region except Yavatmal district. The growth ranges from 2.13 per cent in Chandrapur district to 20.03 per cent in Amravati district while least variability 7.34 per cent was observed in Chandrapur district and highest variability was observed in Amravati district. In period-II



(2010-11 to 2014-15) the growth ranges from 2.60 per cent in Wardha district to 10.01 per cent in Yavatmal district. The least variability 7.05 per cent was found in Wardha district while the highest variability was found in Akola district i.e. 27.27 per cent. **Keywords:** Subsidy, phosphorous fertilizer, growth rate, instability

MSAEJMU-50

Impact assessment of water banks (input technologies) in Satara district of Maharashtra

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The present study was undertaken with the objective to study the components of watershed, its impact on cropping pattern, income and socioeconomics determinants of society. The study concluded that, cropping pattern changed from dryland crops (jowar and bajra) to cash (sugarcane, turmeric, ginger, pomegranate and vegetables) crops. The area under dry land crops was reduced from 200 ha to 100 ha. The cash crop area comprises 40 ha of sugarcane, 25 ha of turmeric, 25 ha of vegetables and 5 ha of pomegranate. The increase in components of watershed from (45 to 123) 56 per cent of cropped area was increased. The livestock population was increased leading to 1430 liters of milk collection increasing it two times. The socio-economic condition of farmers have improved, The proper implementation of Hariyali (watershed scheme) and MNEGRA SCHEME have helped to develop 45 units of earthworm units and helping to develop more 48 units. The Water banks have changed the agricultural mechanization setup of village as due to more area under crops the agricultural implement's like tractor, rotatavator, seed drill and drip irrigation had been increased. The WATER BANKS have led to encourage the organic farming and use of chemical fertilisers.

Keywords: Input Technology, Water banks, assessment, cropping pattern

MSAEJMU-56

Effect of spacing and sowing time on vegetative growth and economics in seed coriander under Vidarbha region

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The cultivation of coriander for seed production has been restricted in Rajasthan, Gujrat, Bihar and part L of Himachal Pradesh. But under diversification of cropping pattern, most of the farmers of Vidarbha region due to favourable agroclimatic conditions. Nowadays want to grow coriander crop as seed spice. Appropriate planting time and spacing in between two rows and plants are the key factors towards production of more yield of coriander seeds with high quality. The experiment was conducted at Chilli and Vegetable Research Unit, Dr. PDKV., Akola during Rabi seasons three consecutive years starting from 2014-15 onwards. The experiment was conducted in Factorial Randomize Block Design with fifteen treatment combinations. The different five dates of sowing was first level of an experiment (D) of rabi season starting from second fortnight of September i.e. 15th September (D₁), 1st October (D₂), 15th October (D_3) , 1st November (D_4) and 15th November (D_5) . The another sub factor (S) of spacing with three levels i.e. (S_1) close $(30 \times 30 \text{ cm})$, (S_2) moderate $(45 \times 45 \text{ cm})$ and (S_3) wider $(60 \times 60 \text{ cm})$. The result of the present experimentation reveals that, seed coriander crop sown on 15thOctober along with 45 X 45 cm gave significantly better vegetative growth of the plant. However, significantly the maximum (12.96 q/ha) seed yield, along with good qualitative characters, as well as the maximum GMR, NMR and B: C ratio was obtained from the moderate spacing (45 x 45 cm) in between the rows and plant sown on second fortnight of October 15^{th} (D₃S₂) combination.

Keywords: Diversification, GMR, NMR, seed coriander



Impact of extension activities through awareness and skill

development programmes among rural women

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gricultural extension plays a crucial role in promoting agricultural productivity, increasing food security, improving rural livelihoods, and promoting agriculture as an engine of pro-poor economic growth. The purpose of the study was to improve the socio economic status and nutritional status of rural women. For this purpose many girls from Renzipora area in district Pulwama of Kashmir region were provided with skill development trainings and large number of rural women were made aware regarding benefits of health and hygiene and techniques to improve the nutritional status of their family. The trainings were provided on campus as well as off campus of KVK Pulwama. A total sample of 20 rural girls and 20 rural women were selected purposively to check the impact of the programs. The information was gathered by using a self-devised interview schedule. The results obtained through percentage calculation delineate that the respondents. Apprised through various health and nutrition related awareness were having knowledge and were following the advices given during the course of lectures and awareness programmes. However, as for as skill development programmes are concerned partial adoption was observed particularly in case of soft Toy making and Cutting and Tailoring, with 25% girls following the skill for income generation whereas, bread crafting was adopted just for their decorative purposes without going for sale purposes. KVK's has developed a framework for designing and analyzing extension, and monthly action plans are framed to provide skill development programmes and health and nutrition related awareness to rural women/girls under extension activities. In addition, some of these programmmes are designed to strengthen the capacity of the rural women to make them self-reliant and independent members of the society.

Keywords: Skill development trainings, rural women, adoption

MSAEJMU-72

Optimum spacing of poplar for maximum growth and higher economic return under poplar based agroforestry system in Yamunanagar (Haryana)

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ndian agriculture is facing challenges and constraints due to growing demographic pressure, increasing L food, feed and timber needs, natural resources degradation and climate change (Chauhan and Mangat,2006; Dhyani and Handa, 2013). Diversification of existing farming systems by developing suitable agroforestry models seems to be the need of the day (Chauhan and Ritu, 2005; Dhillon et al. 2012). Populus deltoides, is one such promising species recognized as important tree component in agroforestry system to prevent land degradation and obtain biological production on sustainable basis (Pandey, 2007). The present study was conducted during 2015-16 in the Yamunanagar district (77° 28' E longitude and 30° 1' N latitude and elevation of Yamunanagar is 255 m (837 ft) above m.s.l. The Yamunanagar region has maximum area under poplar plantation in Haryana. Six and seven years old plantations of poplar with different spacing's were selected for recording data in order to find out growth potential (Total height and Basal diameter). Height of trees was measured from base to top in meters and diameter of trees was measured at the base in centimeters. Mean annual increment for both total height and basal diameter were worked out for six and seven years in all the spacing's. For findings suitable cropping pattern for higher economic return have been based on the interviews and discussions with the farmers of several villages. The data recorded for height and DBH were analyzed statistically following Panse and Sukhatme, 1978. The 4.2 x 4.2 m spacing more suitable for maximum growth of poplar and agriculture crops and higher economic return under poplar based agrisilviculture system. Sugarcane is a best



agriculture crop under poplar based agrisilviculture system during initial two years. Third year onwards, crops like wheat, oats, berseem etc. grown successfully throughout its rotation. **Keywords:** Demographic, natural resource, agroforestry, *Populus deltoides*, sustainable.

MSAEJMU-115

Impact analysis of technological intervention on maize promoted through front line demonstrations under temperate area of Jammu and Kashmir

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Maize crop is majorly grown under rainfed conditions in about 27,000 ha area in district Doda of Jammu province. The study was carried out during *Kharif* season of 2014 and 2015 in 10 villages across 2 blocks (Marmat and Bhaderwah) of Doda district. In all 100 frontline demonstrations on maize crop were carried out in an area of 20.0 ha with the active participations of farmers with the objective to demonstrate the latest technology of maize production potential, technological gap, extension gap, technology index and economic benefit of improved technologies. Frontline demonstration is one of the important tools for transfer of technology and this programme is being implemented through Krishi Vigyan Kendra's of country. FLD's are organized on improved production technology at farmers field. This process not only helps in demonstrating the ways and means of increasing productivity but helps in obtaining feedback for further refinement of the production technology. The results revealed that FLD recorded higher yield as compared to farmer's practices over the two years of study. The improved technologies recorded average yield of 27.62q/ha which was 32.99 percent higher than the obtained with farmer's practices of 20.73q/ha. In spite of increase in yield of maize, technological gap, extension gap and technology index existed which was 19.87q/ha, 6.89q/ha and 41.94 percent, respectively. **Keywords:** Frontline demonstration, Extension gap, Technology gap, Technology index.

MSAEJMU-121

Impact of front line demonstration on okra in Kathua district of Jammu and Kashmir

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ne of the important mandates of the Krishi Vigyan Kendras is to disseminate the agricultural innovations developed by researches through frontline demonstration (FLDs).FLD is a form of applied research to demonstrate the potential of agricultural innovations to participating farmers, neighobouring farmers and extension workers. The main objective of the Front Line Demonstrations (FLDs) is to demonstrate the production and protection technology at the farmer field under the complete supervision of scientists in different agro climatic regions and farming situations. Realizing the importance of frontline demonstrations in transfer of okra production technologies, Krishi Vigyan Kendra, Kathua, Jammu &Kashmir conducted FLDs at farmer's field and accordingly study was conducted in Kathua district. The study revealed majority of the beneficiaries (90%) had adopted high yielding variety resistant to yellow vein mosaic virus. The important package of practices where more increase in adoption was found were use of recommended fertilizer dose (57%), seed treatment (50%), use of high yielding improved variety (47%), line sowing on ridges and furrow, plant protection measures to control insectspests and diseases (40%), weed management (35%), use of proper seed rate and spacing (30%). The mean knowledge and adoption scores of beneficiaries were higher comparatively to non-beneficiaries. It was also observed that majority of beneficiaries had medium to higher knowledge and adoption of production technology promoted through front line demonstration by KVK. This might be due to the concentrated educational efforts made by KVK scientists in implementation of front line demonstrations. There was



significant difference observed in yield of okra before the conductance of FLD and after FLD programme. B: C ratio of okra after FLD was higher than before FLD. It showed impact of FLD on adoption of okra production technologies. The factors responsible for low B: C ratio before FLD was less adoption of all the recommended package of practices for okra crop in this region. The data also signified strong satisfaction of farmer about the services rendered by scientists through front line demonstration ultimately lead to increase in knowledge and adoption level of beneficiaries and higher yields and economic net returns. **Keywords:** Front Line Demonstration, Impact, Adoption, Benefit: cost ratio, Okra

MSAEJMU-124

Impact assessment of agricultural and allied trainings on livelihood of

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he Krishi Vigyan Kendra Ferozepur has conducted Vocational/short term trainings for rural vouth/farmers and extension functionaries. The present study was focused on impact of agricultural and allied trainings organized by Krishi Vigyan Kendra Ferozepur on self-employment and up gradation of their livelihoods. A total of 158 trainees who have attended training programme on cultivation of button and dhingri mushroom, bee keeping, dairy farming, preservation of fruits and vegetable, stitching of garments and protected vegetable cultivation were selected as the respondents of the study. The findings revealed that more than 43.6% respondents were belonging to 30-40 years age group and about 70.25 per cent respondents were educated. More than half of the respondents were belong to schedule caste families and landless. About 22.7 per cent of the trainees had training on bee keeping, 20.8 per cent on dairy farming, 19.6 per cent on cultivation of button and dhingri mushroom, 12.6 per cent of the trainees received training on preservation of fruits and vegetable. Majority of the trainees had adopted the skills on self-sustainable level/household level with highest adoption in cultivation of button and dhingri mushroom (51.6%), 50% in bee keeping followed by 33.3% in soap and detergent making, 24.2% in dairy farming, 20% in fruits and vegetable preservation and 20% in stitching of garments. The number of adoption of protected vegetable cultivation was lowest but found highest adoption at commercial level. Economic impact of trainings at self-sustainable level/household level is quite visible in terms of income generation as trainees had started and adopted skills as subsidiary or main occupation. Keywords: Impact, adoption, vocational training, sustainable level

MSAEJMU-150

Effect of foliar application of salicylic acid and prohexadione-calcium on post-harvest life of apple Cv. "Red Delicious"

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The present experiment entitled "Effect of foliar application of salicylic acid and prohexadione-calcium on post-harvest life of apple cv. Red Delicious" was conducted at private orchard Nikas, Pulwama during 2014 and 2015. The experiment comprising of 10 treatments *viz.*, control, salicylic acid (SA) @ 50 ppm, 100 ppm, 150 ppm and 200 ppm, prohexadione-calcium @ 600 ppm, SA @ 50 ppm + prohexadionecalcium @ 600 ppm, SA @ 100 ppm + prohexadione-calcium @ 600 ppm, SA @ 150 ppm + prohexadione-calcium @ 600 ppm and SA @ 200 ppm + prohexadione-calcium @ 600 ppm was laid out in Randomized Complete Block Design with three replications. Results revealed that with the advancement of storage period there was increase in TSS, total sugar content and physiological weight of fruits and decrease in firmness and titrable acidity of the fruits irrespective of treatments during both the years of study. However, changes during storage in terms of total sugar content, TSS, titrable acidity, fruit firmness and physiological loss in weight were minor in fruits harvested from trees treated with salicylic acid @ 150



ppm + prohexadione-calcium @ 600 ppm. Results of present investigation have led to the conclusion that trees sprayed with salicylic acid @ 150 ppm in combination with prohexadione-calcium @ 600 ppm resulted in production of fruits with better storability.

Keywords: Apple, foliar spray, Prohexadione-calcium, salicylic acid, storability.

MSAEJMU-168 Impact of chawki rearing technology on cocoon production and socioeconomic upliftment in rural Areas

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C ericulture is a farm based commercially attractive activity which falls under cottage industry providing Demployment to poor landless and marginal farmers of the country. The growth of Sericulture industry in India has been encouraging due to appropriate technologies developed by different Institutions of Sericulture practicing states. Success of bivoltine silkworm rearing mainly depends on proper chawki rearing method for obtaining assured cocoon crop. After realizing the relevance of evolved technologies regarding rearing of young age silkworms, present study was conceived for upliftment of poor silkworm farmers of this region with an objective to demonstrate and popularize chawki rearing among silkworm rearers in the field for achieving higher quantity of cocoon yield thereby earning more income. The activity of rearing young age silkworms at Co-operative Chawki Rearing Centers was conducted under technical guidance of experienced scientists and skilled field staff. During the study, a total of 276 silkworm rearers were adopted from different villages of District Udhampur and Co-operative Chawki rearing centers were setup in the field during spring and autumn seasons from 2013 to 2015. During total period of study a quantity of 206.75 ounce of bi × bivoltine (Spring season) and multi × bivoltine (Autumn season) seed was chawki reared and distributed among adopted rearers and a total quantity of 10426.45 kg cocoons were harvested. On the basis of three years averages, cocoon production of 53.5 kg/ounce in spring and 35.6 kg/ounce in autumn was obtained. This was higher than the field average of 33 kg/ounce in spring and 25 kg/ounce in autumn. The results achieved in the present study clearly show that chawki rearing technology is effective in boosting the cocoon production resulting into higher income generation. To enhance the cocoon production, the evolved technology needs to be percolated vigorously at field level through extension machinery in such a way that the farmers get convinced about the benefits of improved techniques for higher remuneration of their produce.

Keywords: Technologies, Chawki, Upliftment, Cocoon production, Income

MSAEJMU-181

Effect of feeding formaldehyde treated concentrate, urea and soybean meal on yield and cost of production of cow milk

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The present was undertaken at Department of Animal Husbandry and Dairy Science, Dr. PDKV, Akola. Feeding of 1.5% formaldehyde treated 70: 30 Sugras: SBM concentrate mixture with 2% added urea diet to lactating cows (T₃) was evaluated in relation to Sugras untreated ration (T₁). It is concluded that Lactating cows reared on HCHO treated 70: 30 Sugras: SBM concentrates with 2% added urea ration produced 15 and 19% more milk and 4% FCM in comparison to control diet comprising feeding of Sugras milk ration. The milk yield obtained in T₃ cows was more 15.43 and 9.48% over that of milk yields of T₁ control and T₅ cows. The average milk yields were 5.83, 6.13, 6.73, 5.69 and 6.15 kg/d/cow under T₁, T₂, T₃, T₄ and T₅ groups respectively. There was increase in the feeding cost of the cows in T₃ to the extent of 6.12% (Rs. 52/d) over that of T₁ control (Rs. 49/d). However, cost of feeding/kg milk yield was lower by 8.09% (Rs. 7.72) against T₁ (Rs.8.40). Therefore, in spite of more feeding cost, the monitory income was



more by Rs. 18.62/d/cow in reference to T_1 control group. As a result, the feed conversion efficiency was found more in T_3 (83.73%) against 73.14% in T_1 control group. Thus, the result suggested that feeding 1.5% of formaldehyde treated 70: 30 Sugras: SBM concentrate mixture (27.47% CP) with 2% added urea diet to cows has a potential to increase milk yield of medium producer, viz. 6 to 7 kg of milk with 4.3 to 4.5% fat by 15% without any detrimental effect on serum total protein and blood urea levels of the cows. **Keywords:** Formaldehyde treated concentrate, urea, soyabean meal, cow milk.

MSAEJMU-198

Agricultural research investment, agricultural growth and livelihood security in Jammu & Kashmir

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Thile agriculture has changed from a resource-based to a science-based venture, the importance of investment in agricultural research is crucial. Agricultural research has been the primary source of total factor productivity growth; therefore, the choice of issues addressed in this study was to make a comprehensive look at the growth of research investment in agriculture in relationship with agricultural growth in the state. This study perused the secondary information obtained from published and unpublished records of Planning & Development Department and Directorate of Economic & Statistics, Government of Jammu & Kashmir. Simultaneous equation model (tested for estimation errors) was fitted and estimated by employing 2SLS procedure to quantify the impact of agricultural research on agricultural productivity in the state. The investment in agricultural research in the state has increased significantly upto 2005-06, however, it has shown a drastic decline towards recent years. Current as high as Rs 304 lakh were invested in agricultural research and constitute only 6 per cent of total agricultural investment. Investment in terms crop land revealed that this investment has gone done from Rs 109/ha to just Rs 27/ha in recent years. The estimates of compound growth rates also indicated that the investment in agricultural research has decelerated over the year. The intensities revealed that agricultural research investment constituted only 0.11 per cent of agricultural net domestic product of the state which is much lower compared to total investment in agriculture or non-agricultural sector. Although capital use efficiency in the state has improved over the years but it is still lower than that of non-agricultural activities. The model estimates revealed significant role of agricultural investment on agricultural growth and livelihood security in the state. Futher the elasticities of investment in agricultural research explained that any further enhancement in the investment would have better pay off. The study emphasized that the declining trend of agricultural research investment should be reversed to have desired impact of this investment and extended policy options for ensuring livelihood security by way of research investment and productivity growth. Keywords: Agricultural research investment, agricultural growth, livelihood security, J&K

MSAEJMU-229

Effectiveness of kissan vani programme broadcast from AIR Kathua in transfer of agricultural technology

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Communication channels play pivotal role in disseminating information. But when the bulk of population is illiterate and inaccessible to modern means of communication, the challenge is all the more difficult. In this situation mass media like radio can play a significant role in disseminating information. Radio is a very popular and powerful communication medium and has proved very effective in helping to disseminate agricultural information. One of the special features of All India Radio is its 'farm and home units', which are engaged in disseminating scientific information about farming to needy people living mostly in poorly accessible villages. There are number of sources of agricultural information which a farmer can use. In order to find out how the farmers rate radio broadcast in respect of the



credibility of the information as compared to other sources. The present study was conducted in Kathua district of J&K state. The total sample consisted of 120 respondents form ten villages of two blocks. Data were collected with the help of structured interview schedule. Over whelming majority (85.9%) reported that the programme Kissan Vani was very useful. Majority of respondents (57.6%) were perceived to be in medium effectiveness of Kissan Vani programme in transfer of agricultural technology. Majority (77.5%, 74.1% and 65.0%) of the respondents suggested that the Technical terms/scientific words should be simplified in to Dogri language, Interview with the progressive farmers and organization of Kissan Goshti in case of modes of presentation respectively. A very high majority (72.3%) of the respondents suggested that there should be a Broadcast of live programme with Successful entrepreneur where as 65.6 per cent suggested that there should be an increase in the duration of the programme, 65.0 per cent are in favour of discussion of farmers with KVK Scientists followed by 62.5 per cent which are in favour of use of local language respectively.

Keywords: Effectiveness, broadcast, agriculture, technology.

MSAEJMU-300

Climate changes and its interaction with insect pests

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limate change may have an effect on all organisms, including plants, insects and their interactions \checkmark with weather, plants and herbivores because they are ectothermic and sensitive to precipitation. Moreover, the insect physiology, behaviour, development and species distribution may also be affected in a changing climate. The population abundance of an insect species is manipulated by the host plant, natural enemies or changing weather conditions. The major factors which influence the pests are temperature, CO₂ concentration, precipitation, natural enemies and their host plant. Temperature is probably the most important environmental factor influencing insects pests majorly. The winter mortality is usually a key factor affecting the population dynamics of many temperate insects, especially to those do not enter diapause but continue activity throughout the winter as temperature permits. A higher temperature in winter stimulates the reproduction of overwintering adults and leading to faster population growth and an additional generation in some insect pests. Both direct and indirect effects of moisture stress on crops make them more vulnerable to be damaged by pests, especially in the early stages of plant growth. There will also be instances where warmer conditions will increase the effectiveness of many natural enemy species and/or increase the vulnerability of their prey. Some insects are sensitive to precipitation and are killed or removed from crops by heavy rains. A decrease in winter rainfall could result in reduced aphid developmental rates because drought-stressed tillering cereals reduce the reproductive capacity of overwintering aphids. As a result of the C: N ratio change in the plant, phloem sap becomes more concentrated at higher temperatures, and provides a richer source of amino acids for sap feeders. The concentration of a range of secondary plant compounds tends to increase under drought stress, leading to changes in the attraction of plants to insects.

MSAEJMU-304

Genetic improvement of mungbean (*Vigna radiata* L.) and its role in enhancing pulse production under rainfed conditions of Jammu region

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India is rich in genetic diversity of major pulse crops, but the productivity and the production of pulse crops remains low compared to the world and hence there is need to enhance the utilization of wild and related species for increasing the production. The present study was conducted at the experimental farm of



Advanced Centre for Rainfed Agriculture (ACRA) Dhiansar during kharif 2016 and 2017. Twenty-five varieties of mungbean were evaluated for yield and its attributing traits continuously for two years under rainfed conditions of Jammu region. The study revealed that highest seed yield/plant was exhibited by mungbean variety IPM 2-14(12.10g/pl), followed by IPM 99-125(9.25g/pl.), Pusa Vishal (8.73g/pl.) and IPM2-3(8.67g/pl). However, varieties IPM 205-7 and Pusa 0672 were the best varieties on the basis of yield and its components under rainfed conditions. On the basis of plant height, minimum plant height was showed by variety PM 3 followed by PM 5, Pusa Vishal and SML668. In addition to plant height, these varieties were also early in maturity but these varieties are low in yield and should be involved in hybridization programme with high yielding varieties for the introgression of genes for earlines early to escape the drought during pod setting and developmental stages. **Keywords:** Mungbean, pulses, rainfed

MSAEJMU-307 Effect of conservation modules on SQI in rainfed orchards of Jammu

zone

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ango is popular among masses due to its excellent flavour, delicious taste; delicate fragrance, attractive colour and nutritive value which make it rank among the best fruits of world. However, these traits can only be obtained by proper orchard management of which soil health management is of utmost importance for proper nutrition. Soil health alone is an important aspect to be studied in orchards as it plays a major role in determining the yield as well as quality of mango fruit. The mango (Mangifera indica L.) is one of the choicest fruit of tropical and sub-tropical region of the world, especially in Asia. Its population and importance can easily be realized by the fact that it is often referred as "King of Fruits in the Tropical World. The nutrition that soil provides have major bearing on the fruit quality and biochemical indicators. Keeping this in view, a study was conducted to assess the quality of rainfed mango orchards in the Kandi region of Jammu division of J&K as well as the impact of conservation practicesviz., trenches and basins (depending upon the slope of orchards). Long-term soil conservation management in mango orchards improved the quality of soils through enhancing the organic carbon fraction and biological status. Various soil physico-chemical parameters mere assessed using standard procedures. Each parameter was given weightage depending upon its importance. The value of OC (g/kg) was 6.8, 7.3 and 7.6 for Reasi, Basohli and Billawar respectively. The nitrogen content ranged from 330-360 kgha⁻¹ (Reasi - 330 kgha⁻¹, Basohli-340 kgha⁻¹, Billawar-360 kg ha⁻¹). The overall SQI for the three different agro ecological regions was 0.45 (LESS) for Panthal (Distt. Reasi), 0.75 (OPTIMUM) for Marapatti, Basholi (Distt. Kathua) & 0.95 (MORE) for Billawar. Maximum value for soil moisture content (15.10%) was recorded in full moon water harvesting structure and minimum, 11.50% in control. Soil moisture status in Cup & Saucer techniques ranged from 13.8 to 10.6% where as in control plot it varied from 10.9% to 8.2%, respectively. Under plastic and organic mulches soil moisture content recorded was 15.14 and 11.2%, respectively which was higher as compared to the control. The studies revealed that plastic mulches gave higher values of soil moisture content as compared to organic mulches. Keywords: Rainfed, mango orchards, soil quality, conservation practices



Poster Presentations

MSAEJMU-31

Socio-economic impact of improved soybean technology on farmers

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The present study was undertaken as Joint AGRESCO Project for the year 2012-13 in Amravati district of Maharashtra State. An ex-post facto design of social research was used. A sample of 100 adopters of Univ. recommended soybean technology as respondents were drawn and information was obtained from them which were considered for tabulation and analysis of data. The findings revealed that nearly three fourth (71.00%) of the soybean growers had high adoption level followed by medium (29.00%) adoption level. Impact of soybean technology was measured in terms of change in yield which was 10.42q/ha. before adoption of soybean technology. It was increased to 19.35 q/ha after adoption of soybean technology. It was sobtained in income by 40.67 per cent. Land use under soybean crop was changed by 39.39 per cent, whereas one third (33.69%) change was noticed in case of family education. In case of annual spending pattern the change was (28.09%). In case of type of house the change was (19.32%). Change in monthly thrift habit was noticed very less (14.21%). In case of social participation the change was (10.93%). Change in assets was noticed very less (10.84%). Less than 10.00 per cent change was noticed in case of cropping pattern (9.09%), in case of land utilization pattern (7.90%), in case of occupation (6.25%) and in case of employment the change was only 5.97 per cent. Overall impact change was 21.69 per cent.

Keywords: Socio-economic impact, technology and soybean Farmers

MSAEJMU-32

Psycho-social factors of weather forecast decision making behaviour among farmers in Vidarbha

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he purpose of this study is to explore the relationship between decision making behaviour of dryland farmers with their different demographic and psychosocial variables taking into cognizance the information regarding weather forecasts. Decision making with respect to agricultural weather forecasting in the present study is the process of choosing the best alternative for the purpose of attaining specific goals involving the resources, environment, economic and personal characteristics of a farmer. Decisions imply the production decisions taken by farmers taking into cognizance the existing weather and information regarding future weather. The study was carried out in Akola district of Vidarbha region of Maharashtra State with a sample of 150 farmers as respondents. A draft interview schedule with scales, tests etc. for measuring the variables of the study was first developed and pre-tested before data collection. The psychosocial variables (independent variables) numbering 16 were identified as likely predictors of decision making behaviour (dependent variable) of farmers. Correlation and multiple linear regressions were employed to analyze and interpret the data. Regression analysis showed that extension contact, farm size, weather knowledge, innovativeness, achievement orientation and risk orientation contributed positively and significantly towards decision making behaviour. The relative importance of these factors reflects both internal environment and external social relations of farmers that pave way for collective nature of decision making attitude. Results are discussed in terms of their implications for future development of decision-support systems and technology transfer activities to farmers for better adoption of weather forecasts.

Keywords: Decision making behaviour, attitude; Weather forecast and Risk orientation.


Performance of nitrogen fertilizer subsidy (Input Technologies) in Vidarbha

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The present study entitled performance of nitrogen fertilizer subsidy in Vidarbha was carried out in Vidarbha region of Maharashtra state with objective to know the growth rates and variability in nitrogen fertilizer subsidy. The data pertained to the period of 11 years i.e. from 2004-05 to 2014-15. From study it was observed that, in period-I (2004-05 to 2009-10) the highest growth (15.34 per cent) was observed in Amravati district while the lowest growth (3.93 per cent) was observed in Chandrapur district while highest variability (38.60 per cent) was found in Wardha district, while the least variability (10.35 per cent) was found in Bhandara district. In period-II (2010-11 to 2014-15) in nitrogen fertilizer subsidy growth ranges from 3.30 per cent in Gadchiroli district to 5.62 per cent in Wardha district. The least variability 7.16 per cent was found in Yavatmal district while the highest variability was found in Akola district.

Keywords: Subsidy, nitrogen fertilizer, growth rate, instability

MSAEJMU-48

Effect of exogenous auxin application on fruit cracking in litchi (*Litichi chinenisi* Sonn.) cv. Dehradun under field conditions of district Reasi

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Litchi (*Litchi chinenisi* Sonn.) an arillate fruit species possessed a unique structure compromising thin and leathery pericarp that enclosed the aril as its edible part, Fruit cracking is a serious physiological disorder in litchi that occurs in litchi coincides with a period characterised by high day temperature (35-40°C) and low relative humidity. Besides climatic effects abnormal development of skin during early fruit growth promotes the disorder.in this context experiment was carried out at three locations of district Reasi and auxins viz different concentrations (20,30,40 and 50 ppm) were sprayed on dates at farmers orchards on anthesis and pea stage respectively. The study revealed that different concentrations of NAA has shown variation in effect on percentage of fruits carried to maturity. Highest percentage (22.21%) carried to maturity was observed with NAA application at 50ppm and least (11.21%) with20ppm.NAA 40ppm and 50ppm were at par each other. Data revealed that 50ppm NAA concentration recorded highest fruit weight (19.11 gm) while NAA ppm was at par with highest concentration. Number of days from fruit set to maturity indicated that NAA had a significant effect in reducing fruit cracking when compared to control. **Keywords:** Litchi, fruit cracking, auxin, Reasi

MSAEJMU-80

Adoption of technology of wheat production in Amravati district

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An attempt has been made to study Adoption of Technology of Wheat Production In Amravati District with view to study the extent of adoption of technology in Wheat. The study was based on primary data collected from the Amravati district. The findings of the study showed at overall level, the area under Wheat was observed to be 16.36 per cent. In case of medium size of group of land holding of farmers the extent of adoption of first factor of recommended technology in wheat cultivation i.e. Soil type was



observed to be 24 per cent and had adopted between the range of technology adoption index i.e. 36 to 70 per cent and in case of large size group 81.48 per cent farmer had adopted recommended technology as per adoption index ranging between 71 per cent to 100 per cent. Manure, fertilizer, seed rate, and irrigation were the most important factors which influence the yield of Wheat crop Hence it is recommended that the farmer should be convinced for adopting recommended level of these inputs. Increase in the level of adoption of recommended technology in Wheat crop was associated with the increase in cost of cultivation and leads to high margins of profit.

Keywords: Wheat, adoption, recommended technology

MSAEJMU-96

Impact of new technologies on *Nagli* (Finger millet) production in South Konkan region of Maharashtra

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The productivity of any crop is related with level of technology. Agricultural Universities are giving new high yielding/hybrid varieties as well as new technologies for increasing the productivity. But farmers are not using these technologies and therefore, there is a large gap between potential yield and actual yield. *Nagli* is important cereal followed by rice grown in Konkan region. While studying the impact of new technologies on *Nagli* it was observed that the average Technology Adoption Index of *Nagli* among the sample farmers was 47.07 per cent. Use of fertilizer was found low as compared to recommended dose. Per hectare input gap for manure was 81.73 per cent and for nitrogen it was 46.16 per cent. The overall yield gap was 6.65 quintal at farm level. With increase in input use the yield gap observed to be decrease inversely. At overall level adoption of technologies on farmers' field was 47.07. Therefore, productivity was also low.

Keywords: Impact, input gap, profitability, technology adoption index, unit cost, yield gap.

MSAEJMU-146

Evaluation of sowing method in hybrid maize in Poonch district

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aize is the most important crop of the district, cultivated on an area of approximately 24 thousand hectares. Agricultural productivity of maize is low i.e. 20.0 quintals per hectare (Digest of statistics, 2014-15). In order to increase the productivity of maize crop in the district, KVK, Poonch and Agriculture Department made consistent efforts in the past 5 years by introduction of hybrid maize. As a result, the demand of hybrid maize seed increased from 457.8 (quintals) in 2013-14 to 979.8 quintals in 2015-16 (Source, Department of Agriculture, Poonch). Similarly, the area under hybrid maize increased from 2289 to 4899 ha during the same period (source, Department of Agriculture). KVK Poonch conducted a baseline study of tribal farmers to study the adoption of sowing methods and it was found that level of adoption of line sowing was 16% among tribal farmers as compared to 34% in other farming families. KVK Poonch therefore felt an urgent need to change the mindset of tribal farmers of the district. 98 front line demonstrations were laid on hybrid maize seed (double deklab) under tribal sub plan in 12 panchayats during the year 2016 and performance of hybrid maize seed was compared with local (desi variety) in 5 selected panchayats viz. Degwar, Kankote, Nangali, Noona Bandi and Bandi Chechian. At the same time, the method of sowing (broadcasting versus line sowing) was compared at 20 locations in above selected villages. It was observed that hybrid maize gave higher yield as compared to desi pili. Similarly, Double deklab gave higher yield in line sowing (49.25 q/ha) as compared to broadcasting method (39.4 q/ha) and also gave highest net returns per hectare (Rs. 51292.50) and benefit cost ratio (2.54) in comparison to broadcast sowing with net returns of Rs. 38630 and B: C ratio 2.08. Line sowing also ensured ease of cultural operations coupled with healthy crop stand and less lodging problems at harvesting. Keywords: Frontline Demonstrations, hybrid maize, Poonch



Impacts of small-scale water management interventions on crop production and livelihood in Orissa agro-ecologies

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The impact of created water management technological interventions was assessed in different agro-L ecosystems of the state of Orissa. Questionnaire based farmer's response and focus group discussion at the intervention site of tank cum well system in high rainfall area, sub surface water harvesting structure in coastal area and two stage rain water harvesting techniques in mid table land areas was the basis for impact analysis during 2015-17. Mixed and diverse response observed in terms of physical status of irrigation structures, their present day utilization and existing crop production practices. On the basis of the farmers' responses at tank cum well system intervention site under sloppy land situation, the benefit obtained due to dug wells and water harvesting structures was initially up to 68% higher rice yield (from 2.25 to 3.8 t/ha) which at present is still 15% higher (2.60 t/ha) with 33% increased cropping intensity). Dug wells are found maintained better as compared to water harvesting structures. Results of the two stage rain water harvesting study reveals that the benefit gained by the farmers due to utilization of additional water resources was quite good and the sustainability of the lowland pond is significant. The farmer getting benefit of rice yield from 1.6 to 3.5 t/ha, 119% increase from pre adoption period by the farmers is found persistent. The field assessment of sub surface water harvesting structures revealed that the created structures are still maintained even after 12 years of exit plan and benefits in rabi rice yield is about 7.1% (from 6.7 to 7.18 t/ha) with 108% (from 0.28 to 0.58 t/ha) increase in fish yield compared to pre-adoption period. The technology has also expanded in other fields and impact of the structures on increasing productivity of rabi and summer crops, cropping intensity and generating supplemental income through pisciculture is found evident. Further, livelihood also measured based on the assets pattern over the pre adoption period and are measured based on a 5-point continuum scale. Assets pattern among beneficiary shown an impressive improvement from 52 to 86 percent across the study village. Maximum gain was recorded at sub-surface water structure, where 86 percent improvement recorded, leads to further investment in farm pond for fish farming. Repairing of structure, technical guidance, financial support is the need of the hour to boost the morale of farmers and the technological intervention to carry forward in the field.

Keywords: Agri-water interventions, adoption impacts and livelihood.

MSAEJMU-157

Effect of pre and post-harvest urea on mineral nutrients of apple cv. Red Delicious

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N itrogen is the most important element for plant growth and development. Consequently, application of N fertilizers had the most significant effect in increasing crop production (Mengal and Krikby, 1987). Because of its importance in crop production, N fertilizer is often used as an 'insurance policy' to achieve maximum productivity (Sanchez *et al.*, 1995). Environmental contamination resulting from leaching of nutrients, especially N, from orchards is a major concern for local communities. New strategies are required in orchard management to reduce potential of nutrient leaching loss. One practical strategy to reduce possible N- contamination of water is use of foliar N sprays instead of soil applications (Bondala *et al.*, 2001). Thus, for increasing the apple production and productivity, it seems to be desirable to have some of technological intervention in the package of practice for apple growers so that we can be able to boost up the productivity and encourage the farmer to grow and earn more. Keeping the above points in view, the present research was carried out at Experimental Orchard of Division of Fruit Science. Pre and



post-harvest urea sprays were applied. Urea (0.3 and 0.5%) were sprayed 4 weeks after petal fall and urea (0.3, 1, 2 and 5%) were sprayed after harvest. The studies revealed that fruit and leaf N, K, Ca Mg and B were highest in trees treated with 2 and 5 per cent urea applied at 10 per cent leaf fall. While phosphorus and calcium decreased. Post-harvest urea applications after harvest appear to be most efficient in producing N to the developing flower buds.

MSAEJMU-158

Economic impact of imazethapyr + pendimethalinin summer urdbean

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n investigation entitled "Economic impact of imazethapyr + pendimethalin in summer urdbean" was conducted during summer season of 2015 at research farm of Division of Agronomy, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu. Thirteen weed management treatments viz. imazethapyr 70 g/ha as pre-emergence and post emergence, imazethapyr 80 g/ha as pre-emergence and post emergence, imazethapyr + imazamox (RM) 70 g/ha as pre-emergence and post emergence, imazethapyr + imazamox (RM) 80 g/ha as pre-emergence and post emergence, pendimethalin 1000 g/ha as pre-emergence, imazethapyr + pendimethalin (RM) 1000 g/ha as pre-emergence, 2 hoeings (15 and 30 DAS), weedy check and weed free were laid out in randomized block design and replicated thrice to evaluate the effect of different herbicidal treatments on plant height, seed yield and economics of summer urdbean. All the herbicides were applied by using a Knapsack sprayer fitted with flat-fan nozzle with spray volume of 500 litres water/ha. All the weed management treatments had a significant influence on plant height and seed yield of summer urdbean. Different weed management treatments showed non-significant results with respect to plant height at 15 DAS. However, at 75 DAS significantly highest plant height (50.17 cm) was recorded with treatment weed free. Amongst the different herbicidal treatments, imazethapyr + pendimethalin (RM) 1000 g/ha as pre-emergence recorded the highest plant height to the tune of 47.61 cm. Highest seed yield (910 kg/ha) was observed with treatment weed freewhich was statistically at par with treatment 2 hoeings (15 and 30 DAS). Amongst the different herbicidal treatments, imazethapyr + pendimethalin (RM) 1000 g/ha as pre-emergence recorded the highest seed yield to the tune of 786 kg/ha which was statistically at par with all the post emergent herbicides applied at 3-4 leaf stage (imazethapyr + imazamox (RM) 80 g/ha, imazethapyr 80 g/ha, imazethapyr + imazamox (RM) 70 g/ha and imazethapyr 70 g/ha). Highest B: C ratio of 2.56 was recorded with imazethapyr + pendimethalin (RM) 1000 g/ha as pre-emergence which was closely followed by imazethapyr + imazamox (RM) 80 g/ha applied at 3-4 leaf stage.

Keywords: Impact, urdbean, imazethapyr, pendimethalin.

MSAEJMU-169

Effect of mulching and sustainable irrigation practices on fruit cracking and quality of litchi (*Litchi chinensis* Sonn) cv. Dehradun

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The litchi (*Litchi chinensis* Sonn.) is an important sub-tropical evergreen fruit tree belonging to the family Sapindaceae. India is the second largest producer of litchi in the world after china. In India litchi is growing under an area of 91 thousand hectares with a total production of 578 thousand metric tonnes. It is grown in the states of Bihar, Tripura, West Bengal, Uttar Pradesh, Punjab and Haryana. In Jammu division, litchi is grown under an area of 930.51 hectares with a total production of 2264.40 metric tonnes. Litchi flowers in March and the fruit matures during the month of June, a season characterized by high temperatures and relatively low rainfall. Thus, water deficit is a major limiting factor in litchi fruit production. Water management is an important aspect of litchi cultivation. Litchi requires optimum soil



moisture for its optimum growth, development and fruit production. An average litchi plant requires 600-800 mm water but the water requirement may vary with plant age or size as well as season. Mulching is a beneficial practice to obtain higher income from orchards and results in higher yield. The practice of mulching in fruit trees imparts manifold beneficial effect, like stabilization of soil temperature, reduced water loss through evaporation, resulting more stored soil moisture, maintenance of soil fertility, suppression of weed growth, improvement in growth and yield, reduces erosion by wind or water, checks surface run-off and suppress the weed growth. Keeping in view the immense importance of water management for successful litchi cultivation, the present investigation was therefore, carried out to assess with the objective to study the "Effect of mulching and irrigation intervals on fruit cracking and quality of litchi (*Litchi chinensis* Sonn.) cv. Dehradun.

Keywords: Litchi, mulching, irrigation fruit cracking.

MSAEJMU-171

Influence of different levels of boron on yield and growth parameters of cauliflower in an acid alfisol of Himachal Pradesh

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field experiment was conducted during rabi 2013-14 at the experimental farm of Department of Soil Science, College of Agriculture, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur, to evaluate the influence of different levels of boron on cauliflower (Brassica oleracea L. var. botrytis) yield and growth parameters. The experiment with ten treatments consisting of eight levels of boron (0.0, 0.75, 1.5, 2.5, 5, 10, 20 and 30 kg ha⁻¹ along with 100% NPK + FYM (a) 20 t ha⁻¹ fresh weight basis), one treatment comprising of only FYM @ 20 t ha⁻¹ and one absolute control was laid out in a randomized block design replicated thrice. Boron (B) was applied as boric acid (17.5% B) along with recommended dose of nitrogen (N), phosphorus (P) and potassium (K). The results revealed that the different treatments exercised a marked and significant effect on days taken for curd initiation and curd maturity, plant height, number of leaves and curd yield. Curd yield varied from a minimum of 25.0 g ha⁻¹ in absolute control to maximum of 110.3 q ha⁻¹ in the treatment receiving B (a) 1.5 kg ha⁻¹ + 100% NPK + FYM which was statistically at par with the treatment where B was applied @ 0.75 kg ha⁻¹ along with 100% NPK + FYM. The maximum increase of 29.3% in curd yield was recorded in the treatment receiving B @ 1.5 kg ha⁻¹ along with 100% NPK + FYM followed by application of B @ 2.5 kg ha⁻¹ + 100% NPK + FYM, where increase was to the tune of 23.2% as compared to treatment where no boron fertilizer was added. The application of boron influenced growth parameters significantly up to 5 kg ha⁻¹. Minimum number of days for curd initiation and maturity (83 & 90, respectively) were recorded in treatment where boron was applied (a) 5 kg ha⁻¹ + 100% NPK + FYM and maximum days for curd initiation and maturity (93 & 101, respectively) were taken in absolute control. Plant height ranged from 21.3 cm in absolute control to 35.5 cm in treatment where boron was applied @ 1.5 kg ha⁻¹ along with 100% NPK and FYM. Maximum number of leaves (16) were recorded in treatment where boron was applied (a) 1.5 kg ha⁻¹ + 100% NPK + FYM and minimum number of leaves (12) where no fertilizers and FYM were applied. Higher rates of boron i.e. 10, 20 and 30 kg ha⁻¹ had toxic effects on growth parameters as well as a reduction of 43.5 per cent in curd vield was recorded at highest B level.

Keywords: Cauliflower, boron, growth, yield.

MSAEJMU-175

Effects of nitrogen and silicon on plant growth and yield attributes in rice

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The field experiment was conducted at Agronomy Research Farm of SKUAST-K during Kharif season 2014 and 2015 entitled "To assess the effects of nitrogen and silicon on plant growth and yield attributes in rice". Three N levels (N_1 : 120, N_2 : 150, N_3 : 180 kg/ha) and four Si applications (Si₀: Control,



Si₁: 5%, Si₂: 10% and Si₃: 15%) were used in a factorial experiment in completely randomised block design with four replications. Number of tillers m^{-2} and relative growth rate were significantly highest with 180kgN ha⁻¹ from 30-45DAT but from 60DAT upto harvest, these growth parameters were significantly highest with 120kgN ha⁻¹. However, number of tillers m^{-2} and relative growth rate were significantly highest with 15%Si. The yield attributes *viz.*, the number of panicles m^{-2} and panicle weight, biological yield and harvest index were significantly highest with 120kg N/ha. Similar observations were significantly highest with 15% Si. The treatment combination N₁Si₃ (120kgN ha⁻¹ with 15%Si) proved to suitable and economically feasible for plant growth and increasing yield in transplanted rice under temperate Kashmir conditions.

Keywords: Growth, nitrogen, rice and silicon and yield.

MSAEJMU-182

Effect of levels of custard apple (Annona squamosa L.) pulp on sensory evaluation and coat of production of whey beverage

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The present investigation entitled Effect of Levels of Custard apple (Annona squamosa L.) Pulp on Sensory Evaluation and Coat of Production of Whey Beverage was carried out in the laboratory of Department of Animal Husbandry and Dairy science, Dr. PDKV, Akola. Whey beverage was prepared with different combinations of whey and custard apple pulp as 97: 03 (T₁), 94: 06 (T₂), 91: 9 (T₃), 88: 12 (T₄) and 85: 15 (T₅). The samples were subjected to sensory evaluation and cost of production, which were calculated on the basis of prevailing cost of ingredients and concern process requirement. Sensory evaluation the results revealed that overall acceptability scores obtained were 7, 7.5, 8.75, 7.75 and 7.25 for the treatment T₁, T₂, T₃, T₄ and T₅ respectively. The treatment T₃ scored significantly highest scores for flavour, colour, consistency and overall acceptability which were found superior amongst all the treatments. The beverage prepared from all combinations of whey and custard apple pulp was found acceptable. The cost of production per kg of beverage was increased with increase in custard apple pulp percentage. i.e. Rs.15.17 (T₁), Rs. 21.14 (T₂), Rs. 27.11 (T₃), Rs. 33.08 (T₄) and Rs. 39.05 (T₅). **Keywords:** Custard apple, whey beverage

MSAEJMU-190

Trends in impact assessment methodologies for KVK extension programmes

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The present paper focuses on the trends being followed by the researchers across the country to assess the impact of various activities carried out by Krishi Vigyan Kendras (KVKs). To find out impact of KVK activities, different methodologies for impact assessment are being followed. Most commonly extension gap, technology gap and technological index are the widely used indicators to assess the impact. Yield gap analysis, increase in net income, knowledge and adoption enhancement are other indicators used by many researchers. Some of the researchers also use percent increase in yield over the farmers practice, cost and returns and enhanced cost benefit ratio for impact assessment of the Front Line Demonstrations. Besides comparison of the FLD and non-FLD farmers with regards to the technology under consideration is another widely used approach. Productivity enhancement, area expansion and horizontal spread of technologies over the period of time are other parameters on which the impact is also being calculated. One of the trends for proper analysis of impact is the counterfactual analysis using a comparison group by ether single difference or double difference measures. In some cases, impact evaluation establishes whether the intervention had a welfare effect on individuals, households, and communities, and whether this effect can be attributed to the concerned intervention. The most common limitations of some of the impact



assessment methodologies are lack of clarity about the indicators, lack of standardized methodology and lack of distinction between outcome and impact. **Keywords:** Impact, indicators, evaluation, extension gap, adoption, KVK

MSAEJMU-195 PRD as a farming strategy for maximizing crop productivity in Kandi areas

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rought is a severe environmental stress limiting agricultural production in many countries. Climate change and expanding land use in horticulture have increased the pressure on water resources. Therefore, great emphasis is placed on water management for dry conditions based on plant physiology, with the aim of increasing water use efficiency. Worldwide, successful attempts have been documented regarding the use of deficit irrigation methods, namely partial rootzone drying (PRD) to improve water use efficiency (WUE) in various tree crop species. Water productivity (WP) is defined as crop yield per unit functional irrigation water that is the efficiency of applied irrigation water. PRD is an irrigation technique that consists of irrigating one half of the rootzone, while the other half falls dry. Irrigated and dry sides are periodically changed. Later on, some far-reaching studies on PRD were conducted in Australia and the PRD term was used and developed for grapevines. Partial root-zone drying irrigation (PRD) is the new deficit irrigation strategy that is generally adapted in the last decade to a vast kind of agronomic and horticultural crops to increase the water productivity (WP). This paper generally reviewed the most recent studies on PRD. Since PRD is newly applied to some tree species, it is recommended to do more studies on different kind of trees in different environmental conditions. Therefore, PRD is recommended for irrigation of farms and gardens in kandi areas which are suffering from lack of fresh water resources for agricultural production. It is noteworthy that studies on PRD are still continuing and in future new results will be available from other crop species, probably from horticultural and tree crops with a high irrigation water requirement.

Keywords: PRD, crop productivity, irrigation

MSAEJMU-199

Use of plant growth regulators for improving fruit production in subtropical crops

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Plant growth regulators or phytohormones are organic substances produced naturally in higher plants, controlling growth or other physiological functions at a site remote from its place of production and active in minute amounts. Thimmann proposed the term Phyto hormone as these hormones are synthesized in plants. Plant growth regulators include auxins, gibberellins, cytokinins, ethylene, growth retardants and growth inhibitors. The plant hormones or regulators are the organic chemical compounds, which modify or regulate physiological processes in an appreciable measure in the plant when used in small concentration. They are readily absorbed and move rapidly through the tissues, when applied to different plant parts. Detailed knowledge of the mechanism of action and advance use of existing bio-regulators will not only aid the search for new products, but will be useful in predicting possible secondary effects of potentially market-able compounds in terms of their effects on the environment. The exogenous application of bio-regulators might, therefore, act as a powerful tool not only for enhancing the growth, productivity, quality of fruits but also in combating the ill effects generated by various biotic and abiotic stresses in plants in the near future. There by aiding to enhance potential crop yield and alleviating hunger and malnutrition in the ever-increasing human population of the world. Future research needs, therefore, require a better understanding of the mechanism responsible for developmental processes in plants at the cellular and



molecular levels, and a more comprehensive description of the specificity of bioregulators in mediating key biochemical steps. **Keywords:** Fruit production, plant growth regulators

MSAEJMU-202

Economic approaches in impact analysis

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Efficiency analyses is the knowledge of the extent to which programs have been implemented successfully and the degree to which they have the desired outcomes is indispensable to program managers, stakeholders and policymakers. In almost all cases, however, it is just as critical to be informed about how program outcomes compare to their costs and there analyzed by cost benefit analysis. Costeffectiveness analysis can be used to determine the least-cost means of achieving the objective. Costeffectiveness analysis is often used for evaluating health, education, environmental and defense programs and policies, because program/policy benefits are generally not easily or accurately measured in monetary terms. The information that cost-effectiveness analysis contributes is often summarized by the cost effectiveness (CE) ratio, which is the cost per unit health effect achieved by using a particular health intervention. There are three main approaches to impact assessment, forward tracking, backward tracking, and evaluation of mechanisms to increase research use. Research impact were investigated in the study. The research impact be captured in robust ways, the appropriate methods for assessing impact in local and devolved policy contexts data should be collected to assess research impact and effect of assessing impact at different times. Contribution analysis is founded on theory-based approaches to evaluation. Contribution analysis can be used as a way of linking activities to outcomes by creating convincing evidence chains that would demonstrate research uptake, use and impact. It offers a step-by-step approach designed to help managers, researchers, and policymakers arrive at conclusions about the contribution their programme has made to particular outcomes.

Keywords: Impact analysis, efficiency, cost effectiveness.

MSAEJMU-204 Effect of PBR's and nutrient applications on nutrient status and fruit cracking of Eureka lemon

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itrusis an important genus of the family Rutaceae, which occupies unique position among popular fruit crops and extensively grown in tropical and sub-tropical regions. Among the acidic citrus fruits, lemon is a leading premier citrus and is quite popularly grown in the northern plains of India. Lemon has potential to bear in many flushes making it long duration crop having round the year availability of the fruits and longer shelf life. Lemon juice is widely used in the preparation of soft drinks and possesses special dietic values associated with its high vitamin C content. On the other hand, lemon is confronted with a very serious problem of fruit cracking. Garcia-Luis et al., (2001) studied the response of application of growth regulators to fruit cracking and found them relevant to splitting as this application markedly affected the rind structure, affecting both cell size and the thickness of the flavedo. Hoffmann (2007) explained citrus fruit splitting as one of the most exasperating problems experienced by the citrus fruit growers. Deficiencies of calcium, boron and potassium in plant have been reported to cause nutritional imbalance leading to fruit cracking. Foliar feeding of PBR's and nutrients is a new and innovative approach to check fruit the fruit cracking. Proper spraying schedule of PBR's and nutrients before fruit splitting helps to control cracking and enhance the nutrient status of the plant. The application of the synthetic auxins results in thin and/or smooth rinds, leading to an increase in thickness and rind coarseness which has subsequently been shown to reduce fruit splitting. Potassium is involved in numerous biochemical and physiological processes which are vital to plant growth, yield, quality and stress.



Adequate potassium nutrition has also been associated with increased yields, fruit size, increased soluble solids, ascorbic acid concentrations, improved fruit color, increased shelf life and shipping quality of many horticultural crops (Lester *et al.*, 2007, Kanai *et al.*, 2007). Therefore, the studies were carried out to evaluate the impact of different foliar application of PBR's and nutrient on leaf/fruit nutrient status and fruit cracking of Eureka lemon with the objectives to find out the effect of foliar application of PBR's and nutrients on fruit cracking and nutrient status of Lemon cv. Eureka.

Keywords: PBR, nutrient, fruit cracking

MSAEJMU-205

Huge technological gaps in maize cultivation: Is it an outcome of extension deficit in tribal areas of Kashmir

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ribals are most vulnerable sections of the society and they rely on subsistence agricultural practices for their living. The agricultural practices are practiced under rainfed conditions over terraces drawn out on undulated topography. This background motivated us to analyze the maize cultivation in relationship with technological gaps so as to arrive at the extension gaps and policies to bridge them. This study mainly perused the primary data obtained from sample respondents selected in tribal areas of Kashmir valley though; some secondary information was employed to substantiate the findings. Appropriate tools were employed to analyze the data. The results revealed that tribals were allocating major proportion of their cropped area for maize cultivation followed by cherry and legumes. It was observed that there were huge technological gaps in the use input technologies. Moreover their intercultural operations were far from the scientific recommendations which led to lower returns and uneconomical farming practices. Further lower productivity and fairly low quality of the produce resulted in lower returns to their little surpluses. Study revealed poor role of extension agencies in these area which could be the major cause of their unscientific maize cultivation. Only few respondents were found to have seen any extension personnel around their farms and major of them even did not know about such agencies. A significant difference was observed in yield levels of respondents having received information from friends or extension worker and those having no information. The study also examined the various dimension of their contacts and information sources and could ascertain an important role of extension agencies if their farming has to be made remunerative. Based upon findings, this study emphasized upon strengthening/streamlining extension system in these areas among other policy options.

Keywords: Maize cultivation, Extension deficit, Technological gaps, Tribal areas, Kashmir

MSAEJMU-211

Role of bio-stimulants and solubor on quality of apple cv. Red Delicious

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A pple is the most important and extensively used fruit trees cultivated in temperate zones. Health and superior quality of fruit as one of the most crucial organs of the trees is in direct relation with health of humans. Therefore, to improve its quality, modern feeding procedures such as spraying Bio-stimulants and solubor should be employed to ensure reaching of target i.e, fruit. Improved crop quality and the level of substances and elements existing in it, in response to population and growth and human nutritional needs is much more important compared with increasing yield per unit of surface. Solubor is free flowing, so it pours easily into a tank like a liquid. It dissolves completely with typical tank agitation. Boron is an essential micronutrient. When it is not present in sufficient quantity, apple and pear profits are reduced. A major effect of boron nutrition in fruit trees is its role in fruit set. (Faust, 1989). Application of seaweed



extract as an organic bio-stimulant is fast becoming an accepted practice in horticulture (Turan and Kose, 2004). Seaweed extracts are reported to be effective fertilise in many crops including vegetables, fruit trees, flowering and grain crops (Ferra and Lourens, 2004). Many physiological responses shown by crop plants are reported (Singh and Chandel, 2005) due to cytokineins present in the extracts. Triacontanol (TRIA) is a 30-carbon primary alcohol and functions as a plant growth promoter (Ries *et al.*, 1977). It plays an active role in the up regulation of many biochemical and physiological processes in plants (Chen *et al.*, 2003).

Keywords: Bio stimulants, solubor, apple.

MSAEJMU-212

Influence of growth regulators on peach production

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Deach (Prunus persica (L.) Batsch. is a highly popular fruit crop grown in temperate regions of the world. In India, peach cultivation is confined to mid hill zone of Himalayas extending from J&K State to Khasi Hill at an altitude of 1500 to 2000 metres above mean sea level. Low chilling cultivars are also grown in sub mountainous zones of Punjab, Haryana, Delhi and U.P. and also gaining popularity in subtropical areas of Jammu. Main peach growing areas in Jammu region are hilly areas of Poonch, Doda, Kishtwar, Ramban Udhampur, Reasi, Rajouri and Kathua districts. Recently, the new orchards of low chill peaches are also being planted in Jammu, Samba and Kathua districts. In order to increase the quality and yield of peach, growth regulators must be applied with adequate coverage, which are easily absorbed by the plant and translocated to the site of activity in sufficient concentration to give the desired response. These are chemicals used to modify tree growth and structure, remove excess fruit, or alter fruit maturity. The use of growth hormones for reducing the excessive vegetative growth can help in providing required light air and reduce the shade effect to almost all the branches, thus providing better growing conditions. Chemicals like Paclobutrazol, Succinic acid can be used to reduce the excessive vegetative growth by decreasing the length of nodes. Application of auxins and gibberellins like IAA and GA₃ can help increase the fruit size. Fruit colour can be enhanced by the application of auxins like 2, 4, 5-T. Storage quality of Peach is another important aspect which can be addressed by application of gibberellins to reduce the storage disorder. Use of benzyl adenine or kinetin can help in increasing the growth ad yield in the stressed peach trees. Spraying of ethylene on the crop can help induce uniform ripening. Application of Growth regulators at the right time and concentration will help improve the peach production. Keywords: Peach, auxins, paclobutrazol, quality and yield.

MSAEJMU-228

Assessment of adoption gaps in production technologies of *Brassica* napus L.

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Oilseed crops have been the backbone of agricultural economy of India from time immemorial. Oilseeds are the main source of raw materials for vegetable oils. They are essential components of human diet and are rich source of energy and earners of fat soluble vitamins A, D, E and K. The productivity of oilseed crop in the district is low (8 quintals/ha) as farmers are growing these crops in marginal area and due to non-adoption of improved package of practices, therefore efforts have been made through FLDs to introduce new high yielding varieties of these crops to demonstrate improved production technologies to increase productivity of oilseed crops in the district. The present study was undertaken in Kathua District of Jammu & Kashmir to analyze the status of Gobhi Sarson production technology, constraints in its cultivation and the possibilities to increase production. A fundamental problem to overcome insignificantly increasing oilseed production is to change the prevailing perceptions of their



status as a subsistence crop and to consider as a commercial crop. This will require aggressive on-farm demonstrations of the viable technical options to alleviate the gaps in technology of production of oilseed crops. It emphasizes dissemination of improved varieties and low cost, environmental friendly crop husbandry techniques. Keeping this in view front line demonstrations (FLDs) on Gobhi Sarson were conducted during rabi 2013-14 and 2014-15 and proved immensely useful in increasing the production and productivity of oilseed crops in the district along with evaluation of adoption gaps. The improved practice produced 49.7 and 51.8 per cent more seed yield and 61.5 and 71.3 per cent higher returns of Gobhi Sarson than the crop raised by the farmers themselves in 2013-14 and 2014-15 respectively. **Keywords:** Frontline demonstration, Gobhi Sarson, Production technology, seed yield

MSAEJMU-230

Impact of KVK Interventions on Yield and Income: A Case Study of Village Sagoon, Jammu

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The study was conducted in Jammu district of Jammu and Kashmir state to assess the impact of KVK interventions. The study revealed that farmers were satisfied with KVK activities namely frontline demonstrations and capacity building programmes that built their confidence to shift from traditional Maize-wheat cropping system and cultivate pulses and oilseed crops. The cultivation of pulses and oilseeds helped the farmers to fetch an additional income of Rs, 40,800 and 6100 per ha, respectively. Moreover, demonstrations of proven technologies of maize and wheat helped the farmers to fetch more yield per unit area. Overall, the KVK activities opens new horizons and helped farmers to think differently than the routine cultivation of traditional crops namely maize-wheat.

Keywords: KVK, Frontline demonstrations, technologies

MSAEJMU-234

Effect of balance fertilizers application on yield and economics of wheat in Rajouri district

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heat is the staple food in the Jammu Plain, adjacent to the province of Punjab. Wheat is a crop which can be grown in the tropical and subtropical, temperate and cold zones even beyond 67°N. Generally sown in autumn, it can stand the cold of the severe winter months and resumes growth with the advent of warm spring and summer. The productivity of wheat in the state continues to be quite low on account of several biotic and abiotic stresses besides, unavailability of quality seed of improved varieties and improper use fertilizers. Total area under wheat crop in the district is about 43494 ha, with the productivity of 15.95 q/ha. Its productivity is quite low as compared to their yield potential of the crop this was due to Imbalance use of fertilizers and seed sowing through broadcast or seed drill. In such situation demonstration was conducted of balanced dose of fertilizers with improved variety of wheat along with seed cum fertidrill machine on the farmer's field. Wheat yield advantage of 22.07% was obtained under recommended practices over farmers practices, consequently farmers gain additional profit in term of monetary of Rs 7005 and Rs 10848/ha. This was due to significant increase in yield attributes viz. No. of effective tiller/plant, No. grains/ear, test weight (1000 grains) and yield q/ha 11.5,6.8,2.45 and 21.07% respectively were recorded under recommended practice as compared to farmers practice. Percentage returns to fertilizers 3.7 to 4.8% during 2015-2016 which is beneficial in future to farmers and improve their standard of living as per FAI.

Keywords: Yield, B: C ratio and percentage return to fertilizers.



Economics of management practices against stem borer in paddy under midhill conditions of Rajouri

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Paddy is second major kharif crop, after maize, grown over an area of more than 8000 hectares in Rajouri district of Jammu & Kashmir. The crop is ravaged by only a few insect pests and diseases in the district as compared to other paddy growing areas. Major insect pest in the district has been observed to be paddy stem borer (*Sesamia inferens*) with losses ranging from 5 to 21 per cent. An experiment was laid out at farmers field at three different locations under mid hill condition of Rajouri (J&K) to find out the efficacy and economics of various management practices to control paddy stem borer (*Sesamia inferens*) during kharif 2016. The results of the experiment revealed that minimum infestation (9%) of the stem borer was observed in filed where clipping of flag leaves was practised and seedlings were dipped in clorpyriphos (0.2%) for 4 hours before transplanting. These plots also gave maximum yield of 32.1 quintals with cost benefit ratio of 1.99. It was followed by another treatment where crop was broadcasted with carbofuran 3G @ 20 Kgs per hectare. In such plots, 11 per cent infestation was observed with an yield of 29.1 q/ha and C: B ratio of 1: 1.90. Among the treatments, minimum yield of 25.4 q/ha was obtained from plots where only seedling dip method was adopted with 18 per cent borer infestation. This treatment gave CB ratio of 1.85 as against 1.71 from farmers practice. All the treatments were significantly superior over check *i.e.* farmer's practice.

Keywords: Paddy, Stem borer, management.

MSAEJMU-239

Effect of organic manures on seed production of okra var. Seli special under intermediate zone of J&K

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O kra (Abelmoschus esculentus L. Moench) is one of the most important vegetable crops grown in Jammu region. It is a nutrient exhaustive crop and farmers apply chemical fertilizers indiscriminately. However, in order to standardize its seed production technology under organic system, an experiment was conducted at RARS, Rajourion okra var. Seli Special during rainy season of 2016. The treatments comprised of FYM, Vermicompost and Poultry manure alone or in combinations were compared with control (recommended fertilizer dose. The Ist year results revealed significantly highest seed yield (19.3 kg/ha) in treatment combination T₇- Half dose FYM + $1/4^{th}$ dose each (VC @ 1.87t/ha + PM @ 1.25t/ha) as compared to other organic treatments. However, maximum seed yield of 19.8 kg/ha was recorded in T₈-Control-Recommended fertilizer dose (100: 60: 60 NPK/ha) which was at par with T₇. Half dose FYM + $1/4^{th}$ dose each (VC @ 1.87t/ha + PM @ 1.25t/ha) The highest seed yield in in T₇ can be attributed due to the highest values of other agro-biological features viz., plant height, number of pods, pod weight and number of seeds per pod as compared to control.

Keywords: Okra, organic manures, J&K



Economic analysis for different methods of wheat sowing in intermediate zone of Rajouri district in J&K

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The farm power and machinery jointly represent the largest single item of expenditure constituting about 60 percent of total investment on a farm. The selection of tractor and matching implements for sowing of wheat is very necessary for increasing productivity and decreasing cost of cultivation per hectare. The study was conducted to evaluate the performance of broadcasting method of seed sowing after two times cultivator, line sowing after two times cultivator and Zero till seed cum fertilizer drill for sowing of wheat crop on farmers' field in intermediate zone of Rajouri district in J&K. It was found that yield and net return for sowing seed by broad casting, line sowing and Zero till seed cum fertilizer drill was 19.4q/ha and Rs 22,000/ha, 21.5q/ha and Rs28,800/ha and 25.5q/ha and Rs42,000/ha respectively. The benefit cost ratio was 1.45, 1.57 and 1.72, respectively for these methods of sowing. Increase in yield by Zero till seed cum fertilizer drill was 52.59 percent over Broad casting method.

Keywords: Zero till seed cum fertilizer drill, broadcasting, line sowing, yield, cost

MSAEJMU-244 Effect of tillage systems and mechanization on yield and economics of maize sowing

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An experiment was carried out on farmers' field in intermediate zone of Rajouri district in J&K to assess the effect of tillage system on yield and cost per hectare of maize crop. The sowing of maize under three treatments consisting of T_1 (Tractor drawn cultivator three times, T_2 (Power tiller operated rotavator two times) and T_3 (Power tiller operated rotavator one time). It was found that the yield of maize by treatments T_1 , T_2 and T_3 was 21.0q/ha, 31.0q/ha and 30.0q/ha respectively whereas net returns was Rs 18,400/ha, Rs 26,400/ha and Rs 31,200/ha respectively. The benefit cost ratio by treatments T_1 , T_2 and T_3 was 1.38, 1.86 and 1.98 respectively. Increase in yield by treatment T_3 was 42.86 percent over treatment T_1 . The results of agronomic observations revealed that plant height and depth of root were superior in treatment T_3 whereas treatment T_1 was found to be less effective. **Keywords:** Power tiller, Rotavator, Cultivator, Yield, Benefit cost ratio

MSAEJMU-248

Effect of times of transplanting and nitrogen levels on productivity of fine rice SJR-129 in irrigated sub-tropics of Jammu and Kashmir

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Rice (*Oryza sativa L.*) is one of the most important cereal crop of the India as well as world. It is staple food of more than the half of the global population i.e. about 3 billion people and the demand is expected to increase as population increases (Carriger and Vallee, 2007). Fine rice enjoys a special place both in domestic as well as international market (Gupta and Kumar, 2008). SJR-129, newly evolved cultivar of fine rice developed by SKUAST-Jammu, is an early maturity variety having plant height of 110-115 cm with yield potential of about 44q/ha. The productivity and quality of fine rice depends on the



environmental conditions and the agronomic practices especially the times of transplanting and nitrogen management which plays a significant role in achieving higher productivity of rice crop. Transplanting of rice in the optimum period of time is critical to achieve higher grain yield. Besides transplanting date, nutrition is an important factor which tremendously affects the grain yield of fine rice. Among the nutritional factors, nitrogen (N) is essential for rice and usually it is the most yield-limiting nutrient in irrigated rice production around the world (Samonte *et al.*, 2006). The application of nitrogen fertilizer in fine rice either in excess or less than the optimum rate affects both yield and quality of rice to a remarkable extent. Therefore, nitrogen is the key input for increasing the productivity of fine rice (Mahajan *et al.*, 2010).

Keywords: Transplanting, rice, nitrogen levels

MSAEJMU-254

Economic analysis of mango based agroforestry system in sub tropics of Jammu, J&K

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groforestry practices to yield multiple harvestable products, while concurrently providing numerous conservation and ecological benefits as well as new market opportunity to the land owner. Fruitbased agroforestry systems actively manipulate and utilize the interactions among components (fruit trees, crops and/or livestock) resulting in more diversified economies for both short- and long-term products and provide a market for both agronomic and fruit crops. This type of intercropping concept holds remarkable application in conditions where land remains locked under age old orchards. The owner gets economic returns from the sale of fruits only. Mango is one such crop which bears fruit in alternate years and exhibit lower orchard efficiency. Thus, it limits the horizontal expansion of the orchard and hence, the economic benefits to the farmer/grower. In this context, the present investigation was undertaken at Udheywala Farm of SKUAST-J, Jammu where four important medicinal plants viz. Ginger (Gingiber officinalis), Turmeric (Curcuma longa), Stevia (Stevia rebaudiana) and Kalmegh (Andrographis paniculata) were grown under the canopy of mango orchard to screen out the best tree-crop combination based on bio-economic analysis. As a measure of plant performance for yield, land equivalent ratios (LER) were calculated to evaluate the efficiency of the agri-horti system. The monoculture equivalents were less than one for turmeric, stevia and kalmegh in all the treatments, indicating that production in such a system reduced the yield of each crop relative to what had been produced in a similar sized monoculture plot i.e sole crop. The maximum LER (13.48) was recorded for Mango + ginger followed by Mango + turmeric (1.57), Mango + kalmegh (1.53) and the least was in Mango + stevia (1.01). It was concluded that ginger was the most suitable intercrop with mango whereas stevia was unsuitable under the sub-tropical conditions of Jammu region. Keywords: Mango, LER, Stevia, Ginger, agroforestry, Turmeric, Kalmegh

MSAEJMU-255

Pest Management through economic optimality in brinjal cultivation Mangal Tambe, N.V. Shende, S.M. Thawale, N.N. Pusdekar, A.D. Dhunde, Utkarsha P. Gaware

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Plant protection plays a vital role in modern agriculture, fertilizers, plant protection measures, irrigation and improved seeds are the key elements of new agriculture of technology. The new technology is unfortunately associated with the high pests and diseases incidences. In the absence of adequate plant protection measures, the positive contribution of improved seeds fertilizer and irrigation to output could be completely nullified and farmers may income heavy losses. In Maharashtra area under Brinjal was 35.0 thousand hectares during 2015-16, production 690.0 thousands MT. with productivity of 25.00 MT/ha. In Nagpur district area under Brinjal in 2015-16, 1689.00 ha production 38957.00 MT/ha. Brinjal or egg plant (Solanum melongena L.) is an important solanaceous crop of subtropics and tropics. The study has been



undertaken in district of Vidarbha region. Primary data was collected from Katol, Hingana and Mauda tahasils of Nagpur district. 12 villages are selected purposely, from these tehsils, each village 8 farmers were selected over all 96 farmer were selected for present study. The data pertain for the year 2015-16. The regression coefficient of manure, quantity of pesticide and seed was significant at five per cent level. The other remaining variables were not significant. About one per cent variation was explained by the variables included in function. Thus, if one per cent increase manure or fertilizer, there was significant income in gross income i.e. 6.031 per cent on the other hand the variables like expenditure on seed as quantity of pesticide used indicates negative impact on gross income with significant. Expenditure elasticity of pesticide use in brinjal cultivation there was expenditure on seed and number of application are five per cent significant. Quantity of pesticide required for brinjal 1.176 litr/ha. The requirement of the optimum pesticide as estimated through production function. The actual quantity (2.1 lit/ha) of pesticide use was high in the sample farmer. Hence, it is suggested that farmer should aware about application of pesticides on the basis of economic threshold level. It is also need to educate farmer to aware about the discriminate use of proper pesticide.

Keywords: Pest management, brinjal, economic optimality.

MSAEJMU-256

Pest management through economic optimality in cabbage cultivation N.V. Raut, N.V. Shende, A.D. Dhunde, Utkarsha P. Gaware, S.M. Thawale, N.N. Pusdekar and

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Abbage is the most important cash crop considering its place in the agriculture economy of the state. It is a very sensitive crop and neglect of any particular operation or change in climatic condition may cause heavy damage to its production of cabbage. Nagpur is one of the highest cabbage producing district in Vidarbha region (Maharashtra). The study has been undertaken in Nagpur district. Data pertains to the vear 2016-17. Primary data was collected from Kalmeshwer, Kampti and Narkheda tahasils of Nagpur district. 12 villages are selected purposely, from these tehsils, each village 8 farmers were selected over all 96 farmer were selected for present study. The study revealed that, the regression coefficient of labour, quantity of pesticide and manure and fertilizer was significant in Cobb-Douglas production function at overall level. Expenditure elasticity of pesticide use in cabbage cultivation there is total family income is 5 per cent significant quantity of pesticide required for cabbage 0.49 litr/ha. The requirement of the optimum pesticide was estimated through production function. The actual quantity of pesticide use was high in the sample farmers. The resource use efficiency analysis clearly indicated the resources were not properly used as guided by the economic principles. The MVP/MFC ratios were negative for plant protection chemicals. Thus, the withdrawal of these resources would maximize the returns from cabbage production. The farmers need to be educated and advised about the proper use of these resources particularly plant protection chemicals.

Keywords: Pest management, cabbage, economic optimality.

MSAEJMU-257

Extend of adoption of technology in orange cultivation

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In recent years fruits and vegetables have gained prominence due to their potential rates in ensuring nutritional security to the population and their role in diversification of agriculture. It is under this background that adoption of disease management in horticultural crops in general and rejuvenation of mandarin orange orchard in particular has become important. The present study was undertaken in Nagpur district of Maharashtra State of India. In all total 60 farmers were selected from three Tahsils of Nagpur district for the year 2015-16. The data was collected from the orange growers by personal interview. The



study of extent of adoption indicates that hundred per cent of the farmers were adopted the two component of technology of rejuvenation i.e. pruning and application of Bordeaux paste. However, may be due to nonavailability of well decomposed FYM with sample farmers, overall only 10 per cent farmer shown under high level of adoption. It is a very popular practice of application of Nitrogen amongst cultivator. On an average 60 per cent farmers were adopted the recommended level of technology. On the other hand only 2 per cent farmers were the high level of adoption of application of phosphorus. An examination of total adoption index revealed that 75 per cent farmer had either low or medium adoption of the technology. Therefore, it provides an opportunity for increasing their level of adoption of the through extension support and input subsidization. The average adoption index was found to be 30.50 this reveals that most of the farmers adopted the technology only at partial level and there was a need to promote the adoption of technology including all its components. As perceived by farmers, scarcity of electricity during irrigation, absence of proper extension services, non-availability of well decomposed FYM and Neem Cake and lack of labour availability were found to be the four most important constraints which limit wider adoption of rejuvenation technology. Therefore, making available of electricity for irrigation and better access to extension services would lead to wider adoption.

Keywords: Technology, adoption, orange.

MSAEJMU-260

Response of prohexadione calcium and paclobutrazol on vegetative growth and return bloom of pear cv. Clapp's favourite

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ncient Greek poet Homer praised pears as one of the gifts of God. This prehistoric fruit has been Lunder cultivation both in Europe and Asia for about 3000 years. In India, improved pear cultivars were introduced in later part of 19th century and cultivation got momentum with success of 'Bartlett' and 'Gola' cultivars in hills. Because of its tolerance to a wide range of soil and climatic conditions, it is grown in both temperate and subtropical conditions and can tolerate as low as -26°C in dormancy and as high as 45°C in growing period. In temperate conditions fruits trees mainly pome fruits such has apple and pear suffers from many problems, like diseases, insect pests and morphological problems like canopy volume, shoot elongation, abortion of fruit lets which hampers the fruit size and fruit quality. An excessive shoot growth in temperate trees like apple and pear directly competes with the fruit growth for assimilates. particularly during the early stages of fruit development when shoot and fruit growth are optimal. This competition may reduce the number of fruit cells, thereby, limiting fruits from reaching their potential fruit size and adversely impacting yield. Although many growth retardants are used to overcome these problems like Adenile Benzyl Amine, GA₁₂ Aldehyde, Chlorogemutat and Ethephon but significant results has not been found. Application of growth retardants like Prohexadione-calcium and Paclobutrazol can significantly reduce these problems when applied at appropriate time and in proper quantity. Prohexadione-calcium is an acylcyclohexadione plant growth retardant jointly developed by BASF, Germany) and Kumiai Chemical Industry, Tokyo. Prohexadione-calcium reduces the plant shoot growth by inhibiting late stage of GA biosynthesis. Paclobutrazol (PBZ) also called cultar is a potent gibberellin synthesis inhibitor that effectively controls vegetative growth of fruit trees. It basically inhibited the activity of mono-oxygenases as a result GA12 is stopped to converted into GA1 i.e., active form of gibberellic acid. Therefore, the effect of Prohexadione calcium and Paclobutrazol was studied on vegetative growth and return bloom of pear cv. Clapp's Favourite

Keywords: Pear, vegetative growth, prohexadione calcium and paclobutrazol





Economics of different grafting methods on walnut under intermediate agro-climatic conditions of Jammu and Kashmir

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The present investigation was carried out in the experimental farm of Regional Agriculture Research L Station (RARS), Rajouri, Tandwal, SKUAST-JAMMU during 2015. The experiments were laid out in Factorial Randomized Block Design with three replications. The experiment was consisted of three different grafting methods viz., Tongue grafting, Cleft grafting, Side grafting on four different dates viz., 4th week of February, 1st Week of March, 2nd week of March and 3rd week of March. The economics of using different grafting methods in walnut have been worked out by calculating net returns from each of the three methods. In this analysis, only the cost of the treatments for different grafting methods and cultural management practices has been considered for estimating the total cost. This cost includes material as well as labour cost of the treatment. An economic analysis of walnut plants has been presented through studying their cost and returns. The study revealed that the total cost of grafting of walnut plants up-to their survival was same in all the grafting methods (Rs. 22880). After different survival rate of three methods. tongue grafting gave maximum returns (Rs. 43200) and minimum in side grafting Rs. 23600). However, benefit: cost (B: C ratio) was found to be maximum in tongue grafting (1: 1.89) and minimum in side grafting (1: 1.03). From the present study it can be concluded that among the different grafting methods, tongue grafting is most suitable and economically feasible as it resulted in highest net returns under intermediate agro-climatic conditions of Jammu and Kashmir.

Keywords: Walnut, grafting, intermediate agro-climatic zone.

MSAEJMU-263

Effect of training programme on knowledge and adoption behaviour of farmers on mushroom production technologies

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study was conducted to ascertain the level of knowledge and adoption behaviour of the farmers with Arespect to Mushroom production technologies due to trainings imparted by Krishi Vigyan Kendra, Kathua. Farmers were selected from the four villages namely Chainpura, Kashed, Qunthal, and Nihalpur Palli and imparted training on scientific mushroom production technologies. Twenty-five trainees and equal no. of non- trainees were randomly selected making the sample size of 50 farmers. It was found that trainees had high level of knowledge (100%) where as in case of non-trainees, 26% high level, 30% medium level and 44% with low level of knowledge. There was a significant difference between trainees and non-trainees regarding the knowledge about the scientific technologies of mushroom production. The study also revealed that most of the trainees (74%) had higher level of adoption followed by medium level (26%) whereas, most of the non-trainees had medium level of adoption (44%) followed by low level of adoption (56%). This indicates that there had been a significant difference between trainees and nontrainees regarding the extent of adoption of scientific technologies of mushroom production. Trainees had higher level of adoption of recommended package of practices as also higher mean scores than the nontrainees. Thus, it could be concluded that the trainees had more knowledge and extent of adoption of scientific mushroom production technologies. The KVK should organize more number of training programmes for maximum benefit of the farmers

Keywords: Adoption behaviour, Mushroom production technologies.



Plant growth promoting activity of *Pseudomonas* sp. in Brinjal (Solanum melongena)

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Plant growth- promoting rhizobacteria (PGPR) are free living bacteria present in the rhizosphere of the plant, enhanced the growth of the plant either directly or indirectly. The indirect promotion of plant growth occurs when PGPR lessen or prevent the deleterious effect of plant pathogens on plants. The direct mechanisms involve nitrogen fixation, phosphorus solubilization, Hydrogen cyanide, production of phytohormones such as auxins, cytokinins and gibberellins, and lowering of ethylene concentration. In the present study, seventeen bacterial isolates were isolated from the rhizosphere of vegetable crops from different location of Jammu region. Out of seventeen isolates, seven isolates were selected on the basis of their cultural, morphological and biochemical characters which is similar to *Pseudomonas* sp. To evaluate the efficacy of these isolates in respect to their plant growth promoting activity, all the seven isolates were inoculated by seedling dip method and the result showed the significant increase in root and shoots length, root fresh and dry weight and shoot fresh and dry weight of brinjal plant in all the treatments as compared to control. Among the treatment the I-15 showed the best plant growth promoting activity followed by I-14. So, the screened isolates can be advantageously used in organic farming of brinjal.

MSAEJMU-267

Effect of corpus luteum on quantity and quality of oocytes recovery from sheep ovaries

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The present study was undertaken to assess the effect of presence or absence of corpus luteum on quantity and quality of sheep oocytes. For this reason ovaries were collected from local slaughtered sheep and oocytes were recovered by three methods viz., aspiration, puncture and slicing. Six hundred sheep ovaries were used each for with or without corpus luteum and numbers of cumulus oocytes complexes (COCs) collected against with or without CL were graded and recorded. The overall mean number of total and usable oocytes recovered per ovary was 5.00 ± 0.02 and 3.11 ± 0.02 . The mean number of good, fair and usable (Good+Fair) oocytes yield in ovaries with corpus luteum were significantly lower (P<0.05) than ovaries without corpus luteum. The recovery of poor quality oocytes was significantly higher (P<0.05) compared to good and fair quality oocytes in ovaries bearing CL and fair quality oocytes. The results showed that ovaries without corpus luteum is better than ovaries with corpus luteum for recovery greater number of good as well as fair quality oocytes from sheep ovaries. **Keywords:** Sheep, corpus luteum.





Impact of improved technologies on quality cocoon production

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C ericulture industry has occupied a prominent place in the industrial development in Jammu and Kashmir and is known to produce the best quality bivoltine silk as the climate is congenial for bivoltine silkworm rearing. This industry attained a unique importance among all other sectors and provides an excellent and unique opportunity for socio-economic progress in the state. It needs proper management, appropriate technology and its transfer to the silkworm rearers. The cocoon productivity not solely depends on the quality seed supply or the in time supply of the inputs to the farmers but also in the degree of adoption of suitable technology by rearers and its management. It was observed that due to absence of updated technology by rearers is the major reason for low level cocoon productivity in the state. The survey of rearers revealed that the technology packages viz., introduction of season specific hybrids, application of disinfectants for control of silkworm diseases, chawki/late age rearing techniques, mountages and mounting care etc. had substantial effect on cocoon production and productivity. The cocoon yield of farmer who was supplied chawki worms after 2nd moult, rendered average yield between the range of 35-40 kg. Introduction of new high yielding spring specific hybrid namely CSR2 x CSR4 yielded 40 kg per ounce against ruling hybrid SH6 x NB4D2 which recorded yield of 30-35 kg/ounce. In order to enhance cocoon productivity in the state more proactive approach needs to evolve region/season specific cost effective technologies and to be adopted for the long term development of sericulture industry.

Keywords: Sericulture, bivoltine, cocoon productivity.

MSAEJMU-286

Economic impact of weather forecast based agromet advisories in intermediate zone of Jammu region

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The present study was conducted to assess the economic impact of weather forecast based agromet advisories issued by Agro-meteorological Field Unit's (AMFU), Rajouri jointly with India Meteorological Department (IMD), New Delhi. The main aim was to study the percent increase/decrease in net return due to AAS and to know effectiveness and usefulness of Agromet Advisory Services (AAS) in intermediate zone of Jammu region. The major crops chosen for the study included food grains, oilseeds, cash crops, fruit and vegetable crops. Four seasons comprising two Kharif (summer) and two Rabi (winter) during 2015-2017 were chosen. The sample set consisted of 40 farmers, comprising 20 responding and 20 non-responding farmers. Results obtained that, Agromet Advisory Services has decreased cultivation costs overall by up to 20% for the studied crops. Initial results in some cases had shown increased costs of up to 10% but this was more than offset by consequent rise in net returns of up to 63%. These district-level forecasts have shown incremental benefits up to 15% in vegetable crops with weather based Agromet Advisories. Agromet Advisory Services (AAS) is an effective communication media for transfer of technology regarding climate changes information. Agromet Advisory Services (AAS) provides basic, timely and accurately pre-information of different climate and weather conditions of different crops and helpful to farmers for increase interest, knowledge, adoption and impact of climate changes on agricultural practices.

Keywords: Advisories, agrometeorology advisory service, economic impact, yield.



Economic impact of pinching technique in annual chrysanthemum

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The present research study was carried out at the field of horticulture section, Rural Institute Pipri, Wardha (Maharashtra) to assess the impact of pinching technique in annual chrysanthemum during 2013-14 in *rabi* season. The experiment was laid out in factorial randomized block design with five plantings time. The observations were recorded in respect of vegetative growth, flowering, yield and quality parameters. The results obtained that, the higher yield of annual chrysanthemum raised the gross monetary return, that reflect to increase net monetary return and boost the benefit cost ratio in mid-October planting as well as under single pinching at thirty days after transplanting. Thus, greater the net monetary return higher is the benefit cost ratio.

Keywords: Impact, chrysanthemum, pinching.

MSAEJMU-288

Economic approaches in impact analysis

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Fificiency analyses is the knowledge of the extent to which programs have been implemented successfully and the degree to which they have the desired outcomes is indispensable to program managers, stakeholders and policymakers. In almost all cases, however, it is just as critical to be informed about how program outcomes compare to their costs and there analyzed by cost benefit analysis. Costeffectiveness analysis can be used to determine the least-cost means of achieving the objective. Costeffectiveness analysis is often used for evaluating health, education, environmental and defense programs and policies, because program/policy benefits are generally not easily or accurately measured in monetary terms. The information that cost-effectiveness analysis contributes is often summarized by the cost effectiveness (CE) ratio, which is the cost per unit health effect achieved by using a particular health intervention. There are three main approaches to impact assessment, forward tracking, backward tracking, and evaluation of mechanisms to increase research use. Research impact were investigated in the study. The research impact be captured in robust ways, the appropriate methods for assessing impact in local and devolved policy contexts data should be collected to assess research impact and effect of assessing impact at different times. Contribution analysis is founded on theory-based approaches to evaluation. Contribution analysis can be used as a way of linking activities to outcomes by creating convincing evidence chains that would demonstrate research uptake, use and impact. It offers a step-by-step approach designed to help managers, researchers, and policymakers arrive at conclusions about the contribution their programme has made to particular outcomes.

Keywords: Impact, economics, cost effectiveness.



Impact of micro irrigation and fertigation on acid lime productivity, profitability and water use efficiency in semi-arid climatic conditions of Maharashtra

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field experiment was conducted during 2012-13 to 2013-14 to study the effect of micro-irrigation based on evaporation depletion with reduced doses of NPK applied through fertigation on fruit yield, profitability and water use efficiency of acid lime at AICRP on Tropical Fruits, Dr. PDKV, Akola during the years 2012-13 and 2013-14. The study was conducted in FRBD comprised of three levels of microirrigation (I_1 -100, I_2 -90 and I_3 -80% Evp) and three levels of fertigation (F_1 -100, F_2 -80 and F_3 -60% RDF) in nine treatment combinations replicated thrice. The results revealed that the highest total number of fruits per plant and fruit per hectare (annual harvest) was found significantly higher in micro-irrigation level @ 100% at Evp. (I_1) and fertigation at 100% RDF (F_1) individually which were at par with micro irrigation at 90% Evp. (I_2) and fertigation at 80% RDF (F_2) . However, in Hasta bahar the significantly highest fruit yield per tree and per hectare was obtained with micro irrigation at 90% Evp. (I₂) and fertigation at 100% RDF (F_1) which was at par with I_3 and F_2 . The treatment combination of I_3F_1 produced significantly highest fruit per tree and per hectare followed by I_2F_1 and I_2F_2 which were at par with each other. The higher B: C ratio was obtained with micro irrigation at 90% Evp. (I2) and fertigation at 80% RDF (F2) and in treatment combination of I_3F_2 and I_2F_2 levels. The fruit yield efficiency and water use efficiency was significantly higher in with micro irrigation at 80% Evp. (I_3) and fertigation at 100% RDF (F_1) followed by micro irrigation at 90% (I₂) and fertigation at 80% RDF (F₂) which was at par with each other. Hence, it can be concluded that the application of irrigation level at 80% Evp and fertigation at 80% recommended dose of fertilizers was found beneficial in enhancing productivity and profitability of acid lime along with higher water use and fruit yield efficiency in semi-arid climatic conditions of Maharashtra. Keywords: Micro irrigation, fertigation, productivity, profitability







Theme - II

Economics of Innovative Agricultural Production & Integrated Systems of Management

Lead Papers	:	02
Oral Presentations	:	46
Poster Presentations	:	54
Total	:	102



Lead Paper - IV

Pre- and post-harvest management of banana for domestic and export market

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ABSTRACT

India rank 1^{st} in area & production of banana in the world however, its presence in international market is negligible. Quantitative production system of banana is well established in the country. However, we still could not supply the banana quality desired in the international market. Further the quality of banana in domestic market is also poor. Despite of huge value loss in banana supply chain, consumers do not get the quality they desire. In the last few years there is growing demand for assured & committed supply of quality banana with efficient supply chain. Number of international buyers is looking for dedicated, nationwide suppliers, which can guarantee high volumes and wider range of fresh produce, while complying with the stricter requirements. It is not that we do not have quality production technologies to match up with the International Standard but we lack in proper pre & post-harvest management. India is now considered as a major supplier of an internationally accepted Grand Naine variety. Further with the tissue culture banana sapling & high tech cultivation practices suggested by Jain Irrigation Systems Ltd many banana growers have established both quantitative & qualitative production systems also which could meet the desired export specifications. Therefore, it is high time we shift over from traditional cultivation & post-harvest practices to Hi-tech modern cultivation & improved postharvest management practices developed by Jain Irrigation Systems Ltd Jalgaon; to match up with the international & domestic demand of quality banana. This paper describes special pre harvest & post-harvest management practices developed by Jain Irrigation Systems Ltd to produce desired quality banana for export & domestic market.

Keywords: Post harvest management, banana, export, market

INTRODUCTION

If you want a quick fix for flagging energy levels, there is no better snack than a banana. Containing sucrose, fructose and glucose-combined with fiber, a banana gives an instant, tasty, sustained and substantial boost of energy. No wonder, banana is the number one fruit with the world's leading athletes. But energy isn't the only way a banana can help us keep fit. It can also help overcome or prevent a substantial number of illnesses and health symptoms e.g. Anemia, Blood Pressure, Depression, Hangover, Chest burn, Morning Sickness etc making it a must to add to your daily diet. When you compare banana to an apple, it has four times the protein, twice the carbohydrate, three times the phosphorus, five times the vitamin A and iron, twice the other vitamins and minerals. It is also rich in potassium and is one of the best value foods around.

Banana is basically a tropical crop, grows well in temperature range of 13-38 C with varying relative humidity conditions. In India banana is being grown all over the humid tropics to hot dry arid & mild subtropics through selection of appropriate varieties like Grand Naine. Similarly, it is also being grown successfully on a wide range of soils having good drainage with 5.5 to 8 pH.

Banana Production & Export Scenario

India ranks 1st in banana production with 29.78 million tonnes, produced over an area of 0.83 million hectares. China is at 2nd rank with 9.85 million MT production from 0.39 Million hacters. India's share in world banana production is 29.19% (Table 1). World productivity of banana is only 14 MT per hectare. Area & production share of banana is 11.3% & 36.5% of the total area under fruit crops & total fruit production in India respectively. Average productivity banana in India is 35 MT per hectare. The Major banana growing states are Tamil Nadu, Maharashtra, Gujrat, Andhra Pradesh, Karnataka, Kerala, Madya Pradesh, Orissa, Bihar, West Bengal and Assam.

Table 1. World Scenario in Area, Production & Productivity of Banana in 2010

Country	Area MMT	Production Mn	Productivity	Share in World
Country		MT	(MT/Ha)	Production (%)



India	0.83	29.78	35.88	29.19
China	0.37	9.85	26.37	9.65
Philippines	0.44	9.10	20.24	8.92
Brazil	0.48	6.96	14.30	6.82
Ecuador	0.21	7.93	36.78	7.77
Indonesia	0.10	5.75	56.83	5.64
United Republic of Tranzania	0.42	2.92	6.96	2.87
Guatemala	0.06	2.63	41.52	2.59
Mexico	0.07	2.10	27.34	2.06
Colombia	0.08	2.03	25.27	1.99
Other Countries	1.91	23.00	11.98	22.49
World Total	5.01	10.20	20.35	100.00

Source: FAO Stat

Maharashtra accounts for 4.83 million MT production & 83000 hectares area under banana (Table 2), which is now increased to 5.24 million MT & 83191 hectares in 2010-11. Maharashtra ranks second in the country in respect of area & production with highest productivity of 62 MT/ ha. Moreover, banana produced in Maharashtra is marketed all over the India.

Table 2. State wise Area	, Production	& Productivity	of Banana ir	India, 2010-11
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State	Area (Mn Ha)	Production (Mn MT)	Productivity (T/Ha)
Maharashtra	0.08	5.11	62.35
Tamil Nadu	0.12	5.51	44.01
Gujrat	0.06	3.97	61.50
Karnataka	0.11	2.30	20.40
Andhra Pradesh	0.07	2.70	35
Madhya Pradesh	0.03	1.70	45.20
Assam	0.04	0.72	15.20
West Bengal	0.04	1.01	24.00
Bihar	0.03	1.50	47.60
Odisha	0.02	3.70	14.67
Kerala	0.05	0.45	8.21
Uttar Pradesh	0.03	1.35	41.50
Chhattisgarh	0.01	0.30	25.18
Manipur	0.004	0.03	8.51
Others	0.07	2.61	33.66
Total	0.83	29.77	35.85

Source: NHB

Jalgaon district alone contributes about 64% of the banana produced in the state which accounts for about 3.34 Million MT from 60007 ha in 2008-09. Other major banana growing districts are Parbhani, Ahmednagar, Hingoli, Nanded, Nandurbar, Buldhana, Aurangabad, Kolhapur & Thane (Table3).

Table 3: District wise Area	, Production &	Productivity	of Banana in	Maharashtra,	2008-09
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District	Area (Ha)	Production (MT)
Jalgaon	60007	3342621
Parbhani	9562	885900
Ahmednagar	3084	230927
Hingoli	3080	285356
Nanded	1740	161208
Nandurbar	1694	94678
Buldhana	1025	66303
Aurangabad	1000	105521
Kolhapur	918	54713
Thane	550	12835
Total	83191	5240062

Source: Published in Agrowon, January 26, 2009



Comparatively, India is ahead in area & production quantitatively than other banana producing countries. Our productivity is reasonably better than many banana producing countries. We are producing export quality fruits but lagging in handling & maintaining the quality after harvest. Therefore, our presence in international market is insignificant since decades. We hardly export 0.1 million MT every year. Our share in world banana export is about 0.1% only. The major banana exporters (Table 4) in the world are Ecuador, Costa Rica, Philippines, Colombia, Guatemala, Belgium, USA, Honduras, Thailand, Panama, Cameroon, Germany, Brazil, France, China & Spain etc. The banana sector is the only strongly concentrated sub sector of the otherwise highly fragmented fruit sector. The Dole Food Company, Chiquita, Fresh Del Monte, Noboa & Fyffes together still control around 80% of the world banana export.

Rank	Country	Export Quantity (Mn MT)	Proportion of total world production (%)	Proportion of total export by major exporting countries (%)
1	Ecuador	5.2	6.0	30.7
2	Costa Rica	2.3	2.6	13.5
3	Philippines	1.8	2.1	10.6
4	Colombia	1.6	1.9	9.7
5	Guatemala	1.4	1.6	8.4
6	Belgium	1.2	1.4	6.9
7	Honduras	0.6	0.7	3.4
8	USA	0.5	0.5	2.7
9	Panama	0.4	0.5	2.6
10	Germany	0.4	0.5	2.5
11	Côte d'Ivoire	0.3	0.3	1.7
12	Cameroon	0.2	0.3	1.3
13	Dominican Republic	0.2	0.2	1.2
14	Brazil	0.2	0.2	1.1
15	France	0.2	0.2	0.9
16	Netherlands	0.1	0.1	0.7
17	Italy	0.1	0.1	0.7
18	Bolivia	0.1	0.1	0.5
19	Yemen	0.1	0.1	0.5
20	Belize	0.1	0.1	0.4
	Total	16.9	19.6	100.0

Table 4: Major Banana Exporters in the World in 2007

Source FAO Stat

However, the scenario is beginning to change now. Banana is considered as a balance diet & its consumption worldwide is increasing. Moreover in the last few years there is growing demand of supply volumes, product assortment, tracking & tracing, production standards & efficient supply chain. Number of international buyers is looking for dedicated, nationwide suppliers, which can guarantee high volumes and wider range of fresh produce, while complying with the stricter requirements. India being largest producer of banana, now it is considered as a major supplier of an internationally accepted variety like Grand Naine, throughout the year.

It is not that we do not have quality production technologies to match up with the international standard but we at the moment lack in special pre harvest & improved post-harvest management practices required to produce quality banana for export. Jain Irrigation Systems Ltd (JISL), Jalgaon has done a pioneering work in introducing, promoting & disseminating advanced technologies in tissue culture plantlets & Hi tech cultivation with the introduction of Grand Naine variety, drip irrigation & fertigation management & improved post-harvest management practices in since 1986.

India has a special advantage of varied agro-climatic conditions; by virtue of this we can cultivate several special varieties in different season in different region throughout the year. Beside varied agroclimatic condition, Research & Development and huge practical work done by Jain Irrigation Systems Ltd has given a boost to the banana production in India. Many growers are inspired by Jain Irrigation Systems Hi-tech cultivation technology and are able to produce quality banana for export by using internationally accepted Grand Naine variety, disease free tissue cultured planting material, varied crop geometry to suit



variation in soil & climate, excellent irrigation & nutrient management through fertigation, bunch management, low pest & disease incidents & it's better management, excellent mat management & improved post-harvest management practices. Indian farmers have contributed a lot in adopting improved quality production management systems. Millions of farmers have adopted JISL's tissue culture banana plantlets & Hi-tech cultivation technology for achieving yields as high as 100 MT/ ha. Average productivity of Hi-tech banana grower is 87.9/ha.However, quantitative production alone is not the only important criteria; it should also be associated with quality & food safety management system. The players in banana value chain in domestic & export are neglecting special pre & post handling practices which are considered as essentials in international banana trade. Desirable quality for export is not only the size of the finger but also to provide blemish free & uniform fruits in all other aspects. Poor pre harvest, harvest & post-harvest practices leads to a huge damage to the fruits in turns a loss of value to the growers & other drivers of the supply chain.

In domestic market, with the globalization, quality exotic fruits are available on the fruit stalls in every medium & big city. Health consciousness & availability of appealing exotic fruits led to increase in consumer awareness. Banana is a perishable commodity, it has to reach the consumer with no or negligible superficial damage. Banana Wagon Climate Experiment conducted by the Market Planning and Design Centre, Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India revealed that about 32% of banana gets spoiled during harvest and post-harvest handling (Table 5). The value of such a huge spoilage could easily go in crores of rupees. This is equally true for road transport; perhaps it could be more than the rail transport.

Cause	Cumulative spoilage (%)
On tree	1-2
Harvesting	3
Field Transport	12
Railway wagons	25
Destination	32

Table 5. Spoilage of Banana during harvest & Post harvest Handling System

SPECIAL PRE HARVEST OPERATIONS

Orchard Cleaning

Thorough cleaning of the orchard prior to bunch emergence should be done. Unwanted dead leaves should also be removed.

Desuckering

Desuckering should be done regularly until shooting. However, in areas where ratoon is also taken for second crop a follower is allowed after inflorescence has appeared.

Bell Injection

Bell injection of banana buds should be practiced with 40 ml of 0.2% chloropyriphos solution before downward bending of the bud.

Denavelling

Removal of male buds should be done at the sight of opening of two false hands on the bunch. The male buds should essentially be broken by twisting them with hands in order to avoid contamination from cutting tools.

Bunch Thinning

One to two small bottom hands should be removed from the bunch in order to facilitate uniform bunch development. Keep only 7 to 8 hands.

Pruning of leaves

Rubbing leaves damages the fruit, therefore, such leaves should also be pruned periodically. Older and infected leaves should also be pruned. All the unwanted materials clinging to the bunch such as bracts & leaves should be removed.

Bunch Spraying

The bunch should be sprayed with a solution of 0.2% Chloropyriphos & 1% Carbendazim.



Hand Separating

Small perforated polyethylene separators should be put onto each hands of the bunch.

Bunch Covering

The bunch should be covered with a polyethylene-perforated sleeve & tied from the top.

Tagging

Bunch should be tagged with respect to the week of bunch emergence & covering.

Propping

When the bunch has developed the plants should be provided with suitable supports from bunch side to avoid falling of bunches.

Wind break

Wind breaks like Shevri (Sesbania egyptifolia) can be raised along the border of field in East-West direction to avoid damage due to heavy & hot winds.

Harvest & Post Harvest Management

Main objectives of applying harvest & post-harvest management technology to bananas are to maintain quality (appearance, texture, flavor, nutritive value, economic value and safety) and to reduce losses between harvest and consumption. Effective management during harvest & post-harvest period, rather than the level of sophistication of any given technology, is the key in reaching the desired objectives.

Selection of the bunch

Bunch should be selected by assessing the bunch & fruit characteristics. Bunch should be healthy, diseased free, fruits should comply the size & quality criteria for the export and most importantly they should be matured enough for harvesting & intended use.

Maturity indices

Banana harvested too early may lack flavor and may not ripened properly, while harvesting it too late may over ripe the fruit & cause splitting after ripening. Bananas to be marketed locally can be harvested at more mature stage than those which are to be exported. Maturity indices are established on the basis of fruit shape, angularity, grade or diameter, length of finger and number of days elapsed after flowering. Market preferences can also affect the decision for harvesting slight or full maturefruit.

Assessment of maturity

Age of the bunch: Age of the bunch is measured from the time when the fruit bunch is first visible on its emergence from the pseudo stem. Tag colored strip down the side of the polyethylene film bunch cover and maintain record of shooting period to determine the age of the bunch.

Angularity of the fingers: Fullness of the fingers is one of the most commonly used methods. Angularity decreases and the fruit become more rounded as its growth progresses. For export market harvest the bunch when fingers of second hand from top are ³/₄ rounded and age of the bunch is 11 to 12week. Harvest may be delayed upto 98-112 days after opening of the first hand for domestic market.

Bunch Harvesting & Handling

- Avoid exposure to the sun as much as possible during and after harvest
- Harvest in late evening or early morning when pulp temperature is relatively lower, reducing the energy needed for subsequent cooling.
- Avoid damage during harvest & subsequent operations, as injuries cause fruits to decay, increase water loss, increase respiration and ethylene production rates leading to quick deterioration.
- Most established bunch transportation method in major banana countries is cable &trolley mechanism. It could be manually pulled and or motorized. This system works well where the field size is in tunes of hundreds of hectares & plant density low. The cable & pulley systems does not suits to the Indian conditions as the plant density is high & size of farm is very small. Hence it is desirable to carry out all the post-harvest operation on the field itself in Indian condition.
- When dehanding & subsequent post-harvest operations are done at field itself, bring the harvested bunch on well-padded stretcher or hanging it to a horizontal bamboo to collection center. The bunch



should be handled carefully so that it will not touch the ground and or bruised by any object or standing plants in the field.

- Keep the bunch in shade after harvest in hanging position for weighing & dehanding.
- Prior to dehanding remove the bunch cover carefully followed by removal of padding materials/hand separators, remove dried florets also.
- Dehand the bunch into individual hands. Dehanding should be done with bunches on the tree as far as possible and or near the boundary of field or in an open space in the field itself.
- While dehanding, cut the crown closed to the main stem of the bunch. Cut it evenly, leaving as much as possible of the crown attached to the hand, otherwise its outer fingers may detached during subsequent handling.
- A curved knife, with the inside curve sharpened, is usual but in some cases a curved chisel type knife is preferred. In all cases the knife must be very sharp to give a clean & smooth cut in a single movement. Deflowering of the bananas should be done simultaneously.
- In Indian context, it is desirable to carry out all the post-harvest operation in the field however if the pack house is at distance place, dehand the bunch in the field & then follow the steps as given below
- Put the hands immediately in plastic crates embedded with cushioning material after dehanding. Alternatively, dehanded banana can also be transported on multi-tier cushioned trolleys to the pack house.
- Keep the hand so that its crown would rest on bottom of the cushioned crate & the finger tips would face upward. A crate should contain 4-5 hands depending upon the size of the hands. If the fingers in the hands are not upright then separators must be used in between hands to prevent bruising.

Transportation

Dehanded bananas are transported to pack house within two hours of harvest. Preferably use cool van to transport bananas to pack house or well cushioned ambient transport. Avoid exposure to sun and heat. Load the vehicle carefully. Do not throw, drag and or drop the loaded crates. Crates be stacked one over other in cool van and transported to packhouse for subsequent operations. Crates shall also be properly padded with suitable cushioning material. Transport speed and tyre pressure be maintained as per road condition from orchard to packhouse. Alternatively, dehanded banana can also be transported on multi- tier cushioned trolleys to the pack house.

Pack house Operations Receiving

Unload the vehicle in such a way that it is easy to carry into the packing house and yet avoid damage to the produce. Take the produce to washing section either manually or by conveyers.

Pre-sorting

- On arrival of crates in washing section, remove the banana hands carefully in order to prevent chances of mechanical injury to fruits.
- Inspect each & every hand for any injury, bruising or disorder & remove if any.
- Deflowering of fingers if any should be done simultaneously.
- Check the quality parameters e.g. length, angularity, girth of finger.
- Inspect & keep the hands in washing tanks immediately to remove the impurities, dirt, latex and to cool the fruits by removing field heat.

Washing

- Washing chain consists of 3 tanks containing potable water.
- Tank 1 consists of clean potable water with alum solution. Add 1gm of alum per liter of water.
- Washing of hands is done to remove impurities, dirt & latex oozing from the crown portion.
- Latex has no physiologically detrimental properties but if left on the surface of the fruit, causes unsightly staining, which can affects the market value of fruit.
- Remove injured, decayed, twins, diseased & injured fruits. De flowering and giving a clean cut to crown is also done simultaneously.
- Handsarecutintoclustersof4-6fingers.Preliminarysortingforlength, girth & quality is done.



- Remove non-confirming & smaller fruits than specified length & girth.
- Put the clusters immediately in 2nd tank containing sodium hypochlorite (100 ppm for few minutes) to disinfect the fruits. Again the clusters are checked for length, girth & overall quality.
- Put the clusters in 3rd tank to treat with fungicide (1 g/l). This is done to avoid fungal infestation in post-harvest handling. Again the clusters are checked for quality, length & girth. Remove the fruits that are non-confirming & smaller than specified length & girth & send them to domestic market.
- Sometimes it is desirable to dip the clusters in wax emulsion solution to prevent excess moisture loss from the fingers.

Excess surface water removal

Remove excess surface water adhering on the surface of fruits by high capacity blowers and or fans with ambient air. Alternatively, excess water could simply be allowed to drip dry.

Grading & quality check

Keep the bananas on an inspection table, inspect & remove the fruits which do not meet the desired quality specifications.

Summary of Codex Quality Standards

In all classes, subject to the special provisions for each class & tolerances allowed, the bananas must be:

- whole (taking the finger as the reference);
- firm; sound/healthy fruits, produce affected by rotting or deterioration which make it unfit for consumption is excluded clean, practically free of any visible foreign matter;
- practically free of bruising;
- practically free of pests affecting the general appearance of the produce;
- practically free of damaged caused by pests;
- with the stalk intact, without bending, fungal damage or desiccation;
- with pistils removed;
- free of malformation or abnormal curvature of the fingers;
- free of damage caused by low temperature;
- free of abnormal external moisture, excluding condensation following removal from cold storage and bananas packed under modified atmosphere conditions;
- free of any foreign smell and/or taste;

In addition, hands and clusters must include:

- a sufficient portion of the crown of normal coloring, sound and free of fungal contamination
- a clean cut crown, not beveled or torn, with no stalk fragments.
- Bananas are classified into 3 classes namely Extra Class, Class I and Class II.

Extra Class: Bananas in this class must be of superior quality. They must be characteristic of the variety and/or commercial type. The fingers must be free of defects, with exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.

Class I: Bananas in this class must be of good quality. They must be characteristic of the variety. The following slight defects on the fingers, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package. The defects must not, in any case, affect the flesh of the fruit, slight defects in shape and color; slight skin defects due to rubbing and other superficial defects not exceeding 2 cm² of the total surface area.

Class II: This class includes bananas which do not qualify for inclusion in the higher classes, but satisfy the minimum requirements as specified above. The following defects may be allowed, provided the bananas retain their essential characteristics as regards the quality, the keeping quality and presentation. The defects must not, in any case, affect the flesh of the fruit. Defects in shape & color, provided the



produce retains normal characteristics of bananas. Skin defects due to scrapping, scrabs, rubbing, blemishes or other causes not exceeding 4 cm^2 of the total surface area.

Provisions concerning size

For the purposes of sizing bananas the length of the fingers is determined along the outside curve from the blossom end to the base of the pedicel where the edible pulp ends and the diameter is defined as the thickness of a transverse section between the lateral faces. The reference fruit for the measurement of the length and grade is for hands, the median finger on the outer row of the hand, for clusters, the finger next to the cut section of the hand, on the outer row of the cluster. The minimum length should not be less than 14 cm & minimum grade should not be less than 2.7 cm. However, the minimum length & grade of finger depends upon the customer requirement. Generally customer in international market demands for minimum 7 inches long & 38 to 48 mm circumference.

Packaging

- Packaging could be a cushioned plastic crate and or a CFB box for domestic market. For local or nearer markets cushioned crates could be used but for distance market CFB boxes could be used to suit the economics.
- However, for export market CFB box is the only packaging used.
- Inspect& paste the sticker to at least three fingers in a cluster.
- Keep the clusters gently in telescopic CFB boxes with polyurethane lining.
- Keep the clusters with its crown down and finger tips up.
- there should be provision of ventilation holes in the boxes
- Packaging in plastic films can modify the atmosphere surrounding the produce (MAP)
- Vacuities the plastic bags and add an ethylene scavenger such as potassium permanganate to increase the green life of produce.

Labeling

- labels can be preprinted on boxes, or glued, stamped or stenciled on the boxes.
- provide the necessary information on CFB box, such as variety, weight, quality grade, producer's name, country, area of origin, nutritional value, bar codes or any other relevant information on traceability.
- shipping label should contain the following information (depends on customer requirement)
 - Common name of the product (banana) and its variety (Grand Naine)
 - Name and address of exporter, packer and dispatcher
 - o Country of origin
 - o Net weight
 - Size and grade
 - o Number of hands and or fingers
 - Recommended storage temperature &RH
 - Special handling instructions

Adequate cooling

Climatic condition in most of the banana growing area in Maharashtra is hot & dry. Such a climatic condition causes field heat buildup & rise in the fruit & pulp temperature. Rise in produce temperature speed up the respiration rate & ethylene generation which in-turn hastens the ripening process. This field heat must be removed before the produced is packed & sealed in polybag inside the corrugated fiber board box. The aim of cooling is to remove the field heat and slow down respiratory activity, to reduce water loss and ethylene production. The cooling must be adequate & uniform. However, care must be taken to ensure that fruit & pulp temperature will not go below 13.5°C to avoid chilling injury & other undesirable effects.

Transport of Boxes

• The packed boxes are palletized or unpalletised at the pack houses depending upon customer requirement. Palletized or unpalletised boxes are loaded in to a 20 and or 40 feet insulated refer



container to transport it to Nava-Sheva port for further shipment.

- Green bananas be shipped under refrigeration to prevent the initiation of ripening before they arrive at their destination.
- Stacking of boxes in the containers must be done with great care to ensure adequate ventilation between the stacks & all the boxes.
- Bananas be shipped under a control temperature of 13.5 to 14.5°C with 90 to 95%RH.
- There should be ample void space between the last stack and the sides of the transport vehicle.
- The load should be braced to prevent shifting against the rear door during transit. A simple wooden brace can be constructed and installed to prevent damage during transport.

Controlled ripening

- Green bananas in boxes and or cushioned plastic crates should be loaded into the ripening room (lower temperatures can damage the fruit).
- The room should be closed, insulated & airtight and be maintained at 16 to 18°C & 85 to 90% RH. Temperature is controlled and maintained by a thermostat.
- Supply ethylene into the room at a concentration of around 100 ppm (0.01%).
- The ethylene acts as a catalyst initiating the hormonal process of ripening.
- The room is then kept closed for 24 hours. At the end of 24 hrs, room should be ventilated to clear the ethylene gas and the carbon dioxide released during the initial ripening phase and maintain at 18°C reducing to 15°C over three to four days.
- Room should be regularly vented to maintain the carbon dioxide level below 1%, as carbon dioxide levels exceeding 1% inhibit further ripening.
- A common way of ventilating involves opening the doors for at least twenty, minutes every 6 hours after first 24 hrs of ethylene exposure. Exhaust fans & hatches may be used for venting off the gases. The room should be finally ventilated and the ripe fruit are removed.
- The above method would take around 4 days to ripen the bananas uniformly. It is generally recommended to market the produce at a color stage of 3.5 to 4. Table-6 shows the day wise changes in ripening of banana.

Ripening (Days)	Peel color	Remarks
1	Green	Color at the time of shipment
2	Green, trace of yellow	Color at the time of discharge
3	More yellow than green	Beginning of the discoloration of peel indicates the progressing maturity
4	Yellow, green tip	Optimal maturity for order from wholesale and retail trade as well as delivery ripening plant
5	Full yellow	Best indication for sale in retail trade as the fruit still keeps well for some days
6	Yellow, lightly flecked with brown	The fruit now looks best and is very tasteful but very sensitive to mechanical damage
7	Yellow with increasing brown areas	Small brown spots indicate that the fruit is over-ripe

• As far as possible, ripening is done at the destination market for both export & domestic.

Marketing & Brand Development

World market has beginning to open for Indian fresh fruits. Recently USA, Japan has permitted import of Indian mangoes, now discussion in on with the Australia. Worldwide fresh fruit including banana is marketed with the brand name along with committed & assure supply volumes & desired quality consistently. There is a huge demand for banana in UAE, Oman, Muscat, Tehran, Yemen, Iran, Iraq, Saudi Arabia, China & European countries. India has a unique advantage of year round production & supply with shorter transit distance to Gulf countries than the other major exporting countries. Export of Indian bananas would only be possible if we could develop our brand by producing & maintaining desired quality consistently.



Now we are set to offer spotless & international standard quality banana. We need to develop our brand for quality banana as across the globe. World leader in banana trade like Chiquita & Dole are selling banana with their brand name since decades.

In domestic market also, there is a huge demand for quality banana hence we should seriously think and switch over from traditional systems to modern system of banana cultivation through pre and post-harvest management & efficient supply chain.

Finally the Desired Quality Blemish free uniformly ripened banana!!!!!!





Lead Paper - V

Integrating farming system for livelihood security: An approach towards sustainable agriculture

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ABSTRACT

In J&K state the agriculture is at a cross-roads wherein the small holdings, profitability, livelihood security and sustainability issues are the factors adding to the existing agrarian crisis in the state in particular and the country in general which requires a decisive direction shift at the policy level towards adoption of integrated farming system. Thus, there is a need of fundamental change from the unilateral, top-down, prescriptive "knowledge generation and transmission" models of agriculture development adopted in the country so far, which have in fact resulted in an ecological, economic and social crisis in the farming sector of the state during 40 years of adoption and that climate change is one more imperative for drastic change to address the situation. Climate change is already a reality for farming community and that conventional models of agricultural research and extension have failed to address the need of the hour unless some fundamental recasting in the form of diversified farming system is adopted. The immediate need for interventionist action precludes traditional models of research and support systems and requires alternative but urgent programmatic interventions, led by farmers' institutions and their local resources, knowledge and innovations. Existing mainstream models of farming are GHGinducing and are not conducive to adaptation either given their high external-input dependencymodels which increases the risk of vulnerable farmers. Integrated farming system a key to sustainable agriculture, on the other hand, holds immense mitigation and adaptation potential, specifically in the context of climate change even as it improves rural livelihoods and addresses the ecological crisis in farming of today under various climatic regions of Jammu in particular and state in general. Jammu region of the J&K state is bestowed with varying climate zones i.e. subtropical, intermediate and temperate zones, which is best suited for diversified farming, as the promotion of single enterprise is neither beneficial from economy point of view nor is sustainable under the given climate change crisis. The integration of Crops, Horticulture, Animal, Fish cum Poultry, Mushroom, Vermicompost, Apairy, Biogas and Boundary plantation enterprises in Jammu region under integrating farming system is having the potential to improve the farm income to three folds besides will address the sustainability issues in the long run.

Keywords: Integrated farming system, livelihood security, sustainable agriculture

INTRODUCTION

A griculture will have to be in the centre of the national priority for meeting our ever growing needs of food, nutrition and household security, which in India's context is an integral part of the national security. Agriculture will have to change for the best and if not attended immediately, it would aggravate hunger, poverty and disparity, leading to social unrest conflicts. Therefore, we have to prepare ourselves like a war to fight against hunger, poverty, malnutrition and unemployment and this war has to be won for peace, prosperity and tranquility with the much needed balanced and harmonized inclusive agriculture.

The country has started its journey from nearly 50 million tonnes of food grains during 1950-51 to a production of about 260 million tonnes during 2013-14 which is a record production till date which involves rice of more than 95 million tonnes, wheat 86 million tonnes and pulses 18 million tonnes. Similarly the production of oilseeds, fresh fruits, milk, eggs, fish which is also the highest production witnessed during the year. Globally, the country produces 25% of total pulses, 22% of sugarcane, 21% of rice, 12% of wheat and 16% of milk. Rice and wheat together produces nearly 33% of total global production which has brought in sense of self- respect, confidence, pride and honour to country. Globally, India ranks number one in production of pulses, tea, jute and milk; number two in production of rice, wheat, maize, sugarcane and cotton and number three in production of cereals. Also, the country ranks highest in population of cattle, buffalo, goat and sheep which is in chronological order of one, two and three among the world. This production is coming with the share of 2.3% of global land, 4.2% of water resources and 11% of arable land which supports 18% of world's population.



Future projections revealed that demand of food grains would increase to 345 million tonnes in 2030 with decreased arable land, costly inputs, less water, poor soil health with multi nutrients, deficiencies of N P K Zn B and many micro nutrients, costly labour with climate change and global warming. In India, water availability per capita will be reduced to 1500 m³ by 2025 from 500 m³ in 1950. It is projected that availability of water for agriculture use in India may be reduced by 21 per cent by 2020 in drop of yields of irrigated crops especially rice. Thus, price rise and withdrawal of food from poor masses, policy reforms are needed from now to avoid the negative developments in the years to come. These reforms may include the establishment of secure water rights to users, decentralization and privatization of water, management functions, appropriate levels, rising reforms, markets in tradable property rights, introduction of appropriate water saving technologies. There is a need of paradigms in our approach and future strategy. Our major concern to be addressed will be water crises, soil degradation, fatigue, genetic erosion, increasing biotic and abiotic stresses (pressures), inefficient management practices, inadequate markets, unfavourable trade, increasing knowledge lag in management, production of farm produce, harvest and post-harvest losses. New technologies should be science based, technically feasible, economically viable and socially acceptable.

The state of J&K accounts for 3.20 per cent of total area of the country with a geographical area of 103187 sq. km situated at an altitude variation of 300-5400 meters above mean sea level constitutes about 67.5 per cent of North-Western Himalayan region. In the state, agriculture is the core sector of economy which contributes about 26.91 per cent in the Gross State Domestic Product with 70 per cent of the state population deriving their livelihood directly or indirectly from this sector. In spite of increase in food grain production from 4.52 lakh tonnes in 1950-51 to 15.70 lakh tonnes, the demand is still deficit by 38 per cent. The deficiency in cereals is nearly by 40 per cent, 70 per cent each in pulses and oil seeds and 30 per cent in vegetables. The State still meets its demand by procuring large quantities from other states even after 6 decades of our independence. Similarly in vegetable sector, although the quantum of products and bio-products has increased but there is a deficit of 1.55, 20.20 and 57.0 per cent in case of milk, egg and meat/poultry production, respectively. The state is also confronted with negative production growth rates of -2.55, -0.48, -3.36 and -0.44 per cent in case of maize, wheat, cereals & millets; and food grains, respectively with negative productivity trends of -2.78, -4.86 and -0.35 per cent in case of rice, wheat and total food grains respectively (Economic Survey, 2008-09).

Horticulture forms an important sector in the economy of J&K State and is one of the key sector for employment and income generation because large scale industrialization suiting to ecosystem has not taken place. The sector is currently having an annual turnover of fruits worth Rs. 3000 crores and giving employment to over 25 lakhs people. Keeping this in view the state government has declared horticulture a thrust area and is taking a number of steps to boost it. Temperate zone of Jammu and Kashmir is the fruit bowl and perhaps no state has greater ambience for horticulture; as indigenous apple, pear, vine, mulberry, walnut, hazel, peach, apricot, raspberry, gooseberry, currant and strawberry are the potential examples. Besides saffron and kaala zeera the temperate crops are the other very important crops that have a history of many centuries. The state of J&K has the monopoly for producing saffron and is placed second in the world after Iran. The productivity is half in comparison to that of Iran and Spain. Commercial floriculture and cultivation of medicinal and aromatic plants have great potential which need to be promoted on a large scale due to their tremendous biodiversity and climatic advantages.

These temperate fruits grown at elevation of 1000 to 3000 metres above sea level are important cashfetching fruits of the state. These fruits not only supplement the diet of the people in the state and country but form an important item of our exports. From the stage of tree plantation to the point of its marketing, it has a good potential in employment creation. There is need to explore other options, that too in the field of value added agriculture under its diversified practice. However, the state is facing many problems with regard to the development of horticulture. It includes low productivity, great variability in important fruit crops like walnut and almond, higher percentage of offgrade fruits, poor connectivity with the market place and small and fragmented land holdings having marginal farmers, which has forced us to introduce highdensity plantation of apples and soft fruits like strawberry and currants around cities and towns.

Therefore, horticulture sector continues to remain the important sector for socio-economic development of the people. With serious constrains on area expansion and declining scope of other sources of growth of agriculture output, the diversification of agriculture towards non-food grains and high value cash crops including fruits and vegetables, compatible with the comparative advantage of the region is suggested as a viable solution. These crops have potential of income augmentation, employment


generation, poverty alleviation and export promotion. According to a study, in the state of Jammu and Kashmir, the scope to raise output through diversification is highest in the country as one per cent shift in area from food grains to non-food grains entails more than 3 per cent growth rate in crop output.

During the last several years, diversification of Agriculture in State towards high value commodities, i.e. fruits, vegetables and livestock products is taking place at a faster pace and is reflected in the high share of High Value Commodities (HVCs) in agricultural production in a number of districts. Sustained economic and income growth, urbanization and globalization are fuelling, rapid growth in demand for high value commodities in the State, high value horticulture has a comparative advantage in production and labour absorption over staple food items and thus is reckoned as an important activity for small orchard holders equally important, the consumption of high value commodities (HVCs) is on rise, the evidence shows that by 2025, demand for fruits, vegetables, milk, egg, meat and fish would almost be doubled than that was in 2000. This sector is most vibrant sector for economic development in state. The per capita income of Jammu and Kashmir is 324 US dollar which is more than the national average. The monthly expenditure of J&K is also higher than normal average. The urban/rural difference is lesser due to horticulture earning of the farmers. Keeping this gap in production and requirement in view there is vast scope for boosting the agriculture in the state and simultaneously going for the diversification of agriculture which besides horticulture and crop sector includes mushroom cultivation, bee keeping, medicinal and aromatic plants and various animal products as the state has to invest more than Rs.1400 crores in procurement of meat, poultry and animal products including fodder, feed etc.

Overview of Agriculture production Scenario in J&K

In the state of Jammu and Kashmir, 58 per cent of the area under agriculture is rainfed and remaining 42% is irrigated (Fig. 1). Agro-climatically the state is divided into four zones: Sub-tropical zone (2.53 lakh ha), intermediate zone (3.56 lakh ha), temperate zone (4.04 lakh ha) and cold arid zone (0.29 lakh ha). About 64%, 90% and 44% of the area in sub-tropical, intermediate and temperate zone respectively is rainfed (Fig. 2).

The mean annual rainfall in these agro-climatic zones is 1069 mm (Sub-tropical zone), 1478 mm (intermediate zone), 680 mm (temperate zone) and 83 mm (Cold arid zone). Socio-economically the biggest constraint of the agriculture in the state is small land holding size of 0.66 ha with more than 77.97% farmers having less than one hectare of land against 1.33 hectare holding size on National basis.



Fig. 1. Irrigated area

Fig. 2. Agro-climatic zones

In J&K state, 11.28 per cent, 92.72 per cent, 56.99 per cent and 96.15 per cent area under rice, maize, wheat and barley, respectively is cultivated as rainfed crop which attributes to low productivity and production in comparison to national yields. The productivity of various crops including rice, maize, wheat, pulses and oilseeds in the State is 21.83 q/ha, 20.05 q/ha, 17.35 q/ha, 5.10 q/ha and 8.5 q/ha, respectively compared to 22.03 q/ha, 27.85 q/ha, 19.21 q/ha, 6.38 q/ha and 10.86 q/ha on national average.

The cultivated apple (Malus borkh) is considered as one of the most important and widely grown fruit in temperate zones of the world with regard to its acreage, production, economic returns and nutritive, value and popularity. The tree is small and deciduous reaching 3 to 12 meter tall with broad, often density twiggy crown blossoms are produced in spring simultaneously with the budding of the leaves. The fruit matures in autumn and is typically 5 to 9 cm's in diameter enriched with nutrients; the apple is fourth widely produced fruit in the world after banana, orange & grapes. In spite of certain problems the comparative feasibility and profitability in apple production has proved to be better as compared to the



other farm enterprise during the last one and a half decades or so. The area under apples has increased significantly and resulted to higher production (Table 1), which clearly indicates its potential in Integrated Farming System in temperate fruits.

Year	Area under Apple (000 Hac)	Apple Production (000 Mt)	Productivity	Area under Rice (000 Hac)	Rice Production (000 Ount)	Productivity
2004-05	107.93	1093.33	10.12	250.04	4928	19.70
2005-06	111.88	1151.34	9.01	259.01	5574	21.52
2006-07	119.04	1222.18	9.51	252.52	5546	21.96
2007-08	127.80	1311.85	10.54	263.25	5620	21.34
2008-09	133.10	1332.81	8.99	257.63	5637	21.88
2009-10	138.19	1373.00	9.16	259.89	5011	19.28
2010-11	141.17	1852.41	10.15	261.35	5077	19.42
2011-12	154.72	1747.22	10.46	262.54	5045	19.21
2012-13	173.63	1500.25	9.5	262.56	5078	19.34

Table 1: Comparative productivity of Apple and Rice cultivation in J&K state

Source: Digest of statistics Jammu Kashmir, Financial Commission (Rev), J&K

Socio economic status of farming community is one of the most well thought issue that needs a special attention. Smaller and fragmented holding size as small and marginal farmers constitutes 94 per cent of the total land holdings in J&K state, higher population growth rate, illiteracy, unorganized marketing and distribution, poor infrastructure, *etc.* are the socio-economic constraints of temperate zone in particular and other zones of the state in general. As per the 8th Agriculture census (2005-06) of the State, the total number of operational holders has been worked out to be 1377808 and average size of operational holding was found out to be 0.67 ha. About 94% of the operational holders fall in the category of marginal and small farmers. About 5% of the operational holders fall in semi-medium category holding, only 1% of the operational holders fall in the medium category holding and only 0.04% of the operational holders fall in the large category holding. Adoption of Integrated Farming System is the only solution for uplift of the socio-economic status of the farming community of the state, which is having fragmented small and medium land holdings.

Paradigm shift towards Apple Cultivation

The state has the largest potential for production of quality temperate horticulture crops. It has created niche production of apple, pears & dry fruits, among temperate fruits Apple ranks first in terms of production and productivity. The annual production of apple in the state is about 9.09 lacks tone at an average yield of 10.09 tons/ha. However, the production & productivity of apple crop has been fluctuating during last two decades this is due to drought or some other conditions. In spite of this apple production has increased from just 6000 metric tons in 1950-51 to more than 9 lakh tones, area increased from 7000 hectares to more than 90 thousand hectors and yield per hectare in Jammu & Kashmir State is highest in the country, which is much higher than national average of 6.86 ton/ha. It is also compared well with the world average of 10.82 tone/ha or China (9.93 tone/ha) which is world's highest producer of apple.

Need for Farming System

Adoption of horticulture based Integrated Farming System in the state is having vast potential for taping the natural resources and increases the productivity, profitability and sustainability. Exploding population, urbanization and industrialization, are leading to decline in per capita availability of vital agricultural resources and also fragmentation of farm holdings, making them operationally uneconomic. The process of marginalization of land holdings is likely to continue due to various demographic reasons. As discussed above, it is evident that per capita arable land is continuously decreasing and is expected to shrink further. Such farm families have certain basic needs including food (cereal, pulses, oilseeds, milk, fruit, honey, fish, meat, egg etc.) feed, fodder, fibre, employment, etc. To fulfill these, farmers have been doing their own farming system for a long time.

At SKUAST-Jammu level, lot of efforts have been made, aiming at increasing the productivity of different components of farming system like crop, dairy, livestock, poultry, apiculture, vegetables production, horticulture, mushroom cultivation, sericulture, etc. have been made. But, our national scenario is clearly indicative of the fact that normally, a farming family maintains multi-enterprise systems, depending upon his/her family requirements, knowledge base, socioeconomic setup, agro-climatic



conditions and available farm resources. However, to have a systematic integration of multi-enterprise systems in a scientific manner, components needs to be chosen in such a manner that product or by-product of one component becomes the input for other, becoming complementary and are organically well interlinked to each other without wastage. For example, by-product and waste material generated from cultivation of many crops is used as raw material for many industrial uses or as fuel or as feed/ fodder to the cattle of the farm. The animal dung may also be used as fuel or a mix of dung, urine and crop residues may be used for production of compost/ farmyard manure that is applied to crops and fishpond. The silt deposited at bottom of a fishpond can again be utilized as manure to crops. The FYM can substitute about 25% of recommended NPK for crops. Crops like mustard serve as a good source of nectar for honeybees, besides providing edible oil for human and cake for animal feed. The crop residues can substitute 12% of recommended NPK. If fishpond embankment is used for cultivating fodder/flower/fruit/vegetable crops, it provides extra output either for human or animal.

Farming systems approach of agricultural research is one venture to harness the complementarities and synergies among different enterprises and augment the total productivity, profitability and gainful rural employment. Unlike commodity research, where the focus is on increasing productivity/profitability of individual crop/ animal, under farming system approach it is the farm household that remains the focus of the research programme.

The university has developed a model of Integrated Farming System which includes multiple enterprises mainly Crop + Horticulture + Animal unit + Fish cum Poultry + Apiculture + Vermicomposting+ Biogas + Mushroom unit coupled with boundary plantation targeting small and marginal farmers. The model is having the potential to revolutionize the farming practices and the approach will not only boost the vertical productivity and sustainability but also will improve the livelihood security of the farmer to many folds. Therefore, the State Govt. has to emphasize on launching of mega project on Integrated Farming System on the lines of the SKUAST-Jammu model with the intervention of including potential temperate crops.

Potential of Farming System towards Sustainable Agriculture (as LOW-GHG) and improving Livelihood Security

Integrated Farming System leads towards sustainable agriculture (with crops, trees, livestock etc.) which is based on locally adapted agro-diverse cropping patterns and use of local resources (natural resources and natural processes), based on local knowledge, skills and innovations. The integrated farming system approach would also like to highlight the potential of sustainable agriculture, in terms of mitigation of GHG emissions as well as adaptation to climate change. Further, it holds great potential for meeting global and national food security requirements even as it leads to improvement of farmers' livelihoods through enhancing their net incomes and improving the productivity of their resources in the long run.

Food security

A question that is often posed with regard to sustainable agriculture is whether it will be able to feed the growing population. We respond by saying that sustainable agriculture does not imply lowered yields, as experience of successful farmers' bears out on the ground. This is reinforced by an FAO report (2007) which says that "conversion of global agriculture to organic management, without converting wild lands to agriculture and without using N-fertilisers would result in a global agricultural supply of 2640 to 4380 Kcal/person/day". Sustainable intensification in developing countries through organic practices would increase production by 56 per cent. A meta-analysis of 133 scientific papers concluded that organics was particularly competitive under lower yield environments, a feature that is common in developing countries. Organic yields on an average are comparable to conventional yields although yields do decline initially when converting from high-input systems and almost double when converting from low-input systems. In India, it should be remembered that a majority of land is rainfed and continues to be low-input by default.

Improvement in Rural Livelihoods

While macro-level food production and availability levels are likely to increase through sustainable agriculture, at the individual and community level too, there are bound to be improvements. It has been felt that access to food will increase by livelihood improvement both for farmers and agricultural workers through integrating the various components in a farming system mode. Recycling of farm waste through various composting methods will improve food access by increasing productivity, diversity and conservation of natural resources, by raising incomes, improving employment and by reducing risks. It has been recorded that shift to sustainable agriculture practices can reduce the outward migration from rural areas.



Reduction in GHG Emissions

Changes in farming models and practices towards sustainable agriculture offer a significant opportunity at reducing GHG emissions. Under Integrated Farming System there is a great potential to reduce its fossil fuel dependence in many ways. For instance, for soil productivity management, internal inputs and practices are used, which in the longer run minimizes the use of chemical fertilizers- for instance, creating the micro-climate required for increased soil (beneficial) microbial activity. This is done by returning bio-mass to the soil. Legume production, crop rotation, mixed cropping etc., are other ways of achieving this. Shifting to organic agriculture instantly under Indian condition is a debatable issue but adopting the Integrated Farming System can lead us to move towards organics and as per the estimates it prevalent that the IFS approach is having the potential for avoidance of methane emission to considerable limits through the promotion of aerobic micro-organisms and high biological activity in soils, oxidation of methane can be increased. Through practices like System of Rice Intensification, which is mostly based on principles of ecological farming, flooding in rice paddies can be reduced and thereby, methane emissions. Nitrous oxide, result of overdoses and losses on nitrogen, can be effectively minimized through integrated farming practices. While production of chemical fertilizers is an energy-intensive process that emits carbon dioxide and nitrous oxide, application of nitrogen fertilizers makes the soil emit nitrous oxide. These can be avoided through by using recycled inputs in the system i.e interdependence of waste output of one component to be used as input for the other component.

Integrated Farming System also increases the Soil Organic Carbon (SOC) by incorporating organic materials into the soil. Soil can be a major source of storage of carbon, about twice as much carbon as in the atmosphere. Minimizing fertiliser use replaces soil organic matter in intensive systems, which reduces potential sequestration. Crop, tree and livestock integration with a systematic recycling of organic wastes is an integral part, which can lead to sustainability. Long term studies have shown that compost application and cover crops in rotation were particularly adept at increasing soil organic matter even in comparison to no-tillage techniques. While conservation tillage is promoted elsewhere as a way of sequestration of carbon dioxide, this is often done by the use of chemical herbicides and GMOs which have their own ecological implications. In sustainable agriculture however, mitigation of climate change can be addressed both carbon sequestration and minimized emissions of GHGs. Agro-forestry as a boundary plantation is also a desired principle of integrated farming systems which further adds to the potential towards sustainability in carbon sequestration.

Adoption of Integrated Farming System

Integrated Farming System (ecological farming/sustainable agriculture/LEISA etc) approaches are now acknowledged for the wide set of ecological and economic benefits that accrue to the practitioners as well as consumers of agricultural products. These approaches which are based on low external inputs are also low energy intensive and less polluting hence mitigate and help in adapting to the climate change. However, the promotion of Integrated farming system on a large scale is often confronted about its potential as well as its practical limitations.

These successful experiences had three elements in common. First, all have made use of locally adapted resource conserving technologies. Second, in all there has been coordinated action by groups or communities at local level. Third, there have been supportive external (or non-local) government and/or non-governmental institutions working in partnership with farmers. Almost every one of the successes has been achieved despite existing policy environments which still strongly favor 'modern and established' approaches (technology and support systems) to agricultural development. Now the challenge is to create a policy environment to scale up across the temperate region of the J&K in particular. This needs a newer approach in terms of capacity building, horizontal learning, newer institutional systems and newer forms of financial support to be put in place. The programmatic support to agriculture today favour only high external input based agriculture. As a result, none of the mainstream programs provide any support for promotion of these models. This needs the recasting of program guidelines or initiating newer program to provide support to more sustainable models in agriculture which can be easily accessible to small and marginal farmers. The Integrated Farming System can initiate a programmatic support to scale up sustainable agriculture and livelihood security with the objectives to-

- Characterize existing farming systems to know the productivity, viability and constraints.
- Develop and validate region-specific Integrated Farming System Models for enhanced system
 productivity, profitability and sustainability and reduce the risks and vulnerabilities with uncertain
 weather conditions and degraded and limited natural resources in these regions, by adopting



suitable cropping patterns and production practices, which can build livelihood security systems to cope up with the natural disasters like drought, floods and other climate uncertainties

- Assess relative efficiencies of the IFS model in terms of economics, resource use and energy and diversify the assets and income sources to sustain the livelihoods by integrating livestock and horticulture into agriculture and promoting on-farm and off-farm employment opportunities
- Optimize individual components of IFS in regional perspective. Conserve and efficiently use the available natural resources like soil and water, and promote biomass generation.
- Capacity building of stakeholders in Integrated Farming Systems through appropriate trainings and organize farmers into institutions which can help them to have better planning, greater control over their production, help to access resources and support, improve food security and move up in the value chain,

Applicability of Integrated Farming System and its basic guidelines

Sustainable Agriculture

Sustainable Agriculture can be defined as an integrated farming system which is based on locally adapted cropping patterns and local resource (natural resources and natural processes) use based on local knowledge, skills and innovations. The capacity of a farming system to adapt to changing climate and weather conditions is based on its natural resource endowment and associated economic, social, cultural and conditions. The viability of these elements also constitutes the basis for sustainable agriculture, understood as agricultural production that: ensures adequacy of food production; does not harm the resource base; is economically viable; and enhances quality of life. Many climate and weather risk management strategies fit squarely into sustainable agriculture practices and can, therefore, be promoted with several of the programs and policies targeting environmentally responsible production.

Strategies to be adopted

- Changes cropping patterns and cropping systems to suit the local resource and weather conditions. *Multiple/mixed cropping, intercropping systems with legume components etc.*
- Ecological farming practices which can maximise the local resource use. Many of these practices are based on indigenous knowledge and focus on building soil biological productivity. Less dependence on chemical Pesticidal Management, Organic Soil Management, Community Seed Banks, System of Rice Intensification, soil moisture management etc. have already proven to be useful.
- Locally adopted crop varieties specially in saline and flood prone areas, drought prone areas, making suitable selections adopting Participatory Plant Breeding and Participatory Varietal Selection.
- Developing suitable farming systems integrating agriculture, horticulture and livestock.

Farmers' Institutions

Organized communities have proven to be more effective in planning and managing their resources and livelihoods, lobbying for a policy change and securing their entitlements. Appropriate institutional systems for each of the purposes need be established.

Strategy to be adopted

- Integrated farming research model needs to be extended to dry land agriculture as the total area under the rainfed situation of the state is about 77% and there will be the real breakthrough for food security and livelihood for the poor resource farmers.
- Capacity building programmes for farmers shall made mandatory in which the provision may be made for making and arranging the need based trainings and visits of the farmers to the Integrated farming system model developed at SKUAST-Jammu. It has been observed that the farmers of the temperate region in particular and J&K region in general are lacking in technical efficiency, which has been estimated about 45%.
- Demonstration of IFS models on the farmer's field near the University vicinity/ research institutions shall be under taken, so that more and more farmers shall adopt.
- There is a great potential of value addition and marketing aspects shall be accorded priority under the IFS components.
- The farmers would be organised into common interest groups federated into producer collectives. Existing institutions like Women SHGs etc. would be used to initially anchoring the program.
- These institutions would take the roles of planning, mobilising resources, organising production, and take up post-harvest management and marketing activities.



• The producer collectives will improve the collective bargaining power of the farmers, will internalize market activities like bulking, primary and secondary processing which improve the village economy.

Food and livelihood Security

Shift to Integrated Farming system is often seen as a compromise on food security. This is mainly because food is understood as only wheat and rice, few pulses, oilseeds and vegetables. The food basket can be increased if we can expand the scope to include millets, coarse cereals, dryland fruits, uncultivated greens etc which can also bring in nutrition security. Data from National Centre for Organic Farming (NCOF), ICRISAT and CMSA have proven that crop productivity can also be maintained with organic/ecological farming. Going beyond the current food security systems like PDS and mid-day meal schemes, systems need to be established to improve livelihood security in terms of sustaining food production in the village, improving income generation opportunities to the small farmers and agriculture labor is important in the rural areas especially in temperate regions. The frequent monsoon failures results in droughts and support systems needs to be build to help the farm families and livestock to tide over.

- Building house hold food security systems by adopting suitable cropping patterns
- Village level management systems for alternative models like grain banks would be appropriate and attempted.
- Suitable off-farm and non-farm employment opportunities would be identified and promoted.

Financial Support Systems

- Currently all the financial support systems to agriculture are given only for external inputs. We need to create proper support systems for farm internalized inputs, community based infrastructure, knowledge and skill building and sharing etc.
- Direct subsidies to farmers rather than input subsidies
- Integrating NREGA with integrated farming system so that each farmer gets 100 labour days for farming can provide ample scope in this direction.
- Explore tools like Direct Income Support which exist in many developed/developing countries need to be explored as decent living income cannot be explored only through pricing mechanism.

Partnerships

At the district/village/block level we need build partnerships between various governmental and nongovernmental agencies to implement the program. At the state level we need to build an alliance of Public sector research organisations, extension agencies, departments dealing with rural livelihoods, SKUAST-Jammu and NGOs which are working on sustainable agriculture/ organic/ natural/ ecological farming.

Broader guidelines for adoption of Integrated Farming System

Selection of Area: Select a contiguous piece of land measuring 1.0-1.5 ha, to represent small and marginal farmers of the region. The yardstick for defining small and marginal farmers may vary among the stake holders and accordingly area selected for the IFS may also vary.

Selection of Enterprise (Module): There is no thumb rule for selecting a specific number of enterprises and allocation of area to different enterprises. It would largely depend upon the common logic of household requirements of an average farm-family of the region, especially in respect of food, feed, fodder, fuel, fiber and reasonable cash. In farming system approach we have to ensure that output from the individual farm unit (IFS Project Area in our case) fulfils aforementioned requirements for a normal size family (size to be specified) along with its farm animals/ fish etc. Moreover, general agro-ecological situations, infrastructure availability, government policies and social acceptability have to be duly considered. As far as possible, select the farming system enterprises, which may fit in a modular format, i.e., they may be developed as self-contained components of the farming system as a whole, with well-defined interface(s) so that they can easily be connected to or disconnected from the system. It should be further diversified with additional components with well-defined objectives and principles of farming systems approach.

Selection of Crops/ Cropping Systems/ Animals: Within each component, identify crops and their most suited varieties to be grown, cropping systems to be adopted, type and number of animals to be raised, species/ breeds of livestock/ fish/ honeybees to be raised. Allocate optimum area under each unit. This should also be taken care in accordance with abovementioned criteria. Since under temperate conditions the important cash crop are the fruits, hence Horticulture based cropping system will have much more relevance.



Technologies to be adopted: All the latest available production technologies for different production/ processing units have to be adopted with optimum levels and should be specified in technical programme.

An Overview of Integrated Farming System Model Developed at SKUAST- Jammu

The SKUAST-Jammu after characterizing the existing farming of the region including the temperate areas has developed the model of 1ha for small and marginal farmers on its farm to study the synergistic of various components of farming. The farming system module developed comprises of Horticulture (Fruit, Vegetable and Flowers) + Crop + Animal + Fish cum poultry + Vermicomposting cum farm waste recycling + biogas + mushroom unit + Small poly house + Boundry tree plantation. The area distribution with regard to 05 family members for individual enterprise has been standardized as under (Table 2).

Component	Year of	Net Area	Gross	Total Cost	Net returns			
Component	start	(ha)	return	(Rs./ha)	(Rs./ha)			
Crop Unit								
Cropping systems	2011	0.3802	63650	38068	25582			
Horticulture unit								
Fruit crops	2011	0.3	13328	17887	9094			
Vegetable	2011	-	29649	4234	11762			
(intercrop)								
Floriculture	2011	0.07	7800	2890	4910			
Agro-forestry	2011	0.1	1315	597	718			
Livestock Unit								
Dairy animals (including	2011	0.08	318212	174599	143613			
Vermicompost & biogas unit)								
Fish cum Poultry Unit								
Poultry/ Ducks	2011	0.001	76578	31989	44589			
Fisheries	2011	0.1	42958	12258	30700			
Apiary unit (03 boxes)	2011	0.001	4500	3300	1200			
Green fodder (Fodder-Fodder	2011	0.07	14543	1763	12780			
Cropping System and on								
bunds planted perinial Fodder								
crops (Hybrid napier)								
Mushroom unit (6 qts wheat	2014	0.02	31034	9780	21254			
straw)								
Grand total	-	1.0	603567	297365	306202			

Table 2: Component wise summary

The profit is quite comparable to existing Farming system, which works out to be 0.80- 0.90 lakhs/ ha. It is evident from the above study of integrated farming system that their is having the potential not only to increase the profit to Rs 3.062 lakhs/ha as compared to existing farming system were the farmer is realizes only Rs 0.80-0.90 lakhs but also increases the sustainability issues. About 150 kg N is being realized through farm waste composting.





Oral Presentations

MSAEJMU-20

Economic impact of technologies developed for soybean crop by Dr. PDKV, Akola

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n the recent past, soybean cultivation has increased manifold as compared to any other oilseed crop in India. For kharif soybean crop many technologies are evolved by the University. It is important to know that at what extent these technologies have been adopted by the farmers on their field and what constraints they are facing in adopting the technologies. Effect of the adoption of these technologies on the production and economics of production also needs to be investigated. The study is mainly consists of three districts of Vidarbha region viz Akola, Washim and Buldhana. The study was based on primary data, collected from 120 farmers of soybean growers. The data on cost and prices were collected from Agricultural cost and Prices Scheme, Dr. PDKV, Akola. The sample consists of all the cultivator spread over the clusters selected for soybean crop grown and the data pertains to year 2012-13. Among three levels of adoption of technologies none of them had adopted the level of recommendation of any technologies. Low adopter group had not utilized even half of recommended dose of Nitrogen and use of manure is observed negligible in low adopter. It is about one fourth in case medium adopter and in case of high adopter it is nearer to 50 per cent i.e. 19.95 qt. The cost 'C' is highest for adopters and followed by medium low adopter. The cost involved in high adopter group is observed highest. The input-output ratio is highest in high adopter group on cost 'A' 1.75, on cost 'C' 1.19 and lowest in low adopters on cost 'A' 1.42 and at cost 'C' it is less than one.

Keywords: Impact, Technologies, economics, adoption

MSAEJMU-22 Study of resource imbalance on cost of production for major crops in Vidarbha

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he study of resource imbalances on Cost of production were calculated in Vidarbha region. All 59 I villages were included in this study. The data on Natural resource profile, Production resource profile, Developmental and Extension Service Profile, Financial, Marketing and Other Developmental Resource Profile was recorded from the Agricultural Price Cell under the control of State Agricultural Universities for the year 2014-15. The, composite indices were worked out and the villages were grouped in to three categories i.e. low developed villages, medium developed villages and high developed villages and this study Cotton, Soybean and Paddy crops were selected in Vidarbha region. There is an urgent need to assess the impact of these factors on the costs of production and identify the pockets having low resource profile for concentrating our future developmental efforts. Thus, this study is aimed to investigate resource imbalances across the selected villages in Vidarbha, their influence on the costs of cultivation of selected crops and the study was undertaken to estimate the cost and returns of selected crops grown under different levels of resource profiles and to study the effect of resource imbalance on cost of production of selected crops. The cost and returns qt/ha for the selected villages in Vidarbha region for Cotton, Soybean and Paddy indicated that production has significant impact of the level of development. The high developed villages recorded for Cotton productivity 17.69 to 18.76 qt per ha, Soybean production 17.33 to 18.17 qt per ha and Paddy production 32.86 to 33.48 qt per ha. In Vidarbha, Cotton production indicated that increasing the benefit cost ratio at Cost- C from 1.38 for low developed villages to 1.44 for high developed



villages. The Soybean production was also identical concluding the benefit cost ratio increasing from 1.45 to 1.63 at Cost- C. As regards the Paddy production benefit cost ratio increased from 1.26 to 1.34. The results of regression analysis indicated that, the contribution explained by the composite indices in Vidarbha region, the Cotton production ranges between 49 to 84 percent, the coefficient was significant. The results of the regression analysis for Soybean production indicated that the contribution explained was in the range 46 to 88 percent, the coefficient was significant. As regards the Paddy productivity contribution explained composite indices in Paddy production in the range of 41 to 43 percent. It is concluded from the above that the productivity of the crops under study have significant effect of the developmental level.

Keywords: Resource, Imbalance, Impact, Marketing

MSAEJMU-33

Hydroponics: a boon for increased agricultural production

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In the present scenario it is very difficult to sustain agriculture growth at 4 percent which is required to L feed the burgeoning population of India. Moreover, continuous cultivation of crops through the traditional system has resulted in poor soil fertility, which in turn has reduced the opportunities for natural soil fertility build up by microbes. This situation has lead to poor yield and quality. In addition, conventional crop growing in soil (Open Field Agriculture) is difficult as it involves large space, lot of labour and large volume of water and in some places like metropolitan areas, soil is not available for crop growing. Hydroponics or soil-less culture is a technology for growing plants in nutrient solutions that supply all nutrient elements needed for optimum plant growth with or without the use of an inert medium such as gravel, vermiculite, rock wool, peat moss, saw dust, coir dust, coconut fibre, etc. to provide mechanical support. Hydroponics or soil-less culture is a system of growing plants which helps reduce some of the problems experienced in conventional crop cultivation, especially land shortage in India where near metropolitan suburbs encroaching the cultivable land for various activities such as housing, factories, institutes, hospitals, recreations centres, parks and play grounds etc. Soil is usually the most available growing medium and plants normally grow in it. It provides anchorage, nutrients, air, water, etc. for successful plant growth. Modification of a soil an alternate growing medium tends to be expensive. However, soils do pose serious limitations for plant growth, at times. Presence of disease causing organisms and nematodes, unsuitable soil reaction, unfavourable soil compaction, poor drainage, degradation due to erosion, etc. are some of them.

Keywords: Hydroponic, boon, vermiculite, soil-less culture

MSAEJMU-45

Production of cut roses in polyhouses is a profitable agribusiness

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Floriculture industry in India is in a boom in recent years. Maharashtra is the leading state in India for cut roses consumption and export. Pune is emerging as a major cut roses hub in India having an export oriented status. The polyhouse technology now a day has become very popular in production of cut roses I and around Pune city. The study is based on data collected from 30 producers growing cut roses in polyhouses around Pune city for the year 2012-13. The average cost of erection of polyhouse (0.24 ha.) was around Rs.23.13 Lakhs. The average cost of cultivation of cut roses was worked to Rs. 5.97 lakh. and it was decreased across the size group of polyhouses. The major items of cost involved were hired human labour, planting material, fertilizers, plant protection chemicals and bed preparation. The average profit realized was Rs.10,25417 with B: C ratio 1.72. The average cost of marketing was estimated to Rs.18.60/bundle. Commission of the intermediaries was the major component of marketing cost. The season, market place and grade influenced the market price of cut roses. The winter season produce had



reaped the maximum prices, whereas exported produce fetched more prices. In export, Channel-III (Cut roses producer- Importer- Wholesaler- Retailer- Consumer) proved to be more efficient. The farmer should adopt the production technology in such a way that maximum produce should be available for marketing during 25th January to 10th February in order to reap the benefit of maximum prices. **Keywords:** Cut roses, polyhouse, technology, adotion

MSAEJMU-48

Effect of exogenous auxin application on fruit cracking in litchi (*Litichi chinenisi* Sonn.) Cv. Dehradun under field conditions of district Reasi

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Litchi (*Litchi chinenisi* Sonn.) an arillate fruit species possessed a unique structure compromising thin and leathery pericarp that enclosed the aril as its edible part, Fruit cracking is a serious physiological disorder in litchi that occurs in litchi coincides with a period characterised by high day temperature (35-40°C) and low relative humidity.Besides climatic effects abnormal development of skin during early fruit growth promotes the disorder.in this context experiment was carried out at three locations of district Reasi and auxins viz different concentrations (20,30,40 and 50 ppm) were sprayed on dates at farmers orchards on anthesis and pea stage respectively. Study revealed that different concentrations of NAA have shown variation in effect on percentage of fruits carried to maturity. Highest percentage (22.21%) carried to maturity was observed with NAA application at 50ppm and least (11.21%) with20ppm.NAA 40ppm and 50ppm were at par each other. Data revealed that 50ppm NAA concentration recorded highest fruit weight (19.11 gm) while NAA ppm was at par with highest concentration. Number of days from fruit set to maturity indicated that NAA had a significant effect in reducing fruit cracking when compared to control. **Keywords:** Exogenous Auxin, cracking, physiological disorder.

MSAEJMU-49

Impact and assessment of integrated farming system to increase farm income in Ahmednagar district of Maharashtra

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The present study entitled with Impact and Assessment of Integrated Farming to Integrated Families to Increase farm income In Ahmednagar district of Maharashtra, objective to study the components of income and socioeconomics determinants of society. The study concluded that, proper allocation and distribution of resources in form of work and income have changed the scenario of farming and living standard of farmers. The cropping pattern, cropping productivity had resulted in increase in agriculture and allied enterprises such as poultry, goatry and agro-horticultural crops. The integrated farming to Integrated families have enrich the ways to increase the farm and non-farm income. The ways and means of use of resources have changed and leading to welfare of farmers.

Keywords: Integrated farming system, farm income, assessment, cropping pattern



Climate change impacts on farm sector growth

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he year 2015 was a challenging one for the agriculture sector. It was the second consecutive year of hardships for farmers owing to drought and inclement weather in several parts of the country highlighting the urgency to address issues of climate change. The concerns are carried forward in the coming year as currently rabi sowing of wheat is lower by 20.23 lakh hectares than last year, the prices of pulses and vegetables continue to rule high and towards sugarcane growers stand at Rs. 5406 crore. Southwest monsoon was 14 per cent below normal of the Long Period Average in 2015 on the back of 12 per cent deficiency in the previous year affecting the kharif crop. The northeast monsoon that followed played havoc in Tamil Nadu and adjoining region with unprecedented floods wiping out entire paddy and cash crops. While the production of pulses and oilseeds is perpetually short of demand for several years now, this time there are concerns about the output of cereals. Although the country is surplus in foodgrains as of now, experts point out that with a legal commitment to provide at least 62.5 million tonnes of subsidized foodgrains in the Targeted Public Distribution System under the National Food Security Act, farmers are keeping their fingers crossed for good weather conditions to achieve a good harvest. Sowing is still going on so hopes are high. At least nine states have declared drought-hit districts this year. These are Karnataka, Chhattisgarh, Madhya Pradesh, Maharashtra, Odisha, Andhra Pradesh, Uttar Pradesh, Telangana and Jharkhand. Tamil Nadu, of course, has flood-hit districts. Parts of Haryana, Uttar Pradesh, Maharashtra, Karnataka and Andhra Pradesh had been hit by drought during 2014-15 as well. Keywords: Climate change, oilseeds, National Food Security Mission

MSAEJMU-54

Strategies enhancing soil health through integrated nutrient management in French bean

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A field experiment was conducted at Research Field of Shalimar campus of SKUAST-Kashmir during *Kharif* season 2014 to study the integrated nitrogen management in French bean (*Phaseolus vulgaris* L.) var. Contendor and its effect on sustenance of soil health. The soil under study was clay loam in texture, medium in available nitrogen, phosphorus and potassium with neutral pH (7.2). The experiment was laid out in randomized block design with 13 treatments and 3 replications. The results revealed that the treatment combination of 75% N through urea + 25% N through vermicompost + biofertilizer (Rhizobium) (T₆) recorded significantly higher number of nodules, primary branches, secondary branches, pod yield, dry matter production, number of pods plant⁻¹, number of seeds pod⁻¹, 100 seed weight, seed and Stover yield, protein content of seeds, nutrient content (N, P and K) in French bean pods and uptake of nitrogen, phosphorus, potassium, at harvesting stage. The available N, P and K status of soil after harvest were improved due to application of organic manures. Maximum net returns were also recorded in treatment combination of 75% N through urea + 25% N through vermicompost + biofertilizer (Rhizobium) (22.5 kg N + 0.55 t ha⁻¹ + 20 g kg⁻¹ seed). The study revealed that the treatment combination of 75% N through urea + 25% N through vermicompost + biofertilizer (Rhizobium) (22.5 kg N + 0.55 t ha⁻¹ + 20 g kg⁻¹ seed). The study revealed that the treatment combination of 75% N through urea + 25% N through urea

Keywords: Nitrogen, vermicompost, biofertilizer, nodulation, Phaseolus vulgaris L., quality, and yield.



Intercropping of vegetables in seed spices, an economical boon to the farmers of Vidarbha

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n investigation entitled "Studies on the intercropping of vegetables in seed spices under diversified Acropping pattern in Vidarbha" was carried out during the rabi seasons of four consecutive years from 2011-12 to 2014-15. The experiment was laid out in Randamized Block Design (RBD) with eight treatments viz., T₁-Ajwain sole crop, T₂- Fennel sole crop, T₃- Cabbage sole crop, T₄- Radish sole crop, T₅- Ajwain + cabbage (1:1), T₆- Ajwain + Radish (1:1), T₇-Fennel + cabbage (1:1), T₈- Fennel + radish (1:1). As a matter of fact, in this experimentation, the sole crop yield in Ajwain, Fennel, Cabbage and Radish as showed in pooled results were obtained maximum. While, there were slightly decreased trend in respect to yield per hectare of Ajwain and Fennel as a main crop, when intercropped with Cabbage and radish as a sub crop during all the years of experimentations and in pooled results too. But economically, intercropping proved better than sole cropping in respect to B: C ratio, LER in present investigation. Intercropping trial was undertaken on same site and with same randomization on Broad Bed Furrow (BBF) with drip irrigation system. The varieties of different crops used under the study were, AA-01-19 (Ajwain), AF-101 (Fennel), Golden Acre (Cabbge) and Pusa chetaki (Radish). Further, it was evident from the pooled results that, significantly the maximum pooled GMR and NMR were obtained from Ajwain + Cabbage intercropping with 1: 1 row pattern. Whereas, the maximum (1: 2.4) B: C ratio and (1: 1.827) LER were recorded with Ajwain + Cabbage and Fennel + Cabbage intercropping (1: 1), respectively. Keywords: Intercropping, BBF, LER

MSAEJMU-58 Utilization crossbred technology HF X Gir Half-bred cows for high milk yield

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The data on milk yield traits of HF X Gir cows maintained at RCDP on Cattle MPKV, Rahuri for period from 1977 to 2011 was collected and analyzed by least- squares technique considering the effect of period, season and age at first calving. Correlation and regression analysis of the traits under study were carried out. The least squares means of WMY and 305 days milk are as 264.05, 290.15, 278.92, 261.45, 248.62, 238.19 kg and 2256.82 kg, respectively. The significant effect of period of calving and age at first calving was observed while non-significant of calving was observed on monthly milk yield with 305 days milk yield ranged from 0.70 to 0.88 respectively. From the result it is concluded that record of M4 may be used for predication of 305 days FLMY of HF X Gir half-bred cows.

MSAEJMU-59

Utilization of herbal supplement in broilers diet for growth performance

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Eighty healthy day old, commercial broiler chicks were purchased from Vyankateshwara hatchery, Pune, Maharashtra. They were randomly distributed into 4 treatment groups viz. T0, T1, T2 and T3 with 20 chicks in each group. Shatavari root powder was added in experimental ration at different levels. The dietary treatments consisted of one basal control (T0), supplemented with 0.5% (T1), 1.0% (T2) and



1.5% (T3) Shatavari root powder, respectively. The experiment was continued upto 6 weeks. The overall mortality in Vencobb-400 poultry birds of various groups during the experimental period was zero. The corresponding average live body weights at the end of 6th weeks of age were 2100.43, 2208.11, 2275.43 and 2341.34 g, in T0, T1, T2 and T3 groups, respectively and body weight of group T3 was significantly (P<0.01) superior over others. The average total weekly feed intake during experimental period was recorded as 1054.35, 1045.60, 1027.25 and 1025.30 g, for T0, T1, T2 and T3 groups, respectively and values of group T3 was significantly (P<0.01) superior over T0, T1 and T2 groups. The average weekly feed efficiency at sixth week were 2.44, 2.16, 2.04 and 1.96 in T0, T1, T2 and T3 groups, respectively and values of group T3 was significantly (P<0.01) superior over T0, T1 and T2 groups. It is therefore concluded that supplementation of Shatavari root powder to basal ration at the rate of 1.5% was beneficial in broilers to improve feed efficiency.

Keywords: Broilers, shatavari, growth, feed intake

MSAEJMU-60

Feed additives technology by using ginger powder on body weight gain in broilers

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The trial was conducted with 80, day old Vencob-400 chicks, which were divided into 4 treatment groups (Five chicks per replicate) i.e. 20 chicks per treatment groups. Dietary treatments consisted of basal diet with no additives T_0 (Control), T_1 , T_2 and T_3 , receiving 1.0%, 2.0% and 3.0% ginger, respectively. The average gain in live weight of chicks at six weeks were 499.18±18.51, 633.60±32.53 476.70±25.23 and 563.90±27.00 g in T_0 , T_1 , T_2 and T_3 , respectively. From the statistical analysis it was observed that average gain in body weight in treatment T_1 (633.60±32.53 g) group was significantly (P≤0.05) higher over other treatments. It is therefore concluded that supplementation of ginger powder to basal ration at the rate of 1% was beneficial in broilers to improve weight gain. Keywords: Ginger, technology, feed additives.

MSAEJMU-61

Feed additives technology by using cinnamon powder on body weight gain in broilers

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The trial was conducted with 80, day old Vencob-400 chicks, which were divided into 4 treatment groups (Five chicks per replicate) i.e. 20 chicks per treatment groups. Dietary treatments consisted of basal diet with no additives T_0 (Control), T_1 , T_2 and T_3 , receiving 1.0%, 2.0% and 3.0% cinnamon, respectively. The average gain in live weight of chicks at six weeks was 499.18±18.51, 476.98±25.56, 501.85±32.06 and 542.45±33 g in T_0 , T_1 , T_2 and T_3 , respectively. From the statistical analysis it was observed that average gain in body weight in treatment T_3 (542.45±33 g) group was significantly (P≤0.05) higher over other treatments. It is therefore concluded that supplementation of ginger powder to basal ration at the rate of 3% was beneficial in broilers to improve weight gain. Keywords: Cinnamon, technology, feed additives.



Assessment of Economic viability of poplar- sugarcane-sorghumwheat rotation under different spacing in Yamunanagar, Haryana

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groforestry is one of the best farming systems that can be used for diversification for natural resource conservation and income generation. Poplar wood can be used for paper, plywood, match sticks. packing boxes, playing items, furniture industry, etc. Marketing of poplar wood is comfortable and wood can be sold in Yamunanagar- Jagdhari and local markets in Punjab and Uttar Pradesh. Intercropping is recommended as it provides agricultural returns on the one hand and results in increased growth rate of poplar on the other due to frequent irrigation and hoeing operations of agricultural crops (Shah, 1988 and Chauhan et al., 2015). The study aims to estimate the economics and cost benefit analysis of the poplar plantation at farmers' field to find the viability of the enterprise. Five types of spacing were observed in case of block plantation of poplar in the study area but different than recommended ones. Maximum number of farmers adopted 4.26 x 4.26 meter spacing followed by 3.96×3.96 m, 4.87×2.74 m, 3.65×10^{-10} 3.65 m, $3.65 \times 2.13 \text{ m}$. However, farmers adopted inter-culture in all the plantations. Economic analysis for overall plantation indicated that B-C ratio was 1.72, which was greater than one and net present worth was 4, 22,749 per ha was recorded in wider spacing (4.87×2.74 m), which was closely followed by $3.65 \times$ 3.65 m under Poplar-sugarcane-sorghum-wheat crop rotation. Which showed that poplar based agroforestry was economically viable in the sampled area (Table 1). Similar trends were reported by Singh (1999). The B: C ratio, internal rate of return and net present worth were found to be higher for wider spacing of poplar plantation followed by closer spacing. Thus, it can be concluded that poplar based agroforestry on 4.87 \times 2.74 m spacing was financially more remunerative than 3.96 \times 3.96 m and 4.26 \times 4.26 m spacing, which, may be attributed to higher number of trees and more production from agriculture crops in the plantation of large size and reduced maintenance cost. The system also gives indirect benefits in diversification in crop rotation, biodiversity conservation, erosion control and maintenance of soil fertility (Singhal and Panwar, 1992). It can be concluded that poplar based agroforestry under 4.87×2.74 m spacing was financially more remunerative than other spacings under such conditions. There is need to develop viable agroforestry systems especially for small farmers, where the number is increasing. Keywords: Assessment, viability, crop rotation

MSAEJMU-75

Integrated Nutrient Management for fruit yield and farmer income

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Integrated Nutrient Management is essential for sustainable crop yield and enhancing farmers' income through the solutions to various soil and crop related problems, like disparity in NPK consumption, imbalance use of fertilizers, decreasing soil organic carbon (SOC) stock and decreasing total factor productivity etc. The authors have been reviewed several research papers of various research scholars, experiments conducted at different locations/ agro-ecological regions of country to summaries the various benefits of the INM on different fruit yield over control practices (no combine uses of various inputs of plant nutrients= Fertilizer+FYM+bio-fertilizers+organic manure+legumes+ cropping systems etc.). The INM options in important fruit crops have been shown an increasing yield over control. The INM production recommendations and practices are useful for farmers, agriculturists, agronomists, soil scientists, environmentalists, agriculture extension workers as well as researchers for further studies in this directions etc. Integrated nutrient management practices were observed in pomegranate, Nagpur mandarian, apple and walnut at Bikaner, Nagpur and Shalimar suggested use of inorganic fertilizers along with vermicompost, neem cake, dalweed mulch and biofertilizers like Azospirillum and Pseudomonas improved fruit yield as well as maintained soil fertility

Keywords: INM, Fruit yield, NPK, FYM



Economic analysis of production of carnation (cut flower) under protected condition in Amravati District

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he present study is an attempt to evaluate the "Economic analysis of production of Carnation (cut I flower) under protected condition in Amravati district". Data used were pertaining to the period Jan. 2016 to Dec. 2016 From Amravati district, twenty four poly house of 560 m^2 and 1008 m^2 sizes were selected. It was observed that the total cost estimated for the year was to be Rs. 850926.8 for Carnation. Net return from cut flower production was accounted to be Rs. 371587.8 for Carnation. The total farm business income worked out to be Rs. 698368.3 for Carnation. The total family labour income was accounted to be Rs. 389554.5 for Carnation. The total farm investment income as estimated to be Rs. 680401.6 for Carnation. The total input- output ratio of first and second year profit at cost 'C' was 3.08 for Carnation respectively.

Keywords: Growers, Gross return, Net return, Benefit cost ratio.

MSAEJMU-90

Economics of production technology of sunflower in western Maharashtra

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Cunflower (Helianthus annuus L.) is an important oilseed crop in India popularly known as "Suraimukhi". Total 450 Sunflower growers were selected were selected randomly. The per cent contributed by low adopters was 10.30, medium adopters 73.33 and high adopters 16.36. The average annual employment of sunflower sample family was found to be 475.27 days at the overall level. The crop production alone provided employment to the tune of 28.55 per cent. The average annual gross income of the sunflower sample families at the overall level was Rs.5, 06,984. The income received from crop production was 63 per cent. The per cent gap in seed use was 14.60. The use of chemical fertilizers shows that 'P' component in sunflower were used at higher levels. The per hectare yield has increased from 5.8 to 11.88 quintal per hectare over the different level of adoption. The added yield was 2.12 Q/ha and 3.96 Q/ha over the low and medium level of adoption. Thus, for producing this extra yield per hectare costs were also increased from Rs. 5.347.20 to Rs. 7.140.84 and accordingly, the added returns were also increased from Rs. 9,584.11 to Rs. 14,361.92 The yield gap I and II was ranged between 3.12 to 9.20 and 0.12 to 6.2 per cent, respectively. The nine independent variables have jointly explained the 61 per cent variation in output for sunflower. Human labour (X_1) , Phosphorus (X_5) and Technology adoption index (X_9) for sunflower were highly significant at 1 per cent level of significance. The sample cultivators reported the problems viz: non-awareness of improved technology, costly plant Protection, non-availability of human/ bullock labor for interculturing etc.

Keywords: Sunflower, impact technology, productivity, farm income.

MSAEJMU-91 Impact of production technology of soybean in western Maharashtra

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he present study was undertaken with objectives to study the employment, income and expenditure **L** pattern, effects of improved production technology, costs and returns, the resource use productivities, constraints in adoption of improved production technologies, the input use gap and yield gap. Total 954



soybean growers were selected for the study. Extent of adoption of all technologies together was estimated by calculating Technology Adoption Index (TAI). The technology adoption index was ranged between 44 to 67 per cent for low to high adopters. The crop production alone provided employment to the tune of 35.09 per cent. The wage earning and services or business contributed 4.52 and 29.50 per cent of total employment. The average annual gross income of the soybean sample families at the overall level was Rs. 4, 96,899 and it ranged from Rs. 4, 38,227 (low) to Rs. 5, 55,817 (high). The crop production accounts almost half of the annual expenditure at the overall level. The seed were used at some higher doses (1.92%). This may be because of the fear of poor germination or crop failure. The added yield was 3.28 q/ha and 6.77 q/ha over the low and medium level of adoption. Thus, for producing this extra yield per hectare costs were also increased from Rs. 6,359.04 to Rs. 7,319.60. The yield gap was ranged between 41 to 69 and 20 to 59 per cent, respectively. The variables *viz;* human labour and potash for soybean were negatively significant indicating that there was an excess use of these inputs and need to curtail up to recommendation level for increasing output. The sample cultivators reported the problems *viz;* high cost of manure, non-availability of water for irrigation, high cost of, high cost of ploughing etc. **Keywords:** Impact, production technology, adoption index, constraints

MSAEJMU-93

Economics of farming systems in Pune district of Maharashtra Jaivik Kumar, K. Patel, R.B. Hile and D.B. Yadav

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A field experiment was conducted on farmer's field at plain zone area of Pune district during the year of 2014-15. The study was carried out with before and after approach for study the economics of diversification of existing farming systems. Before diversification, the results of crop component, animal component, product diversification and capacity building were Rs.2,05,209, Rs. 33,502, Rs.7,607 and Rs 2,63,674. After diversification these were increased Rs.2,32,594 (13.34%), Rs.63,599 (89.84%), Rs.1,311(72.38%) and Rs.33,185 (25.85%). These results were because of providing improved varieties and inputs, arranging visit and training to farmers on field crop production, providing technical knowledge of improved package of practices, supply for semen and artificial insemination and mineral mixture and goat kids of improved breed, providing technical knowledge regarding animal health and providing equipments like grading sieve/ghee making equipments, etc. The study results revealed that the interventions at each aspect of crop, animal and product diversification were increases in employment, income and improved the standard of living of selected farmers. The sustainable diversified farming systems are seen highly profitable and the appropriate diversification of components increases the production per unit area, and reduced the costs of production.

Keywords: Diversification, Existing farming systems, Sustainability, Cropping pattern

MSAEJMU-98

Integrated Pest Management for fruit crops and farmer income

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Integrated Pest Management (IPM) for fruit Crops and farmers' income is an knowledge intensive, ecologically based decision making process that uses a variety of management tools and methodologies to suppress pest population to acceptable levels but relies primarily on natural mortality factors. The authors have reviewed several research papers of various research scholars, experiments conducted at different locations to summaries the various benefits of the IPM on different fruit crops over control practices (no combine use of various inputs of cultural methods, biological methods, chemical methods, pest trapping, monitoring, record keeping, thresholds, planting etc.). The IPM options in important fruit crops have been shown an increasing yield over control. The IPM production recommendations and practices are useful for agriculturists, entomologists, farmers as well as researchers for further studies in this directions etc. IPM has various objectives which include keeping the pest numbers below Economic threshold level instead of their eradication; protecting and conserving biodiversity and decrease the threats;



making plant protection feasible, safe and economical even for the small farmers; focusing strongly on supporting natural mortality factors (e.g. pests natural enemies); minimizing environmental damage and health risks by focusing on control measures, excluding chemical control or use of chemical control at minimum; and regulating the ecological balance of pest natural-enemy complex. **Keywords:** IPM, fruit crops, ETL, farmers' income

MSAEJMU-99

Intercropping model in Banana: Way to doubling the farm income

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The field experiment was conducted to study "Evaluation of the possibility of inter-cropping system with banana cultivation in Tribal area of Chhotaudepur Region of Middle Gujarat" at Agriculture Research Station, Anand Agricultural University, Jabugam which comes under Middle Gujarat Agro-Climate Zone-III during two consecutive years 2014-15 and 2015-16. Main objective of the study was to explore the possibility of increasing monetary return from banana based intercropping system by optimizing vegetables. The experiment consisted of five treatments viz. T₁: Banana sole, T₂: Banana + Cabbage, T₃: Banana + Cauliflower, T₄: Banana + Onion and T₅: Banana + Garlic. The experiment was conducted in RBD with four replications. The soil of the experimental field was sandy loam in texture. The banana cv. Grand Naine was planted at 1.80 m x 1.8 m spacing with one plant per hill. The economic assessment of the intercropping system indicated that banana with cauliflower (T₃) or cabbage (T₂) were most profitable system, which recorded higher banana equivalent yield, net realization and benefit cost ratio as compared to rest of the treatments.

Keywords: Banana, Intercrops, Banana equivalent yield, Economics

MSAEJMU-106

Integrated mite management for fruit crops

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Integrated Pest Management (IPM) is a management system which integrates different practices for economic control of pests. The main of IPM is to suppress pest populations below the economic injury level (EIL) rather than their complete elimination. In case of phytophagous mites, the development of resistance at an alarming rate has been a matter of concern. As such the focus was shifted to the use of integrated management practices. The authors have reviewed several research papers of various research scholars, experiments conducted at different locations on different crops to summarize the benefits of different management tactics viz., cultural methods, biological methods, chemical methods, pest trapping, monitoring, record keeping, thresholds, used under Integrated management on fruit crops over control practices where no management is followed. The Integrated management tactics singly or in combination in general are observed to have a positive impact on crop growth as well on production and productivity. Keywords: Mite management, pests, EIL, trapping

MSAEJMU-109

Integrated Farming System for increasing farm yield and income

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Integrated Farming System (IFS) for increasing farm yield and income is considered as one of the best option towards intensification of small holder farm income to ensure sustainable livelihood. Integration of resources is made through a combination of land, water and animal resources of a farm through careful planning including recycling of bio-resources. The authors have reviewed several research papers of



various research scholars, experiments conducted at different locations to summaries the various benefits of the IFS for increasing farm yield. The IFS options for farmers have shown an increasing yield. The IFS production recommendations and practices are useful for agriculturists, economists, farmers as well as researchers for further studies in this directions etc.

Keywords: Integrated Farming system, yield, income

MSAEJMU-111

Management of cropping systems for resource conservation and mitigation of effects of climate change

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he effects of climate change on Agriculture are becoming more obvious and pose serious threats and L challenges to food security and sustainability in Agriculture. To explore ways of mitigating the negative effects of climate change on Agriculture through resource conservation and management of cropping systems, a field experiment was conducted consecutively for six years from 2010-11 to 2015-16 in a split plot design with three replications at Regional Agricultural Research Station, Karjat, Dist. Raigad (M.S.). The main plot treatments were two tillage systems (minimum tillage and conventional tillage) and four cropping systems (*Kharif* rice followed by *Rabi* cowpea, brinjal, sweet corn and grain *Amaranthus*). Sub plot treatments comprised two mulching treatments (no mulching and mulching @ 3 t ha⁻¹ rice straw to Rabi crops) and two fertilizer levels (RDF: Recommended dose of fertilizers and 125% RDF). The pooled results of 6 years revealed that conventional tillage resulted in significant increase in grain yield of *Kharif* rice by 1.29 g ha⁻¹ (2.84%) as against minimum tillage which produced grain yield of 45.42 g ha⁻¹. The straw yield of rice followed similar trend to that of grain yield. The yield of main produce and by produce of *Rabi* crops was not influenced significantly due to tillage systems. The total Rice Equivalent Yield (REY) and net returns of the system were not significantly influenced due to tillage methods. The B: C ratio of the system was identical under minimum tillage (2.16) and conventional tillage (2.16) indicating that *Kharif* rice and *Rabi* crops can be grown under minimum tillage. The 'Rice-cowpea' cropping system produced significantly the highest grain (48.45 q ha⁻¹) and straw (58.19 q ha⁻¹) yields of *Kharif* rice over rest of the systems studied. Crops grown after Kharif rice viz. brinjal, sweet corn, grain Amaranthus and cowpea produced 11.18, 280.37, 218.40 and 7.95 q ha⁻¹ fruit, cob, grain and grain legume yields and 22.27, 67.17, 337.46 and 70.78 q ha⁻¹ by-produce yield, respectively. Since the different crops were grown in *Rabi* season their yields were converted into REY. 'Rice-Brinjal' cropping system produced significantly the highest REY (373.66 q ha⁻¹) over rest of the systems. 'Rice-Sweet corn' system recorded significantly higher REY (310.36 q ha⁻¹) as compared to 'Rice-Grain Amaranthus' (113.55 q ha⁻¹) and 'Rice-Cowpea' (108.82 q ha⁻¹) systems, however, latter two systems were at par with each other. The 'Rice-Brinjal' cropping system realized maximum and significantly higher net returns (Rs. 3,23,139/- ha⁻¹). However, B: C ratio (2.94) was significantly the highest in 'Rice-Sweet corn' cropping system over rest of the cropping systems except 'Rice-Brinjal' cropping system (2.69). Mulching of rice straw @ 3 t ha⁻¹ to Rabi crops significantly increased grain and straw yields of Kharif rice as well as main produce yield of Rabi crops as compared to no mulching, however, by produce yields of Rabi crops did not differ significantly. Mulching of rice straw to Rabi crops @ 3 t ha⁻¹ significantly increased total REY (232.95 q ha⁻¹), net returns (1,85,424/- ha⁻¹) and B: C ratio (2.17) of the system as compared to no mulching. Application of 25 per cent higher dose over recommended dose of fertilizers (RDF) produced significantly higher rice grain yield (47.50 q ha⁻¹), straw yield (56.77 q ha⁻¹) and main produce yield (133.24 q ha⁻¹) of *Rabi* crops as compared to application of RDF. Further, application of 25 per cent higher RDF produced significantly higher system REY of 233.69 q ha⁻¹ as compared to application of RDF (219.51 q ha⁻¹). Application of 25 per cent higher RDF to both *Kharif* and *Rabi* crops caused significant increase in net returns (1,88,048/- ha⁻¹) and B: C ratio (2.21) of the system as compared to RDF. Minimum and conventional tillage did not exhibit significant effect on chemical properties of soil measured after harvest of Rabi crops. 'Rice-Cowpea' cropping system recorded numerically higher values of organic carbon (1.10%) and available N (228.06 kg ha⁻¹) as compared to other cropping systems, however, the differences were found to be non-significant. There was no any significant effect of different cropping systems on available P_2O_5 and K_2O content of



soil determined after harvest of *Rabi* crops.Mulching of rice straw @ 3 t ha⁻¹ to *Rabi* crops significantly increased organic carbon (1.10%), available N (228.20 kg ha⁻¹), available P_2O_5 (24.48 kg ha⁻¹) and available K_2O (274.38 kg ha⁻¹) content of soil as compared to no mulching. Application of 25 per cent higher recommended dose of fertilizers significantly increased the organic carbon content (1.10%), available P_2O_5 (24.51 kg ha⁻¹) and available K_2O (273.07 kg ha⁻¹) contents of soil as compared to RDF, however, there was no any significant effect of fertilizer levels on available N content of the soil measured after harvest of *Rabi* crops. Thus, on the basis of 6 years data it can be concluded that to get higher yields and economic returns, 'Rice-Brinjal' and 'Rice-Sweetcorn' systems be grown with minimum tillage by applying 125% RDF to both the systems and 3 t ha⁻¹ rice straw mulch to *Rabi* crops to mitigate climate change effects through resource conservation and management of cropping systems. Keywords: Cropping system, mitigation, resource conservation

MSAEJMU-114

Performance of cropping systems under organic, inorganic and integrated packages for soil health

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he performance of four different rice based cropping systems viz., rice-groundnut, rice-sweet corn, rice-mustard and rice-Dolichos bean (Green pod vegetable) to organic, inorganic and integrated packages was studied in a split plot design with three replications from 2005-06 to 2015-16 (11 years) at Regional Agricultural Research Station, Kariat, Dist, Raigad (M.S.), Production systems were allotted to main plots while cropping systems were assigned to sub plots. Results revealed that the grain yield of Kharif rice and dry pod yield of Rabi hot weather groundnut under 100% organic package increased from 30.29 g/ha to 44.11 g/ha and 19.50 g/ha to 30.92 g/ha from 2005-06 to 2015-16, respectively. The grain yields of Kharif rice obtained under 100% organic (44.11 q/ha), inorganic (45.06 q/ha) and integrated (45.11 q/ha) packages were almost similar after 11 years of experimentation. The dry pod yield of Rabi hot weather groundnut was increased under 100% organic package. The dry pod yields of groundnut obtained after 11 years of experimentation were 30.92, 28.82 and 29.03 q/ha under organic, inorganic and integrated packages, respectively. The green cob yield of Rabi-hot weather sweet corn obtained under inorganic and integrated packages was higher than organic package. Organic management gave higher seed yield of mustard as compared to inorganic and integrated management. The green pod yield of Dolichos bean vegetable was improved under organic system in 2015-16 as compared to the yield obtained during 2005-06. The REY of all systems under 100% organic management was increased during 2015-16 as compared to that of 2005-06. The per cent increase under 100% organic management was the highest (57.72%) under rice-groundnut system followed by 30.60%, 23. 68% and 14.55% under rice-sweet corn, rice-mustard and rice- Dolichos bean systems, respectively. In general, the REY of all the systems was higher under 100% organic management as compared to 100% inorganic and integrated management during 2015-16, suggesting that these systems can be grown under organic management. The increase in REY of the systems under organic management could be ascribed to the improvement in soil fertility in terms of organic carbon and availability of primary nutrients. During 2015-16 the maximum net returns (Rs.2,21,901/- ha⁻¹) and B: C ratio (2.40) were obtained from rice-groundnut system grown under 100% organic package. Rice-sweet corn system recorded higher net returns due to 100% inorganic package and the same system grown under 100% organic management over rest of the treatment combinations except rice-groundnut system grown under 100% organic management. The bulk density was considerably reduced under 100% organic management and rice-groundnut system. There was increase in organic carbon content of soil under all the packages and cropping systems except under rice-sweet corn (10.7 kg/ha) and rice-mustard (11.2 kg/ha) systems compared to its initial level (11.4 kg/ha). The maximum organic carbon content (16.4 kg/ha) was noticed due to 100% organic management. Rice-groundnut system recorded higher organic carbon content (15.6 kg/ha) as compared to other systems studied. The available nitrogen content of soil was considerably improved under organic (288.42 kg/ha) and integrated management (284.24 kg/ha) as compared to inorganic management and its initial level (230.00 kg/ha). Similarly, the available nitrogen content was remarkably improved under rice-groundnut (290.74 kg/ha)



and rice-*Dolichos* bean (287.72 kg/ha) systems. In general, there was increase in available phosphorus content under all the packages and cropping systems after 11 years as compared to its initial level. Available potassium content of soil was notably increased under organic management (324.87 kg/ha). Higher available potassium content in soil (319.53 kg/ha) was observed under rice-*Dolichos* bean system as compared to rest of the systems. Thus, based on 11 years of experimentation it is concluded that rice-groundnut system be grown with organic management so as to get higher yields, economic returns and sustain productivity by improving physical property in terms of bulk density and soil fertility in terms of organic carbon and available N, P and K.

Keywords: Cropping system, integrated package, soil health

MSAEJMU-137

Economics of goat rearing business in Osmanabad district of Maharashtra

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oat being one of the earliest domesticated animals is known for its relatively longer association with Jhuman beings and known as "poor man's cow" in India. The world current population of goat is around 810 million and that of India alone possesses 124.36 million. India possesses 15 per cent of goat population as compared to the world goat population and stands second to China. India's contribution to world's goat milk, meat, skin and wool productions accounted for 6 per cent, 19 per cent, 18 per cent and 13.2 per cent, respectively. Similarly, goat meat constitutes 25.40 per cent of the total meat production in India. The contribution of goat milk is just 3 per cent of total milk production of the country. India possesses 22 well recognized breed besides a majority of non-descript of interbreed goat out of the globally indentified 102 breeds. The goat population of Maharashtra is 10.68 million. The present study was undertaken in Osmanabad district. To study economics and marketing of goat by using primary data collected by survey method. Multistage sampling design was adopted in selection of district, tehsils, villages and goat rearers. A sample of 60 goat rearers was drawn from selected villages randomly. From each village 6 goat rearers were selected. Four groups of goat units viz. small, medium, and large were considering for study. The information was however, collected for group of 60 goat rearers. Tabular analysis, linear regression analysis and frequency and percentage were used to accomplish the objectives of the study. The results revealed that per goat net profit from goat rearing business was Rs 1377.88, Rs 2038.91, Rs 1994.89 and Rs 1803.89 in small, medium, large and overall size of goat units, respectively. The Output-Input ratio for small, medium, large and overall size of goat unit was 1.19, 1.36, 1.40 and 1.32, respectively. Goat is multipurpose animal which provides milk, meat, hair and skin. In crop production, it helps by the way of enhancing soil by its manure which is twice rich as compared to cattle manure. Goat can survive under adverse climatic conditions, such as extreme hot and cold and area of desert and mountains. Due to small size of body and domicile nature, housing requirements and management problems with goats is less. Goats are prolific breeders and achieve sexual maturity at the age of 10-12 months; gestation period in goat is short (150 days) and at the age of 16-17 months it starts giving milk. Twinning is very common and triplet and quadruplets are rare. The animal can thrive well on wide variety of thorny bushes, weeds, crop residues, agricultural by-products unsuitable for human consumption. The world current population of goat is around 810 million and that of India alone possesses 124.36 million. India possesses 15 per cent of goat population as compared to the world goat population and stands second to China. India's contribution to world's goat milk, meat, skin and wool productions accounted for 6 per cent, 19 per cent, 18 per cent and 13.2 per cent, respectively. Similarly, goat meat constitutes 25.40 per cent of the total meat production in India. The contribution of goat milk is just 3 per cent of total milk production of the country. Goat is an important part of rural economy, particularly in the arid, semi-arid and mountainous regions of India. With more than 124.36 million goats account for more than 25 per cent of the total livestock in the country and contributes Rs 106335 million annually to the national economy. In the country goat is reared for milk in addition to meat. The country ranks second in goat meat production with 16.19 per cent (430 tonnes). The goat population of Maharashtra is about 10.68 million. In Maharashtra two major breeds of goat are Osmanabadi and Sangamneri found in Osamanabad, Latur and Beed districts of Marathwada region. Goat is having very closely association with lives and aspiration of



poorest of the poor and landless agriculture laborers, peasants and those in the economically backward scheduled caste and small farmers. Goat creates employment to the rural poor besides effectively utilizing unpaid family labour. There is ample scope for establishing cottage industries based on goat meat and value addition to skin and fiber.

Keywords: Economics, multistage sampling, rearing.

MSAEJMU-140

Resource use efficiency in rajmash production by hill farmers of Jammu region of J&K

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The Hill farming is supposed to be very fragile due to its unique ecological entity and topographical diversities. The hills are rich in resources for horticultural crops as well as some pulses. The present study was designed to measure resource use efficiency in rajmash production in Bhaderwah and Bhalla blocks of Doda district of J&K state. The input-output data was taken from the sample of 100 rajmash growing farmers and Cobb-Douglas type of production function was used to work out the efficiency of different resources. The results revealed that human labour, seed, manure & fertilizers and plant protection chemicals had the elasticity of 0.105, -0.388, 0.013 and 0.062, respectively and was statistically significant. The marginal value productivity (MVP) in respect of manure &fertilizers (8.981) and plant protection chemicals (11.344) was more than unity level and for human labour (0.872) it was less than unity level. In case of machine labour (-2.275) and seed (-9.772), MVP value was found to be negative, indicated more than optimum use of these two resources.

Keywords: Hill Farming, Resource Use efficiency, Rajmash, Production Function, MVP

MSAEJMU-165

Residue dynamics of dimethoate 30 EC in apple in Kashmir

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The injudicious and indiscriminate application of pesticides to crops results in residues with L consequential hazards. The extent of hazard depends on the amount of pesticide residues and their toxicity. Considering the food losses caused by pests, it is not feasible to completely dispense with the application of pesticides. The use of pesticides in general and timing of treatment in particular, however, can be regulated to ensure minimum residues on food which can be considered safe for human consumption and for the environment as well. The present investigations were, therefore, carried out to study residue dynamics of dimethoate 30 EC (0.03%)- a commonly used insecticide on apple (Malus domestica Borkh) in Kashmir. The insecticide was applied on Red Delicious apple at farmer's orchard located at Tel Bal, Srinagar one month prior to harvest. The sampling period for fruit and soil (collected from basin under apple tree canopy) comprised 0, 3, 7, 10, 15, 20 and 30 days after application. The insecticide was analyzed by Gas liquid chromatography (GC Varian 450). The studies on dissipation of dimethoate 30 EC in apple fruit revealed that the average initial deposit (ppm) was 5.45±0.29 with a dissipation percentage of 98.49 ppm in 20 days after application and was not detectable beyond this period. The progressive dissipation of insecticide residues down to its tolerance limit suggested waiting period of 6.95 days with half life period of 3.45. The terminal residue was below maximum residue limit (2.0 ppm) set by European Union. Soil samples did not contain detectable residues of pesticides at day zero up to day 30 after application. It indicates that the fruit can be produced residue free and is safe for consumption if judicious use of pesticides with respect to concentration and time is followed. Waiting period based on the prescribed maximum residue limits needs be adopted strictly as index of safety to consumers. Keywords: Apple, dimethoate, persistence, residues and soil



Evaluation of pecan nut [*Carya illinoensis* (Wang). K. Koch.] seedling selections for nut characteristics

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he pecan nut [Carya illinoensis (Wang). K. Koch.] an important edible nut crop belongs to family Juglandaceae is native to North America. Pecan (65-70% fats, 8-10% proteins, high in phosphorous, potassium and vitamins A, C, E and B complex) is superior to walnut in quality and thrives best in areas which are considered lower and hotter for walnut cultivation (Singh et al., 2009). Its importance also lies in nuts having relatively thin shell which cracks easily. In India, pecans were introduced from USA to Himachal Pradesh in 1937 which became major source of planting material in Himalayan region. At present pecan nut is one of the most important temperate nut grown in India. In India, it is mainly grown in Jammu and Kashmir and Himachal Pradesh. The total area under pecan nut production is increasing due its high economic returns and adaptation to intermediate zone (914-1829 m) of Jammu (Ravindran et al., 2006). Though introduced in Palampur, Himachal Pradesh, way back in 1930 (Singh et al., 2011) this nut crop could not assume commercial status for the want of suitable cultivars among orchardists. Due to poor success under vegetative means of propagation, growers used seeds for planting. The plants thus raised through seeds exhibited substantial variability in respect to various morphological characters. Nevertheless, there is huge potential of this nut crop to commercialize being hardy to climatic vagaries and having export value. The existing population at Poonch and Rajouri, comprising the trees of seedling origins exhibit tremendous variability in growth, yield and quality attributes, thereby, providing a platform for exploitation of vast gene pool. Meagre efforts have been made for selection of superior seedling pecan genotypes with desirable traits especially economically important nut and kernel traits. Keywords: Evaluation, seedling selection, orchardists, genotypes

MSAEJMU-179

Studies on supplementation of probiotics on growth performance and economics of Giriraja poultry birds

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The present investigation entitled "Studies on supplementation of probiotics on growth performance of Giriraja poultry birds" was carried out with main objectives to assess the effect of feeding probiotics on Body weights, Feed Consumption, Feed Efficiency (FCR), Dressing Percentage and Economics of Giriraja poultry birds. 90, day old straight run commercial Giriraja chicks were procured from Govt. hatchery. They were randomly and equally distributed in to three treatment groups viz, T₁, T₂ and T₃ with 30 chicks in each group, on equal weight basis. The birds were randomly divided into five replicate groups of each treatment and the chicks were housed in separate compartments. Multistrain probiotics were added in experimental ration at different levels. The dietary treatments consisted of one basal control (T_1) , supplemented with 0.10% probiotics (T_2) and 0.15% probiotics (T_3). The corresponding average live body weights at the end of 7th weeks of age were recorded as 1095.72, 1210.59 and 1305.25 g and average weekly live body weight gain as treatment mean was calculated as 151.92, 166.25 and 181.83 for T_1 , T_2 and T_3 respectively. The average feed consumption at 7th week of age for treatment T_1 , T_2 and T_3 were 673.83, 675.33 and 677.66 g respectively. The cumulative feed consumption at 7th weeks of age were 2650.66, 2662.31 and 2669.65 g for treatments in T1, T2 and T3, respectively. The average weekly feed efficiency at 7thweek age were 2.49, 2.26 and 2.14 and cumulative feed efficiency of various groups T₁, T₂ and T₃ were found as 3.28, 2.81 and 2.66, respectively. Dressing percentage was recorded as 59.54, 63.30 and 65.77 percent for treatment T₁, T₂ and T₃, respectively. The net profit per bird was highest in T₃ (Rs.140.16) followed by T_2 (126.72) and lower in T_1 (Rs.109.41). Keywords: Probiotics, growth performance, economics, Giriraja



Management of pre-harvest fruit drop in Kinnow mandarin (*Citrus reticulata* L.) with plant bioregulators

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itrusis an important genus of the family Rutaceae, which occupies unique position among popular and extensively grown in tropical and sub-tropical region. In India, the total area under citrus is 987.3 thousand hectare with an annual production of 9638 thousand metric tonnes (Anonymous, 2010). Though, citrus is cultivated in almost every state of India but Maharashtra, Andhra Pradesh, Karnataka, Assam and West Bengal are leading citrus growing states. In Jammu and Kashmir, citrus is successfully grown in subtropical areas of Jammu region covering an area of about 13387.63 hectares with production of about 18981.52 metric tonnes (Anonymous, 2011). Citrus fruits have special importance due to their distinct flavors and therapeutic values because they are rich in vitamin C with fair amounts of vitamins A and B. Kinnow (Citrus reticulata L.), a member of citrus family, is first generation hybrid between the King and Willow leaf mandarin was developed by H. B. Frost at California Citrus Experiment Station in 1915 and introduced in 1956 in Punjab which helped in replacing the traditional citrus fruits viz. sweet orange and local mandarin to some extent and strengthening the status of citrus industry in India. Kinnow mandarin is predominantly grown in the north-western region of India, such as Punjab, Haryana, Himachal Pradesh, western Rajasthan and Uttar Pradesh.Kinnow mandarin is gaining commercial importance due to wholesome nature of the fruit, multifold nutritional and medicinal values besides excellent desert quality, characteristic aroma, pleasant and outstanding appearance, relatively less granulation, precocious bearing habit and adaptability to even adverse weather conditions. Its overwhelming consumer acceptability and economic profitability made it a top ranking fruit among all the citrus species grown in northern India (Kumar et al., 1998). Cultivation of Kinnow in Jammu and Kashmir state, is recent and at present it is commerciallycultivated in parts of Jammu, Udhampur, Rajouri, Poonch, Kathua and Doda districts of Jammu division, with area under this crop increasing progressively. Kinnow is commercially cultivated due to better yield, processing quality, fresh consumption and better adaptation to agro-environmental conditions (Ahmed et. al., 2006), however, pre-harvest fruit drop is one of the major reason of low productivity in India. Fruit drops at various stages of fruit development due to malnutrition, water stress, excessive insect pest attack and most important among them is the hormonal imbalance. Fruits are dropped when the concentration of auxins decreases and the concentration of abscissic acid (ABA) increases (Marinho et al., 2005) as the endogenous hormones and their balance play a modulating role in the mobilization of nutrients to the developing organs. The use of plant bio-regulators has become an important component of modern agro-technical procedures for most of the cultivated plants and especially for fruit plants (Monselise, 1979). So in citrus also, excessive fruit drop can be controlled by the exogenous application of plant bio-regulators. The auxins and gibberillins are used to control the fruit drop and to improve the fruit quality in different citrus species (Almeida et al., 2004). Application of PGRs including GA₃ and cytokinins for quality fruit production is well documented in mature trees of Satsuma mandarin (Garcia-Luis et al., 1985), Sunbrust mandarin (Pozo et al., 2000), Hamlin, Valencia, and Navel cultivars of sweet oranges (Fidelibus et al., 2002). Application of plant growth regulators can re-enforce hormonal balance in the peel, reducing or retarding this precocious fall and the losses at harvest (Primo et al., 1966). Hormone balance acts on the polygalacturonase activity which together with cellulase is responsible for the degradation of the two important components of cell wall i.e. cellulose and pectin (Monselise and Goren, 1978). Spraying of auxin prevents the dropping of fruit by maintaining the cells at the zone of abscision, preventing the synthesis of hydrolytic enzymes, such as cellulase, which decomposes the cell walls. Use of 2,4-D as a growth regulator to promote size and to control fruit and leaf drop was reported by Sarvoski and Stannard (1974) and has been recommended for citrus crops in California. According to El-Otmani (1992), the combined application of GA₃ and 2.4-D reduces the precocious drop of fruit through the action of auxin and retards the softening and senescence of the peel. So the efficacy of different plant bioregulators to reduce preharvest fruit drop and improve the quality and yield of Kinnow mandarin were studied under the subtropical conditions of Jammu.

Keywords: Pre-harvest fruit, bioregulators, cellulase



Enterprising Himalayas through apple based horticulture production system: Status, Issues and Policy implications

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study on "A value chain analysis of apple in Jammu & Kashmir" was carried out in the Baramulla Adistrict of the valley during 2014-15. Apple being main fruit in the district has predominant position in area, production and productivity. Both primary and secondary data was analyzed to interpret the results for this study. Primary data was collected from the 70 sample respondents from a cluster of 6 villages delineated from the Pattan zone along with market functionaries and other important players of value chain. The secondary data was collected from the relevant secondary sources. The apple value chain in Kashmir has been comprehensively analyzed in this study. The study revealed that the horticulture is an important area for development, and the valley grows mostly apple. The trends in the apple production showed that the acreage diversified towards crop increased at a faster rate during last ten years and the farmers witnessed more potential for the fruit. The fruit crop has performed differently across the districts with overall moderate growth and high variability in Kashmir division as indicated by growth and variability analysis. The study revealed that majority of the farmers were marginal farmers with upto 2 hectares of land under apple orchards. Cost of apple cultivation works out to be Rs. 209062 per hectare with net returns to the tune of Rs.494063 per hectare. The study of marketing of apple identified five marketing channels and the channel 1 viz. Producer-Whole seller/Commission agent-Retailer-Consumer, was the major route for apple trade as more than 30 per cent of the farmers produce was marketed through this channel. Marketing efficiency was found maximum (0.68%) in this channel for the obvious reason as it involves less number of intermediaries. The establishment of Terminal market of Sopore proved a major facilitator in the marketing of apple in the study area. The processing and the cold store units, the major functionaries in the value chain of apple were also studied. During the study it was found CA store was lacking in the district, particularly for apple storage. However, one processing unit (JKHPMC) covering limited apple shed for producing apple juice concentrate was established long back in the district. The study in essence revealed that there is lack of convergence between production and apple based industrial and entrepreneurial value chain. The strategic alignment of the farm, the market functionaries, the processor and the cold chain needs to be realigned for ensuring productivity and adequate returns to each stakeholder. The emerging socio economic needs and increasing education in the valley has created a window of opportunities for large apple production base and needs to be converged and integrated into the value chain. The situation demands prospective planning in apple value chain in order to address the concerns of stakeholders.

Keywords: Apple, Production, Marketing, Value chain.

MSAEJMU-222

Agricultural diversification and profitability of fruit and vegetable production among farmers in Udhampur district

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A griculture addresses the challenge of meeting the growing demand for food despite less opportunity for agricultural expansion on supplementary lands whereas crop diversification refers to the raising of varieties of crops in a given area in a crop season. The more is the number of crop grown in an area, the higher is the crop diversification. It is perceived as one of the most ecologically feasible, cost effective, and rational ways of reducing uncertainties in agriculture and that too during environmental changes. This study which was conducted in Udhampur district of Jammu region reveals how crop diversification shows preparedness of farmers to cultivate fruit and vegetable crops other than cereals and these fruits and vegetables provides profitability to the farmers of the area. The cost and return analysis revealed that respective gross returns were Rs. 63342.23, Rs. 316336.85, Rs. 95295.24 and Rs. 14000.00, respectively



for maize, tomato, walnut and garlic. Per hectare net returns were found to be highest (Rs. 187332.11) in tomato whereas lowest (Rs. 8711.40) was observed in case of maize. Herfindahl Index was used for calculating the crop diversification which depicted that the index value was highest in Bashat area with its value 0.52 followed by Bupp (0.41), Mantalai (0.35) and Kosar (0.42) with an overall average value of 0.43. The regression estimates for crop diversification are also estimated, where the dependent variable HI indicates that lower is the value more will be the crop diversification and vice versa. The R² value of 0.89 obtained from the analysis shows that 89 per cent variation has been determined by the independent variables under study. Fertilizer consumption, irrigation and area under fruits and vegetables influence agricultural diversification at 5% level of significance. The agricultural development in the study area has mostly taken the form of shift towards vegetable and fruit production. The study has revealed that the selected villages of Chenani block in Udhampur district are witnessing movement towards crop diversification to enhance their income.

Keywords: Crop diversification, fruits, vegetables, maize

MSAEJMU-224

Economic potential of superior harad clones in Kandi village of Jammu

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Harad (*Terminalia chebula*), is growing naturally in the forest, cultivated on the bunds of farmer's fields or village common lands popularly known as ghasnies under traditional Agroforestry systems in Kandi Villages of Jammu. The average yield per tree from existing plantations was recorded to be 80-110 kg. There are reports of trees bearing 5-7 quintals of fruits/trees generating an average income of Rs. 15000-25000 per tree per year for a superior genotype named Raj Harad that have been found existing at Mathwar village for over 100 years. With coming up of superior grafting clones of harad, the expected economic returns from these grafted clones at an early bearing age of 7-8 years will Rs 593750 per ha that will be almost double than the existing seedling plantations fetching an amount of Rs 300000 that too after 12-15 years of bearing. Moreover, fresh weights of fruit per tree will also differ significantly. Standardization of the scientific production technology of superior clones including Raj harad will boost the adaptation and cultivation of superior clones of better adoptability by the farmers with more development of entrepreneurship among the rural masses.

Keywords: Economic potential, harad, clones

MSAEJMU-227

"Integrated Pest Management" Bioefficiency of Flonicamid 50% wg (Ulala) against Major Sucking Insect Pests of Okra N.L. Dangi, Lekha and M.K. Mahala

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A field experiment was conducted in RBD at RCA farm, MPUAT, Udaipur to evaluate the bioefficacy of Flonicamid 50% WG at 150, 200 and 250 g/ha against aphids, jassids and whitefly of okra during *kharif*, 2015 and 2016. The maximum reduction in the population of aphid, jassids and whitefly in okra was recorded in case of two sprays of Flonicamid 50% WG @ 250 g/ha that also recorded highest marketable yield of 74.00 and 73.33 q/ha during 2015 and 2016, respectively. Next effective treatment was Flonicamid 50% WG @ 200 g/ha.Minimum dose of Flonicamid 50% WG @ 150 g/ha and Thiamethoxam 25% WG @ 100 g/ha were at par in the control of aphids, jassids and whitefly. Imidacloprid 17.8% SL @ 100 ml/ha and Dimethoate 30% EC @ 2310 ml/ha were at par to each other and provided minimum control of aphids, jassids and whitefly as compared to other insecticidal treatments. **Keywords:** Okra, Flonicamid 50% WG, Aphid, Jassid, Whitefly.



Growth, yield and economics of hybrid rice cultivars (Oryza sativa) as influenced by graded levels of N, P, K under sub-tropical irrigated conditions

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Rice (*Oryza sativa* L.) is a major staple food for more than half of the world's population. In Asia, more than two billion people are getting 60-70 per cent of their energy requirement from rice and its derived products. Rice is grown in more than 114 countries across the world. Globally, it occupies an area of 168.4 million hectares with a production of 719.73 million tonnes. Among different rice growing countries, India has the largest area and it is the second largest rice producer next to China. To meet the demands of increasing population and maintain the self sufficiency, the present production level needs to be increased to 120 million tonnes by 2020. There is no scope for horizontal expansion of cultivable area, therefore cultivation of hybrid rice cultivars with good management practices and efficient use of input resources are necessary for achieving desired level of productivity. Introduction of hybrid rice is an important step toward augmentation of rice yield. The production can be enhanced by introducing hybrids varieties of rice as their yields about 1.0 to 1.5 t/ha higher than promising high yielding varieties like Jaya (Bali et al., 2006). The potentiality of high yielding rice varieties depends upon their efficacy in utilizing the available soil nutrients. The proper dose of NPK fertilizer is very important to harness the yield potential of rice with economic efficiency. Higher yield potential of hybrid rice makes them highly responsive to fertilizers but information on hybrid rice nutrition is meagre. Therefore, adequate fertilization at right time in proper manner is essential to achieve potential yield of hybrid rice.

Keywords: Growth yield economics, Hybrid rice cultivars, economic efficiency

MSAEJMU-251

Management of walnut weevil (Conotrachelus juglandis) in Poonch district

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Alnut (Juglans sp.) is an important horticulture crop of the Poonch District. Small fruit size and low yield due to walnut weevil (Conotrachelus juglandis) is the major problem of the farmers of Poonch district. An On Farm Trial (OFT) was conducted by KVK Poonch for the management of the pest and checking fall in production due to crop damage from walnut weevil, a menace that poses threat of huge damage and loss to crop yield and farmers livelihood. Three trials were conducted at three different locations of district Poonch with three treatments at each location. Two technologies were assessed for the control of the pest, whereas farmers practice was considered as control. Treatment I- Farmers Practice (no measures), Treatment II- Soil application of carbofuran @ 100 g/plant, Treatment III- Trunk Banding with polyethylene sheet followed by two sprays of metasystox @ 1.5 ml/l. Results of the trial at farmers field revealed that Trunk banding + two sprays of metasystox (a) 1.5 ml/l proved best in managing the pest walnut weevil (18% insect incidence) with BC ratio of 6.22, followed by Soil application of carbofuran @, 100 g/plant (23% insect incidence) and BC ratio of 5.90, whereas, in farmers Practice (no measures) 39% insect incidence was recorded with BC ratio of 5.0. Farmers were recommended to practice Trunk Banding with polyethylene sheet followed by two sprays of metasystox $\langle a \rangle$ 1.5 ml/l for the effective control of the walnut weevil.

Keywords: Walnut weevil, carbofuran, polyethyle sheet



Tinospora cordifolia possesses *in vitro* anticancer and antifungal potential

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Cancer is the major cause of mortality in the world and cancer cases are on rise in Jammu and Kashmir with summer capital Srinagar tops the number with 898 cancer patients while the number stands at 853 in Jammu and 62 in Leh/ Kargil districts of the Ladakh region. Fungal diseases presently also destroy a huge quantity (tonnes) of the top five food crops- rice, wheat, maize, potato, soybean, each year, in the State which could otherwise be used to feed those who do not get enough to eat. In *vitro* anticancer and antifungal potential of *T. cordifolia* has been evaluated in the present research andresults revealed that the methanolic extract from stem part of *T. cordifolia* 100 µg/ml showed significant results against prostate (PC-3) and colon (HCT-116) cancer cell lines as 77% growth inhibition was observed in the former and 71% growth inhibition was observed in the later case. The extract alsoshowed remarkable activity against *B. specifera* with IC₅₀ values of 0.70 ± 0.02 mg/mL. However, less activity was observed against *C. lunata* and *A. alternata* with IC₅₀ values of 1.2 ± 0.12 and 1.35 ± 0.07 mg/mL respectively. **Keywords:** *Tinopora cordifolia*, Anticance, antifungal, fungal disease

MSAEJMU-270

Dystocia due to uterine torsion in a non-descript goat- a case report

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The aim of this paper is to report the incidence of uterine torsion in a non-descriptive goat. A five year old pleuriparous non-descriptive goat showed clinical signs of intermittent straining and spirally twisted anterior part of the vagina to the right causing. A 270-360° clockwise right uterine torsion was diagnosed. Rotation of dam by applying plank was attempted to relieve torsion. On rotation, torsion was relieved and cervix was found completely dilated. Mild traction was applied and a live female fetus was delivered. Then, two Furea boli (Nitrofurazone 60mg, Urea 6g) were placed inside the uterus and it was administered with enrofloxacin (Enrocin) @ 5 mg/kg b wt, Melonex (meloxicam) @ 0.1 mg/kg b wt, IM for 5 days. Fluid therapy was given on first day. Animals recovered successfully after completion of treatment.

Keywords: Dystocia, uterus torsion, fluid therapy

MSAEJMU-271

Dystocia in goats, causes and treatment

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This study was conducted on 13 goats (1.5-5 years of age) suffering from dystocia was presented to TVCC, FVSc & AH, R.S. Pura, Jammu. On the basis of vaginal examination the goats were classified to three groups according to the causes of dystocia and treatment methods were employed to deliver kids. The first group composed of 6 goats suffering from dystocia due to lateral deviation of head and neck, this group was managed by mutation and forced extraction to relief the case and all the fetus were alive. The second group composed of 4 goats suffering from dystocia due to bilateral shoulder flexion associated with absolute fetal oversize, these cases was treated using partial fetotomy by removing the fore limbs from the



shoulder region and delivered fetus were dead. In last goup, 3 goats suffering from dysocia due to relative fetal oversize or narrow and small pelvis of the dam or uterine torsion, the caesarean section was performed to treat these cases and the fetus were dead. **Keywords:** Dystocia, treatment, caesarean section

MSAEJMU-281

Integrated disease management of bean anthracnose caused by Colletotrichum lindemuthianum

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F our different chemical fungicides viz. carbendazim, thiram, dithane M-45 and carboxin and two biocontrol agents viz. *Trichoderma viride and Trichoderma harzianum* were tested singly as seed treatment and foliar spray for their efficacy against bean anthracnose in field conditions. The field experiment was conducted during 2012 at experimental field at Sartengal of SKUAST-Jammu, RHRSS, Bhaderwah, Doda. The experiment was laid out in Randomized Block Design (RBD) with thirteen treatments including water spray as control. Each treatment was replicated thrice in 2×2 m size plot. Two sprays were given at 30 and 45 days after sowing. *in vivo* studies revealed that all the fungicides and biocontrol agents were significantly effective against bean anthracnose but among the treatments bavistin is most effective in both seed treatment as well as foliar spray followed by carboxin. Whereas among biocontrol agents *T. viride* is more effectve than *T. harzianum*. **Keywords:** IDM, anthracnose, fungicides, RBD

MSAEJMU-287

Prevalence of reproductive problems in the Jammu region

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The present information is based on the data obtained from 11 clinical camps attended by the authors as a reproduction resource person, in the Jammu region. Among the total cases (n= 329) presented which were related to reproductive problems the prevalence of the anoestrus was maximum (42.86%) followed by repeat breeding (37.08%). Though other reproductive problems such as infantile female genitalia (0.6%), follicular cyst (0.6%) and cervico-vaginal prolapse (0.3%) were also presented. The main livestock populations in the villages were cattle and buffalo. At many places facilities for treatment of animals and artificial insemination (AI) were not adequate. The knowledge of farmers about animals' deworming and feeding balanced ration was too little. The interaction meetings of scientists with the farmers were very fruitful and it helped in addressing causes of various managemental and reproductive problems and to suggest their corrective measures. Medicinal treatments on various problems were suggested on the spot and information literatures were also distributed. These types of interaction and veterinary clinical camps should be organized on regular intervals so that farmers may get appropriate consultancies on various aspects of animal care and reproductive management of their livestock may be done effectively. **Keywords:** Clinical camps, farmer scientist interface, reproductive problem



Successful estrus induction and breeding of ewes during late breeding

season

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wes are seasonal breeding animal and shows normal ovulatory cycles during the autumn and winter Leseason. Most of the ewes remain in anestrus during non-breeding season. In govt. breeding farms, natural breeding is preferred and ewes are kept with ram for about 45 days after onset of the breeding season. About 30% ewes fail to conceive and remain empty till the next breeding season ensues. Pregnancy diagnosis using ultrasound can detect non-pregnant ewes and these ewes may be induced to breed in late breeding season. Estrus induction and breeding of such ewes during late breeding season can yield more lambs to the farm. A successful trail of inducing estrus, using progesterone implants were made at Govt. Sheep Breeding Farm, Panthal, during late breeding season with the aim to enhance reproductive performance of the ewes. Total twenty non-lactating ewes were selected and were treated using conventional intra vaginal progesterone (P₄) sponge procured from CSWRI (ICAR), Avikanagar. The P₄ sponges were kept in situ for 12 days and inj. ECG@ 200 IU was given to each animal on the day of withdrawal of progesterone implant. All treated ewes (100%) responded to the treatment and exhibited estrus after withdrawal of implant. The onset of estrus was 20-30 hrs and mean duration of estrus was 24-36 hrs. In the present study, intensity of estrus was good in 12 ewes (60%), fair in 4 ewe (20%) and weak in 4 ewe (20%). Conception rate was 55% and lambing rate was 100%. It was concluded that conventional P₄ sponge along with PMSG is cost effective in inducing estrus in non-lactating ewes during late breeding season.

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Studies on follicular population with respect to side of sheep ovaries Sudhir Kumar, Utsav Sharma and Sharad Kumar

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The present study was aimed to observe the follicular population in sheep ovaries with respect of side of ovary viz., right or left ovaries. For this purpose 600 ovaries were collected from local slaughtered sheep. The mean number of small, medium, large size and total surface follicles on left and right ovaries were recorded as 2.97 ± 0.03 , 2.29 ± 0.02 , 1.59 ± 0.02 , 6.86 ± 0.03 and 2.46 ± 0.02 , 2.03 ± 0.01 , 1.39 ± 0.01 , 5.88 ± 0.01 , respectively. The mean number of small, medium, large size and total surface follicles were significantly higher (P<0.05) in left ovaries compared to right ovaries. The mean number of small surface follicles in both left and right side ovaries. The total surface follicles (6.86 ± 0.03) were also significantly higher (P<0.05) in left side ovary compare to right side (5.88 ± 0.01) ovary. Therefore, it can be concluded that left ovaries were more active than right ovaries in sheep.

Keywords: Sheep, follicular population, ovaries.



Impact assessment of skill development training programmes on entrepreneurship development

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S ponsored training programme lime the one by Agriculture Skill Council of India (ASCI) has huge implications on the improving the entrepreneurship development of the farmers especially the landless farmers. A skill development training programme on Small Poultry Farmer of Kathua district of Jammu region was sponsored by ASCI. The impact of the training programme on the livestock farmers' capabilities and performance level in their farm practice was evaluated over the period of time. A multistage approach was used where data were primarily collected using personal face-to-face feedback before and after the training programme from all the 20 participants. Analysis of findings suggested that on a general account a positive trend has emerged from this study indicating the effectiveness of the training programs although with range of variations of benefits gained by the farmers. A majority of the respondents agreed that the program have been useful and had made them become better entrepreneurs along with improving their economic status.

Keywords: Farming practices, performance, skill training, livestock farmers.



Poster Presentations

MSAEJMU-16

Growth of pigeon pea crop in Maharashtra- TFP analysis

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Measurement of productivity growth is very essential to take appropriate policy decisions for the development of the agriculture sector. Present study measures total factor Productivity growth of pigeon pea crop in sub-sector of Maharashtra State. The Tornquist-Theil chained Divisia index approach was applied for the measurement of total factor productivity using output and input data of Pigeon pea crop. Farm-level data on yield, level of inputs use and their prices for the period 1989-90 to 2008-09 were taken from the state funded cost of cultivation scheme. The multi-variable model was estimated to know the determinants of total factor productivity growth taking total factor productivity as dependent variable. Beside double sown area, other explanatory variables includes total amount of loan, net cropped area, area under irrigation, area under high yielding variety, annual rainfall, villages electrified, number of tractors, number of pump sets, road density. The results indicated that total factor productivity growth was positive in Pigeon pea crop in sub sector of Maharashtra State. Area under irrigation, area under high yielding variety and significant impact on total factor productivity of pigeon pea crop in sub-sector.

Keywords: Pigeon pea, Productivity, Total Factor Productivity, Tornquist-Theil Index

MSAEJMU-19

Production performance of pigeon pea (tur) in Solapur district of Western Maharashtra

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The study was conducted in Solapur districts of Western Maharashtra. The objectives of study also examine trends, costs and returns structure, resource use efficiency, marketing cost, seasonal fluctuations in arrivals and prices, and problems in production and marketing of pigeon pea in Solapur district of Western Maharashtra. The study was based on the primary data of 90 pigeon pea cultivators for the year 2011-12. The secondary data on area, production and productivity for period 2000-01 to 2009-10. The functional analysis was also carried out by using Cobb-Douglas type of production function. The production of pigeon pea has increased due to productivity increases and area under pigeon pea also increases. The major items of cultivation cost were rental value of land, bullock power, human labour, seed, plant protection, fertilizer and manures. Per quintal cost of production was ₹ 2626.49 and net price realized was ₹ 3870.31 The input output ratio at cost C was 1.43. However, Producer-Wholesaler-Retailer-Consumer was the major marketing channel, per quintal cost of marketing was found to be ₹ 386.63. The major problems faced by farmers in the production of pigeon pea were incidence of high wages rate of labour, high costs of inputs, non-availability of loan in time, non-availability of labour in peak period. while in case of marketing the major items of cost were commission, transport and packaging charges. lack of market intelligence and high market charges. The study suggests that the extension education programmes have to be strengthened for the spread the awareness of improved production technologies and modern cultivation of pigeon pea among the farmers in order to improve the productivity of pigeon pea.

Keywords: Compound growth rates, price spread, indices of arrivals and prices



A study of technological input and yield gap of pigeon pea in Vidarbha

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rield gap is an important aspects as it affects production. This is more important for a country where Y ield gap is an important aspects as it affects production. This is there are producing region to region. Even with in regions, yield gap is substantial as a large majority of the farmers are producing much less than many of the promising farmers whose productivity is very high with similar technology for narrowing down the yield gap between the farmers' fields and demonstration plots, there is a need to take up in depth analysis of yield gap. It may not always possible for the farmers to raise the crop productivity on their farmers to the level of research station. However, it would be realizable to aim at demonstration plot yield (Potential farm yield) level. Hence in this study more emphasis is given to yield gap II, i.e. difference between demonstration plot yield and farmers field to assess the input gap and yield gap of Pigeon Pea crop and to measure the contribution of each components of technology. The study was based on the primary data collected from Agricultural Prices Scheme, Dr. PDKV, Akola for the year 2012-13. The farmers distribution in all 120 farmers from Akola, Buldhana and Amaravati district were collected. The sample consists of all the cultivator spread over the clusters selected for pegion pea crop grown. The study was concluded that, total Yield gap was highest in low adopter (6.81 gt/ha) and less in high adopter (1.87 qt)/ha. The level of adoption of recommended manure, phosphate and Nitrogen are the responsible factors in the reduction of vield.

Keywords: Yield Gap, phosphate, nitrogen

MSAEJMU-23

Oilseeds production in India- An overview

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dible oils constitute an important component of diet in Indian households and accounts for about 6-7 per cent of food expenditure. Edible oils consumption has shown a steady growth (5.5%) during the last decade and is expected to grow further. The per capita consumption has increased from about 12 kg per year in 2006-07 to 15.4 kg in 2012-13. The increase in demand for edible oils is attributable mainly to growing population, increase in income levels, and changing demograhics and food habits. However, the current per capita consumption levels of India (at 15.4 kg/ year) are much lower than global averages (26.3 kg/year) and much lower than developed countries like USA (56.7 kg/year) and the EU (59.7 kg/year). Demand for edible oils in India is expected to further grow but there is a significant gap between demand and supply of edible oils due to slow growth in domestic oilseeds production, low productivity levels. shifting of acreage to other high-value crops, etc. This gap has been met through imports, which accounted for about 57 per cent of the total oil consumption in 2013-13. The share of imports has increased from a meagre 2-3 per cent in early-1990 to almost 57 per cent in the recent years. Domestic output has increased by about 2.7 per cent while imports have increased at an annual growth rate of about 9 per cent during the last decade. Given the positive macro-economic fundamentals, demographic changes diversification and globalization of Indian diets, edible oils have a strong demand growth outlook over the medium-to-long term but the obvious question that arises is if India will continue to be a major importer of edible oils or will it achieve the goal of self-reliance in edible oils through technological, institutions and economic interventions. Hence, understanding the Indian edible oilseeds sector and the factors limiting the production, productivity and marketing of major oilseeds in the country is of paramount importance for promoting oilseeds production, improving farmers' income, alleviating rural poverty, and ensuring nutritional security. This study was conducted during 2011-12. Keywords: Oilseed, production, economic interventions



Studies on the effect of integrated nutrient management on yield and quality of plum (*Prunus saliciana* L.)

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The present investigation entitled "Effect of integrated nutrient management on growth, yield and quality of plum (*Prunus saliciana* L.) cv. Santa rosa" was carried out at four different locations in district Poonch of Jammu & Kashmir, viz., Loran, Mandi, Rajpora and Bainch as OFTs (On Farm Trials) during the year 2015-16. The experiment was laid out in randomized block design (RBD), comparing of three treatments *viz.*, recommended dose (NPK, 735, 280, & 1080 g/tree), intervention (N_{50%} + VC_{20%} + FYM_{20%}, P_{25%} + VC_{50%} +FYM_{25%} K_{75%} + VC_{15%} + FYM_{10%}) and farmers practice (Full dose of N + 7-10 kg FYM) as control. The results were pooled and indicated that the intervention ((N_{50%} + VC_{20%} + FYM_{20%}, P_{25%} + VC_{50%} +FYM_{25%} K_{75%} + VC_{15%} + FYM_{10%}) was found to be most effective in producing better yield and quality followed by recommended dose (NPK, 735, 280, & 1080 g/tree). However, increased physio-chemical properties (organic matter, water holding capacity, porosity, particle density and available soil nutrient status) of the soil was also observed to be effective with treatment (N_{50%} + VC_{20%} + FYM_{20%}, P_{25%} + VC_{50%} +FYM_{25%} K_{75%} + VC_{15%} + FYM_{10%}), during both the years of study. Keywords: INM, physio chemical, FYM, OFT

MSAEJMU-47

Performance of oats (Avena sativa) varieties in temperate areas of Poonch district

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A griculture and Animal husbandry play a vital role in the economy of Poonch district. Animal Husbandry is a major enterprise and provides livelihood to nomadic and migratory families which constitute about 47.5% of the population of the district. The availability of fodder is major issue in the district as area in high hills remains fallow during the winter months due to lack of suitable varieties of Oats for the area. An On Farm Trial was conducted from rabi 2014 to evaluate the performance of promising Oats varieties viz. Kent (Farmer's practice), Sabzaar (SKUAST-K, recommended variety) and Palampur-1 (CSKHPKV, intervention) in temperate area of Poonch district. Trial was replicated in farmers field at 5 locations in Poonch Haveli, Mandi and Loran area of district Poonch. On the basis of three years results, it was found that Palampur-1 remained green for longer period and gave higher green fodder yield (300 quintals) per hectare as compared to sabzaar (280 quintals per hectare) and kent (255 quintals per hectare). Palampur-1 also gave highest net returns per hectare (Rs. 39,500) and benefit cost ratio (2.92) followed by sabzaar with net returns of Rs. 35,800 and B: C ratio 2.77 whereas Kent recorded lowest net returns (Rs. 33,500) and B: C ratio (2.61) Farmers actively participated in the trial and were satisfied with the performance of the variety Palampur-1 which gave higher yield of Green Fodder over the other two varieties.

Keywords: Temperate, Sabzaar, fodder, kent

MSAEJMU-51

Agricultural mechanization

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A gricultural Mechanization" or "Farm Mechanization" refers to the development and use of machines that can take the place of human and animal power in agricultural processes. The mechanization of agriculture that took place during the 20th century led to major changes in how farmers plant, irrigate and harvest crops. Combines, tractors, harvesters and other machinery have enabled farmers to increase their



production while relying less upon an extended labor force. In other words, agricultural mechanization is the process whereby equipment, machineries and implements are utilized to boost agricultural and food production. It is the application of machineries, equipment and implements in the day to day farm activities to increase marginal output in food production and poverty eradication. Agricultural mechanization reduces drudgery which hitherto makes it difficult for large scale food production and which has also been making it difficult for nations who have to meet their food requirements for the teeming population. In order to solve the problem of drudgery and other problems associated with food production, various measures has been introduced to combat these problems through mechanization. Agricultural mechanization involves the design, manufacture, distribution, use and servicing of all types of agricultural tools, equipment and machines. It includes three main power sources: human, animal and mechanical with special emphasis on mechanical (tractive power). In other words, "Agricultural Mechanization" helps in increasing production, productivity and profitability in agriculture by achieving timeliness in farm operations, bringing precision in metering and placement of inputs, reducing available input losses, increasing utilization efficiency of costly inputs (seed, chemical, fertilizer, irrigation, water etc.), reducing unit cost of produce, enhancing profitability and competitiveness in the cost of operation. Keywords: Mechanization, drudgery reduction, equipment, machine

MSAEJMU-73

Role of integrated farming system and its impact on sustainable soil health management: An overview

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gricultural soils are able of being a resource based system and strategy for managing in the livelihood food security. Progressive enlarge in the concentration of integrated farming system for management of sustainable soil health management livelihood food security and identifying strategies to lessen concentration of these gases in the environment. Farming system is distinct as a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which comparable development strategies and interventions would be appropriate. It has direct relationship with soil as it is cycle of which soil is an component. In the presence of soil organic matter and soil microbial population are primarily useful indicators of soil health and productivity of crop production and livestock. A long-term integrated approach will be an appropriate solution for standardizing fertility management in organic farming considering the complex interactions among different components of this system. The need of sustainable agriculture is universal and way to achieving it has been clear through intensive empirical research. Several indicators for the sustainability of agricultural systems have also been developed. Use of synthetic fertilizers and their effects on crop production, soil health, environmental quality, biodiversity conservation and self-reliance of farming system have been discussed in the context of agricultural sustainability scope of this study is to realize relation of farming system to soil health. This present paper highlights the use balance dose of fertilizer for maintain the soil health management for good quality and better crop production

Keywords: Farming system, resource, indicators, soil quality and soil health.

MSAEJMU-74

Comparative economics of production of local varieties and improved varieties of banana in Sindhudurg district

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The area under banana cultivation in Sindhudurg district of Konkan region is increasing since last decade. The importance of this crop in the economy of the region is in near future therefore it is need



of time to conduct systematic research in respect of production and other related aspects of this highly remunerative crop. A cross sectional sample of 60 improved variety and 60 local variety banana growers was drawn from Sawantwadi and Dodamarg tehsils. The data related to the agricultural year 2015-2016 were collected by personal interviews with the banana growers and analyzed with suitable statistical tools. Banana growers preferred *Goa mandol, Keral mandol, Sonyal, Saldati, Rasbal* and *Manyal* varieties for plantation as there is assured market for disposal. The banana cultivation is a labour intensive venture providing higher employment opportunities to the family members. The per hectare yield realized from improved variety of banana was 56750 kg and its rate received was Rs.10.47/kg. Hence, returns received from banana were Rs. 594172.50. the per hectare yield received from *Goamandol* was 35646 kg. The rate realized was Rs. 37.42/kg and hence returns received from banana were Rs.13.34 lakhs. **Keywords:** Comparative economics, local varieties, improved varieties, yield

MSAEJMU-82

Economic analysis of production of Dutch rose (cut flower) under protected condition in Amravati district

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The present study is an attempt to evaluate the "Economic analysis of production of Dutch rose (cut flower) under protected condition in Amravati district". Data used were pertaining to the period Jan. 2016 to Dec. 2016 From Amravati district, twenty-four poly house of 560 m² and 1008 m² sizes were selected. It was observed that the total cost estimated for the year was to be Rs. 833982.8 for Dutch rose. Net return from cut flower production was accounted to be Rs. 297577.2 for Dutch rose. The total farm business income worked out to be Rs. 641738.5 for Dutch rose. The total family labour income was accounted to be Rs. 306675.5 for Dutch rose. The total farm investment income as estimated to be Rs. 632640.1 for Dutch rose. The total input- output ratio of first and second year profit at cost 'C' was 2.77 for Dutch rose respectively.

Keywords: Cost, Production, Poly house, Benefit cost ratio.

MSAEJMU-83

Economic analysis of brinjal in Amravati district

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In this study, an attempt has been made to study Economic analysis of brinjal in Amravati district with view to study the Cost, returns and profitability. The study was based on primary data collected from the Amravati district. Per hectare use of human labour, manures and bullock was highest in medium size group. Use of Plant protection chemicals was highest in small size group. For brinjal cultivation, at overall level the per hectare cost of cultivation at Cost 'A', Cost 'B', and Cost 'C' was Rs. 78404.01, Rs. 115007.09 and Rs. 130009.18 respectively. For brinjal cultivation, per hectare gross return at overall level was Rs. 199325.00. Profit at Cost 'A', Cost 'B', Cost 'C' for overall size group was Rs. 120920.99, Rs. 84317.91 and Rs. 69315.81 respectively. The output input relationship determines the relative efficiency of capital. In case of brinjal, at overall size group input-output ratio at Cost 'A', Cost 'B', and Cost 'C' were 2.54, 1.73, and 1.52 respectively.

Keywords: Brinjal, Cost, Return and profitability etc.





Comparative economics of cucumber grown under different

technology

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In this study, an attempt has been made to study Comparative Economics of Cucumber Grown under Different Technology with view to study the Cost, returns and profitability. The study was based on primary data collected from the Amravati district. Poly house technology, shade net house technology and open field condition these technologies was used for present study. In case of open field, shade net technology and poly house gross returns from cucumber production at overall level were Rs. 119000.00, Rs. 523800.00, Rs. 633000.00 per hectare. The gross returns obtained from poly house technology were highest as compare to shade net technology and open field condition. In poly house technology, cost 'A', cost 'B' and at cost 'C' was higher than the shade net and open condition. The net return obtained from poly house technology (Rs. 250266.53) and open condition (Rs. 18053.97). The input -output ratio of cucumber production at cost 'C' was highest at poly house i.e. 2.11 followed by shade net technology (1.91) and open condition (1.18). Yield obtained from poly house technology was higher (320 qtl/ha) then followed by shade net (268 qtl/ha) and open condition. The yield obtained from poly house technology was double of open condition.

Keywords: Cucumber, technology, cost and returns.

MSAEJMU-88

Economics of wheat production in subtropical Jammu division of Jammu and Kashmir

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Theat is the one of the major cereal crops in the Jammu and Kashmir (J&K) state and is cultivated in an area of 292.07 thousand hectares (ha) with a production of 6018.81 quintals (DES, 2014-15). The productivity of the wheat is abysmally low at 20.61 q/ha in (2013-14), compare to the national productivity of 31.17q/ha in 2013-14 (DES 2014). A study was conducted in the subtropics of Jammu division of the J&K state covering Jammu, Kathua, Samba and Udhampur distracts to find out the factors impacting productivity and the economics of wheat production. The study was conducted in Jammu, Kathua, Samba and Udhampur districts of subtropics of Jammu division. These districts were selected purposively for the study as wheat procurement centres (PCs) were set up in these districts in *rabi* marketing season (RMS) 2013-14. Multistage sampling technique was employed for selecting the final sample of 225 wheat growers. Data were collected by personally interviewing the sampled farmers. The data were analyzed by using SPSS-14 computer programme. The results of the study reveal that the yield was the highest in the Kathua district at 30.86 q/ha followed by Samba, Jammu and Udhampur (Table 1). The factors of wheat productivity, causing a variation of 37, percent were recently release higher yielding varieties namely HD 2967 and PBW 621, number of irrigations, use of herbicides and seed replacement ($R^{2=}$ 0.37, F= 25.25, df= 177). The farmers sold their produce at different market prices which was the highest in Samba district at Rs 1474/q followed by Jammu, Kathua and Udhampur. Due to higher production and higher market price the gross return was also high in Samba district at Rs 45,148/ha followed by Kathua, Jammu and Udhampur. Due to the low productivity and lowest market price, the gross return was the lowest in Udhampur. The total paid out cost in the production of wheat in the subtropical area was higher in the Samba district at Rs 23,363/ ha followed by Jammu, Udhampur and Kathua. The output- input ratio was the highest in district Kathua (2.03) followed by Samba, Jammu and Udhampur. Keywords: Rabi marketing season cost of production, output- input ratio.


Economic analysis of bajra production technology in Western

Maharashtra

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) aira or pearl millet is an important staple food grain next to sorghum. It constitutes major source of Benergy and protein. In general, bajra has more fat and protein content than sorghum. The present study was undertaken to achieve the required production level of wheat crop through higher productivity, in depth analysis of wheat cultivation methods and adoption pattern of technology in Western Maharashtra. The study period of this project is 2015-16. The total number of sample was 108. The bajra growers earned a sum of Rs. 2,99,045.00 as total income. The maximum income was earned through crop production (32.33%). The total annual employment was observed to be 440.78 man days, out of which 53.40 per cent was on-farm and 46.60 per cent was off-farm employment. The excess use of 13.69 per cent for 4 kg/ha recommended level of seed in bajra cultivation was noticed at overall level, accompanied by 60.03 per cent of gap in manure application. The per cent increase in bajra yield levels in medium over low adopters was observed to be 25.84 per cent, while it was 48.77 per cent in high over medium adopters. The ICBR was estimated to 1.12 and 2.17 for medium and high adopters, respectively. It was observed that there exists a gap of more than 60 per cent between the potential farm and actual yield levels of bajra. P fertilizers and plant protection in case of bajra were positively significant at 5 per cent level of significance while machine power was negatively significant at 10 per cent level. Non-availability of labour for intre culturing, non-availability of chemical fertilizers at proper time and high cost of manure and seed were the major constraints opined by the bajra growers. Farming community should also try to adopt the technology of bajra production to the fuller extent to maximize yield.

Keywords: Economic analysis, production technology, fertilizer

MSAEJMU-94

Production performance of major crops in Pune district of Maharashtra

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griculture plays an essential role in the process of economic development of India. Development of agriculture sector determines the growth and development of other sectors of an economy and hence the prosperity of nation. Besides providing food to nation, agriculture generates employment also contributes to market of industrial goods and earns foreign exchange. Agricultural production is influenced by physical, socio-economic, technological, environmental and organizational factors. An endeavour is made to study land use and cropping pattern in Pune district for different years. The region having 15642 sq.km. area comprises 14 tahsils of Pune district. This study is based on secondary data collected from socio-economic review and district statistical abstract of pune district. This present study is the answer to many questions relating to land use, cropping pattern and growth trends in area production and productivity of major crops of the district as we emphasis on land use pattern, cropping pattern and growth trends in area production and productivity of major crops in this study. The study will let us know the existing pattern of land use and cropping pattern in the district. With the help of this study we can know those various changes or factors which will help in improving land use pattern, cropping pattern and growth trends in area production and productivity of major crops of the Pune district. Such type of study represents real situation of land use pattern, cropping pattern and growth trends in area production and productivity of major crops in Pune district and helps to planners and agricultural scientist for agricultural planning at tahsil level. The study revealed from the growth rates that, production in most of the crops increased due to increase in productivity.

Keywords: Land use pattern, cropping pattern, growth trends



Economics of production and marketing of *Rabi* sorghum in Western Maharashtra

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he study was conducted in Solapur, Satara districts of Western Maharashtra. The objectives of the study were to study resource use pattern, resource use gap, cost of cultivation, cost and returns structure of rabi sorghum. Besides this, marketing practices and channels in marketing, marketing cost and price spread, factors affecting the gross price received by the farmer were studied. Also, problems faced by the farmers in production and marketing of *rabi* sorghum in Solapur and Satara districts were examined. The study was based on the primary data of 90 rabi sorghum cultivators for the year 2010-11. From each selected village, 15 cultivators, 5 from each size group viz., small, medium and large were randomly selected. Thus, total sample consisted of 30 farmers each of small, medium and large size groups. The standard cost concepts and Cobb-Douglas production function was used for analyzing the date The average per hectare use of resources such as human labour, bullock labour, machine power, seed and manure was 28.73 man days, 7.31 pair days, 7.94 hours, 13.34 kg and 5.27 quintals, respectively. The average use of fertilizers was 19.42 kg nitrogen, 11.48 kg phosphorous and 6.55 kg potash per hectare. It was noted that there was a low and imbalanced use of all the inputs in all the size groups. At the overall level, the gap in use of manures, N, P and K were 78.92, 75.73, 70.40 and 83.63 respectively. The average per hectare cost of cultivation of rabi sorghum was estimated to ` 22036.33. Among the items of total cost, the rental value of land, human labour, bullock labour and depreciation on farm implements etc., were the major items of cost in the total cost of cultivation of rabi sorghum. The cost 'A', cost 'B' and cost 'c' were Rs.12058, Rs.18112 and Rs.22036 respectively. The average production of 7.07 quintal per hectare of main produce was obtained from rabi sorghum. The gross returns obtained were Rs.25897.29 at the overall level with B: C ratio was 1.18 and profit at cost C being Rs.3860.96. The average per quintal cost of marketing of rabi sorghum through channel-I was Rs.223.56 at the overall level. The major items of marketing cost were commission charges, transportation and packing charges. It accounted for 59.35, 29.39 and 5.88 per cent, respectively, while in the case of channel-II, the cost of marketing was Rs.59.63 which less is than that of channel-I. Price spread in marketing of rabi sorghum was maximum in channel-I due to large chain of intermediaries. In channel-I the producers share in consumer's rupee was Rs.89.06 per cent, in channel-II and it was Rs.96.79. Price received by the producer was maximum (2450 Rs./qtl.) in channel-I than that of channel-II (1800 Rs./q). The regression coefficient of manure, nitrogen, potash, irrigation and human labour were positive and significant, while phosphorous fertilizer and bullock labour were negative and non-significant at the overall level and there were large variations in between farmers. The major production problems faced by the cultivars were high wage rates, non-availability of labour, high fertilizer cost, quality of produce, non-availability of credit in time. Technical knowledge of rabi sorghum cultivation, non-availability of inputs and difficulty in transportation. The major marketing problems expressed by farmers were high commission rate, faulty measures and weights in market, lack of market intelligence, faulty market management and high transportation charges. Looking to overall situation of *rabi* sorghum marketing, it can be said that the present system of marketing need to be reorganized, so that the producers will get remunerative price for their produce and consumer buyers will also derive maximum benefit out of their spending. Establishment of sorghum processing plants and storage facilities are needed for fetching higher prices throughout season to the farmer. There should be the facility of dissemination of market information, so that the farmers can get remunerative and higher prices for the rabi sorghum. There is a need to advice rabi sorghum growers to use machine power if possible in order to minimize per hectare human labour requirement and because it contributed the major share in the of cost of cultivation of rabi sorghum.

Keywords: Economics, cost concept, manure, faulty market



Identification of existing farming systems in north Konkan region of Maharashtra

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Types and systems of farming in India are as old as Indian civilization itself. Different crop combinations and crop and livestock combinations give more returns to farmers than pure farming and generate employment opportunities on the farm. The study was conducted in Raigad district of North Konkan region (M.S.) with object to identify different farming systems, to synthesize and integrate available resources in different farms systems and to work out contribution of each production activity in identified farming system. The identified farming systems in study area were, only cropping (47.50%), Crop + Poultry (19.17%), Crop + Dairy (15.83%), Goatry (5.83%), Crop + Dairy + Poultry (9.17%) and Crop + Dairy + Goatry (2.50%). Per farm investment on assets was more (Rs. 841257) in Crop + Dairy + Poultry farming system. Employment generation was more in Crop + Dairy + Goatry system. Maximum net returns (Rs. 94000) were obtained from crop + Goatry farming systems. The per capita income was increasing in Crop + Poultry followed by Crop + Dairy + Poultry and Crop + Goatry + Dairy. Thus, finally it can be concluded that crop production + Dairy + Goatry, Crop production + Goatry and Crop production + Dairy farming systems are giving more gainful employment and per capita income. **Keywords:** Farming system, labour use pattern, land use pattern, profitability.

MSAEJMU-101

Studies on integrated nutrient management in rice

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Rice (*Oryza sativa*) is one of the most important food crops in the world, forms the staple diet of 2.7 billion people. It is grown in more than hundred countries with a total harvest area of approximately 158 million hectares, producing more than 700 million tons annually. Being the staple food for more than 65% of the people, our national food security hinges on its growth and stability. Rice being staple diet of the majority in Kashmir valley and is grown on an area of 140 lac hectares once in a year only because of the extreme climatic conditions. Average productivity of rice in the state is 2 tones/ha which is far below the realizable potential. To enhance productivity a holistic approach is needed which includes Integrated nutrient management that aims at the efficient and judicious use of all the sources of plant nutrients in an integrated manner, to attain sustainable crop production with minimal impact effect of chemical fertilizers on soil health and least disturbance to soil environment. Integrated use of chemical fertilizers, manures and such other inputs have shown positive and encouraging results in enhancing rice productivity in a sustainable and ecofriendly manner. Taking cognizance of such studies, the present investigation was conducted at Telbal area of district Srinagar (J&K) to study the comparative use of integrated nutrient management on vegetative growth and yield of hybrid rice (Pant Sankar Dhan-3) during summer 2015. **Keywords:** INM, staple diet, food security

MSAEJMU-102

Economic analysis of greengram production in Marathwada region of Maharashtra

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The present was undertaken to study the input use, cost structure and profitability of greengram production in Marathwada region of Maharashtra. For these purpose two districts namely Parbhani and



Nanded was purposively selected. Two tehsils was selected from each district on the basis of highest area under greengram and three villages from each selected tehsil were purposively selected. From each selected village ten greengram growers were randomly selected. Thus, from two districts 120 greengram growers were selected for present study. The primary data was collected with the help of pretested schedule. The data pertains for the year of 2015-16. The data then tabulated and analyzed by using standard cost concept i.e. Cost-A, Cost-B and Cost-C. The study revealed that by using the mentioned physical inputs the main produce (grain) was occurred about 7.15 quintals and by-produce (straw) was 1.83 quintals. It is observed from the table that Cost-C was Rs. 38025.55 which the share of Cost-B was 93.08 per cent followed by Cost-A was 69.64 per cent. Among the all items of expenditure, proportionate of hired human labour was 23.24 per cent followed by rental value of land (21.78 per cent), machinery charges (12.20 per cent) and bullock labour (11.92 per cent). Gross returns were Rs. 50537.87 in which main produce was main produce was Rs. 50266.72 and by-Produce Rs. 271.15. It is clear from the table that Net profit from greengram crop was found to be Rs. 12511.32. The Output Input ratio was 1.33. **Keywords:** Cost, input, economic, analysis, greengram, production, returns

MSAEJMU-104

Impact and assessment of apiculture agrobased firms in Pune district of Maharashtra

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India produces quantity of honey approx. 65000 MT per year. India is abundant in nectar and pollen resources. According to preliminary documentation, over 100 different kinds of bee flora have been identified. Out of the total of about 150 million hectares of cropland, nectar and pollen crops are grown in one third of the area. The following objectives were studied, To know requirement of Cost and Capital for starting own beekeeping business. The efforts were made to study the economics of Shivsagar Beekeepers firm and to know the investment and income pattern of Shivsagar beekeepers firm. The study concluded that, Cost of honey production/ kg of Shivsagar. Beekeepers were Rs. 200. NPW of Shivsagar Beekeepers was Rs. 35,21,240. BCR of Shivsagar Beekeepers was 1.29. IRR of Shivsagar beekeepers was 41.76. Profitability Index of Shivsagar Beekeepers was 1.32. Pay Back Period of Shivsagar. Beekeepers were 3 years & 2 months and 7 days. Break Even Point of Shivsagar Beekeepers was 4,686 kg &13,12,114. Margin of Safety of Shivsagar beekeepers was 8,314 kg & 32,17,886. Current ratio of Shivsagar beekeepers was 0.13. Gross Ratio of Shivsagar beekeepers was 0.58. Net Profit Ratio of Shivsagar beekeepers were 42.60.

Keywords: Apiculture, Internal Rate of returns, Benefit Cost ratio, Efficiency

MSAEJMU-105

Economics of resource use of greengram production in Maharashtra

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The data were related to greengram output and inputs collected from office record of State Cost of Cultivation Scheme, Govt. of Maharashtra, during the year 2013-14. The total sample size was 138. The simple statistical tools and the Cobb Douglas production function was fitted to the data. Result indicated that at state level, the per hectare use of human, bullock, machine power and seed utilization indicated that irrespective of region, use of these resources was more or less same on region and state level of greengram grower. The per hectare manure utilization is less than the recommended dose 50 q/ha. due to the non-availability and increasing cost of manures, whereas use of chemical fertilizers nitrogen, phosphorus and potassium was 18.46, 23.38 and 5.20 kg/ha, respectively. The results in respect of



productivity all seven have jointly explained 74 per cent of the total variation in the output of greengram, in that regression coefficient of human labour, bullock labour, manure and potash fertilizer at state level were positive and significant which indicated that these variables have major contribution on output. The resource use efficiency in greengram production in Maharashtra state was observed that, the ratios of MVP to MC was positive and more than unity for human labour, manures, nitrogen and potash indicating less use, which could help to increase production up to maximum level by their optimum utilization. **Keywords:** Greengram, Cobb-Douglas production function, resource use productivity.

MSAEJMU-112 Integrated Nutrient Management for rice-sweet corn cropping system to sustain soil fertility

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Konkan region of Maharashtra state comes under high rainfall zone receiving 3,000 to 4,000 mm rainfall in 90 to 100 rainy days during Kharif season. Therefore, rice is main crop grown during Kharif in the region. The increased irrigation facilities in the region has increased the possibilities of growing different cash crops during Rabi-hot weather season after harvest of Kharif rice. However, the increased temperatures due to climate change there is an adverse effects on Rabi-hot weather crops. Therefore, it was necessary to make interventions for minimizing climatic risks and increase the production and productivity by sustaining the soil fertility in long run. Recently the experiments conducted at various research stations of Dr. Balasaheb Sawant Konkan Krishi Vidvapeeth. Dapoli have showed that the sweet corn crop grown after harvest of *Kharif* rice has emerged an important cash crop with high productivity being a C_4 crop that withstands higher temperature. However, both crops being cereals and exhaustive, a field experiment was planned and conducted to study the effect of Integrated Nutrient Management for these system based high value crops (Rice-Sweet corn crop sequence) consecutively for seven years from 2008-09 to 2014-15 at Regional Agricultural Research Station, Karjat, Dist. Raigad (M.S.). There were seven nutrient management treatments for both the crops. Rice variety Palghar-1 during Kharif and Sweet corn variety Sugar-75 during Rabi- hot weather were grown. The results showed that, an application of 100 per cent RDF to both Kharif rice and Rabi sweet corn crops of the system produced maximum yield and total REY (222.29 q ha^{-1}) of the system and realized maximum net returns (Rs. 1,67,013 ha⁻¹) with the highest B: C ratio (2.14) over rest of the treatments followed by integration of 50 per cent RDF through inorganics alongwith 50 per cent RDN through FYM to both the crops. The soil nutrient status revealed that the integration of 50 per cent RDF through inorganics alongwith 50 per cent RDN through FYM to both the crops improved the soil organic carbon content and available NPK nutrient status. Therefore, to get higher yields and economic returns by sustaining soil fertility and productivity, application of 50 per cent RDF as inorganics and 50 per cent RDN through FYM to 'Rice-Sweet corn' cropping system was found to be most effective for minimizing climatic risks. Keywords: INM, Cropping system, soil fertility, NPK

MSAEJMU-113 Integrated farming system model for small and marginal farmers

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The integrated farming systems play an important role in agriculture. The rapidly expanding population leads to increasing food, feed and fuel demands, resulting in intense pressures on agro-ecosystems, while at the same time creating the potential for increased incomes from farming. The increasing demands for food will have to be met under the additional challenge of climate change, which will strongly impact agriculture. The integrated farming systems are vulnerable to climate change and must adapt to maintain



and improve productivity and its stability. Konkan region is the western coastal part of the Maharashtra State. Agriculture in the Konkan region is characterized by the preponderance of extremely small size and scattered land holdings. The average land holding of small and marginal farmers is 1.44 and 0.36 ha, respectively. This region comes under high rainfall zone receiving on an average 3000 to 3500 mm rainfall in 95 to 110 rainy days during Kharif season. The soils of South Konkan Coastal Zone are lateritic and North Konkan Coastal Zone are non-lateritic (medium black) in nature having slightly acidic in reaction. Considering the Agro-climatic conditions, natural resources, land holding of farmers and farmer's needs of the region, an ideal integrated farming system model for small and marginal farmers has been developed on an area of 1.00 ha at Regional Agricultural Research Station, Karjat, Dist. Raigad under All India Coordinated Research Project on Integrated Farming System. The IFS model comprised different enterprises viz., crops and cropping systems on an area of 0.50 ha, horticulture component (fruit crops + nursery) 0.40ha, livestock components namely, dairy, goatary and poultry on area of 35.75 m2 each (107.25 m2), vermicompost unit on 18.00 m2 and rest of the land (874.75 m2) is used for operational and other purposes. The 3 years compiled data of the IFS model showed that as far as the demand of essential foods for a family of 6 members per annum is considered, the annual production in this model was surplus for cereals, oilseeds, milk, fruits and vegetables commodities. This region is dominated by rice based cropping systems due to high rainfall. Therefore, the total production of the model is converted in terms of Rice Equivalent Yield (REY). The average of three years data showed total production of 38.38 t REY obtained from 1.00 ha area. In terms of economic returns, the gross and net returns were Rs. 5,28,161.28/- and Rs. 1,23,479.50/-, respectively with B:C ratio 1.31. Under crops and cropping systems, Rice-Brinjal, Rice-Watermelon, Finger millet-Cowpea, Groundnut-Field bean, Cucumber-Sweet corn and Fodder crop (Perennial-Napier Bajra Hybrid) systems were grown on 0.50 ha area. This component produced 10.99 t REY (28.63%) with gross and net returns for Rs. 1,50,951.45 (28.58%) and 50,362.89 (40.79%), respectively. The horticulture component included fruit crops namely, mango, anola, sapota and coconut grown on area of 0.35 ha apart from nursery (0.05 ha). In nursery, mango and sapota grafts were prepared and sold. The contribution of horticulture component in terms of REY was 6.14 tonnes (16.00% of total production). This component contributed Rs. 85,002/- (16.09%) and Rs. 13,602.03 (11.02%) gross and net monetary returns, respectively. Livestock component comprised dairy, poultry and goatary. Initially in the year 2012-13, two cross bred jursey and 1 local cow were purchased. Dairy component contributed 8.19 tonnes REY which was 21.34% of the total REY. Dairy component gave average gross and net returns of Rs. 1,12,373.50/- and Rs. 26,569.12/-, respectively. The per cent share of gross and net returns to total was 21.28 and 21.52, respectively. At the initiation of model, goat unit of 6 females and 1 male was purchased. Every year the saleable male and female goats were sold. Average of 3 years showed that the goat unit contributed 4.67 tonnes REY and its per cent share was 12.17. This component realized Rs. 64.277.33 (12.17%) gross and Rs. 13,041.33 (10.56%) net returns. In 2013-14, 2014-15 and 2015-16, one day old 190, 330 and 471 number of chicks were purchased and reared. Out of which, 173, 314 and 439 survived birds were sold. The monetary returns from poultry were converted into REY. The average production of 5.01 tonnes REY was obtained from poultry component which was 13.05 per cent in total IFS model production. Poultry realized Rs. 69,240.33/- (13.11%) and Rs. 16,846.75/- (13.64%) gross and net returns, respectively. The edible by produce of crops and cropping systems and main produce of forage crop were fed as a dry and green fodder to dairy animals. Crop residues, livestock manures/ droppings and shed wastes were used for preparation of vermicompost. The vermicompost unit produced 3.38 t REY (8.81%) giving Rs. 46,316.67/- (8.77%) and Rs. 3,057.33 (2.48%) average gross and net returns, respectively. Total quantity of 41,741 Kg/lit/No. of farm produce and by produce for worth of Rs. 1,01,469,75/- (21.29%) to be purchased from the market were utilized and recycled within different components of the model during 2015-16. The average employment generation through present IFS model was found to be 964 man days and its value was Rs. 1,68,504/- which contributed 41.64% in the total cost of production. The average total cost of production of the IFS model was Rs. 4,04,681,83/- ha-1, which included outside purchase for Rs. 1,45,968.91/- ha⁻¹ (36.07%), value of recycled material within the system of Rs. 90,208.92/- ha-1(22.29%) and for farm labours costing Rs. 1,68,504/- ha⁻¹ (41.64%). Economic indices showed the gross and net profit of Rs. 5,28,161.28/- and Rs. 1,23,479.50/- ha⁻¹, respectively with B:C ratio 1.31. Farmers can increase their net returns by saving the expenditure on farm labours through employment of family labours. Keywords: IFS, vermicompost, agroclimate condition, net return





Economics of production and marketing of oyster mushroom in Chirang and Bongaigaion district of Assam- A comparative study

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ushroom is a popular delicacy in North East India. From the time immemorial the native people of MNorth East region relish the naturally growing edible mushrooms. It is also exported to Bhutan. There are many wild species of mushroom that are consumed by people after collecting from forest areas. Often people meet with fatal accident due to consumption of misidentified wild mushroom. With the intervention of Krishi Vigyan Kendra, Chirang, the ovster mushroom has a high demand in the markets of Chirang and Bongaigaon district. Present study was conducted in Chirang district and Bongaigaon district of Assam due to higher concentration of mushroom cultivators. Gross return and benefit cost ration revealed that on an average situation human labour and paddy straw was being used efficiently by mushroom farmers in both the district. However, there exists a scope for increasing the levels of quality mushroom spawn, expenditure on dryer and water spraying since currently they were used sub-optimally on the sampled farmers. In Chirang district mushroom growers sample revealed significant inefficiency in mushroom drying. Marketing aspects indicated that Channel A (Producer- Pre-harvest Contractor-Retailer- Consumer) was patronized by about 11 percent of the sample mushroom growers in Chirang and more than 17 percent growers in Bongaigaon district. Channel C (Producer- wholesaler- retailerconsumer) is largest channel through which 56 percent of produce in Chirang and 64 percent in Bongaigaon district are routed. This channel was found to be most popular. The study also reveals that there is a also off season demand for dry mushroom but due to lack of proper drier farmers are unable to supply mushroom in off season.

Keywords: Economic, production, marketing, mushroom

MSAEJMU-119

Integrated nutrient management for vegetable yield and farmer income

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Integrated nutrient management for sustainable crop yield and farmer income are strategies/practices for suggesting answers of various soil and crop related problems, like disparity in NPK consumption, imbalance use of fertilizers, decreasing soil organic carbon (SOC) stock and decreasing total factor productivity etc. The authors have been reviewed several research papers of various research scholars, experiments conducted at different locations/ agro-ecological regions of country to summaries the various benefits of the INM on different vegetable yield over control practices (no combine uses of various inputs of plant nutrients= fertilizer+ FYM+ bio-fertilizers+ organic manure+ legumes+ cropping systems etc.). The INM options in important vegetable crops have been shown an increasing yield over control. The INM production recommendations and practices are useful for farmers, agriculturists, horticulturists, agronomists, soil scientists, environmentalists, agriculture extension workers as well as researchers for further studies in this directions etc.

Keywords: INM, yield, FYM, bio-fertilizer



Integrated pest management for vegetables

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Integrated Pest Management (IPM) is a broad-based system of pest management in which all techniques Land methods are combined in a compatible manner to keep the pest population below economic injury levels. It focuses mainly on natural control and should be based on prevention, monitoring, and control which offer the opportunity to eliminate or drastically reduce the use of pesticides, and to minimize the toxicity of and exposure to any products which are used. The main aim is not to eliminate the pest but to suppress their populations at level where bio control agents can regulate them further. The authors have reviewed several research papers of various research scholars, experiments conducted at different locations on different crops to summarize the benefits of different management tactics viz., cultural methods, biological methods, chemical methods, pest trapping, and monitoring, record keeping, thresholds, used under integrated mite management on vegetable crops over control practices where no management is followed. Integrated mite management has objectives including reducing the pest population below the threshold rather than eliminating them, promoting the use of resistant varieties so that insect attack may get minimum, preventing the development of resistance to pesticides, protecting the natural enemies to maximize their population by reducing their mortality by chemicals and preventing the pest resurgence and secondary pest outbreak. The authors have reviewed several research papers of various research scholars, experiments conducted at different locations involving use of different management strategies to summarize the various benefits of the Integrated pest management in vegetables. Based on the observations of many researchers, scientists and scholars the authors came to conclusion that although different methods involved for managing pest problems in vegetable ecosystem managed pests to a greater extent. Adoption of IPM is a time-consuming process and require patience which is not the case with chemical control in which immediate effect is seen so make it much acceptable. But the problem with use of chemical pesticides is that many pests like DBM have developed resistance to a number of insecticides. Moreover, there is a concern with the consumption of pesticide treated vegetables and now a days market demands organic vegetables which necessitate the use of non-chemical control particularly IPM. It has been reported from many studies that methods like selection of location specific resistant varieties, weed management which may act as potential source of pests and thus necessitate the removal of weeds from within and around cropping areas particularly western flower thrips (WFT) and tomato spotted wilt virus (TSWV). Residue management and field sanitation are also reported by some authors as important methods for managing pests. Integrated pest management involving combination of a number of tactics viz., use of resistant varieties, bio control agents, cultural practices, mechanical methods, physical methods or even guarantine control are known to increase yield, guality of vegetables and thus B.C ratio of vegetable production.

Keywords: IPM, TSWV, DBM, field sanitation

MSAEJMU-127

Input use pattern and profitability of mango cultivation in Ratnagiri district of Maharashtra state

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Mango is one of the important tropical fruit crop of India. It is considered as a national fruit of India and recognized as king of fruits and the most common fruit due to its nutritive value, highly delicious taste and captivating flavor. It occupies relatively the same position as enjoyed by the apple in the temperate world. Mango is grown in all parts of Maharashtra state. In Maharashtra, the Konkan region is well known for mango production. The warm and humid climate throughout the year and rain free season from November to May prevalent in this region is ideal for mango production. However, it is not considered as commercial proposition except in Konkan region. In the year 2011 the area under mango in Maharashtra was 4.77 lakh ha with total production of 3.31 lakh MT. Total area under cultivation of



mango in Ratnagiri and Sindhudurg districts is 60,015 hectare and 19,270 hectare, respectively. While aggregate production in south Konkan region is about 96,184 tonnes. (Anonymous 2010-11). Mango plantation is capital intensive and its gestation period is quite long. Low productivity is the major bottleneck in boosting its export. The world mango productivity is about 14 to 16 tonnes/ha while, in India, it ranges from 8 to 10 tonnes/hecatare.However, the mango productivity in the Konkan region is very low which ranges around 2.5 tonnes/hectares. This may be due to various factors like alternate bearing, application of inadequate fertilizer doses, lack of proper management of spraying schedule, differences in productivity, duration of flowering and fruiting and up to some extent inequality of mango fruits across different farms size and locations. Furthermore, there is no proper utilization of available resources that affect the yield and management of mango and its profitability.

Keywords: Constraints, frequency distribution, input utilization, productivity, profitability.

MSAEJMU-138

Economics of sericulture in Osmanabad district of Maharashtra

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C ericulture is an art of rearing silkworm for the production of cocoons which is the raw material for the D production of silk. Silk is the queen of fabrics, starting from the Vedas to this day. India is the second largest producer of raw silk in the world next to China. India's raw silk production was 1450 tonnes in 2014-15. Mulberry raw silk contributes about 85 per cent the total silk production in India. The total area of mulberry in the country is around 282244 hectares. The area under mulberry plantation and raw silk production of Maharashtra is 4504 hectares and Marathwada is 200 tonnes and 444 hectares 10.53 tonnes respectively. India is also the largest importer of raw silk and largest consumer of the silk in the world. Sericulture has a remarkable advantage of simultaneously addressing several governments of India's development properties related to economic growth and social development. Sericulture is an important agro based rural industry that helps our economy and generates higher income and employment. It is practiced in a wide range of agro-climatic regions. In fact, the recent technological advancements have made it possible to practice it on an intensive scale, mainly due to increased profits obtained from it as compared to most of the crops and enterprises. Multistage sampling design was adopted in selection of district, tehsil, villages and sericulture producers. In first stage, Osmanabad district was selected in Osmanabad district, Osmanabad and Kalam tehsils were selected. Five villages from each tehsils were selected. Sixty sericulture producers were selected. The data were collected during the year 2015-2016 from 1st July, 2015 to 30th June 2016. The analytical techniques like tabular analysis, functional analysis, and frequency and percentage method were used to analyze the data in the present study. A gross return was found to be Rs 43135 from per field and Rs 74370.62 from per hectare of mulberry garden, Cost-C was Rs 36901.45 and Rs 63623.19 from per field and per hectare, respectively. In regards to the cocoon production gross return from the 3.48 batches was Rs 78895.19 and from one batch was Rs 22670.00 Total cost was Rs 49707.11 and Rs 14283.34 from 3.48 and one batch, respectively. Net profit from 3.48 batches was Rs 29187.98 and from one batch was Rs 8387.18. The output-input ratio was 1.58. Per kg cost of production was found to be Rs 200.75. Sericulture is an art of rearing silkworm for the production of cocoons which is the raw material for the production of silk. Silk is the queen of fabrics, starting from the Vedas to this day. There are four types of silk mulberry (Bombyx mori) tassar (Antheraea paphia), eri (Philosomia ricini) and muga (Antherea assama). India is the second largest producer of raw silk in the world next to China. India's raw silk production was 1450 tonnes in 2009-10. Mulberry raw silk contributes about 85 per cent the total silk production in India. The total area of mulberry in the country is around 282244 hectares. The area under mulberry plantation and raw silk production of Maharashtra is 4504 hectares and Marathwada is 200 tonnes and 444 hectares 10.53 tonnes respectively. India also the largest importer of raw silk and largest consumer of the silk in the world. Sericulture has a remarkable advantage of simultaneously addressing several governments of India's development properties related to economic growth and social development. Sericulture is an important agro based rural industry that helps our economy and generates higher income and employment. It is practiced in a wide range of agro-climatic regions. In fact, the recent technological advancements have made it possible to practice it on an intensive scale, mainly due to increased profits obtained from it as compared to most of the crops and enterprises. The success of sericulture business is completely depends on the factors like silkworm variety quality of



mulberry leaves and management. Because, the factors decide the quality and quantity of cocoon production. To increase the cocoon production and to reduce the labour cost it is advisable to choose silkworm strain and mulberry variety which is suitable for particular set of condition, soil and climate. There is a scope for development of sericulture industry in Maharashtra from the point of view of farmers (rearers) innovators, extension workers. There is a need for finding out the relative production for obtaining higher net returns from sericulture enterprise.

Keywords: Economic, sericulture, silk, yield

MSAEJMU-141

Yield and economic sustainability of rainfed cotton and soil health under conservation tillage and integrated nutrient managementin vertisols of central India

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field experiment was conducted to study the yield and economic sustainability of rainfed cotton and soil health under conservation tillage and integrated nutrient management in Vertisols during 2010-11 to 2015-16 at Research field, Department of Soil Science and Agril. Chemistry, Dr. PDKV, Akola (M.S.). The experiment comprised of eight treatments including 100% recommended dose of fertilizers (60: 30: 30 NPK kg ha⁻¹) and the various combinations integrating 50 and 25% N through FYM, wheat straw, glyricidia green leaf manuring (GLM) and compensation of RDF to cotton. The experiment was laid out in randomized block design with two sets of conditions namely, conservation and conventional tillage replicated thrice. The experimental soil was moderately alkaline in reaction, low in available N, medium in P and high in available K. The plot wise soil samples were collected and analyzed for available nutrients (N, P and K) as per standard methods. The pooled results revealed that the significant increase in cotton vield was recorded under conservation tillage with improvement in organic carbon, available nitrogen and higher monetary returns as compared to conventional tillage. The integrated use of 50% N through GLM + compensation of RDF through chemical fertilizers recorded significantly higher seed cotton yield, sustainable yield index with improvement in soil fertility status and was at par with the application of 50% N through FYM + compensation of RDF through chemical fertilizers. The highest net monetary returns and B: C ratio was obtained with 50% N through GLM + compensation of RDF through chemical fertilizers. Hence, it can be concluded that conservation tillage along with integrated use of 50% N through glyricidia green leaf manuring as an alternative to FYM and compensation of RDF through chemical fertilizers found beneficial in yield and economic sustainability of cotton in Vertisol besides improvement in soil fertility under rainfed condition.

Keywords: Rainfed, INM, GLM, FYM, soil fertility

MSAEJMU-142 Economics of production of chrysanthemum in Ahmednagar district of Maharashtra

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The present investigation was conducted with keeping view an overall objective of studying the economics of production of chrysanthemum in Ahmednagar district of Maharashtra. The study was conducted to examine costs, returns, resource use productivities and resource use productivity of chrysanthemum growers. The data was based on a sample of 90 chrysanthemum growers selected from two tahsils viz., Nagar and Parner. Three villages from Nagar tahsil and three from Parner tahsils of Ahmednagar district were selected for study. The primary data was obtained by survey method for the year 2015-16 concerning aspects of production and marketing. The sample farmer were classified into three size



groups of holdings i.e. small group (upto 0.10 ha), medium group (0.11 to 0.20 ha) and large group (above 0.20 ha) for estimating the resource use efficiency and profitability of sample farm, Cobb-Douglas type of production function was used. The findings of the study revealed that at the overall level, the per hectare use of total human labour was 402.78 mandays comprising of 145.71 male labour days and 257.07 female labour days. The per hectare bullock labour, planting material, manures and machine power used in chrysanthemum was 4.04 perday, 230.92 kg, 53.14 qtls and 13.54 hrs, respectively. The average per hectare total cost of cultivation (Cost C) for chrysanthemum was `198311.85 at the overall level. The major item of cost of cultivation were family human labour, rental value of land, hired human labour and planting material. The average per hectare production and gross income for chrysanthemum was58.51 qtls. and 306490.99, respectively. The three marketing channels were observed. The average per kg marketing cost was worked out to 11.48 (Channel-I), 8.32 (Channel-II) and 2.66 (Channel-III). The major items of marketing cost were commission, transport and packing charges. In marketing, major problems faced by chrysanthemum growers were price variation in market, high commission charges, high transport cost. Keywords: Chrysanthemum, manures, labour, commision

MSAEJMU-152

Study on modeling and forecasting of green coffee production in India Prema Borkar, V.M. Bodade and R.G. Deshmukh

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orecasting of any agricultural produce plays a major role in optimal decision formulae for government and agricultural sector in India. This study aimed to divulge the contribution of green coffee for the next thirteen years, beginning from 2018-19, by using an appropriate model. To develop the appropriate model, time series data have been used. Since forecasting is one main objective of building the time series model, therefore at present, time series data are widely and frequently applied in the area of empirical research. Autoregressive Integrated Moving Average (ARIMA) or Box-Jenkins methodology is most popular for forecasting stationary time series data. To make forecast, firstly, we test the stationarity of the data, secondly, develop an appro-priate ARIMA model and finally, make forecast based on the selected model. Based on Autocorrelation Function (ACF), Partial Autocorrelation Function (PACF) and resulting correlogram, the data are seen to be nonstationary. To make the data stationary, we have to take second difference. Primarily, various models are considered for green coffee production. After that we select three ARIMA models, i.e., ARIMA (1, 1, 1), ARIMA (1, 1, 0) and ARIMA (2,1,1) on the basis of smallest Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC). Finally, ARIMA (1, 1, 0) is selected from these pre-selected models for green coffee production, based on the smallest values of Standard Error (SE), Absolute Mean Error (AME), Root Mean Square Error (RMSE) and Mean Absolute Percent Error (MAPE) and forecasting is made by using this model. In this paper, we divide the total period into two parts: i) Estimation period and ii) Forecast period. In the estimation period, we see that our estimated value fits the data very well and then we make forecast for the mentioned years. The forecast value of the green coffee production shows a sustainable upward trend.

Keywords: ARIMA model, Forecasting, Green Coffee, Agricultural Production, MAPE.

MSAEJMU-154

Growth and instability of horticultural crops in India

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ruits, Vegetables, Flowers, Plantation crops and Spices are major Horticultural crops in India. The horticulture production is estimated as 283 million tonnes in year 2015-16. China ranked first in fruit production with 154.364 million tonnes (MT) in 2013, followed by India (82.631 MT). The vegetables production also boosted from 165 lakh tons in year 1950-51 to 1683 lakhs tons in year 2014-15. The



demand for flowers is increasing globally at approximately 10 percent per annum. Indian floriculture industry is growing at higher rate. Karnataka, Tamil Nadu, Andhra Pradesh are major states in the country. India shares 0.61 percent in world floriculture industry. Plantation crops occupy less than 2 per cent of the total cultivated area (i.e. 3.82 per cent of total crop land) but still its earns Rs. 16,000 million and shares 12.72 per cent of the total export earnings of all commodities or 75 per cent of total earnings from the export of agricultural produces. India is the world's largest producer, consumer and exporter of spices. India shares half in global trade of spices. India produces 75 of the 109 varieties of spices listed by ISO. So it is necessary to identify growth and instability in Horticultural crops over time to get guideline for framing policies. The data is collected from the Indian Agricultural Statistic Research Institute on the Area, Productivity and Production of the Horticultural crops from the year 1991-92 to 2014-15 on the Area, Productivity and Production of the Horticultural crops in India. The results show that that the good Horticultural crops production achieved in India in last 25 years. The second decade has shown good growth as compared to first decade. The growth in area (3.06%), productivity (1.56%) and production (4.67%) of the Horticultural crops in India is positive and significant. The production of the flowers achieved at the rate 11.91 per cent per annum, which is followed by vegetables (1.53 per cent). Instability Index shows that the Production of Horticultural crops in India was more unstable as compared to Area and Productivity of Horticultural crops during the period from 1995-96 to 2014-15. Amongst the crops groups, the instability was seen more in area, productivity, production of flowers, followed by fruits and vegetables (ranges from 25 to 110 per cent). The previous years' area and productivity made positive effect on next years' production of Horticultural crops in overall period. the effect of area on production is highest in vegetables (22.24 thousand tons per thousand hectare of area), followed by fruits (12. thousand tons per thousand hectare of area). The productivity of all crops except plantation crops has shown positive contribution in production.

Keywords: CGR, Instability, Horticultural crop, India, trend

MSAEJMU-160

Economics of different grafting methods on pecan nut (*Carya illinoensis* Wangenh) under intermediate agro-climatic conditions of Jammu and Kashmir

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An economic analysis of pecan nut plants has been presented through studying their cost and returns under intermediate agro-climatic conditions of Jammu and Kashmir. The study revealed that the time total cost of grafting of pecan nut plants up-to their survival was same in all the three methods (20415.6). After different survival rate of three methods, tongue grafting gave maximum returns (5384) and minimum in side grafting (484.2). However, benefit-cost (B: C ratio) was found to be maximum in tongue grafting (1: 1.26) and minimum in side grafting (1: 1.02). **Keywords:** Pecan, economics, grafting, B: C ratio, net returns

MSAEJMU-161 Economic analysis of bittergourd cultivation in Aurangabad district of Maharashtra

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B B, C and is an inexpensive source of proteins and minerals. It purifies the blood, activates spleen and liver and is highly beneficial in diabetes. The medicinal value of the bitter gourd in the treatment of infectious diseases and diabetes is attracting the attention of scientists worldwide. Bitter guard considerable variation in nutrients, including protein, carbohydrates, iron, zinc, calcium, magnesium, phosphorous and



ascorbic acid.in extra posses anti-oxidant, anti-microbial, anti-viral, antihepatotoxic and anti-ulcerogenic properties while also having the ability to lower blood sugar. The fruit is used as a vegetable as well as it can be used as a medicine for diabetics and vermifuge. Per hectare use of physical inputs in production was observed that, total 352.98 man-days of human labour were utilized. Per hectare return was Rs. 647987.64 while the total cost of cultivation was Rs. 236080.18. The share of cost-A and cost-B in cost-C was Rs.64160.53 and 172519.57. Farm business income was Rs. 583827.11. The net profit was arrived at Rs. 411907.46, with the output-input ratio of 2.74 and per farm total production of bitter gourd was found 23.28 q.

Keywords: bitter gourd, Cost of cultivation, output-input ratio.

MSAEJMU-163

Economics of chickpea cultivation in Ahmednagar district of Maharashtra

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Chickpea (*Cicer arietinum* L.) is one of the major pulse crops grown in India. Chickpea has the richest, cheapest and easiest source of best quality proteins and fats. Chickpea is also a good source of vitamins (especially B vitamins) and minerals like potassium and phosphorus. The multistage sampling design was adopted for selection of district, tehsil, villages and chickpea growers. In analytical techniques, the objective, i.e. to estimate per hectare costs and returns of chickpea production were achieved by tabular analysis in which simple statistical tools and different cost concept viz. cost-A, cost-B and cost-C, and output-input ratio were used. The present investigation revealed that, per hectare return was Rs. 77817.22 while the total cost of cultivation was Rs. 39596.37. The share of cost-A and cost-B in cost-C was Rs. 52455.48 and 55539.52. Farm business income was Rs. 38220.85. The net profit was arrived at Rs. 22277.71, with an output-input ratio of 1.70 and Per farm total production of chickpea was found 15.38 q. Keywords: Chickpea, cost of cultivation, output-input ratio.

MSAEJMU-164

Selected farming systems in Latur district of Maharashtra

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he farming system is an integrated set of activities that farmers perform in their farms under their resources and circumstances to maximize the productivity and net farm income on a sustainable basis. An attempt has been made to study selected farming systems in Latur district of Maharashtra. Multistage sampling design had been used for the selection of districts, tahasils and villages, farming systems crop + sericulture from Latur district were selected for the present study. The data were collected from the agricultural year 2014-15. In case of sugarcane main produce and by produce was observed in crop + sericulture farming system i.e. 896.30 quintals. In case of expenditure Cost-A (55.95%) and Cost-B (81.98%) was found in crop + sericulture farming system. Net profit and the output-input ratio was observed in crop + sericulture farming system i.e. Rs. 64815.10 and 1.55. Establishment cost of the mulberry garden was Rs. 82809.99. Per hectare per annum expenditure in mulberry cultivation was Rs. 68892.86. In regard to return, it was also observed that main produce of mulberry in the form of green leaves was Rs 62822.05. By produce of mulberry plants in the form of sticks was Rs 10293.97. Thus, gross return was Rs 73116.02 per hectare. Per batch per annum net profit was Rs. 42427.14. In general outputinput ratio was 2.48 in cocoon production business. In profitability crop + sericulture was a most profitable farming system from which net income of Rs. 302442.00 per annum was obtained by the farmers in farming systems.

Keywords: Selected farming, multistage sampling, gross return





Economic analysis of production of guar crop in Amravati district

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The present study of economic analysis of production of guar crop in Amaravati district was carried out during the year 2012-2013. The study was based on primary data. The primary data of 60 growers were collected from three tahsils of Amravati district and functionaries involved in guar crop procurement producer, wholesalers, and retailer were selected for collecting information. Guar crop is most important pulse crop seed crop grown in Morshi, Chandur Bazar and Bhatkali tahsil of Amravati district. Although, it is cultivated on small scale, it contributes sizable share in total earning of the farmer. However, yield and profit from guar crop are uncertain. Per hectare total cost of cultivation of guar crop was highest in the large group i.e. (Rs. 68544.03) followed by small group (Rs. 68232.86) and medium group (Rs. 67880.25). The benefit cost ratio of guar crop was 1.74 in small group, 1.77 in medium group and 1.97 in large group. Keywords: Guar, marketing channel, production cost

MSAEJMU-172

Assessment of economic return from marigold flower grower in Jammu

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Floriculture is the branch of Horticulture that deals with the cultivation of flowering and ornamental plants for sale or for use as raw materials in cosmetic industry. India has made significant improvement in production of flowers, particularly loose and cut flowers, which have huge potential for export. Commercial flowers cultivation in India provides an opportunity for rural development owing to its higher returns per unit area and the new employment opportunities. India has a scope to bridge the gap between demand and supply as global demand for floriculture products is growing at a faster rate. Our country is enriched with diverse agro climatic condition such as fertile land, suitable climate abundant water supply, low labour cost, availability of skilled man power etc., which are quite beneficial for growing a variety of flowers plant throughout the year. This paper aims to conducting study on assessment of cost of production and economic return from open pollinated marigold flower production in Jammu district of J&K.

Keywords: Economics, Marigold, Production technology

MSAEJMU-173

Fish farming in polylined pond- An integrated approach

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Doda district of Jammu & Kashmir blessed with vast natural water resources and therefore having potential of quantum fish production. The present status of fish production from the district is insufficient, and hence provides an opportunity for new interventions. This needs, farmer's awareness about the recent advancement in the fish farming technologies. Most of the soil of the district is of sandy, silty or rocky type, and therefore the water holding capacity is very low. There are several water harvesting cemented tanks constructed by the state govt. departments, for several purposes excluding fisheries, while in most of these ponds there is problem of getting cracks one or two year of construction, because of the frequent earthquakes. In view of the above back ground, KVK-Doda brought a technology of constructing/converting seasonal pond into perennial pond by poly-lining. KVK organized several awareness/trainings/demonstration programmes for dissemination of this technology in different villages of



the district, and launched the same. The results are very encouraging, and a farmer namely Mr. Maskoor from village Malnai of district Doda, who adopted this technology first time in the district history and started fish (Chinese carp) farming reported that "before poly-lining of my cemented tank I was unable to hold the water even for 15 days, but now after KVK intervention my pond is always full of water and I am using this water for several purposes like cattle and irrigating vegetables grown near by the pond". Several other farmers also now adopted this technology for fish farming (either in cemented tank or constructed new earthen pond) as well as water storage for irrigation and other purposes. The technology introduced in the district by KVK-Doda getting good response and result in water conservation as well as in boosting fish production, and in near future enhancing farmers income status. The technological intervention is in line with the Hon'ble Prime Minister statement "Per Drop More Crop". Keywords: Poly-lining, water conservation, Chinese carp, fisheries

MSAEJMU-180

Integrated Livestock Farming

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¹ombining ecological sustainability and economic viability, the integrated livestock farming system \checkmark maintain and improves agriculture productivity while also reducing negative environmental impacts with main aim to decrease the risk factor and increase the returns for socio-economic improvement of the society. Increase productivity, increase profitability, improves soil fertility, provides balance food and nutritional security, employment generation. Better eco-recycling of produces i.e. farm residues/ byproducts/wastes, regular money flow around the year, adoption of new technology, solves the energy crisis, minimize in pollution hazards, improves micro climate, conservation of natural resources, minimize the risk of failure in productivity, Maintains sustainable production system without damaging resource base, provides full family employment throughout the year, endless recycling of waste within the farming system, Improvement in the living standard of farmers, efficient utilization of land available within the farm. Crop- livestock farming, Crop- livestock- fishery, Crop-livestock- poultry-fishery, crop-poultryfishery-mushroom, crop-fishery- duckery, crop livestock- fishery- vermicomposting, crop-livestockforestry, Agri-silvipasture apiary, Agri- Horti- silvi-pastural system, Agri- horticulture- sericulture, etc. Lack of awareness about sustainable farming system, Unavailability of varied farming system modules, lack of credit facilities at easy and reasonable interest rates, non-availability of assured marketing facilities specially for perishable products, Lack of deep freezing and storage facilities, lack of timely availability of inputs, Lack of knowledge/ education among teaching continents specially for unemployed youths and woman's, etc.

Keywords: Integrated, vermicomposting, socio-economical, apiary

MSAEJMU-185

Resource utilization based intercropping in sustainable agriculture; economics of innovative agricultural production & integrated systems of management

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Intercropping is an ancient farming practice, involves the simultaneous cultivation of two or more crops on the same piece of land with a definite row pattern. It is eminent to point out that to produce additional food from less expanse of land through more efficient use of natural means with minimal impact on the environment in order to meet the increasing population request (Amos *et al.*, 2012). The main objective of intercropping is to augment total productivity of the crop per unit of area as well as judicious and equitable utilization of resources such as nutrients, water, solar radiation, space and farming unit including labour. However, intercropping may be a means to address some of the major problems associated with modern



farming, pest and pathogen accumulation, soil degradation and environmental deterioration (Vandermeer, 1989), thereby helping to deliver sustainable and productive agriculture (Lithourgidis *et al.*, 2011). Hardarson and Atkins (2003) found legume-cereal intercropping increase the fixation of nitrogen by legumes. It also reduces seasonal work peaks as a result of the different planting and harvesting times of intercropping crops. Intercropping provides year-round ground cover, or at least for a longer period than monocultures, in order to protect the soil from desiccation and erosion. Intercropping gaining popularity among smallholder farmers as it offers the possibility of yield advantage compared to sole cropping through yield stability. Considering the multiple merits that can occur from intercropping, particularly in the seek of sustainable agricultural systems, as well as the environmental problems with current farming systems, it seems reasonable to continue research on the possibilities of growing more than one crop in a field at the same time.

Keywords: Intercropping, Modern farming, Sustainable agriculture.

MSAEJMU-187

Benefit Cost ratio of different mulching materials on Aonla (*Emblica* officinalis Gaertn.) under rainfed conditions of Jammu

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he present study was conducted during 2013-14 to study the Benefit Cost ratio of different mulching materials viz., black polythene, white polythene, paddy straw, saw dust, sarkanda, dry grass and control (unmulched) on aonla under rainfed conditions of Jammu. Twenty-eight trees were selected for the study and laid out in randomized block experimental design with one tree per treatment replicated four times. Application of treatments was done during the spring season viz., 19th February, 2013. During the course of study, all the trees were given uniform cultural operations as per the package of practices for fruit crops of SKUAST-Jammu. The Benefit Cost ratio of using different mulching materials in aonla orchard of cv. NA-7 have been worked out by calculating net returns for each treatment. The net returns obtained from different treatments have also been compared with control, i.e. unmulched. The cost incurred on each treatment per hectare was worked out by taking into consideration the cost of variable inputs only viz., fertilizer, basin preparation, mulching, irrigation, plant protection measures, harvesting, labour cost etc. Gross income was calculated by multiplying the fruit yield per hectare for a given treatment by the sale price of the fruit. Net returns were calculated by deducting the cost of cultivation from the gross income. Benefit Cost ratio was calculated by dividing Gross present value of income (B) with Gross present value of cost (C). The total cost of cultivation in present investigation was found to be higher (Rs. 2566.60) in treatments T_1 and T_2 i.e. black polythene mulch and white polythene mulches whereas it was (Rs. 2478.30) in the treatment (T_7) i.e. control. The costs incurred on preparation of basin (Rs. 142.86), labour charges (Rs. 428.57), FYM (Rs. 600.00), fertilizers i.e. urea, DAP and MOP (Rs. 241.06), irrigation, plant protection and harvesting charges (Rs. 853.57) were found to be same. The only difference was the cost of different mulching materials. Benefit: Cost (B: C ratio) was found maximum in the black polythene mulch (1: 2.04) treatment and minimum 1:1.69 each in white polythene mulch and control. This may be attributed to higher yields and superior quality of fruits with different mulching treatments. From the present study it can be concluded that among the different mulching treatments the application of black polythene is most suitable and economically feasible as it resulted in highest B:C ratio under the rainfed conditions of Jammu.

Keywords: Benefit cost ratio, mulching, DAP, MOP



Impact of panchagavya on organic chickpea (*Cicer arietinum*) in Reasi district of J&K

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Reasi district of Jammu and Kashmir is situated in the foot hills of Shivalik range and is located at 1528 meters above mean sea level. This district is predominantly a rainfed as only 6 per cent of the cultivated area is under irrigation. Major occupation of people is agriculture and majority of the farmers are using the traditional technologies resulting in low. Maize and wheat are predominantly cultivated crops in the region which accounts for 65-70% of the total area sown. Meanwhile vegetables and pulses have also immense potential in the district. J&K especially Reasi has huge potential for organic farming as a large area in the state is already under semi-organic cultivation due to the lack of availability of chemical fertilizers in these areas and the farmers of these areas hardly applying the chemical fertilizers. Despite of stagnant yield in the area due to less availability of organic sources of nutrients (FYM, Vermicompost, Compost etc.), farmers are now compelled to use chemicals in their fields as there is no other suitable alternative that can be used for assured and higher returns without impairing the soil fertility. Panchagavya, a Vedic formulation, an efficient plant growth stimulant that enhances the biological efficiency of crops and increased productivity. Panchagavya as biofertilizer is used to activate biological reactions in the soil and to protect the plants from insect pest and disease incidence. In this context, the use of panchagavya came as a boon to step-up for the improvement of fertility and productivity of crops. Keeping the potential of organic inputs in the district a study was conducted for two successive seasons during *rabi*, 2015-16 and 2016-17 "Impact of panchagavya on organic chickpea (Cicer arietinum) in Reasi district of J&K". Research was conducted in Talwara, and Kanah villages of Pouni block of district Reasi, with the objective to evaluate the effect of panchagavya on growth, yield and economics of chickpea (Cicer arietinum). The recommended dose of nitrogen for chickpea was supplemented with different combinations of organic manures with equal proportions based on their N content. Panchagavya was prepared in the farm by using cow dung 5 kg, Cow's urine 3 litres, Cow's milk 2 litres, Curd from cow's milk 2 litres, Ghee from cow's butter 1 litres, Sugarcane juice 3 litres, Tender coconut water 3 litres, Banana 12 numbers and after 21 days of mixing the same was applied under different concentrations (control, 4 and 7%) at branching and flowering. The result reported that among different treatments, foliar spray of panchagavya @ 4% at branching and flowering stage showed its superiority by producing the highest plant (54.9 cm), seed (2054 kg/ha) and stover (2483 kg/ha) yield of chickpea along with maximum net return of 45600 and B: C ratio of 3.05.

Keywords: Chickpea, Panchagavya, organic manure, economics

MSAEJMU-246

Evaluation of on-farm management practices of maize under rainfed area of Rajouri

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A mong the *kharif* crops, maize (*Zea mays* L.) is an important crop in Rajouri District acts as the staple food for over 90% of the population and is grown mostly under rainfed conditions. The present level of maize production needs to be increased in order to meet the ever increasing demands. This required level of production can be achieved through the increase in productivity, which in turn requires high level of management practices. Attempts were made to improve productivity and to increase area under maize by adoption of recommended packages. In order to compare performance of recommended packages on farm trials (OFT's) were laid out at farmers' field to show out the worth of recommended packages over farmer practices. The demonstrations resulted in enhancement in productivity of maize crop. An on-farm experiment was conducted in low hills intermediate zone of Rajouri District of Jammu and Kashmir to



study the impact of application of recommended dose of nutrients and full package of practices as against farmers' practice in maize under rainfed conditions. The treatments were evaluated at five locations during kharif 2016. The different treatment were: T₁: Farmers' practice (Imbalance use of fertilizers i.e. application of FYM according to availability and urea only, high seed rate, no criteria of method of sowing, plant protection measures and inappropriate weed control measures). T2: Recommended dose of nutrients (75% of recommended dose of nutrients i.e.45 Kg N, 30 Kg P₂O₅ and 15 Kg K₂O/ha + FYM @ 3 t/ha and other improved agronomic practices). T3: Full recommended package of practices (75% of recommended dose of nutrients i.e.45 Kg N, 30 Kg P₂O₅ and 15 Kg K₂O/ha + FYM @ 3 t/ha + zinc sulphate @ 10 Kg/ha and other improved agronomic practices). Results of the study revealed that single intervention of applying recommended fertilizers nutrients over the existing farmers practice increased the overall grain yield of maize by about 16 per cent. However, the magnitude of increase in maize yield owing to the application of recommended package of practices over recommended nutrient and existing farmers practice was 3 and 20 per cent, respectively. The economic analysis indicated that net returns and returns per rupee invested were also markedly influenced by treatment T_2 : (Recommended dose of nutrients) and T₃: (Full recommended package of practices). Highest net returns of ₹ 34929 were recorded with recommended package of practices followed by recommended fertilizer nutrients (₹ 33950). Whereas, lowest net returns of ₹ 26349 were obtained with farmers' practice. Maximum returns per rupee invested (₹ 2.20 and ₹ 2.22) were recorded where 75% of recommended dose of nutrients + FYM @ 3 t/ha alone and along with zinc sulphate @ 10 Kg/ha was applied, respectively. On an average, the recommended package of practice increased net returns and returns per rupee invested by about 33 and 13 per cent over the farmer's practice, respectively. Hence, it is concluded from the study that for feeding the growing population, farmers should go for recommended package of practices in maize crop without any compromise.

Keywords: Maize, Farmyard manure, zinc sulphate, rainfed area

MSAEJMU-247

Effect of integrated nutrient management on productivity and profitability of blackgram under intermediate conditions of Rajouri

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lackgram (Vigna mungo L.) is a popular crop of India and provides variety of protein rich vegetarian Badishes for human. Multiple nutrient deficiencies, reduction in production per unit area and deterioration of soil health are reported due to continuous use of only chemical fertilizers. Use of organic manures alone or in combination with chemical fertilizers will help to improve soil health. Keeping, these facts in view a field experiment was conducted under on farm trials during *kharif* 2015 at five locations in Rajouri District to find out the effect of integrated nutrient management on productivity and profitability of Blackgram. The experiment comprised of 3 treatments: T1- Farmer practice (Imbalance use of fertilizers), T2- Recommended dose of NPK (N: P-16: 40 Kg/ha), T3- 75% recommended dose of NPK + FYM @ 2.5 t/ha + seed treatment with *Rhizobium*. FYM was applied one month before sowing and seeds were treated with *Rhizobium*. Blackgram variety *Uttara* was used as the test crop. Results indicated that the integration of inorganic and organic sources of nutrients was more effective in enhancing the crop growth, yield and economics of the Blackgram. Integration of inorganic fertilizers with farmyard manure and *rhizobium* resulted in significantly higher seed yield of Blackgram (3.07 q ha⁻¹) as compared to sole application of recommended inorganic fertilizers (2.70 q ha⁻¹) and farmer practice (2.17 q ha⁻¹). An increase of 41 per cent in seed yield of Blackgram was observed with integration of inorganic fertilizers, farmyard manure and *rhizobium* over existing farmers' practice. Economic analysis of the data showed that maximum net returns of ₹ 14603 was associated with 75% of recommended dose of nutrients along with FYM @ 2.5 t/ha and seed treatment with *rhizobium* followed by recommended dose of nutrients alone (₹ 12512) and farmers' practice (₹ 9074). On an average, 75% of recommended NPK along with FYM @ 2.5 t/ha and rhizobium increased net returns by about 17 and 61 per cent over recommended NPK and farmers' practice, respectively. Similarly, maximum returns per rupee invested (₹ 2.00 and ₹ 2.18) were obtained



where full recommended dose of nutrients alone and 75% of recommended NPK along with FYM @ 2.5 t/ha and *rhizobium* was applied, respectively. Whereas, lowest returns per rupee invested of $\mathbf{\overline{s}}$ 1.87 were obtained with farmers' practice. Hence, the present investigation conclusively inferred that maximum profitability can be obtained by using 75% of recommended NPK along with FYM @ 2.5 t/ha and *rhizobium*.

Keywords: Blackgram, INM, rainfed area

MSAEJMU-250

Cost of cultivation of Bt. cotton

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The present study entitled "Cost of Cultivation of Bt. Cotton" was undertaken to know the cost and returns. The study has been undertaken in Wardha district of Vidharbha region. Data pertains to the year 2016-17. The standard cost concept was used for working out per hectare cost and returns. The following conclusions were drawn from the study. The per hectare cost of production for overall 120 farmers at cost 'A₁', 'A₂' is Rs.41841.94, cost 'B₁' is Rs.43967.58, whereas cost 'B₂' is Rs.64442.72 and cost 'C₁' is Rs.46310.60, Cost 'C₂' is Rs.66785.73 whereas cost 'C₃' is Rs.73464.31. At overall level the input output ratio at cost 'C₂' was 1: 1.84. High cost of human labour was major problem followed by lack of financial facilities low level of productivity.

Keywords: Bt. Cotton, financial facilities, cost of cultivation

MSAEJMU-253

In vitro anticancer and antifungal potential of Giloy

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ancer is the major cause of mortality in the world and cancer cases are on rise in Jammu and Kashmir with summer capital Srinagar tops the number with 898 cancer patients while the number stands at 853 in Jammu and 62 in Leh/Kargil districts of the Ladakh region. Fungal diseases presently also destroying a huge quantity (tonnes) of the top five food crops- rice, wheat, maize, potato, soybean, each year, in the State which could otherwise be used to feed those who do not get enough to eat. Plants have been used for treating various diseases of human beings and animals since time immemorial. They maintain the health/ vitality of individuals and also cure cancer and infectious diseases without causing toxicity. Medicinal herbs play an important role in primary health care system among rural population since synthetic anticancer and antimicrobial remedies are beyond the reach of common man because of the cost factor. More than 50% of all modern drugs in clinical use are of natural products, many of which have the ability to control infectious diseases and cancer cells. Plant-derived products can be valuable source for the discovery and development of unique anticancer and antimicrobial drugs Therefore, in the present research work *Tinospora cordifolia* (stem) was collected from Jammu region and investigation was carried out to examine the *in vitro* cytotoxic potential of *T. cordifolia* stem against eight human cancer cell lines from six different origins such as MCF-7 and T-47D (breast), SW-620 and HCT-116 (colon), A-549 (lung), MDA-MB-435 (melanoma), OVCAR-5 (ovary), PC-3 (prostate). The stem part of the giloy was also evaluated against three pathogenic fungal strains viz., Alternaria alternata, Curvularia lunata and Bipolaris specifera. Methanolic extract of the plant was used as test material and in vitro anticancer efficiency was determined via SRB assay and antifungal activity was determined by Poisoned Food Technique. Results revealed that the methanolic extract from stem part of T. cordifolia at 100 µg/ml showed significant results against prostate (PC-3) and colon (HCT-116) cancer cell lines as 77% growth



inhibition was observed in the former and 71% growth inhibition was observed in the later case. The extract also showed remarkable activity against *B. specifera* with IC₅₀ values of 0.70 ± 0.02 mg/mL. However, less activity was observed against *C. lunata* and *A. alternate* with IC₅₀ values of 1.2 ± 0.12 and 1.35 ± 0.07 mg/mL respectively. Further investigation is required to isolate and identify active molecule (s) responsible for the observed activity.

Keywords: Tinospora cordifolia, Giloy, anticancer, antifungal, methanolic extract

MSAEJMU-269

Study of follicular population in relation to season on sheep ovaries

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The present study was aimed to observe the follicular population in sheep ovaries with respect of side of ovary viz., right or left ovaries. For this purpose 900 ovaries of each side were collected from local slaughtered sheep. The mean number of small, medium, large size and total surface follicles on left and right ovaries were recorded as 2.97 ± 0.03 , 2.29 ± 0.02 , 1.59 ± 0.02 , 6.86 ± 0.03 and 2.46 ± 0.02 , 2.03 ± 0.01 , 1.39 ± 0.01 , 5.88 ± 0.01 , respectively. The mean number of small, medium, large size and total surface follicles were significantly higher (P<0.05) in left ovaries compared to right ovaries. The mean number of small surface follicles were significantly higher (P<0.05) than medium and large size follicles in both left and right side ovaries. The total surface follicles (6.86 ± 0.03) were also significantly higher (P<0.05) in left ovaries were also significantly higher (P<0.05) in left side ovary compare to right side (5.88 ± 0.01) ovary. Therefore, it can be concluded that left ovaries were more active than right ovaries in sheep.

Keywords: Follicular, seasons, ovaries, sheep

MSAEJMU-282

Validation and popularization of IPM Technology to enhance the productivity of pulses at farmers' field of southern Rajasthan

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The IPM technology was validated and popularized in pulses i.e. greengram, blackgram and chickpea in Southern Rajasthan through farmers' field experiments and farmers field schools during 2015-16 and 2016-17. The IPM module viz., summer ploughing and clean cultivation, early sowing of high yielding varieties, seed treatment with Trichoderma @ 8 g/kg seed; Rhizobium and PSB @ 250 g/10 kg seeds, sowing at 30 cm row to row spacing, installation of pheromone traps and bird perches, spray of Imidacloprid 17.8 SL @ 200 ml/ha against sucking insect pests, spray of Imizathpyper @ 1.5 l/ha at 2-3 leaf stage of weed to control weed in greengram and blackgram, need base spray of Quinalphos @ 1.25 lit/ha/ SINPV/ HaNPV @ 250 LE/ha at flowering and pod formation to control pod borer was applied. Farmers' field schools were organized at regular interval to develop the skill and awareness of the farmers about the pests, nature of damage, application of IPM component and natural enemies of the pests. The IPM module reduced the population of sucking pests viz., aphids, green sting bug, whitefly, jassids and borers over non-IPM. The seed yield of blackgram and greengram were 12.19 and 8.37 q/ha in validation trial as against non-IPM farmers practices 7.40 and 6.77 q/ha, respectively during Kharif, 2015-16, whereas chickpea yield was recorded 19.63 q/ha in IPM field against non-IPM field (15.87 q/ha) during Rabi 2015-16. The yield of blackgram and greengram in validation trial with a mean of 11.61 and 9.54 q/ha were recorded against non-IPM farmers practices of 8.05 and 7.13 q/ha, respectively during Kharif 2016-17. Similarly, during Rabi 2016-17, chickpea yield in IPM field was 19.91 q/ha as against non-IPM field of 14.48 g/ha.

Keywords: IPM, greengram, blackgram, jassids, borer.



Hypersensitivity in plants against pathogen ingress

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Hypersensitive response (HR) refers to rapid host cell death in plants. As the process is involved in disease resistance in plants, it remains a focus of interest for plant pathologist. There occurs a programmed cell death (PCD) in plants during hypersensitive response which is a functional term used to describe cell death as a normal part of life of multicellular organisms emphasizing the role of developmental cell death. The plant hypersensitive response (HR) involves an interaction between the products of AVR gene of pathogen and R gene of the plant and HR is the result of incompatible reaction between the two. HR inhibits the growth of the pathogen by killing infected and uninfected cells producing a physical barrier composed of dead cells. The mechanism of cell death seems to be common in all living organisms while the precursors and processes variations involved might have small variations. **Keywords:** Pathogen, hypersensitive response, PCD.

MSAEJMU-297

Soil moisture depletion as influenced by soil depth in Kiwi growing cold humid regions of northwest Himalayas

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An investigation to reveal soil moisture depletion pattern at different depths in Kiwi growing soils of northwest Himalayas was conducted during the year 2015 at SKUAST-K Farm, Srinagar. The soil moisture depletion at different depth was determined. It was observed that soil moisture depletion showed varying trends with varying soil depth. During the period 813-830 days after sowing (DAS) the soil moisture increased up to 2nd depth and thereafter it showed a decreasing trend where as during the period 859-876 DAS the soil moisture depletion showed a decreasing trend with increasing depth. During the period 880-899 DAS the soil moisture depletion showed totally different trend where it increased up to the first soil depth then decreased thereafter. During the period 900-913 DAS the soil moisture depletion showed totally different rend where it increased up to the first soil matric potential. A negative but significant linear relationship between Soil moisture content and soil matric potential in all soil depths i.e (30, 45, and 60 cm) was observed. The information generated during the investigation can act as platform for researchers working in the related fields to design the strategies to reduce moisture depletion and increase the water use efficiency. This will further help in reducing the input cost and hence will help in elevating the income of Kiwi growers of the region.

MSAEJMU-298

Water management in litchi

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The litchi (*Litchi chinensis* Sonn.) is an important sub-tropical evergreen fruit tree and belongs to the family Sapindaceae. India is the second largest producer of litchi in the world after china. Litchi makes significant contribution to the lives and economic health of millions of people in the South-east Asia. In India litchi is growing under an area of 91 thousand hectares with a total production of 578 thousand metric tonnes. It is grown in the states of Bihar, Tripura, West Bengal, Uttar Pradesh, Punjab and Haryana. In Jammu division, litchi is grown under an area of 930.51 hectares with a total production of 2264.40



metric tonnes. The fruit of the litchi comes to the market in May or early June when very few other fruits are available, thus they fetch remunerative price in the market. Nutrients management is essential for maximum yield, good quality and profitability. Besides nutrient management, water management is also an important aspect of litchi cultivation. Water scarcity has been observed in the main litchi growing states of India. When water becomes scare, its demand management becomes key to the overall strategy for managing water. Since horticulture is the major competitive user of diverted water in India, demand management in horticulture would be a focus point to reduce the aggregate demand of water to match with available future supplies, thereby reducing the extent of water stress that the country is likely to face.

MSAEJMU-299

NICRA and the Diversified Integrated Farming

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he adopted village under National Initiative on Climate Resilient Agriculture in Pulwama District is Wakherwan. The major climatic vulnerabilities faced by the village are non-availability of water at critical periods of growth which affects the horticultural crops like Apple. These crops mainly depend on rainfall for irrigation. The successful interventions carried out in the adopted village under each module include Natural Resource Management (Vermicomposting), Crop Production (Protected Cultivation of Vegetables, Seed Production, and Intercropping of Garlic), Mushroom Production and Livestock & Fisheries (Popularization of Hardy Breed of Poultry). Under the NRM module, 10 vermicompost units were set up in the adopted village. The farmers have readily adopted this intervention as 6 more vermicompost units have been set up by the farmers. This intervention has brought good returns to the farmers and more number of farmers is willing to take up this intervention. This intervention was taken up in the village after the devastating floods of September 2014. Keeping this in mind 10 polyhouses in the adopted village were set up with help of our station, to get back them on track. This intervention not only increased the production of vegetables in the area but also benefitted the farmers economically. Presently, 50 farmers are willing to take up this intervention and have approached to the concerned department. The village being drought prone, seed production of vegetables has been introduced because of reduced irrigation requirement. The farmers have produced 07 quintal of turnip seed from an area of 0.60 ha. This intervention has been taken to improve the livelihood of the farmers of the adopted village and has proved successful, but lack of marketing facility being one of the biggest constraint for adoption. Due to the irregular pattern of rainfall and extreme temperatures during last few years the risk of crop failure had increased in case of sole cropping. So, to ensure reasonable returns, intercropping of Garlic in Apple orchards was taken up in the adopted village recently and has proved quite affluent. To tackle the cold stress in backyard poultry, hardy breed of poultry (Vanraja) was distributed among 50 number of farmers. A total of 500 Vanraja chicks were distributed among these beneficiaries. Clinical examination of affected birds was done and was treated immediately by prescribing drugs. It was also found that the Vanraja birds are docile in nature and easily become prey for predators otherwise these birds can easily tackle the cold stresses. The establishment of custom hiring centre for farm machinery has enabled farmers to use implements for carrying out agricultural operations on time. Implements/equipment's like Mini Tractor, Power sprayer and Irrigation pump set have been purchased and kept in CHC for use by farmers. So far an amount of Rs 40000/- has been generated through CHC in spite of facing the problem of manpower for operating the available implements.

Keywords: NICRA, Natural Resource Management, crop production.



Role of organic farming in Integrated Pest Management

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he goal of Integrated Pest Management (IPM) is to control populations of pests below levels that result in economic damage. This is achieved through the integration of all suitable control techniques in a compatible manner. In contrast, organic farming systems rely on ecologically-based practices such as cultural and biological pest management and virtually exclude the use of synthetic chemicals in crop production. Genetically modified crops are not allowed under organic farming systems, the fundamental components and natural processes of ecosystems, such as soil organism activities nutrient cycling and species distribution and competition are used directly and indirectly as farm management tools and to prevent pest populations from reaching economically-damaging levels. For example- crops are rotated planting and harvesting dates are carefully planned and habitats that supply resources for beneficial organisms are provided. Soil fertility and crop nutrients are managed through tillage and cultivation practices, crop rotations, cover crops and supplemented with manure, composts, crop waste material, and other allowed substances. In organic systems, the goal is to design the production system so that pests do not find plants, are controlled by natural enemies (biological control), or their damage is kept to a minimum. Vigorous, healthy plants are more able to withstand damage caused by arthropods and disease. Therefore, the approach of managing the system for beneficial processes and cycles and creating healthy soil and plants is at the foundation of integrated pest management in organic systems. Keywords: Organic farming, IPM, ecology, GMO

MSAEJMU-305

Compatibility studies of pesticides against insect pests and diseases of apple

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study on compatibility of various insecticides and fungicides against major diseases and pests of Apple was conducted at Shalimar campus during Kharif-2010-2011 and 2011-2012. Fungicides and insecticides are recommended to be sprayed separately without admixing suspensions involving huge labour and time components. Different pesticides were sprayed with at five different phenological stages (pink-bud, petal-fall, fruit-let and fruit development stage-I & -III). Standard controls comprising of recommended sprays were also given at these stages for comparison, in addition to unsprayed check. Observations with respect to foliage and fruit scab. Alternaria leaf blotch and percent mortality of European red mite (ERM) and San jose scale (SJS) were recorded at petal-fall, fruit-let, fruit development stage-I, II and pre-harvest stages. Further, pesticides tested at Shalimar (Srinagar) during 2010-11 and found compatible were verified during current season at three locations viz., Asham (Bandipora), Zainpora (Shopian) and Chetkak (Bandipora) at the above mentioned stages for final recommendations. The pesticidal combination exhibiting physical incompatibility was discarded in the initial phase. No incidence of apple scab, Alternaria leaf blotch (ALB) and European red mite (ERM) was observed at petal fall stage. However, Sanjose scale (SJS) was noticed at this stage. Combined spray of fungicide and insecticide proved equally effective in controlling SJS. Myclobutanil 10WP (30g) + Dimethoate 30EC proved most effective (68.6% SJS mortality) which was at par with Flusilozole 40EC (30ml) + Dimethoate 30EC (100ml), Funarimol 12EC (40ml) + Dimethoate 30EC (100ml), Dodine 65WP (60g) followed by Dimethoate 30EC (100ml) and Fenzaquine 10EC (40ml). At pre-harvest stage, all the treatments controlled scab, ALB, ERM and SJS in comparison to unsprayed check. Penconazole had least foliage scab incidence and Dithionon + Dimethoate showed lowest intensity (2.30%). Fruit scab incidence and intensity was



lowest in Penconazole +Melbactin and Dithionon + Melbactin respectively. ALB incidence and intensity was least in Dithionon 75 WP (75g) + Melbactin 1EC (ml) and Dithionon 75WP (75g) + Dimethoate 30EC (100ml) treatments (9.43 & 4.67) respectively. The mortality of ERM was high in Abamectin treatment. Similarly SJS mortality was high in dimethoate sprayed alone. Thus compatible chemicals can effectively minimize labour, time and inputs. **Keywords:** Pesticides, apple, compatibility

IMPACT OF AGRICULTURAL TECHNOLOGIES IN ENHANCING GROWTH AND INCOME





Theme - III

New Dimensions of Agricultural Credit, Cooperation and Marketing

Lead Papers	:	02
Oral Presentations	:	21
Poster Presentations	:	23
Total	:	45



Lead Paper - VI

Enterprising Himalayas through apple based value chain: An initiative for growth & farmers income

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Context

Fruit crops in Himalayan region have witnessed most significant increase in area contributing to the shifts at a very high pace with bright prospects towards horticulture sector. Important reason being handsome returns to the farmers. Horticulture in general and apple cultivation in particular, has developed as an industry and more and more land is apportioned to this sector each year in Himalayas. While the cereal based production system provides household nutritional security in the state. It is ability of apple based horticulture system to generate sufficient income to provide livelihood security even to smallholders.

Apple (*Malus borkh*) is one of the oldest fruits known to man. It is a deciduous fruit (fruit which shed their leaves). The deciduous fruits are divided into pome, soft and stone fruits. The apple is among the pome fruits. Apple tree is small and deciduous reaching 3 to 12 meter (9.0 to 39 feet) tall with broad often densely twiggy crown blossoms are produced in spring, simultaneously with budding of leaves. The fruit matures in autumn and is typically 5 to 9 cm (2 to 3.5 inches) in diameter. It has been found wild in most temperate parts of the world and cooler higher hills of sub-tropical areas. It was, probably, first domesticated in the Caucasus, but fast spread all over Europe, even in pre-historical times. From Europe, apple spread to USA, Australia and South America. Apples are found wild in the hills of North India, but nothing much is known about the cultivated apple. The earliest plantations must have been established in Kashmir by the turn of the sixteenth century. The apple is the pomaceousfruit of the apple tree, species *Malus domestica* in the rose family (*Rosaceae*). The tree originated in Central Asia, where its wild ancestor, *Malus sieversii*, is still found today. There are more than 7,500 known cultivars of apples, resulting in a range of desired characteristics. Different cultivars are bred for various tastes and uses, including cooking, fresh eating and cider production.

Apple is considered as one of the most important and widely grown temperate fruit of the world with regard to its acreage, production, economic returns, high nutritive value and popularity. Apples are full of healthy antioxidants, fiber, vitamins and minerals. One medium sized apple contains 95 calories and 4.4 g of dietary fiber. In addition, an apple is a good source of potassium, phosphorus, calcium, manganese, magnesium, iron and zinc. Apples also contain vitamins A, B1, B2, B6, C, E, K, folate, and niacin. Apples come in different shapes and sizes, so the amount of calories and vitamins in apple varies. Best of all, apples contain no fat, sodium or cholesterol (Wani *et al.*, 2015). Apple is the fourth widely produced fruit in the world after banana, orange and grapes with a growing demand. About 76 million tonnes of apples were grown worldwide in 2012, with China producing almost half of this total (49 per cent). The United States, with more than 5per cent of world production is the second-leading producer. Other important global players are Turkey (3.8 per cent), Poland (3.8 per cent), and India (2.9 per cent). The largest exporters of apples in 2009 were China, the U.S., Turkey, Poland, Italy, Iran, and India while the biggest importers in the same year were Russia, Germany, the UK and the Netherlands (FAO, 2013).

Indian scenario

India's share in the total world apple production is merely 2.90 per cent. The average productivity of apple in India is nearly 6-8 tonnes per hectare, which is much lower than that of countries like Belgium (46.22t/ha), Denmark (41.87 t/ha), Netherlands (40.40 t/ha) and even 100 t/ha in USA. Substantial progress has been recorded in previous plan periods in apple fruit cultivation in terms of area coverage, production and productivity and still a vast potential exists for both vertical and horizontal expansion. Yield of apple has shown an increase from 4.12 to 13.07 M.T. per ha (1975-2010), yet it is far below the level achieved by advanced countries. Jammu and Kashmir, Himachal Pradesh, Uttarakhand and Arunachal Pradesh are the major apple producing states of India. The two important states namely J&K and Himachal Pradesh accounts for 92 per cent of the total production and about 85 per cent of the total area under apple in India. As far as productivity of apple is concerned J&K has the highest productivity (8.6 tonnes/hectare) followed by Himachal Pradesh (3.9 tonnes/hectare) and Uttarakhand (2.16 tonnes/hectare) (NHB, 2012).



Situation analysis in J&K

Apple is the principle fruit crop of Jammu and Kashmir and accounts for 51 per cent of total area of 2.72 lakh hectare under all temperate fruits grown in this state. Average yield of commercially important apple cultivars per unit area is the highest in the country ranging between 10-12 tonnes/ha, but it compares poorly to the yields of 20-40 tonnes/ha in horticultural advanced countries of the world. Climatic and other agro-ecological factors of Kashmir are ideally suited to the cultivation of many apple varieties. Apple is produced by large number of small farmers scattered around the valley whereas, the consumers are located throughout the country. Apple is cultivated in almost all the ten districts of Kashmir region, with Baramulla, Shopian, Kulgam and Pulwama and Bandipora being the highest producers. The harvesting of fruit begins from August for Early Maturing Cultivars and continues till November with peak activity in September and October. Small produce, lack of time ability, knowledge of marketing system and liquidity potential etc., prevent them to undertake direct marketing of apple. The marketing system for apple is highly complex and is composed of different marketing channels for distribution of apple in different markets. In each channel varying number of functionaries are involved and numerous specialized business activities called marketing functions are to be performed by them (DES, 2014). Only around 1.6% of the country's production gets exported. Presently, a small quantity of apple produced in India is exported, mainly to Bangladesh and Sri Lanka. Export of fruit from outside J&K State, has occupied a prominent place in trade of the State but it is showing fluctuating trend over the years. The total quantity exported 2012-13 is 13 lakh MTs, against 10.30 lakh MTs in the year 2011-12. Although, the production under horticulture sector is increasing year by year but there is no significant growth in the export of horticulture produce outside the State. The reason for low growth in export of fruits outside the State is introduction of Market Intervention Scheme (MIS) under which "C" grade apples are procured at a support price of Rs.6 per kg for processing into juice concentrates in the locally established juice processing units. Secondly, India is also importing fruits from foreign countries as free trade policy is in force at the country level. The Government is making all efforts to promote exports from Jammu and Kashmir State (Nagash Farheen, 2015).

J&K leads in terms of production and provides the maximum marketable surplus. About 30% of A grade, 40% of B grade and 30% of C grade of pre-falls and culled apples account for substantial quantum of around 3 lakh tonnes which needs to be exploited as raw material for processing industry. The increased production yielded some good results and our export worth Rs. 4500.00 crore is expected during 2014-15 as against Rs. 5000.00 crore during 2013. Food processing industry offers tremendous opportunity for commercial exploitation of horticulture of the State but commercial processing is around 1% only due to lack of post-harvesting and processing facilities as well as unscientific packaging. Therefore, opportunities are open for exploiting the potential under processing, with individual, joint venture and Government efforts (Economic survey, 2015).

Livelihood and employment potential

The livelihood and employment Potential of apple is enormous. Besides strengthening nutritional security, it has potential to provide livelihood security system. Apple crop needs intensive cultivation, yield more, have wide agro-climatic adaptability and need processing. Diversification towards apple crop will generate more gainful employment on account of following:

- Shifts have been recorded in Himalayas from agronomic crops to temperate fruits like apple due to scarcity of water for traditional crops like rice, wheat, maize and other cereals.
- Fruit crops in general and apple cultivation in particular turned more remunerative as compared to agronomic crops. A hectare of apple cultivation generated fivefold and three fold more income than cereal and vegetable cultivation respectively.
- Apple crops need 600-800 man days per hectares as against only 150-200 for field crops.
- Apple crops have 8-10 times more productivity than field crops.
- Apple crops can be grown on wasteland and dry lands successfully.
- Adoption of advanced technologies like high density plantation will require large quantities of quality plant material, leading to the employment of youth in public/ private nurseries. Further opportunities for employment, through adoption of advanced grading and packing system and other post-harvest handling activities, will also increase.

Re-engineering value/supply chain

Weak production and supply chain along with poor marketing strategies, low transparency in the marketing system have together completely eroded incentive for producers to improve quality and



productivity of apple. The low quality of apple is linked with mono-culture of a few old cultivars; faulty pruning and training practices; use of seedling rootstock of unknown performance; deficiency of suitable pollinizers; ineffective control of pests and diseases; lack of institutional credit and efficient factor inputs are some other bottlenecks which have turned the terms of trade against producers. The improvement in the production is quite important, but marketing has also an equal role to give a crop commercial orientation. There have been multi-dimensional efforts to increase the production of apple in the state but market regulation has not received proper attention. Apple marketing being complex phenomena requires special treatment and utmost care in the Kashmir Valley. Present marketing system in the state has an inherent tendency to shift more benefits to intermediaries at the cost of apple growers. The present marketing structure is such that 87 per cent of the marketing functions are solely performed by these powerful intermediaries (Bhat, 2010).

The improvement of systems of harvest and post-harvest handling must occur at the critical juncture in the value chain between the large farmers and the large wholesalers/importers. The key to making this happen will be the development of closer and more effective coordination between these two categories of value chain actors. This is necessary so that once good quality apples are produced, the needed postharvest procedures and infrastructure are in place so that the product delivered to the cold storage unit will actually meet the agreed quality standards and be properly treated for prolonged storage. Overall, the apple value chain shows considerable dynamic growth potential. Actors in it, at both the farm level and at the key large wholesaler/importer level are making significant new investments in upgrading production and storage capacities.

Conclusion and policy implications

Apple production and marketing is an important economic pursuit and source of livelihood to 30 lakh people of the state of J&K besides in other Himalayan states. The state in recent years has given lot of attention to the development process of apple industry. However, there exists wide and marked gap in productivity of apple as compared to major apple producing countries of the world. The study of apple value chain of the state, assumes importance in the area of planning as it guides the planners about the area where it is economical to diversify and the areas which would accordingly be most suitable for the development of industries based on the raw material. The relative peace in the state has made it possible for farmers to focus on improving their livelihoods. The apple cultivation has the potential to influence several households and improve their economic prospects. New market players have to be invited in, resources found for investments, change in policy and support systems from the government and building capacities in individuals and institutions for effective and remunerative participation in the value chain. Some of the measures required to improve further prospects of apple farmer can be taken at farm level and enterprise level. But a number of measures like march towards high density apple orcharding with technological back up like use of MCP as is in vogue in USA, China etc., introduction of pollinizers and pollination management for yield and quality gains, re -engineering cold (CA storage) and supply chain management and creation of infrastructure for processing in apple value chain that are critical for ensuring an equitable return to the farmers have to be taken at a sectoral level in close coordination with the government. Revamped apple sector has to be planned with a mix of investments, capacity building, technological innovations and committed institutional leadership and each intervention will definitely create a galaxy to double farmer's income.

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Lead Paper - VII

Agri food value chain upgradation through innovations: A step towards doubling farmers' income

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INTRODUCTION

The world population is projected to increase to 9.1 billion by 2050 (FAO, 2009). Currently, out of the total 7.1 billion, 870 million people are undernourished (FAO and IFAD, 2012). Furthermore, over 70 percent of people suffering from hunger are from rural areas and live in developing countries, and nearly 80 percent of this amount are either directly or indirectly dependent on farming (IFAD, 2011). The increasing population, urbanization and growing income in developing countries drive the demand for food. Conversely, high-energy prices, climate change and depletion of natural resources may act to constrain food supply (Misra, 2014).

Globally 2.5 billion rural poor depend on agriculture for their livelihood, out of this 1.3 billion are small holder farmers and landless labours (Zoellick, 2008). As a result, agriculture plays a crucial role in the economic development of these people (GTZ, 2006; Seufert, 2012). However, it is also a major source of environmental degradation (degrading soil quality, depleting freshwater resources, polluting the environment) through the over use of fertilizers and pesticides and also in contributing to climate change. Ironically, food production critically depends on natural resources, but these resources are also degrading the environment (Seufert, 2012).

Current agricultural practices fail in improving sustainable agricultural goals in a number of ways. Agriculture remains not only a leading cause of environmental degradation, but it is also a major force driving the earth system beyond the safe operating space for people (Rockström *et al.*, 2009). As the global agricultural system currently exists, it doesn't adequately supply nutritious food to people; currently one in every six people in developing countries are undernourished due to a lack of adequate access to nutritious food (FAO 2009) quoted in (Seufert, 2012). The idea of sustainable food security not only requires that people have sufficient access to food at all times, it also demands that the food that is produced be nutritious and of minimal impact to the environment (Müller, 2010). However, the case has also been made for the notion that agriculture must meet the present needs of people without compromising on the ability to meet the needs of future generations (John & Deborah, 2010). At present there are 570 million farms in the world, of which 84 percent are smaller farms with less than two hectares of land (FAO, 2014b), thus a broad array of factors represent pressing challenges to agriculture in general, and small farmers specifically. Among these issues are decreases in soil fertility, water shortages, the loss of biological and agrobiological diversity, climate change, rapidly increasing prices for seeds, fertilizers, pesticides, and changing market demand (IFAD and UNEP, 2013).

Attention has been called to the globalization of agriculture during the last few decades in India. Here, small farmers were affected in a drastic way by the introduction of the new paradigm of commercial food production. Indigenous crops and knowledge are being discarded in favour of monoculture practices directed at international agro-industries (Shiva *et al.*, 2004). In India, agricultural land holdings are characterised by small and marginal farmers amounting to 89 percent of the total operational area (Kant, 2014; Mahendra, 2014). There is also a trend developing in the decreasing size of farms (Gangaiah, 2013).

The challenge of feeding a growing population demands boosting food production in a sustainable manner. Given the impossibility from the industrialized countries to increase the quantity of land devoted to agricultural production it is plausible to forecast that a significant part of this growth needs to come from developing countries and emerging economies (Trostle & Seeley, 2013), wherein the majority of agricultural land is owned and cultivated by smallholding farmers (GIZ, 2012). It is also forecast that most of the projected population growth will occur in developing countries (Carl, 2012).

The diminishing availability of productive agricultural land and the degradation of natural habitats call for efficiency gains in the use of resources and achieving higher yields, nevertheless, the concept of sustainability is challenging in agriculture. There is no universally acknowledged definition of sustainability. Most of the definitions are concerned with the need for agricultural practices to be



environmentally friendly, economically viable, and able to meet human needs in the long run without diminishing the ability/needs of future generations (Beddington, 2011). Sustainable management of land considers practices of traditional knowledge and indigenous and local communities as innovations and also demands:

"a knowledge-based combination of technologies, policies and practices that integrate land, water, biodiversity, and environmental concerns to meet rising food and fibre demands while sustaining ecosystem services and livelihoods" (World Bank, 2006, p. 2)

Given the present state of technological development, not only it is striking that food security has yet to be achieved but with a projected population of 9 billion people by 2050, current production levels will need to be doubled from current standings by that time (Foley *et al.*, 2011). There is a drastic need for changes in the food production system: we need to produce more nutritious food at affordable prices in an effort to ensure livelihoods to smallholder farmers. In view of the considerable challenges ahead, it is important to examine the potential contribution of different types of farming systems for sustainable food security. Prototypes of possible farming systems that try to emulate ecological practices by avoiding the use of external inputs are often promoted as more sustainable forms of food production. A number of studies have confirmed that organic farming is one of the most sustainable agriculture aim at produce food with minimal harm to ecosystems, humans, and animals. It is the most prominent alternative farming system, often proposed as a form of sustainable agriculture (Seufert, 2012). In the present era, sustainable agriculture through use of organic techniques of production is unquestionably feasible and particularly suitable for farmers with a limited amount of land.

Problem Statement

After the 1950's the rapid population growth in India during the post-independence era placed a great deal of pressure on land and traditional farming systems. As a result, technological intervention in agriculture was widely adopted by farmers oriented towards the "Green Revolution". Since then India has become self-sufficient in food production. In addition, it has boasted significant levels of productivity, broadening economic growth and reducing poverty (Evenson & Gollin, 2003; Sebby, 2010). Unfortunately, the positive developments have been accompanied by gradual and negative side effects such as decreases in soil fertility, pesticide resistant diseases and increased production costs, altogether challenging the sustainability of conventional agricultural production at high levels (Sebby, 2010; Vandana, 1991). Consequently, sustainable agriculture and alternative eco-friendly cultivation systems are growing in importance at national, as well as at global levels. Urbanization and rapid income growth are leading to a significant shift in dietary customs in India, away from staples and increasingly towards sustainable and safe food. The growing interest of high-value horticulture crops is further supported by consumers who are health conscious and aware of chemicals related hazards (Eyhorn, 2007; Scialabba & Hattam, 2002).

At present there are 121 million agricultural holdings in India, of which 99 million are small and marginal farmers¹. The majority of them are poor (Mahendra, 2014). Furthermore, three-quarters of India's poor are based in rural areas (Sukhpal, 2008). Research has shown that growth generated from agriculture is more effective in reducing poverty than growth of other economic sectors in India (Zoellick, 2008). In this sense, agriculture is recognized as an important sector for rural development. Linking smallholder farmers with well-functioning domestic and global markets plays a critical part in the long run strategies to reduce rural poverty. Here, the ability to understand how to successfully link poor smallholder producers to relevant and beneficial markets, as well as identifying which markets may benefit what kind of producers, are of critical importance in improving the livelihood of smallholders.

The emergence of organic fruit and vegetable value chains in India has brought with it opportunities and challenges for the whole local socioeconomic system involving different actors and institutions. However, to assess both the positive and negative impacts of organic fruit and vegetables produced in the local system it is necessary to reveal the interactions and relationships between the actors and institutions influencing the operations of these chains. Although there has been a proliferation of studies on organic farming, relatively little attention has been directed towards analyzing the interactions and relationships between the producers, supporting markets, and the extent to which their environment enables them to operate. Therefore, Present paper aims to analyze with the below mentioned objectives-

¹Average size of operational holdings in India is 1.4 hectares (Thapa, 2009)



Objectives of the Research

- Organic fruit and vegetable value chains and
- To analyse and suggest the strategies for value chain upgradation through Innovations for smallholders' livelihood improvement

Method

The research was conducted in Karnataka state in India, the first state in the country to implement an organic farming policy. The source of information used in this study was mainly obtained from personal interviews based on the structured questionnaires, carried out on a sample of 100 respondents of both organic and conventional farmers. A purposive random sampling was drawn from an official list of certified organic farmers. Further we also interviewed 14 other value chain actors to obtain necessary information and more objective understanding of the relations in the chains. In this study, the methods employed for collecting empirical data are survey method, focus-group interviews, key informant interviews, direct observation, and documents. The combination of these different data sources is an attempt to overcome the intrinsic biases derived from using a single source and to explain more fully as well as to give a more balanced picture of the study.

There is no clear-cut method to carry out value chain analysis. Methodologies differ with purpose and context. Therefore, their application and usefulness vary depending on the circumstances and focus of the analysis. The analysis of the value chain development proposed in this study is divided into six major steps.

Table 1: Steps followed to analyze value chains development

1	Mapping
	Identification of actors, service providers, their functions, activities and relations
	Identification of flow of product and enablers involved in each step
	Interactions and interventions of the value chain actors
2	Description of vertical relations in the chain
3	Description of horizontal relations in the chain
4	Description of enabling conditions
5	Description of the external environment
6	End market description

Source: Own elaboration

Theoretical Background

The value chain consists of all value-generating activities, required to produce, deliver and dispose of a commodity (Schmitz, 2005). More precisely, it "describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformations and the input of various producer services), to delivery to the final consumer and final disposal after use" (Kaplinsky & Morris, 2001, p. 4).

Based on Kaplinsky & Morris definition, the most commonly used value chain consists of six stages as mentioned in the Fig. 1.



Fig. 1: Structure and stages of the value chain

Source: Own elaboration based on (Kaplinsky & Morris, 2001; Kula et al., 2006b)



Value Chain Upgrading

Upgrading is a dynamic concept, it allows grasping the changing role of agents in value chains. The upgrading issue was first incorporated into agro-food studies by (Gibbon, 2001). He explained the applicability and suitability of VCA to examine questions of upgrading in developing countries.

value chain upgrading can thus be summarized in a broader definition of:

[.] what the actors in a value chain must do to become more competitive and to generate greater value added in the future. The joint improvement of the value chain by private enterprises and their associations is called "value chain upgrading." (Springer-Heinze, 2007, p. 77)

Product upgrading (U1): refers to the capability of agents to appropriate rent by means of changing the attribute of a product; i.e.: transforming of an old product into a new product with higher quality, value, and thus price. For example, vegetable farmers shift the production of conventional vegetables designated for traditional markets into organic vegetables designated for supermarkets. Product upgrading also includes the introduction of more sophisticated and a completely new product line.



Fig. 2: Illustration of upgrading typology

Source: Own compilation based on (Gereffi et al., 2001; Humphrey & Schmitz, 2004; Kaplinsky & Morris, 2001)

Process upgrading (U2): it can be achieved when the transformation of inputs into outputs is carried out in a more efficient way; e.g. of value-adding activities, production organization, cost efficiency, productivity, and information flow-by, for example, introducing innovative production technology or improving coordination and communication. Process upgrading can take place either within an individual or between chain functions or links.

Functional upgrading (U3): refers to the capacity to generate and retain rent through the adoption of new functions/skills in the value chain (vertical integration, for instance). Further, assuming or acquiring value-adding activities from the subsequent or previous chain function. For example, forming producer's association performs a collective marketing, thereby taking over this value-adding activity from the traders. The introduction of new value-adding activities is also regarded as functional upgrading, for example, when apparel producers design their own product instead of imitating other products.

Network or "relational" ²upgrading or inter-sectoral³ or chain upgrading (U4): is the process of gaining the rent through changes in the relationships with customers or suppliers. It also refers to moving into new value chain or sub-sector by establishing business linkages with new suppliers and buyers.

²(Gereffi *et al.*, 2001)

³(Humphrey & Schmitz, 2004)

In the present study, we use a new typology of innovative upgrading: *collective or horizontal upgrading. It* refers the capability to add value to the determined action of agents in the same knob of the value chain, through collective action (ex: by means of farmers' group). Nevertheless, these upgrading categories are defined as distinctive processes, the way most value chain players seeking proper rent is usually through a combination of different types of upgrading mechanisms. This might be very complementary.

RESULTS AND DISCUSSION

Value Chain Mapping: Actors, Functions, Linkages, and Enablers involved in Fruit and Vegetable Chains

Mapping the value chain facilitates an understanding of the system dynamics and has the capacity to reveal key actors' that are involved, their functions, and linkages with other actors and supporting institutions involved along the chain.

Flow of Fruits and Vegetables through Various Marketing Channels in Karnataka

The most common marketing channel in case of fruits and vegetables in Karnataka is in the sequence of middlemen to retailers to consumers. Well-organized marketing channel for smallholder farmers rarely exists. However, marketing of F&V in the study area are carried out in the following ways. i) Farm gate or on-farm selling: this is the most prominent market practice. However, in exception, a few farmers sell their produce to the buyers at the farm gate. In this mode of marketing, the buying and selling is on an individual basis. Buyers come to the farm gate and transactions happen on the spot with the cash payment. ii) Direct selling: after harvesting farmers themselves do general grading and bring their produce to the wooden or plastic crates and carry them to a nearby city market by bullock carts, motorcycles or by bus. This type of selling mainly exists in the case of conventional fruits and vegetables, when there is a lesser volume of produce. In some cases, they have permanent buyers in the local market and they will go to raith bazar and sell their produce. iii) Selling to middlemen or commission agent: Majority of the conventional farmers in the study area sells their produce through middlemen. Selling to middlemen is an adopted strategy by small-scale farmers, as they face a lot of problems in selling through direct marketing. In some areas where there are no infrastructure and there is limited farmer's network, middlemen are key to bringing produce into the marketplace. iv) *Collective or group marketing:* Some farmers group together and bring their produce to the collection center and market their produce in a group. Organic farmers in the study area follow such a type of marketing. They are organized into groups to get an organic certification as well as to carry out production and group marketing operations. Furthermore, with their experiences and information received from non-governmental organization (NGOs) group members, they decide which crops to cultivate in their farms. The production of fruits and vegetables is done depending on the seasons by the same group of farmers, but their marketing process, and the actor's involvement in marketing are slightly different for both fruits and vegetables. However, the majority of the smallholders of organic farming in the study area are selling their produce through collection center. The collection center is managed by the farmers in a group with the help of an NGO.

In case of organic produce, both organized and unorganized retailers are procuring the produce from collection centers and delivering produce to the end consumers. Whereas, in case of conventional produce, the process, starts from middlemen or traders to wholesalers and retailers and finally leads to consumers. The number of stages for a commodity to reach the consumers is more in conventional compared to the organic chain. However, it also depends upon the location of the market and the targeted market to be delivered in the case of conventional produce. Although in the case of organic produce, the available option is limited and only through collection centers to retailers to final consumers. If the demand for organic produce is less on a particular day of harvest, the perishable produce is inevitably sold in a nearby conventional market.

The Value Chain Mapping of F&V: Functions, Actors and Enablers

In the present study, the value chain mapping; Functions, Actors and Enablers of fruit and vegetable value chains in Karnataka is shown in the Fig. 3 and linkages marked from bottom to top. In the middle of the map is a list of actors involved in the sector according to their respective functions. The left-hand side of the map lists the major functions of the chain actors, which includes input supply, production, collection, trading, wholesaling, retailing and upgrading. Further, the institutions supporting organic sector directly or indirectly are listed as enablers (supporting service providers) on the right-hand side of the map (Fig. 3).





Fig. 3: Functions, actors and enablers of fruit and vegetable value chains in Karnataka

In the case of organic fruits and vegetables, the value chain involves product flowing from input suppliers to consumers via producers and retailers. Producers prepare some of the inputs on their own (Ex: *panchagavya, panchamruta Beejamruta*). In very few cases, they depend on the input dealers. Further, the state government also provides a certain amount of biofertilizersgroup-wise, for the production of fruits and vegetables. When vegetables (Ex: Tomatoes) are grown and ready for the market, farmers themselves harvest together with their family members and bring it to the collection center. A farmer's group operates collection center for sorting, grading, weighing, packaging and labeling the produce according to the retailer's requirements⁴ (Picture 1). Later those produce are marketed to retailers from different parts of Bangalore district.



Picture 1: Sorting, grading, weighing, packaging and labeling the produce Source: Authors own compilation

⁴ In the study area retailers demand to put their own brand code together with organic certification code. Further they also demand particular type of packaging and weighing depending on their customer taste and preferences.



Finally, consumers purchase those produce from the retail outlets or in some cases, delivered to homes. Organic tomatoes are mainly marketed through collection centers⁵. Around 60 percent of the organic tomatoes produced by the sampled small farmers in the study area are collected and marketed through collection center. And approximately, 10 percent of the produce are marketed through the weekly organic markets that are existing at nearby cities. The remaining 30 percent of the organically grown produce are marketed in the conventional markets (through village markets or nearby local market or nearby agricultural produce market committees (APMC's). However, the prices for the organic vegetables are determined by the retailers. They pay a premium depending upon the conventional market price. Organic vegetables are transported by wholesaler/retailers with their pickup tempos or vans. Overall, on an average 60 percent of the organic vegetables produced in that area are supplied to Bangalore through collection center. The remaining 30 percent is sold as conventional produce in the nearby markets. It does not mean that there is no demand for organic produce, but there is no other organized marketing center, where the farmers can sell organic produce when there is excess volume.

Organic vegetables are supplied through the collection center twice in a week throughout the year, but there is a large difference in the price and volume supplied in the main and lean season. The description of chain activities and functions of actors is a basis to analyze the external environment, information structure and both vertical and horizontal coordination in the organic F&V value chain.

The identified actors involved in the organic F&V value chain are shown in Figure. These actors include input suppliers, producers, buyers, consumers and some support institutions like ICCOA and Government dependencies. The present study is particularly concerned with local actors; the emphasis made on the description of their functions. Here we understand each value adding activity or productive process that the product sequentially undergoes from being a raw material up until reaching the consumer. Within the value chains, the various actors have a range of roles and responsibilities as the organic products move along from farm to the consumer while meeting the certification and quality criteria demanded by consumers.

Observed and Potential Linkages of Organic Tomato and Mango Value Chains in Karnataka

The organic fruit and vegetable value chain is a relatively new chain and includes a range of fresh F&V. Compared to conventional value chains it is considered to be very small therefore getting precise data on market share on organic fruit and vegetable are difficult. The Figure illustrates observed and potential organic value chain linkages in the study area. Five distinct market linkages were observed. These linkages showed notable differences in price and payment mechanism, information exchange, investment, financing, coordination, quantity, frequency, extension advice, etc. The linkages between, producers, wholesalers, super-marketers and specialized shops are mainly involving relational/informal contract along the chain.

There are no consumer organizations involved in buying organic produce. This is one of the foremost potential linkages in that area. On one flip side producers are located in the nearby city and selling part of their produce through the conventional market. On the other most of the consumers who prefer organic produce in their food basket, but they do not know where the good quality of the organic produce available. Therefore, if consumer organizations exist, then they will get a good quality produce, on the other hand, producers will get a market for their produce instead of selling as conventional produce. In addition, organic hotels are adding more numbers in bigger cities like Bangalore, there are alot of potentials for the producers to make a linkage with those hotels in the near future. Finally, HOPCOMS⁶ already provides a platform for conventional fruit and vegetable producers group; there is also potential in the coming years to add organic products to it. Presently, state government provides mid-day meals (using conventional fruit and vegetable produce) in the schools. If it changes into organic mid-day meal, the majority of the smallholders will get market linkage for their organic produce.

Upgrading

Upgrading refers to the acquisition of technological capabilities and market linkages that empower firms to improve their competitiveness and move into higher-value activities (Kaplinsky & Morris, 2001).

⁵ Collection center: is a place where farm produce aggregated, sorted, graded, packed and labelled and made produce ready for the buyers (Ex: Super marketers, wholesalers and specialized shoppers etc.). It is located at the vicinity of the production area and operated by producer group with the help of NGO.

⁶ HOPCOMS: The Horticultural Producer's Cooperative Marketing and Processing Society Limited


Upgrading in firms can take the form of process upgrading, product upgrading, functional upgrading and chain upgrading. Upgrading encompasses not only improvements in products, it also invests in people, knowledge, processes, equipment and favorable work conditions. Empirical findings from a number of countries and sectors provide evidence of the importance of upgrading in the agricultural sector (Humphrey, 2003; Humphrey & Memedovic, 2006a; Humphrey & Schmitz, 2002b). However, a number of competing but overlapping conceptualizations of upgrading in global agriculture value chains exist in the literature.

Interventions contributed to an enhancement of the upgrading capacity and inclusion of smallholder producers in Karnataka. Local smallholder producers can acquire new skills and knowledge in their interactions with other value chain actors. Firstly, the type of relationship in question can determine how information flows and how firms upgrade. Secondly, the implementation and compliance with established standards provides opportunities for learning and acquiring skills and knowledge. Fig. 5.7 demonstrates the interactions and seeks to explain how upgrading took place in local chains, on one side, there is the flow of materials starting from the producers. The material is transferred as it passes through different links in the chain, until it reaches the final link: the consumer. On the other, there is implicit knowledge, coordination and communication that is passed through the different links in the form of codified information. Transactions are also taking place between the different actors. One or more links (NGOs, certification agencies) in the value chain have a role in overseeing and coordinating the activities through the various mechanisms. In this interaction, trust-based relationships are formed, and an opportunity to learn and upgrade is opened up to the producers.



Fig. 4: Observed and potential organic F&V value chain linkages in the study area

In this section, we analyze and discuss how the value chain development interactions and Entering into new markets for the first time is a major challenge for many smallholder farmers in developing countries (Poulton, Dorward, & Kydd, 2010). It demands new skills and knowledge, for example, standards and requirements, marketing channels, and consumer tastes (Kaplinsky, 2004). Table 2 demonstrate observed upgrading activities of the fruit and vegetable value chain. Adoption of organic farming itself is a broader form of process upgrading. Improved agronomic practices resulting in higher yield, higher production, and increased sales or increased consumption by the producers themselves, or both. In addition, the processes involved to gain organic certification can impart skills, knowledge and experience.

As outlined in the referenced literature, among the most common interventions in value chains are an improvement of processes within or between nodes associated with the upgrading of product quality. These two upgrading strategies, for product and process, are closely linked. In the present study, the product upgrading was linked to improved processes i.e. the shift to organic production. Certified organic standard not only enhances income potential but also increases product quality. Furthermore, producers add new chain functions such as grading and packaging, thereby improving local employment opportunities.



Table 2: Observed	upgrading	activities	of fruit an	d vegetable	value chains
	10 0			0	

Туре	Observed upgrading activities				
Process upgrading	Broader forms of process upgrading are the shift to organic production.				
Product upgrading	Improved agronomic practices resulting in higher yields, and increased sales, increased consumption.				
	The certification process to an organic standard can impart skills, knowledge and experience.				
Functional upgrading	Cleaning, Sorting, Grading, Weighing, Packaging, and Labeling.				
Chain upgrading	Horizontal upgrading:				
	Smallholder producers coordinate in collective activities in the production and marketing in the form of a producer group/s.				
	Adding new functions to horizontally coordinated firms to meet buyer requirements.				
	Vertical upgrading (integration):				
	Extension services, communication, and information sharing among vertically coordinated actors in the chain.				
	Shortening chains by the exclusion of intermediaries and redistribution of their functions among the partners of a newly formed vertical relationship.				

Source: Authors own observation



Fig. 5: Interactions and upgrading in the organic fruit and vegetable value chains

Standards are driven by the process requirements of buyers (e.g. supermarkets) and organic demands by consumers. The upgrading of a product has associated requirements for the upgrading of the process. However, the safety and quality of fresh fruit and vegetables in both the domestic and export markets are decisive factors in buyer and the consumer satisfaction. The inherent perishability of fresh fruit and vegetables, the long distances they are transported, and the time span between harvesting and final consumption, all mean that increasing consideration has been paid over the past few years to food safety and quality management all along the value chain.

ICCOA played a significant role in the promotion of organic production, marketing and value adding activities for generating improved incomes for smallholder producers in Karnataka, but responsibility for post-harvest operations falls on producers and their organizations. If they fail in the timeliness of their activities related to post-harvest tasks this affects the quality of the final product when it reaches the buyer and ultimately, the consumer. Also, the value-added aspect associated with organic certification is lost if the quality of the end product is deemed below standard by the consumer.

In the present study area efforts have been made or are underway to improve post-harvest operations, as well as quality management through functional upgrading, such as the implementation of on-farm training, a scheduled collection of participants' produce in collection center, and organized cleaning, sorting, grading weighing, packaging, and labeling. These upgrading strategies require not only learning



the requisite skills and developing the capabilities, but also involve changing relationships with buyers and markets (Humphrey, 2004). The principle behind the investment in process and product quality upgrading paying off, is that better products fetch better prices, in instances where this quality-price linkage fails, investment ceases. In horizontally coordinated groups, they were also supplied with basic machines (functional upgrading) and technical assistance with best practices for the production of high-quality organic fruit and vegetables. This has enabled them to enter into new relationships with buyers (vertical coordination). Additionally, greater yield offer better food security and marketing options in domestic markets.

The cost to the smallholder farmers' group of upgrading their agronomic practices in terms of both time and money has been considerable, though now their income stream has been diversified, they are less vulnerable. The challenge now is to maintain smooth and stable supplies to buyers, particularly given the current erratic rainfall patterns and consequent failure of other household crops. The upgrading of organic fruit and vegetable value chains has resulted in increased human capacity and significant poverty reduction impacts. Interviewed farmers mentioned that, group membership is a prerequisite for inclusion into the group and offers access to other services. The collective experience of the certification process can impart skills, knowledge and experience that improve various groups ability to stand alone, similar to the collective action for smallholder market access that took place in Africa (Markelova & Mwangi, 2010).

However, the organic movement is still in its infancy in India, now there is this more apparent than in the lack of storage facilities for producers of perishable products such as fruit and vegetables. This is a serious limitation for the development of the domestic market. Most parts of the improvements have been financed by the buyers or private organic sector partners and delivered by NGOs such as the ICCOA and government extension agencies. Prices of organic foods are significantly higher, however, there are extra costs in the production process for controlling, labeling and separating organic raw materials and products that need to be recovered through the selling price.

All the organic produce from the interviewed producers was reported to be sold to the domestic market. Producers' organizations have post-harvest operations in place to produce constant, high value-added products for the domestic market. However, upgrading activities mainly depends on the nature of the relationships that exist between the major players involved in a transaction. Furthermore, post-harvest operations at the farm and packing house are critical for business success. Some existing linkages try to go beyond the immediate goal of merely improving rural incomes, to enabling rural producers to become overall chain owners. This may call for smallholder producers to get involved in a range of value-adding activities, including produce preparation (cleaning, sorting, and packaging), storage, and transport, and sometimes even retail sale, though direct sale to consumers in urban areas by peri-urban producers should often be encouraged.

As the interviewed farmers are smallholders, adding value to products (process) happens at the farm level. Without guaranteed returns, this can require significant investment, which in turn, increases the degree of risk faced by smallholder farmers. Producing new forms of existing commodities by starting production of organic fruit and vegetables according to new technical or user-specified commodity forms, for instance, is a huge challenge to smallholder farmers seeking to increase their profits. According to (Ponte & Gibbon, 2005), the reward structures in global value chains refer to the rewards or opportunities available to producers in developing countries, and the nature of the roles that trigger special rewards, for example, how premiums and discounts are determined in the market for a particular crop (e.g. quality grades, or securing contracts through forward sales agreements).

Many countries lack sizable agro-processors and while those that do exist may currently have surplus capacity, their ability to absorb additional production is usually limited. Governments and donors promote small and medium enterprises (SMEs) as seen one way to encourage competition and increase value addition (Shepherd, 2007). However, this may be constrained by a variety of factors similar to those experienced by the interviewed farmers such as poor infrastructure, a lack of education and entrepreneurial skills, credit constraints, and a non-risk-taking culture, as well as the high cost of imported processing equipment, packaging materials, and lower demand for their produce.

For many smallholders, domestic market fresh produce based food chains have lower entry barriers, but upgrading possibilities are limited partly because of the lack of adequate support for upgrading from both the public and private spheres. This issue of the nature and scope of institutional support is of crucial importance in their perception of upgrading (Neilson & Pritchard, 2011). The empirical cases of upgrading in the tea and coffee industry in south India have taken from their point of departure in the seminal work of



(Humphrey & Schmitz, 2002b), in that (Neilson & Pritchard, 2011) argued that the concept of upgrading provides a bridge that links the institutional and governance dimensions of the GVC approach. Their entry point is a relational perspective that treats governance arrangements and institutional formations as being co-produced by internal, place-bound actors and external lead firm actors. The institutional environment of the south Indian tea and coffee plantation sector shapes both upstream producers' capacity to participate in value chains and the economic benefits they obtain from such participation. The same focus on the importance of national and local institutions is found in (Selwyn, 2008) who found a more instrumental approach to upgrading processes in east Brazilian horticultural exports, which ia also based on the original categories put forward by (Humphrey & Schmitz, 2002b).

Importers that source produce for major retailers have offered training and transferred knowledge to potential Brazilian exporters of table grapes, in particular by conveying retailer quality requirements and assisting producers in their attempts to comply with these requirements, thereby upgrading both product and processes. Even though these activities are considered crucial for the success of the grape exporters, (Selwyn, 2008) stresses the importance of upgrading for national research institutions and marketing boards, as well as local technical service centers and producer organizations. Similar institutions may be the key for driving the processes that develop into upgrading: they can assist potential supplier firms in gaining access to global markets, and also maintain their position in them (Selwyn, 2008).

Experts and managers of firms who responded to our survey reported that, there is still a need for training services to members regarding organic farming practices, marketing and upgrading activities. They also pointed out that a lack of access to finance prevented the possibility of buying machinery, and it also means that there are no specialized storage facilities or processing equipment. Therefore, in the present case the organic research institutes, governmental and non-governmental organizations, supermarket chains and marketing boards can help smallholder producers' organizations for the expansion of organic fruit and vegetable production and processing activities.

Relational contracts with a high degree of coordination exist due to the increase in asset-specific investment by both buyers and sellers. On behalf of farmers' group, the ICCOA developed a specific labeling and branding for the organic produce. ICCOA made the process of collective upgrading possible. This fact, combined with the reported improvement in quality, enabled product differentiation and substantially increased the level of specificity. As the transaction was based on a relational contract, the buyers were able to build trust not only with a pool of producers groups, but also with other customers.

A higher degree of social capital being developed along the chain enabled the buyers to engage in concerted upgrading with producers and relational upgrading with customers. This study constitutes an example of the combination of horizontal and vertical coordination for value chain upgrading. This process relies on bridging and bonding social capital. In this case, higher levels of social capital reduced the cost of opportunistic behavior in the transactions, both within the groups and between the producers and buyers of organic fruit and vegetables. Similar results were found in Ethiopia study conducted by (Muradian, Chagwiza, Tessema, & Ruben, 2011).

Through their collective action, farmers set up horizontal coordination. Horizontal coordination is the process of greater intra-nodal organization, often in the production and processing node (Mitchell, Coles, & Keane, 2009). Among the farmers surveyed for this research, collective activities in production and marketing took the form of a producers group and also throughadding new functions to horizontally coordinated institutions to meet buyer requirements. Such collective endeavor was directed to achieve a higher level of productivity. Similarly in Kenya newly formed producers groups performed grading and packaging of fruit and vegetables at dedicated centers to meet buyer requirements (Ashraf, Giné, & Karlan, 2008). The group membership of the studied farmers if often self-selecting, therefore, horizontal coordination is more beneficial. In contrast, where institutional membership represents a barrier to entry, the poorest are usually among those excluded (Eyhorn, Mäder, & Ramakrishnan, 2005). Furthermore, the use of groups in value chain upgrading interventions is more effective when functional groups with effective leadership exist, and traditional group structures are employed rather than those imposed by development agents (Schmitz & Nadvi, 1999).). The imposition of rules in artificial groups may cause the breakdown of social cohesion and longstanding networks (Walker, 2001), therefore the development of relationships among actors within functional nodes strengthen the producers' groups.

The purpose of this coordination is to develop economies of scale, increasing functional efficiency and reducing transaction costs. It is often the first step in a sequence of interventions that ultimately facilitate market access, often as a prerequisite for other forms of upgrading, particularly vertical coordination and



functional upgrading in the form of shortening the chain by removing intermediaries (Singh, 2010), pooling resources and sharing costs. This is a common feature of organic smallholder producers in the study area, where certification and inspection costs are prohibitively expensive for individuals, so fees are shared among members (Aranda & Morales, 2002; Bacon, 2005; Raynolds, Murray, & Leigh Taylor, 2004). Currently they are selling produce through collection centers in bulks outputs which are economically feasible volumes to attract domestic buyers and open up new market opportunities (Roy & Thorat, 2008). Also, the producers' group enables access to services and activities such as bulk input purchases, information sharing, training and technical services, and government and NGO support at costs that are lower as a member of a group than they would be for individuals.

Similarly, the results of (Roy & Thorat, 2008) study from India revealed that market information is obtained at high fixed costs for individuals in Indian export horticulture. Therefore, the existence of a producers' cooperative union effectively disseminates information to smallholer farmers at a lower marginal cost. Overall, horizontal coordination makes individuals more creditworthy, which enhances financial stability, in turn enabling investment. These chain-level outcomes translate through increases in individual incomes into household-level outcomes, such as greater assets and improved food security through higher food spending.

Where functional, process, product and chain upgrading requires large resource investments, horizontal coordination brings together individual assets. The smallholder producers' group also developed coordinated relationships among the actors between the nodes. The capacity to develop vertical relationships with other actors was achieved partly through horizontal coordination, that is grouping smallholder farmers and coordinating them. However, there is an intensive program of process and product upgrading at each of the production stages to meet environmental and food quality standards, a prerequisite for supplying to the end markets. For producers who were too scattered to be clustered and who were unable to afford the costs of certification, an inter chain upgrading program should be implemented, in which farmers are initially supported in order to begin the profitable supply of fruit and vegetables to local and regional markets.

As was already mentioned in section 5.2, farmers have informal production contracts, the provision of extension services, information sharing among vertically coordinated actors in the chain. Collectivism also increases bargaining power, resulting in better negotiation outcomes, such as higher premium prices and more favorable terms of business. If prices were stable, even small margins would deliver favorable returns to growers. Collective action also enables the small producer to participate effectively in markets by addressing the issue of their isolation. Shortening chains through the exclusion of intermediaries, and redistribution of their functions among the partners of a newly formed vertical relationship were beneficial. As were direct sales to major retailers by fruit and vegetables producers in India, with the supermarkets taking on the transport function and producers bulking and grading at dedicated collection and distribution centers coordinated by farmers' groups (Singh & Bhaumik, 2008). Farmers gained assured markets with increased prices and agreeable payment terms; the supermarkets reduced their costs through elimination of intermediaries fees and gained the reputation of selling high-quality, fresh produce. Increased value added and more direct linkages with buyers resulting from a combination of strategies that enable functional upgrading-have clearly been demonstrated to improve incomes from the target value chain.

CONCLUSION AND POLICY IMPLICATIONS

The actors involved in the case of organic F&V value chains are input suppliers, producers, buyers, consumers and some support institutions and Government agencies. These actors have a range of roles and responsibilities as the organic products move along from farm to the consumer while meeting the certification and quality criteria demanded by consumers. In Karnataka, organic chains are considered to be new and very small, compared to conventional value chains. Five distinct market linkages were observed. The linkages between, producers, wholesalers, super-marketers and specialized shops are mainly involving relational/informal contract along the chain. Furthermore, these linkages showed notable differences in price and payment mechanism, information exchange, investment, financing, coordination, quantity, frequency, extension advice, etc. The actors engage in these kinds of relational or informal contractual relations primarily to reduce the uncertainty involved in the exchange of organic fruits and vegetables. Also, for economizing the main transaction costs. This indicates that trust between producers and other actors is present. Similarly, frictions are strongly present in relations at the horizontal and vertical level i.e. within and between smallholder producer groups. There are also potential linkages in that area where both producers and consumers can take advantage. If smallholder farmers groups link to consumer organizations, organic hotels, HOPCOMS, and link to schools, producers will get a market for



their organic produce instead of being compelled to sell it as a conventional produce. However, at the same time there are potential advantages, it remains a serious challenge for smallholder organic producer groups with less educated farmers.

The most common marketing channel for smallholder producers in case of organic fruits and vegetables in Karnataka is through *Collective or group marketing*- Smallholder farmersorganized into groups to carry out certification, production, and marketing activities. The production of fruits and vegetables is done depending on the seasons by the same group of farmers, but their marketing process and the actor's involvement in marketing are slightly different for both fruits and vegetables. The majority of the smallholders selling organic produce through collection centers remain selling through conventional marketing channels. The collection center is managed by a farmers group with the help of a NGO. Both organized and unorganized retailers are procuring the organic produce from collection centers and delivering produce to end consumers. In case of conventional produce the chain flow goes from middlemen's or traders to wholesalers to retailers finally to consumers. The number of stages for a commodity to reach the consumers is higher in conventional compared to the organic chain. However, in the case of organic the available option is through collection centers to retailers to final consumers. If the demand for organic produce is lower on a particular day of harvest, the perishable produce is inevitably sold in the nearby conventional market.

In conclusion, the local actors acknowledged the need for consensus and long-term perspective of commitment of collaboration between them. Further, they developed joint lines of action that would enable them to sustain and improve their participation in the national and international market of organic fruits and vegetables in the near future. The business relationships between smallholder producers group and other actors indicate a commitment to win-win situations. This situation has created the upgrading prospects of local actors, particularly for producers who have more limited access to resources necessary to cope with the challenges of increasing competition. Seeking, thereby to stimulate a transformation or reorientation in the way local actors work together is imperative to ensure greater stability and presence of local actors in the market. They have pursued collaborative efforts and worked together over the long-term. Therefore, there is more interdependency and power balance shaping their relationship. Finally social and cultural aspects also have a substantial impact on the commercial relationships among all actors in the value chain of organic fruits and vegetables.

Upgrading

Upgrading encompasses not only improvements in products, but it also invests in people know-how processes, equipment, and favorable work conditions. Adoption of organic farming itself is a broader form of process upgrading. Improved agronomic practices resulted in higher yields, higher production, and increased own consumption with the interviewed farmers. In addition, the certification process to an organic standard imparted skills, knowledge and experience. In case of perishable produce responsibility for post-harvest operations falls on producers and their groups. If they fail to do post-harvest operations in case of F&V, i.e., fail in the timeliness of their activities, that highly affects the quality of the final product when it reaches the buyer and ultimately to the consumer. Also, the value-added aspect associated with organic certification is lost if the quality of the end product is not acceptable to the consumer.

In the study area efforts have been made to improve post-harvest operations as well as quality management through functional upgrading. Examples of this are such as the implementation of on-farm training, a collective collection of the produce in collection center, an organization of cleaning, sorting, grading weighing, packaging, and labeling. These upgrading strategies require not only the acquisition of capabilities but also involve changing relationships with buyers and markets. The cost to the smallholder farmers group of upgrading their agronomic practices in terms of both time and money has been considerable, and their income stream has been diversified, making them less vulnerable. The challenge now is to maintain smooth and stable supply to buyers. Particularly given the current erratic rainfall patterns, it is almost impossible for small farmers to manage consistent supply and successfully processing activities. Further, the interviewed smallholder farmers were constrained by a variety of factors for upgrading such as poor infrastructure, lack of education, credit constraints, entrepreneurial skills, lack of risk-taking culture, the high cost of processing equipments and packaging materials.

As the transaction was based on the relational contract, the buyers were able to build trust with producers group. A higher degree of bridging social capital along the chain enabled the buyers to engage in concerted upgrading with producers and relational upgrading with customers. This study constituted an



example of the combination of horizontal and vertical coordination for value chain upgrading. The process relied on bridging and bonding social capital. In this case, higher levels of social capital reduced the cost of opportunistic behavior in the transactions, both within the groups and between the producers and buyers of organic fruit and vegetables. Functional, process, product, and chain upgrading requires large resource investments; horizontal coordination brings together individual assets. The smallholder producers group also developed coordination relationships among the actors between the nodes. The capacity to develop vertical relationships with other actors was achieved partly through horizontal coordination; that is, creating by grouping smallholder farmers and coordinating them. However, there is an intensive program of process and product upgrading at each of the production stages to meet organic standards (environmental and food quality), which is a prerequisite for supplying to the end markets. Further, producers who were too scattered to be clustered and who were unable to afford the costs of certification should be encompassed by a (inter) chain upgrading program and manage to integrate in the supply of fruit and vegetable to local and regional markets.

The organic movement is still in its infancy in Karnataka. The lack of storage facilities for producers of perishable products such as fruit and vegetable is a serious limitation for the development of the domestic market. Most parts of the improvements have been financed by the buyers or private organic sector partners and delivered by NGOs and government extension agencies. The domestic market found in many small-holders fresh organic produce based food chains have lower entry barriers, but upgrading possibilities are limited partly because of lack of adequate (public and private) support for upgrading. This issue of the nature and scope of institutional support is of crucial importance in their take on upgrading. Governments and donors promote small and medium enterprises as this is seen as one way to encourage competition and increase value addition. Still there is a need for the delivery of training services to finance prevented the buying of machinery. There is no specialized storage and processing equipment. Therefore, in the present case, the organic research institutes, governmental and non-governmental organizations, supermarket chains and marketing boards can help smallholder producer organizations for the improvement of organic fruit and vegetable production and processing activities

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Oral Presentations

MSAEJMU-02 Credit disbursement for agribusinesses by DCCBs- A case study of Sangli DCCB

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n agribusiness tends to be a large scale business operation and may dabble in farming, processing and manufacturing and/or the packaging and distribution of products. Agribusiness includes production, processing and supply of agricultural goods. It includes large scale sugar industries to small scale individual farming i.e. raisin making (small scale), nursery, polyhouses, poultry etc. In grape production Maharashtra occupies the first position with a production of 7.7 lakh tones from an area 0.86 lakh ha, followed by Karnataka, Tamil Nadu, Andhra Pradesh. About 63 per cent production comes from Maharashtra (NHB, 2011). Among the various agricultural commodities grape has been introduced in the cropping pattern on large extent in Western Maharashtra region of the state. Earlier in India, the grapes were mainly used for table purpose. However, due to the low prices of grapes at the time of harvesting, risk of cheating by middleman in grape marketing, being most perishable in nature and the competitive market, the grape producers started processing so as to avoid losses. It is estimated that about 40 per cent of the grapes production in Sangli district is sold only after processing in the form of raisins. The results obtained from the study would be helpful to provide guidelines regarding proper management of agribusiness units. It would provide clear picture of credit requirement, credit gap that exists because of difference between credit requirement and credit availability, income and employment generated in agribusiness units. Keywords: Credit disbursement, dabble, raisin making, cropping pattern

MSAEJMU-07

Marketing of gerbera flowers in Nagpur district of Maharashtra

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he present study entitled "Marketing of Gerbera Flowers in Nagpur District Maharashtra" was undertaken in Kalmeshwar, Saoner and Nagpur (Rural) tahsils of Nagpur district in year 2014-15 based on primary data and the sampling design adopted for the study was multistage sampling. The information about marketing of gerbera regarding total marketing cost, market margin, and price spread was computed on the basis of collection of data by selecting appropriate number of intermediaries from Nagpur market. The total capital investment in gerbera cultivation under polyhouse was worked out to Rs. 1271654.15. The cost of cultivation at Cost 'A', Cost 'B' and Cost 'C' were Rs. 444089.19, Rs. 625547.66 and Rs. 638049.66, respectively. The yield obtained by farmer for 1008 m² was 338822th number of flowers with the gross returns was Rs. 950395.71. The cost of production per flower was Rs. 1.88. The net returns obtained at various costs were Rs. 506306.52 at Cost 'A', Rs. 324848.05 at Cost 'B' and Rs. 312346.05 at Cost 'C'. The break-even point at monetary level without subsidy obtained at Rs. 1271654.00 and with subsidy was at Rs. 635827.00. The net price received by producer was Rs. 23.00 per bundle. The selling price of retailer was Rs.101.36 per bundle. The total marketing cost and market margin were Rs. 6.01 and Rs. 72.35 per bundle, respectively. Following important channel of distribution have been observed while marketing the gerbera flower under study area was Producer→Commission agent \rightarrow Retailer \rightarrow Consumer. The market efficiency in channel operated in selected market for study was calculated to 15.86. In marketing problems displeasure expressed by the growers because of very low price realized in winter season (90.00%) was major problem and it was followed by heavy commission charges (90.00%).

Keywords: Market Efficiency, market margin, break-even point

MSAEJMU-11



Marketing of roses under protected cultivation in Bengaluru rural district- An economic analysis

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The present study was intended to depict the scenario of cut flower growing enterprise under protected L cultivation in Bengaluru rural district of Karnataka state. The main objective of the study was to analyze the cost of production along with the constraints faced by cultivators in production and marketing and to suggest remedial measures thereon. The study has also covered the arrivals and prices of cut flowers in IFAB. The cultivators were selected from Doddaballapur tehsil of Bengaluru rural district purposively for the study because many polyhouses are operating in this tehsil. The cultivators were sampled from three groups viz; rose, carnation and gerbera comprising 30 cultivators from each group thus accounting to total of 90 cultivators. The data relating to marketing margins were collected from 10 wholesalers, 10 retailers and operating in the domestic market. The data relating to production and marketing of selected cut flowers were collected from the respondents for the year 2007-08. The study results revealed that the per hectare cost of cultivation worked out to Rs. 9,617.47 thousand, Rs. 10276.18 thousand and Rs.10988.94 for rose carnation and gerbera, respectively. The major costs incurred were amortized establishment cost and rental value of land. The output-input ratio was more in case of carnation and it worked out to 1.53 indicating more profit as compared to output-input ratio of rose and gerbera which were 1.40 and 1.20, respectively. The less profitability of gerbera was due to high marketing cost (Rs.0.40/flower) incurred by gerbera growers in which commission charges was predominant contributing to 40 per cent. However, the per flower marketing cost of rose and carnation worked out to Rs.0.35 and Rs.0.39, respectively. Per flower production cost of rose, carnation and gerbera worked out to Rs. 4.80, Rs. 5.98 and Rs. 5.28, respectively. The study suggests to evolve low cost green house structures and high vielding varieties indigenously which will help to reduce the cost of cultivation. Government should regulate the intermediaries by licensing and keep watch on them so that the share of producer in consumers' rupee will increase. Also, the government should provide market information to the producers. Keywords: Protected cultivation, indigenously, output-input ration, cultivars

MSAEJMU-13

Marketing of kharif potato in western region of Maharashtra

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Potato is a crop which has always been considered as the "Poor Man's Food". Potato having nutritive value and superior quality protein have the potential of farming a viable subsidiary food crop in India and may remove the nutritional imbalance. Thus, the present work has been undertaken to study the various aspects of marketing of potato with this aim in view the problem viz; "Marketing of Kharif Potato in Western Region of Maharashtra" has been taken for the year. The study were based on primary data, and selected study area was Khed tahsil from Pune district and Khatav tahsil from Satara district were selected on the basis of maximum area under potato. Three villages viz., Kadus, Shel Pimpalgaon and Bahul from Khed tahsil and three villages viz., Pusegaon, Near and Budh from Khatav tahsil were selected randomly. Fifteen cultivators from each of the village were selected randomly on the basis of size of operational holdings viz., small farmers (0.01 to 2 ha.), medium farmers (2.01 to 4 ha.) and large farmers (4.01 ha. and above). Thus, total sample of 90 potato growers were selected randomly for the present study comprising 30 small, 30 medium and 30 large farmers. The overall cost A and cost C per hectare worked out to be Rs. 42734.01 and Rs. 64463.42, respectively. Amongst the major items of cost A seed accounted Rs. 15184.68 (23.56 pre cent) followed by human labour (17.49 per cent), bullock labour Rs. 3317.15 (5.15 per cent). In the case of items of Cost C, the rental value of land was predominant one and worked out to Rs. 17246.35 (26.75 per cent) of cost C. At the overall level, the net profit was Rs. 39484.70 while the net profit in small, medium and large size groups of holding was Rs. 30762.43, Rs. 44238.73 and Rs. 38974.96. At the overall level per kilogram cost of production was Rs. 5.57 and average price received per kilogram was Rs.



8.90. The regression coefficients of human labour (X_1) , manures (X_3) , nitrogen (X_5) and phosphorus (X_6) were positive and significant at 1 per cent level of significance. The average marketing costs per quintal for potato at different markets were Rs. 112.58 at Satara market, 132.31 at Pune market and 31.35 at local market. The major item of marketing cost for potato for channel-I was commission charges Rs. 50.21 (41.00 per cent) other major items was transport charges (38.58 per cent), packing charges (16.33 per cent) and hamali (2.96 per cent). The study advocates that there should be adequate and timely supply of inputs like quality tubers, fertilizers, pesticides etc. at reasonable price, which requires stream lining of distribution channels. Provision may also be made for the supply of credit to purchase the above inputs. **Keywords:** Marketing, nutritive value, human labour

MSAEJMU-17

Loan requirements and cost of acquisition from non-institutional agencies in Maharashtra

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In agriculture, inputs are borrowed from outside the farm and the period of production is long, therefore, the role of agricultural finance is of paramount importance. Credit continues to be one of the limiting factors for small and marginal farmers and agricultural labours. It is a problem when it cannot be obtained and it is also a problem when it is not properly utilized. The availability of agricultural credit to the small and marginal farmers from the institutional sources is still difficult. Of the various sources of credit for agriculture, non-institutional credit still has dominance in total share of credit being made available to agriculture (NABARD,2011). And moreover, availability of the credit in requisite quantities and at required time is the need of the hour in agriculture. In most parts the small and marginal farmers are not in the sphere of institutional credit. The institutional financing agencies are comparatively having less contribution in the credit supply to these people. One more issue is of repayment of the loans. Due to number of reasons, there is problem of overdues in agricultural loans. It becomes therefore, imperative to know the sources of non- institutional agencies and heir role in extending the credit to such famers in Maharashtra. An attempt has been made to analyse the pattern of loan acquisition from institutional and non-institutional agencies and their magnitude and estimation of the cost of loan acquisition and overdue status of these loan.

Keywords: Acquisition, non-institutional, credit, NABARD

MSAEJMU-18

Value addition in paddy rice flakes and puffed rice

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The present study was conducted to value addition in Paddy crop and selected products were, rice flakes and puffed rice. Benefit cost ratios of these products were greater than one *i.e.* 1.46 and 1.34, respectively. Paddy (*Oryza sativa*) belongs to the genus Oryza and the family gramineae. It is one of the important cereal crops in the world after wheat. Rice is the most important staple food for large part of the world because it produces a good yield per unit area, grows well in a temperate climate. The value addition in processing of paddy in rice flakes was the highest in large size (Rs. 1954.25) followed by medium (Rs. 1852.62) and small (Rs. 1688.57) size rice flakes mills. In puffed rice mils, overall value addition was Rs. 1506.12. Whereas, in small and large size puffed rice mills the value addition was Rs.1469.45 and Rs. 1541.74, respectively. The gross returns were the highest (Rs. 2286.83) in rice flakes. The cultivators earn



a good profit from paddy production and there is also advantage of value addition in paddy and it gives good profit to processor and farmer also.

Keywords: Value addition, paddy, break-even point, B: C, fixed cost, variable cost.

MSAEJMU-28

Constraints in marketing of orange

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arketing of orange has become much delicate as it is based on and is being changed alongwith latest high techniques available in marketing system. The present investigation was therefore, proposed to probe into the details of marketing of oranges. Vidarbha region could be specified for Orange only due to the contribution of Nagpur and Amravati districts, covering about 85 percent of the area of Vidarbha region under orange. As regards the problem faced by the orange growers, majority of the sample orange growers opined that the fear of breaking contract by pre harvest contractor (63.33 percent), delay in harvesting of fruits by pre harvest contractor (51.66 percent), the commission agent generally do not give the information about rates I distant markets (41.66 percent), longer chain of intermediaries (40.0 percent), lac of storage facilities (36.66 percent). Pre harvest contractor insist on low price in the event of damage due to natural calamities (36.66 percent) and pre harvest contractor makes several deduction from the contractual amount 33.33 percent).

Keywords: Constraints, high techniques, commission agent

MSAEJMU-37

Agribusiness: A toolfor rural development in India

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ndia has been undergoing a structural transformation indicating a shift from agrarian economy towards Lagro-based activities. Today, agriculture has achieved commercial importance and has changed from subsistence forming to commercial farming, import oriented to export oriented, supply driven technology to demand driven technology etc. New input and new technologies are hitting market everyday. The market for processed and packed food product in increasing day by day and therefore there is a great scope for agribusiness opportunity. This paper discuss how the agribusiness under liberalization globalization, agribusiness has opened new vistas for growth and development of rural economy in India. The study revealed that the farm, off farm and processing component of agribusiness are capable for generating jobs, provision of income, poverty reduction and infrastructural growth for rural development in India. Keywords: Agribusiness, Indian economy and rural development

MSAEJMU-70

Marketing of grapes with special reference to Good Agricultural **Practices (GAP) in Sangli district**

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rapes though being grown across the country, however, have been commercially more exploited in the Maharashtra in general and Western Maharashtra in particular. Though grape line industry is yet to make its presence felt, table purpose marketing is widely practiced in this region many studies relating to the grapes have been carried out. This pretext, the present investigation on marketing practices, marketing cost and price spread in marketing of grapes in the selected markets has been carried out. Grape is one of the most important fruit crop grown in Maharashtra. Especially Sangli district is well known for grape growing from Western Maharashtra of the state. From Sangali district, Tasgaon and Palus tahsils were



selected. Three villages from each tahsil and 12 grape growers, 6 from each group were randomly selected from each village. Thus, in all from each village, 72 farmers were selected for study comprising of 36 farmers i.e. Adopters and 36 farmers i.e. non-adopters. Four marketing channels were identified through which the marketing of grapes was carried out. In case of adopters more than 74 per cent of the total produce was sold through channel I: (Producer- Co-operative marketing society- MAHAGRAPE- Supplier of supermarket- Retail shop of supermarket -Consumer) i.e. Export market. In case of non-adopters 63 per cent of total produce was sold through channel IV: (Producer-Fruit trader-Retailer-Consumer) i.e. On farm sale. For adopters the average per guintal cost of marketing in export market was ₹ 5106.34 and for nonadopters the overall (Distant market, Local market and On farm) per quintal cost of marketing for domestic market was ₹ 1463.13 only. For adopters the per quintal net price realized in export market was ₹ 4697.03 and for non-adopters in domestic market it was ₹ 3023. The margin per kilogram of all intermediaries was ₹ 7.39 for export market. In Indian and Local markets it was ₹ 6.14 and ₹ 5.98. In domestic market for channel-II the overall price received by the producer in Indian market was ₹ 52.71. The price per kilogram incurred by producer was ₹ 23.70. In channel-III and channel-IV the price received by producer was ₹ 47.16 and \gtrless 34.00 respectively and the cost incurred by the producer was \gtrless 16.72 and \gtrless 3.47 respectively. Keywords: Good Agricultural Practice, domestic market, cooperatives.

MSAEJMU-79

Impact of farmers' weekly markets (*Shetkari Athwadi Bazaar*) on farmers' income

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he Farmer-Consumer Markets were re-conceptualized and implemented as the scheme of Weekly Farmers' Markets by Maharashtra State Agricultural Marketing Board (MSAMB). Through these markets, with by passing and elimination of the intermediaries, fresh agriculture produce reaches the end consumers in good shape and quality with minimum post-harvest handling this result in better price realization for producer farmers and good quality produce to consumers at reasonably lower retail prices. The present paper aimed to analyze the quantitative and qualitative benefit accruing the farmers through Weekly Famers Markets (Shetkari Athawadi Bazaar). It has focused on the impact of Shetkari Athawadi Bazaar, on the increment in the farmers' income, as an alternate marketing channel. The problems faced by the farmers while selling of their produce in the market were also studied. Pune city, a district place, is one of the major cosmopolitan cities in the Maharashtra state. Pune district is well-known for growing of vegetables. Around 40 farmers' weekly markets are now running in Pune city by different farmer's companies, hence, Pune city was selected for the study. Out of 40 weekly markets, 5 weekly markets were selected and in all 50 farmers (10 farmers from each of 5 markets) were selected. The data were collected by survey method with the help of specially designed schedule, pertaining to the year 2016-17. The study was restricted to the crops viz; cauliflower, onion, okra, tomato, potato and fenugreek. The collected data were analyzed with the help of simple statistical tools such as percentages, averages, graphical and tabular method etc for interpretation of appropriate results. The study brought out that about 35 per cent of the farmers under study were young farmers. (i.e. below 30 years) and more than 70 per cent farmers had education above SSC. Majority of the farmers who were participated in the farmers market were small farmers. Famers were able to sell more than 95 per cent of the produce they brought for sale. The net price realized in farmer's market for all the commodities was observed higher than the Regulated Market i.e. Agril. Produce Market Committee, (APMC) Pune. In farmer's market, the farmers are getting comparatively higher price for their produce than the APMC market, Pune. The price difference for all the commodities under study, were ranged between Rs. 7.26 (onion) to Rs. 30.90 (cauliflower). All the farmers under study expressed that they were benefitted with better price in Farmers market, resulting into increase in their farm income. Most of the farmers stated that they were having less post-harvest losses in Farmers market than APMC market. All the farmers were satisfied because they received their payment of produce in time and at once. Majority of the farmers (90%) were satisfied with overall market operations in Farmers' Weekly Market. Unavailability of vehicle and higher transport charges for transport of the produce to the Farmers' market was the major problem faced by the farmers, as the quantum of the produce is considerably small.

Keywords: Impact, Shetkari Athawadi Bazaar, APMC, MSAMB



MSAEJMU-85

A critical study of credit and non-credit needs for boosting the apple

value chain in Kashmir

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uring the course of implementation of initial first few five year plans, priority was assigned to achieve self sufficiency in food-grains production. Over the years, horticulture emerged as an important and growing sub sector of agriculture, offering a wide range of choices to the farmers for crop diversification. Jammu & Kashmir State is well known for its horticultural produce both in India and abroad; however, the state has predominance of resource-poor farmers with small/marginal landholdings, of which about three lakh farmers are on subsistence farming. The Reserve Bank of India and NABARD through their special credit programmes and policies have played an important role in breaking the shackles of indebtedness, yet the informal sector still dominates the rural credit scene. Since agriculture continues to depend on the monsoon, it is perceived as a high risk area. The policy framework of agricultural financing has evolved over the years with the aim of creating an enablingenvironment for the smooth flow of resources to agriculture; however informal markets continue to have a substantial share. There are wide regional disparities in the disbursement of agricultural credit. Since the provision of credit is an effective way to increase farm returns under the rain fed hilly conditions, it necessitates a comprehensive analysis of the existing institutional credit system to agriculture in the state. The Non-credit needs like infrastructure, irrigation, electricity etc. being mostly clubbed by the economists in the non-formal credit, hence, the allocation to larger public expenditure in absolute terms and also as a percentage of total public outlay, compared to the past, on agricultural infrastructure and with a better institutional reorganization especially for R&D, education and extension, irrigation and flood control, seeds, organic manure and fertilizers, power, allied agriculture, including breeding, RFI's equity, flexibility, regulated mandis, land reforms and 'pucca' rural roads, is believed to facilitate larger investments in Agriculture. In this context, the study was undertaken with NABARD in the year 2015, which investigated primarily the agricultural credit and secondarily the non-credit needs, in relation to the horticultural growth in the State. The study was further conceived to analyze the overall performance of various stakeholders in apple value chain in Jammu and Kashmir with the following broad objectives: a) To make an assessment of credit and non-credit needs of apple growers and other ground level stakeholders. b) To understand the business aspects of various stakeholders in the apple value chain. The study brought some salient features in the value chain which could lead to the augmentation of apple production in Jammu and Kashmir. Keeping in view this broad spectrum, this study focused upon two districts of the valley for the collection of primary data, viz., Baramulla and Shopian, where apple cultivation is found on a large scale as these have suitable land for temperate fruits. The study explored both the profitability criteria along the value chain as also the infrastructure and non-credit aspects. Further, the study was taken up in two villages from each district, namely Mazbug and Nowpora villages from the Baramulla district and Sindhu Shirmal and Pinjoora villages from the district Shopian. Thereafter, 15 farmers each from the four villages, besides commission agents, pre-harvest contractors, wholesalers, input suppliers and retailers (two in each case from the district) were selected for the study. The secondary data was collected from the relevant secondary sources. The apple value chain in Kashmir was comprehensively analyzed in this study. The study revealed that the horticulture is an important area for development, and the valley grows mostly apple. The trends in the apple production showed that the acreage diversified towards crop increased at a faster rate during last ten years and the farmers witnessed more potential for the fruit. In this study the credit needs of the stakeholders were clubbed together so as to have an assessment of the credit requirements of the stakeholders in the study areas. The credit requirements were then proposed for the stakeholders in the all the four selected villages of the two districts in the tabular form. The study further revealed that 43.33 per cent of the farmers from both the districts avail finance from the banks. There are varying view points on the issue of bank finance. Some farmers would like to ideally use their own surplus income for apple cultivation and sales. Some farmers would actually not like to avail the bank loan considering the cultural/religious factors as regarding interest as also the issue of availing and repaying debt. There is a segment of financially aware farmers who recognize the element of benefits from judicious availment of loans also. The processing and the cold store units, the major functionaries in the value chain of apple were



also studied. It was found that no processing unit was present in the district Shopian, particularly for apple processing, but some efforts have been made in establishing the cold stores, that were 7 in number (more are in the pipeline, in fact Lassipora in Pulwama District will be a pre-eminent CA Store hub in South Asia). As far as district Baramulla is considered, one processing plant of the HPMC was set up in the Sopore block of district Baramulla with the main function of producing apple juice concentrate, however, no cold store units were as such present in the district. The study in essence revealed that there is lack of convergence between production and apple based industrial and entrepreneurial value chain. The strategic alignment of the farm, the market functionaries, the processor and the cold chain needs to be realigned for ensuring productivity and adequate returns to each stakeholder. The study further concluded that horticulture development in the two districts particularly in the selected villages should be guided not only by the objective of attaining food and nutritional security, but also by the concerns of declining profitability, environmental degradation and ecological sustainability. Therefore, horticulture based development strategies should rely on an increase in profitability, especially of the small and marginal farmers, together with the creation of employment opportunities for rural youth, both in the farm and nonfarm sector. The share of high value horticulture is increasing steadily and this segment is perishable in nature and, therefore, requires a very different approach than has been the case in food grains. The comparison with other crops has made most farmers switch over to apple in terms of returns. The detailed interaction/feedback revealed that the farmers are mostly satisfied with the cultivation of Apple but seek a more systematic value chain with an enhanced share in the ultimate consumer price. Keywords: Apple, Production, Marketing, Value chain.

MSAEJMU-134

Economics of marketing of ginger in Amravati division

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The present study of economics of marketing of Ginger in Amravati division was carried out during the year 2013-2014. The study was based on primary data. The primary data of 90 farmers were collected from tahsils of Amravati division and functionaries involved in Ginger procurement producer, wholesalers, and retailer were selected for collecting information. In case of Ginger, Producers share in consumer's rupees was highest in Channel I (Producer-Village trader-Consumer) i.e. 95.31 per cent followed by channel II (Producer-Village trader-wholesaler-Consumer) i.e. 88.84 per cent and in channel III (Producer-Willage trader-Wholesaler-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel III (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel II (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel II (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel II (Producer-Village trader-Consumer) i.e. 88.84 per cent and in channel II and III.

Keywords: Ginger, marketing channel, producer share

MSAEJMU-186

e-National Agriculture Market (e-NAM) "Linking farmer with Market"

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The e-National Agriculture Market (e-NAM), touted as the 'turning point' of India's Agriculture market sector, was launched by PM Narendra Modi on 14 April 2016. On launch day, first big step covers 23 commodities and 21 Market across 8 states. Current Status on 31st July 2017, 455 Mandis across 13 states have been integrated with e-NAM. The e-NAM platform is expected to provide information to both buyers and sellers of produce available, its quality and price at the bidding markets. A farmer, empowered with this information, can take his produce for sale wherever he gets the desired price, thereby connecting producers directly to consumers, processors, exporters or large retailers. The intent is to accrue maximum benefit to both farmers and consumers as farmers decide "when, where and at what price" they sell their produce by collapsing the long supply chain and removing the profit of the middle-man. National Agriculture Market (NAM) is a pan-India electronic trading portal which networks the existing APMC



mandis to create a unified national market for agricultural commodities. The NAM Portal provides a single window service for all APMC related information and services. This includes commodity arrivals and prices, buy and sell trade offers, provision to respond to trade offers, among other services. This portal will eventually link 585 markets by March 2018, creating a seamless national market for agricultural and horticultural produce in India. The farmers will be provided "farmer helpline services" for any information related to this portal and soil testing facilities near the mandis. For the farmers, NAM promises more options for sale at his nearest mandi. For the local trader in the mandi, NAM offers the opportunity to access a larger national market for secondary trading. Bulk buyers, processors, exporters etc. benefit from being able to participate directly in trading at the local mandi level through the NAM platform, thereby reducing their intermediation costs.

Keywords: e-NAM, agriculture market, APMC, portal

MSAEJMU-191

Dynamics of farmer clubs developed by KVK Doda

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he present paper focuses on the dynamics of formation of farmer clubs by Krishi Vigyan Kendra Doda **I** in the district, their contribution in the mobilization of the farming community and internal dynamics of the club members. Formation of farmer Clubs in district Doda was initiated by KVK Doda during the year 2014-15 in collaboration with NABARD with programmes for sensitization of the farming community about need of the farmer clubs, procedure of their formation and leadership development. Consequently, farmers from 10 villages of the district came forward and initiated the formation of farmer clubs in their respective villages under the guidance of KVK. The interested farmers were again trained to form the clubs in a systematic manner. Series of meetings with the farmers were held and consequently 10 farmer clubs with membership ranging from 14-24 farmers were formed. Their office bearers were selected through unanimous decisions of the respective club members. This followed linking the clubs with the banks, the constraints and hard experiences further strengthened the determination of KVK team. Thereafter continuous training programmes on management of farmer clubs, book and record keeping, preparing small projects, organizing meetings, working in convergence mode were imparted to the clubs by the KVK. These clubs were linked with the NABARD to get financial assistance under NABARD farmer club programme. Consequently financial assistance from the NABARD was obtained and the clubs were formally launched during the year 2016-17 with Base Level Orientation Training Programmes (BLOTP). These farmers clubs have not only become a source of mobilization for the farmers but also a platform for the convergence of the line departments there by playing an important role in the participatory extension services. Two exposure visits with in the state sponsored by NABARD and many training programmes have been conducted for these farmer clubs. A significant improvement in the knowledge, adoption, and communication behaviour has been observed in the club villages which may be attributed to the capacity building programmes and collective technology adoption. Keywords: Farmer Clubs, dynamics, NABARD, KVK, training

MSAEJMU-192

Doubling farmers income through animal husbandry and dairying

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Today, India is the larger producer of milk with a major share of total milk production worldwide, milk production has been growing at an average rate of 4-5 percent. The dairy plants are important marketing institutions in producer-consumer chain adding value to each stage of marketing. But these dairy plants are always under pressure to maintain equilibrium between producer's and consumer's interest. To achieve this, the plants should run efficiently in most optimal manner and cost of processing of milk and manufacturing different dairy product should be brought down It has been found that most of the dairy



plants are not running to their installed capacity, that one of the reason is that the availability of milk. Therefore, livestock plays an important role in the economy of farmers and dairy industry. The farmers in India maintain mixed farming system i.e. a combination of crop and livestock where the output of one enterprise becomes the input of another enterprise thereby realize the resource efficiency. Livestock is a source of subsidiary income for many families in India especially the resource poor who maintain few heads of animals. Cows and buffaloes if in milk will provide regular income to the livestock farmers through sale of milk. The animals also serve as moving banks and assets which provide economic security to the owners. A large number of people in India being less literate and unskilled depend upon agriculture for their livelihoods. But agriculture being seasonal in nature could provide employment for a maximum of 180 days in a year. The land less and less land people depend upon livestock for utilizing their labour during lean agricultural season.

Keywords: Animal husbandry, dairy, income

MSAEJMU-193

Augment the opportunities through applying agreement on sanitary and phyto-sanitary measures in small dairy farmers/dairy entrepreneur in India

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he SPS provision of AOA (Agreement on Agriculture) requires all the food & dairy product exporters L to implement international standard relating to sanitary and phyto-sanitory any default importing country is allowed to prohibit imports from defaulting countries in this agreement, this deal with food safety and animal and plant health standards. Under these agreements countries are free to adapt and apply standards in the interest food safelty and health and they have to keep the consumers informed. Importing countries may fix the levels for pesticides residues or permitted use of additives in food product. Each country has its own prescribed standards but organization like WHO and FAO provides standard but it's not compulsory to follow, Codex Alimentarious Commision (WHO and FAO)- provide safety standards for food. Application of SPS in India covers abroad spectrum of production, processing, distribution and fixation of standards should consider the local domestic markets and imported products. As fearly by developing countries the SPS measures have become a barrier to trade. Lack of scientific database and lack of sufficient research in certain areas (Afflo-toxins) are the fact with which India is expected to perform under the WTO regime. The requirements of SPS are certain legislation, training and infrastructure international linkages. Developing countries like India will benefit if developed countries would agree to treat the standard specified by Codex Alimentarious Commission as equivalent. In India the export inspection council is looking after the SPS complaint export quality control and food safety management based certification. Author has analysed the impact and opportunities of WTO and agreement on Sanitary and Phyto-Sanitary measures on small dairy farmers/ dairy entrepreneur in India through secondary data. Keywords: WTO, Agreement, sanitary and phyto-sanitory, AOA, developed countries, etc

MSAEJMU-201

Analysis of fish marketing pattern in Srinagar district of Jammu and Kashmir

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The study is based on the primary data collected from 75 fishers, 10 traders, 10 commission agents/wholesalers and 25 retailers from Srinagar fish market. The information was collected through personal interview method on well structured pre-tested schedule developed for the study. The main objectives of the study were (i) to identify the marketing channels followed in fish marketing (ii) to find



out marketing cost, margin and fisher share in consumer's rupee. The results of the study revealed that the fish of the area was marketed through three marketing channels (i) fisher-consumer (ii) fisher-traderretailer-consumer (iii) fisher-trader-commission agent/ wholesaler-retailer-consumer. The study further revealed that among all the three marketing channels identified for fish marketing, the highest percentage of fisher's share was in channel I being 93.55 per cent because of the fact that there were no intermediaries involved in this channel. Moreover the fisher's share in consumer rupee was 71.75 per cent in channel II while it was lowest 66.50 per cent in case of channel III. It was clear from the results that the absolute advantage of fisher was the highest in channel I being 145/ kg as compared to 120/ kg in channel II 118/ kg in channel III. It may be concluded from the findings that the large number of and intermediaries are involved in the fish marketing in and around the study area. In marketing of fish the fisher's share in consumer's rupee was found to be inversely related to the number of intermediaries involved in the marketing channel. The study suggested that for the efficient marketing of fish there is a need to building organized market and develop proper marketing facilities especially in regard of postharvest like processing and cold storage for increasing fisher's share in consumer's rupee. Keywords: Analysis, fisher, wholesaler, commission agent

MSAEJMU-225

An outlook of price risk in agricultural productions and institutional initiatives

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The prices of agricultural commodities are greatly influenced by the demand & supply fluctuations, speculations, hoarding etc. Moreover, agricultural production is seasonal so farmer is not able to fetch appropriate prices during production because in case of bumper production market prices will fall and owing to the perishable nature of produce and his inability to hold produce, he has to distress sale his produce. In case, if there is less production there would be higher market prices but still the farmer would not be benefited because he has not much surplus to sell. It was observed that in last few years forced/distress sale of tomatoes have been found in Odhisha, Maharashtra & Tamil Nadu. In case of coconuts it was observed in states of Andhra Pradesh and West Bengal, while in case of onion; Maharashtra, Madhya Pradesh & Odhisha farmers suffered the situation of distress sale. The government of India therefore has started various initiatives such as Minimum Support Price and Procurement price to overcome the situation of distress/ forced sale. Presently, on the recommendation of Commission for Agricultural Cost and Prices (CACP) Minimum Support Price is announced by the government for 23 crops before the commencement of agricultural season. MSP is a guarantee price for farmer's produce to protect the farmer against excessive fall in price during the bumper production. On the other hand, procurement price is price at which government buys the food grains from farmer for buffer stocking and PDS purposes through Food Corporation of India (FCI). Procurement price, in contrast to MSP is for food grains only.

Keywords: Price risk, CACP, MSP, Procurement price, PDS.

MSAEJMU-231

Impact of micro finance through SHG's on women empowerment in tehsil R.S. Pura of Jammu District

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In India, Microfinance scene is dominated by Self Help Groups [SHGs] as an effective mechanism for providing financial services to the unreached poor, and also in strengthening their self help capacities



leading to their empowerment. Micro finance is necessary to overcome exploitation, create confidence for economic self reliance of the rural poor, particularly rural women. Apart from the informal sector of finance, the formal sectors like commercial banks, NGOs etc. are taking much interest in providing micro finance to women considering it to be a profitable commercial activity. Women are also participating in micro finance movement by availing the micro-finance services being provided by various financial channels. Micro finance is the provision of financial services to low income clients, including consumers and self employed, who traditionally lack access to banking and related services. Micro credit or Micro finance, is banking the unbankables, bridging credit, savings and other essential financial services within the reach of millions of the people who are too poor to be served by regular banks, in most cases because they are unable to offer sufficient collateral. Women constitute a large proportion of micro finance beneficiaries. Present study was undertaken to highlight the role of Micro-Finance and SHGs in empowering women in R.S.Pura, tehsil of District Jammu. The study was based on both primary and secondary data. A sample of 70 women from six SHG's operational in Mottae, Kaloe, Sandhi, Balachak, Bera and Plasser Villages of Tehsil R.S Pura, was selected and structured interview schedule was prepared to elicit required information. Data was analyzed using cross tabulations, percentages and simple correlation coefficient. The results of the survey reveals that 78 percent of the respondents believe that micro finance has reduced their poverty level to some extent, 44 percent beneficiaries used the loan for starting a new business or expanding the already existing business. Almost 89 percent respondents felt that Micro finance service has a profound impact on the decision making, knowledge, self confidence and economic status of women.

Keywords: Microfinance, SHGs, NGOs, empowerment

MSAEJMU-236

Anardana as a source of livelihood for rural communities of J&K

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The study was conducted in Rajouri district of Jammu and Kashmir to document present status, scope and socio-economic profile of the families involved in collection and trade of Anardana (*Punica granatum L. 'Dhruni'*) towards better livelihood options for the rural communities. A random survey of major Anardana producing blocks Manjakote, Doongi, Rajouri & Kalakote revealed that each household in these areas collects 300-400kg of dried seed, with per household annual collection touching about 500kg above in Manjakote block of Rajouri. The study also revealed that Rajouri district came ought to be the potential producer of Anardana with 158Qtls in 2014-15. However, its commercial potential is yet to be tapped. Good Anardana fetches a price ranging 300-400 per kg at village level, whereas the local commission agents working on behalf of traders at Jammu, Amritsar or Delhi procure in bulk. It was found that in addition to fulfilling the domestic needs, each household engaged in collection of |Anardana adds an average of Rs.40,000 to their annual income.

Keywords: Anardana, socio-economic, livelihood, Rajouri

MSAEJMU-296

Power supply in agriculture and its impact on agricultural output in India

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Before independence, farming in India was mostly dependent on cattle and all agricultural work was labour based. After that, the role of technology in agriculture sector has been constantly increasing and Power is the main soul of agricultural growth which is directly contributing to the country's GDP. The objective of my study is to find out relation between the increase in power supply in agriculture and its impact on agricultural output for the last ten years. The present study is based on secondary data. After the collection of data it has been tabulated and cross tabulated for analysis. **Keywords:** Labour, technology, agriculture, GDP, power supply



Poster Presentations

MSAEJMU-04

Economics of production and marketing of marigold in Nagpur

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he present research was undertaken in Hingna and Katol tehsils of Nagpur district in the year 2014-15 with a view to examine the socio-economic characteristics of Marigold growers, examine input used, cost and returns in production of marigold. In overall 60 Marigold growers were selected for the study. At the overall level the gross cropped area was 2.85 hectares and the cropping intensity was 126.48 per cent. In kharif season, the highest area was sown under marigold crop whereas in rabi season, highest area was under wheat and gram. Among the different size groups, the highest human labour in monitory term was utilized by small (Rs.16983.64) group, whereas lowest irrigation input utilized by (Rs 2000.00) marginal size group. The per hectare cost of cultivation of marginal group farmers i.e. Cost 'A', Cost 'B' and Cost 'C were Rs.32799.54, Rs.65795.25 and Rs.69045.25, respectively. The per hectare cost of cultivation of small group farmers at Cost 'A', Cost 'B' and Cost 'C was Rs.34414.89, Rs.67865.65 and Rs70137.65, respectively. The per hectare cost of cultivation of medium group farmers i.e cost 'A', cost 'B' and cost 'C was Rs.31542.15, Rs.65038.28 and Rs.67440.73, respectively. The per hectare cost of cultivation in overall level, cost 'A', cost 'B' and cost 'C was Rs.33222.01, Rs.66209.11 and Rs69271.05, respectively. At overall level average gross returns was Rs.197200.00. Three marketing channels of distribution have been observed in marketing of marigold crop namely, Producer-Consumer, Producer-Retailer-Consumer and Producer-Wholesaler-Retailer-Consumer. The producer's share in consumer's rupee was highest in channel I i.e. 79.84 per cent followed by channel II (53.46%) and channel II (48.55%). Net price received by producer is highest in channel I i.e. Rs. 2315.54 per guintal hence selling of marigold through channel I found more remunerative. The lack of technical knowledge is the major problem in production while price fluctuation and high cost of transportation are the major problems in marketing. The production and marketing of marigold in Nagpur district could be enhanced by minimizing the constraints. Keywords: Marketing channels, marketing efficiency, economics, marigold.

MSAEJMU-29

Marketing channels and price spread in orange marketing

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The present study of orange marketing in Vidarbha region of Maharashtra state keeping in view the highest acereage under orange. The produce was marketed in local markets through three channels. Channel-I (Producer-retailer-consumer), Channel- II (Producer-Pre harvest contractor-Wholesaler-retailer-consumer), Channel III (Producer-wholesaler-retailer-consumer) The highest (76.90 percent) share of producer in consumer rupee was found to be in channel-I, while the lowest share (59.79 percent) of producer in consumer rupee was found to be in channel -II. The produce was marketed for the distant market through three channel. Channel-IV (Producer-Pre harvest contractor- wholesaler (distant market)-retailer-consumer), Channel-V (Producer-wholesaler (local market)- wholesaler (distant market)- retailer-consumer), Channel-V (Producer- wholesaler (local market)- wholesaler (distant market)- retailer-consumer), Channel VI (69.84 percent) and lowest in channel V (63.68 percent). Keywords: Marketing channels, marketing efficiency, economics, orange.



Agribusiness and food processing industry

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griculture is gradually losing the attraction of a potential occupation with the rural youth due to lower profitability. If farming can be augmented with additional income generated from agri-based industries, it will help to retain the interest of the youth in farming. Such agri-based industries should be centered in the rural hubs so that rural youth is retained in the rural areas. We have to keep in mind that 68.9 per cent of the population in our country lives in 6.40 lakh villages. Though share of agriculture to overall GDP in India has come down to 14 per cent, still 66.2 per cent of rural males and 81.6 per cent of rural females are engaged in agriculture as cultivators or labourers. Thus, agriculture based industries are very important for creating value addition in our agricultural produce and also for creating enormous job opportunities for the rural youth. This is one of the largest sectors in the global economy (USD 7 Trillion) and it is going through a transition phase in India. We produce greater than 600 million tons of food in all. Processing of fruits and vegetables is only 2 per cent in India in comparison to 80 per cent in USA and Malaysia, 78 per cent in Philippines, 70 per cent in France and Brazil, 40 per cent in China and 30 per cent in Thailand. Food Processing Sector is an important segment of the economy, constituting a share of around 9.0 to 10.0 percent of GDP in agriculture. During the last 5 years ending 2010-11, this sector has been growing at an Average Annual Growth Rate (AAGR) of around 6 per cent as compared to around 4 per cent in agriculture and 9 percent in manufacturing. Food and food products are the biggest consumption category in India, with spending on food accounting for nearly 21 per cent of India's GDP and with a market size of Rs. 9.050 billion.

Keywords: Agribusiness, food processing, agriculture.

MSAEJMU-36

Mandi reform: e-NAM

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griculture marketing is administered by the States as per their agri-marketing regulations, under Awhich, the State is divided into several market areas, each of which is administered by a separate Agricultural Produce Marketing Committee (APMC) which imposes its own marketing regulation (including fees). This fragmentation of markets, even within the State, hinders free flow of agricultural commodities from one market area to another and multiple handling of agri-produce and multiple levels of mandi charges ends up escalating the prices for the consumers without commensurate benefit to the farmer. NAM addresses these challenges by creating a unified market through online trading platform, both, at State and National level and promotes uniformity, streamlining of procedures across the integrated markets, removes information asymmetry between buyers and sellers and promotes real time price discovery, based on actual demand and supply, promotes transparency in auction process, and access to a nationwide market for the farmer, with prices commensurate with quality of his produce and online payment and availability of better quality produce and at more reasonable prices to the consumer. The creation of National Agricultural Market in India move against the backdrop of the agricultural produce marketing committee reforms, 2013 and APMC Model Act 2003 with a twin objectives of spot price discovery and real time price dissemination. National Agriculture Market (NAM) is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities. Thus, NAM is a win-win solution for all the stakeholders Keywords: APMC, e- NAM, reform, marketing.



MSAEJMU-103

Seasonal variations in arrivals and prices of greengram in Marathwada region of Maharashtra

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Pulses occupies an important place in Indian economy but these crops are cultivated in high risky region where there are uncertainties on production level, leads to wider fluctuation in arrivals of these crops in the markets which ultimately contribute to price instability. Therefore, present study was carried out to know the arrivals and prices fluctuation in greengram crop over time. Monthly timeseries data for two important markets viz. Parbhani and Nanded of Marathwada region were collected analyzed for the period of fifteen years from 2000 to 2014. Mean, inter and intra year variation, seasonal indices and relationship between market arrivals and prices by correlation method were worked out. Results showed that arrivals and prices of greengram in both markets were seasonal. Peak arrivals of greengram were observed during August to December. The lowest mean arrivals were recorded in June month (23.20 qtls. and 7.87 qtls.) in both markets. The highest degree of variation obtained in July and August in Parbhani and Nanded markets respectively. Highest mean prices were recorded during November (Rs. 3360 gtls) and lowest recorded during August (Rs. 2868.27 qtls) in Parbhani market. Whereas at Nanded market highest prices recorded in November (Rs. 3019.27 qtls) and lowest were obtained during January (Rs. 2628.07 qtls⁻¹). High degree of positive correlation was observed during 2014(0.54) and negative was observed during 2010 (-0.63) at Parbhani market. In Nanded market high degree of positive correlation observed during 2004 and 2008 i.e. (0.60) and lowest were obtained during 2000 and 2007 i.e. (-0.74). The peak prices of greengram were partly coincided with the peak arrivals month.

Keywords: Seasonal, Inter, Intra, Greengram, indices, variation, indices

MSAEJMU-110

Trade of sugar in India: A competitiveness analysis

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Export competitiveness of Indian sugar's has been comprehensively analysed to employing secondary date by using exponential function, growth instability by cuddy della index and NPC for the present study. Time series data on production, consumption, export and import of sugar was collected for the period 1990-2015 divided into three period i.e. period- I (1990-01 to 1999-00), period- II (2000-01 to 2014-15) and period-III (Overall 1990-01 to 2014-15). The present study reveals that, quantity of sugar production and consumption affects the trade balance of sugar export and found positive trade balance in Indian. The overall study reveals that, the growth in area and production of sugarcane was registered a significantly positive i.e. 1.51per cent and 1.55 per cent, respectively, whereas in productively was found non-significant. Similarly, production, consumption, export and import of sugar in India registered a significantly positive i.e. 3.57 per cent, 3.61 per cent and 21.95 per cent, respectively, whereas in import of sugar was a non-significant growth. At an overall level, high instability was found in import, export quantity, than in consumption and production of sugar. The highest instability was found in import quantity with 116.22 per cent. The study revealed that Indian sugar experienced a massive export advantages during the year 1994-95, 1995-96, 2006-07, 2010-11, and 2011-12 and rest of the year, NPC was above one which indicates that sugar is not export competitiveness in future.

Keywords: Compound growth rate, coefficient variation, instability, competitiveness, nominal protection coefficient.



MSAEJMU-116

Promotion of farmers producer company in Washim district: A way forward

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To bring reforms in the agrarian condition of the small and marginal farmers, SAFC, Ministry of Agriculture Govt. India, have taken a national level initiative for farmer Producer Company, and the movement started initially in Maharashtra. Organization of producer, especially small & Marginal farmers into Producers Company has emerged as one of the most effective pathway to address major issue in Indian Agriculture. Maharashtra is promoting small Farmers Producer organization legalizing in Farmers Producer Company. In Washim district of Maharashtra more than thousands of share holder and farmer is involved in food grain processing, seed production and marketing, fish processing and value addition. It is observed that the farmer producer company plays a bigger role in improving access to investment, technology, inputs and market linkages in the district for better realization of price for the farmers produce. It helps to organized farmers into collective group to improve their bargaining strength in market. Keywords: Farmer Producer Company, share holder

MSAEJMU-125

Price analysis of garlic for selected markets of Maharashtra

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The present study aimed to study price movement of garlic i.e. seasonal and cyclical variations, price volatility and co-integration among the major Garlic markets of Maharashtra. For study purpose the data related to monthly average prices of Garlic were collected from major APMCs markets of Maharashtra viz. Ahmednagar, Karad, Nagpur and Pune for the period 2005-2016. Moving average method was used to study seasonal variations. The econometric tools like ADF test, Johansen's Multiple Co-integration test, Granger Causality Test and ARCH-GARCH model were used to study price volatility and cointegration among different markets. The results of study showed that the prices of Garlic were higher in the month of September to January in all selected markets. The cyclical variations observed in the prices of Garlic in the selected markets. Except Nagpur market the price series of other markets showed the consequences of unit root and were stationary at first difference. The selected markets showed bidirectional Causality and influences the prices of each other. All the selected markets showed that volatility shocks in Garlic prices are quite persistent in these markets.

Keywords: ADF test, ARCH-GARCH, co-integration, Granger Causality Test.

MSAEJMU-131

e-National Agricultural Market (e-NAM): Marketing intervention

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The farming community in India gets very less price of their produce. This is mainly because their produce has to pass through many intermediaries. Traders have to get separate licences to operate in different mandis even if they are operating in the same state. Multiple licences are necessary to trade in different market areas in the same state. All this has led to a highly fragmented and high cost agricultural economy. In e-NAM single license is required to operate. The basic objective behind this e-NAM is that farmers are able to sell their crops to buyers anywhere in the country electronically. The e-NAM is basically meant to increase the choice of the farmer when it comes to sell his produce. Farmers can sell the



produce to local traders as well as to traders in other states who are not even present physically. It is a pan India e-trading portal to be deployed in selected wholesale mandis across the country which will be expanded to cover the mandis across the whole country. More options for sale to the farmers are provided thereby increasing their bargaining power ultimately leading to their empowerment. The local traders can access to a wide variety of produce because it can have access to a larger market at the national level. All the stakeholders producers, buyers, processors, exporters stand to gain as it will reduce the brokerage and commissions. The integration of all the mandis in different in the e-NAM platform will lead to a single window solution for all the issues like issue of licences, levy of fee and movement of produce. The e-NAM is also supposed to bring major infrastructural reforms in the APMC mandis, will give higher returns to the farmers due to low transaction costs and promotion of value chains ultimately leading to stabilization of prices. Software for the e-NAM will be provided to all the states by the center without any cost. The central government has also decided to deploy a trained person for one year at all the mandis to facilitate the smooth functioning of the e-NAM portal. Farmers will also be provided helpline services around the clock. It will also bring transparency in the whole transaction and also remove information asymmetry Provision of soil testing laboratories in or near the selected mandis will cater to the soil testing needs of the farmers who will visit them.

Keywords: e-NAM, agriculture, marketing.

MSAEJMU-136

Marketing channels and price spread in goat marketing of Osmanabad district in Maharashtra

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oat being one of the earliest domesticated animals is known for its relatively longer association with Under being one of the contract additional additional additional for the contract of the contr rarely its milk is being used. Goat milk has high nutritive value. Goat milk is easy to digest than cow milk because of small fat globules and is naturally homogenized. Goat milk is said to play a role in improving appetite and digestive efficiency. Goat milk is non-allergic as compared to cow milk and it has anti-fungal and anti bacterial properties and can be used for treating urogenital disease of fungal origin. Casein in its milk makes it a preferred food for children with lever affection and convastescent adults invalids. Goat milk can be steady source of income. However, Osmanabadi goat is very important breed in Marathwada region. It is essential to study the economics of Osmanabadi goat rearing. The present study is analytic oriented. Hence, structural inter-relationship among various variables of the system can be known. The present study was undertaken in Osmanabad district to study the economics and marketing of goat by using primary data, collected by survey method. Multistage sampling design was adopted in selection of district, tehsils, villages and goat rearers. A sample of 60 goat rearers was drawn from selected villages randomly. From each village 6 goat rearers were selected. Four groups of goat units viz. small, medium, and large were considering for study. The information was however, collected for group of 60 goat rearers. Tabular analysis, linear regression analysis and frequency and percentage were used to accomplish the objectives of the study. The results revealed that Cost incurred by producer for one goat was higher in channel-V (Rs 41.76) as compared to channel-IV (Rs 38.01), channel-I (Rs 21.08), channel-III (Rs 13.68), and channel-II (Rs 13.41). Among the various channels of marketing of goat, channel-I (producer-consumer) has highest producer's share in consumer's rupee was 99.35 per cent. Keywords: Goat, marketing channels, price spread.



MSAEJMU-306 Exploring the returns and marketing of radish in vegetable cluster of Chenani

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The present study Cost Benefit analysis and Marketing of Radish vegetable was conducted in Kosar village of Chenani block. For this 25 vegetable growers, and 5 village trader, wholesalers, retailers were selected in the study area and narwal market, respectively. The data were collected with the help of specially tested schedule by personal interview method, using multistage random sampling method for the year 2014-15. The study revealed that the cost of cultivation per hectare for radish over the cost C* was found to be Rs.39055.68/ha and the net return over cost-C* was found to be Rs.160944.32/ha. The B:C ratio was found to 4.12 for radish. It represents that vegetable cultivation is a profitable venture. The study identified Producer to Forwarding/ Commission Agent (Narwal) to Retailer (Jammu) to Consumer as the best channel for marketing of radish and producer's share in consumer's rupee was found to be 50 per cent. Per quintal marketing cost incurred by producer was Rs. 436.64 whereas at retailer's level it was Rs. 105.00 per quintal.

Keywords: Radish, marketing, cost-benefit analysis

MSAEJMU-148

Constraint analysis in fish marketing in Ganderbal district of Kashmir Valley

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The main aim of the study is to analyse the various constraints faced by the fishers in the fish marketing in the study area. The study is based on the data collected from 110 fishers randomly selected from Ganderbal district of Jammu and Kashmir. The information was collected through personal interview method on well structured pre-tested schedule developed for the purpose. The results revealed that most severe constraints, reported by majority of fishers (94.55%) were that the fishers of the study area got low price of their fish. The second most severe constraints, reported by 88.18 per cent fishers was that the absence of cold storage facility. The 80.91 percent of fishers reported that they did not have the knowledge about market information. The 79.09 per cent fishers reported the constraint related to small number of fish traders. The constraints, reported by 75.45 per cent fishers was about most of the fishers being depends on wholesaler. The 63.64 per cent fishers reported that the constraint about the lack of transportation facilities. It may be concluded from findings that the Government should consider the challenges faced by the fishers of this region encourage fish marketing by building organized market and develop proper marketing facilities especially in regard of cold storage and transportation. **Keywords:** Fish, marketing, constraints.

MSAEJMU-155

Perception of farmers towards field trip (Shivar pheri) of Dr. PDKV Akola

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On the eve of University foundation day i.e. 20th October, every year three days field trip (Shivar Pheri) is organized at mega level by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. During this 3 days all the scientist remain present on their respective field, to disseminate the information about agriculture and to deliver the information about university developed technology. A dialogue between farmers and



scientist helps to nullify the barricades in adoption of innovative technologies because individual or face to face method are probably most used extension method in whole university. After this field visit at the end of day, there is a interface programme between scientist and farmers, where farmers asked the queries about the field visit or problems faced by them in their farm. Likewise, taking in consideration the huge response of farmers from 11 district of Vidarbha, it is decided to make the analysis of the field trip, so that it would be feasible to increase the effectiveness of the programme.

Keywords: Field trip, field trip, extension.

MSAEJMU-177 Self-help group as integrated extension service approach of integrated farming system

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Integrated Farming is an innovative concept to improve farm productivity in a sustainable manner through integrating various farm resources and recycling various farm and home wastes. The main objective of Integrated Farming is to integrate the farm, animal and human wastes into useful and productive components such as for the manufacture of vermicompost, biogas and production of crop pest repellents, thereby reducing input cost for farmers. Any technology must be farmer friendly and this integrated farming is feasible and helps the farmers to easily perceive and adopt. Nearly five to ten interventions must be demonstrated in this integrated farming program which is location specific, technically feasible, economically viable, eco-friendly and most important is that these technologies should support farmers to generate incomes on daily, monthly, seasonally and annually. This type of approach towards farming will definitely help farmers to increase income and ultimately to the uplift livelihood of the family. Integrated Farming helps the small and marginal farmers in reducing the input cost and increasing the yield. Integrated model will educate the farmers on the value of resources (wastes) in both their fields and homes and the technology will help them to convert these resources (wastes) into wealth. By adopting integrated farming models the economy of farmers will definitely improve if they realize and adopt the integration of all beneficial and adaptable technologies on their farm. Here the time is demanding that farmers should adopt more than one enterprises or technologies which will help them to generate additional income other than income from regular cropping system. In this context of Self Help Group as integrated extension service center i.e. multidisciplinary team will impart technical know-how in farming for farmers and it will play a vitally important role in imparting new and beneficial technologies in the form of additional enterprises and for regular cropping system to generate more income. Keywords: Integrated farming system, integrated extension service.

MSAEJMU-183

Cost of production and growth performance of indigenous calves fed with different concentrate mixture

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The present study was undertaken to evaluate the "Studies on cost of production and growth performance of indigenous calves fed with different concentrate mixture". Fifteen Indigenous calves were selected and divided into three groups on the basis of nearness to age and body weight. Feeding trials were conducted with three treatments *viz.*, T_1 - Readymade concentrate (Sugras), T_2 - homemade concentrate-I, T_3 - homemade concentrate- II and in all the treatments dry fodder was fed ad. lib and quantity of green fodder + concentrate mixture was provided as per requirement of the basis of feeding standards. It was observed that the higher CP (19.28%) and EE (4.05%) in homemade concentrate-I while, homemade concentrate-II was higher in CF (12.24%) and NFE (60.49). The daily dry matter intake per 100 kg body weight of Indigenous calves was higher in T_2 followed T_1 and T_3 treatments. The highest total



kg/ day/ head body weight gain of Indigenous calves was observed in treatment T_2 (0.392), followed by T_3 (0.336) and lowest in treatment T_1 (0.313). Same trends were noticed in respect to *viz.*, height, length and chest girth of calves. The feeding cost/ kg body weight gain was lowest in T_2 followed by T_3 and T_1 treatment. It was concluded from the results that the feeding of homemade concentrates-I (Maize 30% + GNC 20% + Wheat bran 28% + Turchuni 20% + Minerals mixture 1% + Common salt 1%) was economical for better growth performance of Indigenous calves. **Keywords:** Indigenous calves, concentrate mixture

MSAEJMU-184

Price forecasting of mango in Varanasi market of Uttar Pradesh

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The attempt has been made to forecast the price of mango using ARIMA model in one of the major market of Uttar Pradesh as the state ranks first position in production of mango in India. Varanasi market was selected purposively on the basis of second highest arrival market of mango in the state. Using ARIMA methodology on the monthly prices of mango collected from the Agricultural Produce Market Committee (APMC), Varanasi for the year 1993 to 2015. As the mango fruit having property of alternate bearing, only six month data from March to August was available in the market and accordingly had been used for forecasting analysis using E-views 7 software. The results have revealed that the price in selected market was found to be highest during the start of the season using ARIMA (1,0,6) model, confirming the validity of model through Mean Absolute Percentage Error (MAPE). The MAPE was found to be less than 10 per cent for one step ahead forecast of year 2015. Forecasted price for the month of March was almost doubled than the price of other months. It indicates the necessity of adopting pre and post-harvest management technologies for getting the benefit over increase in prices. **Keywords:** Mango, ARIMA, Forecasting, Price, Uttar Pradesh

MSAEJMU-214

Marketing constraints of mushroom production in India

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There is no denying the way that production of mushrooms in India has gone up over the most recent couple of years yet it has additionally exacerbated its showcasing issues. In this manner, endeavors to increase the production of mushrooms without taking care of its showcasing issues would be counterprofitable. Marketing of mushrooms in India isn't yet sorted out. It is the simple system of producers selling directly to retailer or even to consumer, which has its own impediments. Fresh mushrooms have short time span of usability, can't be transported to long distances without refrigerated transport facilities and are sold in restricted markets in and around production units. The cultivation of mushrooms during the time under controlled condition is limited to couple of business units and 30-40% of the production is being done under the natural conditions amid the winters. Per capita utilization of mushrooms in India is under 50 g as against over a kg in different nations. There has not been any genuine push to advance the item, to reinforce and grow the market with a specific end goal to expand its utilization. Many methods maybe employed to solve the marketing constraints of mushrooms in India viz., development of the market area and reinforcing the demand, formation of cooperatives for sale and diminishing the cost of production and cutting down the sale price to boost the demand, respectively.

Keywords: Mushroom, Marketing, Production, Constraints, Demand.



MSAEJMU-217

Marketing of fish products in Srinagar market of Kashmir valley

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The main aim of the study is to documents the availability of fish products in the Srinagar market. The study is based on the data collected from 75 consumers randomly selected from Srinagar district of Kashmir valley. The information was collected through personal interview method on well structured pretested schedule developed for the purpose. The results revealed that the main products available in the market are dried fish, smoked fish, battered fish, fish kabab, fish cutlet and fish ball. Dried and smoked fish dominate the market in winters when fresh fish is not available as per demand of the market. Fish ball, fish kabab, fish cutlet are readily available throughout the year as most of the people prefer ready to eat/ convenience products due to the working nature of the both male and female family members in nuclear family system. There is a huge potential for the ready to eat fish and fish products as majority of the population is non-vegetarian. People are turning to low fat foods due to health awareness and increased purchasing power. It may be concluded from findings that there is an immense potential for the value added products of fishes in the area so there is need to popularise value added products and fetch the remunerative price.

Keywords: Fish, marketing Kashmir, Ganderbal.

MSAEJMU-266 Trends in area, production and productivity of paddy in Marathwada

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The study based on secondary sources data were analyzed to obtain estimates district-wise trends in area, production and productivity of paddy in Marathwada during different time periods The data were obtained for the period of 53 years beginning with 1960-61 to 2012-13. The data were divided into three sub periods i.e. period-I (1960-61 to 1969-70) for 10 years, period-II (1970-71 to 1990-91) for 20 years, period-III (1991-92 to 2012-13) for 23 years and overall period (1960-61 to 2012-13) for 53 years. The area under paddy in Marathwada has decline during the entire period under study. However, it positively increased during period-I. Region as whole, the area and production was negatively significant and productivity was negative but non-significant. It indicates that production of paddy was decline by due to area decline during the overall period in Marathwada region. It concluded that, the decline in area under paddy during overall period may be due to the shifting of area towards cotton and soybean crops as a substitution crop. As a result of decline in area, the production also declines. The study suggests that the efforts should be made to improve the productivity of paddy in order to increase paddy production in Maharashtra.

Keywords: Production, paddy, trend, Marathwada.

MSAEJMU-294

Economics of production and marketing of chilli in Amravati district

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Vegetables are one of the important aspects of the horticulture sector of India in particular and of the agricultural sector of India in general. Various factors have led to the rise in the area under production of vegetables in India. India continues to the second largest producer of vegetables in the world next to china. During 2013-14, the area under vegetables is estimated at 9.4 million ha with a production of 162.9 million tonnes in India. For this period the total vegetable production was highest in case of West Bengal



(23,045 thousand tonnes) followed by Uttar Pradesh (18,545 thousand tonnes). While in Maharashtra the area under vegetable was (726.00 thousand ha) in 2013-2014 with the production of (10161.83 thousand tonnes). Per capita availability of vegetables in the country is 376.8 (in gms/person/day). Chilli (Capsicum annum L.) is one of the most important commercial spice crops of India. Chilli is used in number of activities such as vegetables, spice, condiments, sauce, pickles. Chilli occupies an important place in Indian diet and it is indispensable item in the kitchen as it is consumed daily as condiment in one or the other form. In this study an attempt has been made to study the "Economics of chilli production in Amravati district" with view to work out the economics chilli production. The economic analysis of data indicating that cost 'C' was found to Rs. 168507.96, Rs. 181705.77 and Rs 184739.08 per hectare for small, medium and large growers respectively. Net returns over cost 'C' was Rs. 80619.40, Rs. 93008.90 and Rs. 107722.00 per hectare and input-Output ratio at cost 'C' was 1.48, 1.51 and 1.58 for small, medium and large growers respectively. There are three channels prevailing in the marketing of chili, namely; Producer-Consumer, Producer-Retailer-Consumer and Producer-Wholesaler-Retailer-Consumer. The price spread through cannel-I were Rs. 214.80 per quintal. In case of channel-III the price spread of chilli was Rs. 923.26 per quintal. The marketing efficiency of chilli in channel-I was 24.02. In case of channel-III marketing efficiency of chilli was 8.24.

Keywords: Vegetables, marketing channels, economics

MSAEJMU-295 Changing trends in agricultural marketing with advancement of ICT

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In India, agriculture is still the basic livelihood source to almost 80% of small and marginal farmers and this sector contributes 13.7% of GDP, though its contribution to the overall Gross Domestic Product (GDP) of the country has fallen from about 30% in 1990-91 to less than 15% in 2011-12, and 6.1% in 2017 a trend that is expected in the development process of any economy. Agriculture still forms the backbone of development. To overcome this drift the demands for information are changing, from crop-technology and packages of practices in the 1960s and 70s to the focus shifting to market prices in national and international markets and value-addition opportunities. In recent times, e-mail facility, social media helped in covering the large distance in the shortest span of time. Thus, acting as an enabler and breaking all hindrances caused by cost, distance and time. In India, use of mobile phone is penetrating in the rural areas at a fast rate. The rural tele density in 2009 was 16.61% which increased to 38.4% in 2012. The Information and Communication Technologies have facilitated the design of solutions to deliver government services for social development at the door step of villagers. Today these digital devices are also being used more specifically in agricultural marketing for making use of informed decisions. The market price information help actors in agriculture value chain make informed decisions that promote efficient production and trade. It is especially valuable for the producers that sell in local and regional markets. It also facilitates spatial distribution of products from rural areas to towns and between markets (FAO) a big enabler for the section of the population which has remained unreached by other technology. Recent studies show that mobile phone coverage alone lead to significant market efficiencies and helped fisherman increase profit by 9% and consumer prices declined by 4% in Kerala. In Sri Lanka, the Gherkin farmers were able to improve their incomes through simple mobile phones applications that helped reduce waste by information received via short message service (SMS). The study found that up to 40% of crop loss could be prevented with quick ICT interventions. This highlights the fast growth of mobile telephony in India and the emerging developing countries of Asia with their key role in reducing information search costs and information asymmetries and increasing market efficiencies.

Keywords: ICT, Agricultural Marketing, Technology





Effect of foliar application of micronutrients on the growth and development of plum fruits (*Prunus domestica* L.), local cv. Choggander

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A field trial was conducted to study the effect of foliar application of micronutrients on growth and development on Plum fruits at farmer's field in district Poonch, Jammu and Kashmir. Poonch is one of the under developed hilly region of Jammu and Kashmir bordering with Pakistan and having total population of 3.75 lakhs. The experiment was carried out in CRD design by selecting ten years old eighteen trees with six foliar treatments and three replications T₁: Zinc (Zn) 1%, T₂: Zinc (Zn) + Boron (B) {1% each}, T₃: Zinc (Zn) + Iron (Fe) {1% each}, T₄: Zinc (Zn) + Iron (Fe) + Boron (B) {1% each}, T₅: Zinc (Zn) + Iron (Fe) + Boron (B) + Copper (Cu) {1% each}, T₀: Control. It was observed that the maximum fruit weight, length, diameter and yield were obtained in T₆: Zn + Fe + B + Cu (1% each) followed by T₅: Zn + Fe + B (1% each) and lowest reading was obtained in T₀ Control. Keywords: Plum, micronutrients.

MSAEJMU-303

Potential of off-season vegetable production in hilly regions

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Vegetables play an important role in human diet by making it balanced and provide most of natural elements viz. vitamins, minerals, fibers, carbohydrates & supplementary amount of proteins. In hills, off season vegetables production is a profitable enterprise. The agro-climatic conditions in the hills are very eco-friendly during summer or rainy season when these cannot be grown in the plains of India due to high temperature. The off season vegetable have a special significance because of their pertinent flavor, taste, aroma, delicious and nutritious nature. The vegetable crops are usually short seasoned and fit well in the cropping system. The major part of district Doda is temperate & sub-temperate. Therefore, the season from March to October can be well utilized for growing most of the vegetable crops. The unavailability of these vegetables in plains especially the metropolitan cities can help to fetch higher prices of vegetables for the farmers of hilly region. The hilly areas possess a vast potential for growing off-season vegetables on commercial scale. Therefore, more emphasis need to be given on extension of offseason vegetable cultivation in unexplored pockets of hilly district of Doda of J&K State. Keywords: Off-season vegetables, hills, Doda district





MSAE National Conference 2017



Theme - IV

Impact of Farmers' Interventions

Lead Papers	:	03
Oral Presentations	:	22
Poster Presentations	:	58
Total	:	82



Lead Paper - VIII

Krishi Vigyan Kendras for enhancing agricultural growth and income

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Introduction

K rishi Vigyan Kendras are the major institutions in India engaged in location specific research and extension of technologies generated. The better approaches of impact assessment can help in assessing the real contribution of these institutions in agricultural growth and enhancing farmers' income in India. The first Krishi Vigyan Kendra, on a pilot basis, was established in 1974 at Pondicherry under the administrative control of Tamil Nadu Agricultural University, Coimbatore. At present, there are 675 KVKs in the country working for development of agriculture and allied activities at district levels under the administrative control of different agencies as below:

Agency	No.
Agricultural Universities	456
ICAR Institutes	63
NGOs	102
State Governments	36
PSUs	3
Other Educational Institutions	15
Total	675

A recent study conducted by National Institution for Transforming India (NITI) Aayog (Suri, 2016) highlighted the need to strengthen the KVKs more in terms of infrastructure, human resources, reviewing and expanding the mandate, besides addressing the shortcomings to cater to the changing needs. It recommends that there is a need for a uniform procedure for transfer of technology from research labs to KVKs at a faster pace; measures to be adopted to increase the outreach of KVKs by adopting innovative techniques (such as forming farmers groups, train farmers'- trainers, redefining cluster approach, continuous interaction at village level, improved demonstration and use of Information & Communication Technology), exemption of KVKs from unrelated duties and re-look into the existing policies regarding subsidies, capacity building of KVK staff, better distribution of inputs, etc.

Objectives of Krishi Vigyan Kendras

The Krishi Vigyan Kendras have been established with the following objectives:

- Conducting baseline survey of the operational area in order to prepare the resource inventory with special reference to identifying the training needs of the farming community.
- Planning and conducting production- oriented, need-based short and long duration training courses both on campus as well as in the villages for various target groups with priority on the weaker and the poor.
- Developing and organizing non-formal educational programmes by way of field days, farm visits, farmers fair, radio talk, Farm Science clubs etc. as the follow up information support to training courses.
- Organizing farm science clubs, both in rural schools and in villages in order to induce in younger generation a liking for and an interest for agricultural and allied sciences and scientific farming through supervised projects.
- Developing and maintaining the campus farms and demonstration units on scientific lines as the facilities for providing work experience to the trainees as also disseminating the latest technical knowhow.
- Providing practical facilities of the Kendra to the teachers and the students of the vocational agriculture of the higher secondary schools.
- Imparting some general education to rural illiterates and school drop-outs in order to make them not only good farmers but also better citizens.



- Providing added training facilities in the areas for home making and nutrition education for rural community.
- Gradually enlarging the training facilities to encompass other important areas such as home crafts, cottage industries etc. consistent to the requirements of the integrated rural development in collaboration with concerned organization.
- Implementing all such schemes of the ICAR and other related organizations which intend to strengthen the training programmes of the Kendra.

The KVKs thus are the down-to-earth institutions committed to vocational training, transfer of latest technologies, on farm research and thus, serving as the light house for overall rural development in the district. The activities of the KVK include technology assessment, refinement and transfer, aiming to bridge the gap between the technology developed at the research institutions and its adoption at the field level by the farmers through demonstration of technology/ products etc. and training of farmers, rural youths and extension personnel. On the basis of "India-2002", there were 578 rural districts spread over the country and this figure has further been raised to 602 districts as per the latest data available on the internet report of NIC.

Focus of KVKs in coming decade

The focus of KVKs in the coming decade shall be on the popularization of agricultural technologies useful for promoting agriculture income and growth.

Integrated Nutrient Management

The aim of Integrated Nutrient Management (INM) is to integrate the use of natural and man-made soil nutrients to increase crop productivity and preserve soil productivity for future generations (FAO, 1995a). Rather than focusing nutrition management practices on one crop, INM aims at optimal use of nutrient sources on a cropping-system or crop-rotation basis. This encourages farmers to focus on long-term planning and make greater consideration for environmental impacts.

INM relies on a number of factors, including appropriate nutrient application and conservation and the transfer of knowledge about INM practices to farmers and researchers. Boosting plant nutrients can be achieved by a range of practices covered in this guide such as terracing, alley cropping, conservation tillage, intercropping, and crop rotation. Given that these technologies are covered elsewhere in this guidebook, this section will focus on INM as it relates to appropriate fertiliser use. In addition to the standard selection and application of fertilisers, INM practices include new techniques such as deep placement of fertilisers and the use of inhibitors or urea coatings (use of area coating agent helps to retart the activity and growth of the bacteria responsible for denitrification) that have been developed to improve nutrient uptake.

Integrated Pest Management

Integrated Pest Management (IPM) is an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides. A well-defined Integrated Pest Management (IPM) is a program that should be based on prevention, monitoring, and control which offers the opportunity to eliminate or drastically reduce the use of pesticides, and to minimize the toxicity of and exposure to any products which are used. IPM does this by utilizing a variety of methods and techniques, including cultural, biological and structural strategies to control a multitude of pest problems.

Production and Management of Livestock

Scientific management of livestock is very crucial for enhancing farmers' income and growth. KVKs are advocating the inclusion of one scientist as an expert in animal production and management for boosting the productivity of animals and animal products.

Organic Agriculture

Organic agriculture systems and products are not always certified and are referred to as "non-certified organic agriculture or products". This excludes agriculture systems that do not use synthetic inputs by default (e.g. systems that lack soil building practices and degrade land). "Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical


methods, as opposed to using synthetic materials, to fulfil any specific function within the system." Three different driving forces can be identified for organic agriculture:

Consumer or market-driven organic agriculture

Products are clearly identified through certification and labelling. Consumers take a conscious decision on how their food is produced, processed, handled and marketed. The consumer therefore has a strong influence over organic production.

Service-driven organic agriculture

In countries such as in the European Union (EU), subsidies for organic agriculture are available to generate environmental goods and services, such as reducing groundwater pollution or creating a more biologically diverse landscape.

Farmer-driven organic agriculture

Some farmers believe that conventional agriculture is unsustainable and have developed alternative modes of production to improve their family health, farm economies and/or self-reliance. In many developing countries, organic agriculture is adopted as a method to improve household food security or to achieve a reduction of input costs. Produce is not necessarily sold on the market or is sold without a price distinction as it is not certified. In developed countries, small farmers are increasingly developing direct channels to deliver non-certified organic produce to consumers. In the United States of America (USA), farmers marketing small quantities of organic products are formally exempt from certification.

Water Management including PIM

Water management includes efforts aimed at increase in crop water productivity (an increased in marketable crop yield per unit of water transpired) through irrigation; decrease in water losses through soil evaporation that could otherwise be used by plants for their growth, and increase in soil water storage within the plant rooting zone through better soil and water management practices at farm and area-wide (catchment) scales. Participatory Irrigation Management (PIM) refers to involvement of Irrigation users in all aspects of Irrigation Management and at all levels. The aspects include the initial planning and design of new Minor Irrigation Projects (MIP's), their construction, supervision as well as improvement and also for decision making, operation and maintenance (O & M), monitoring and evaluation of the system.

Agri-Business and Marketing

While the demand for traditional agricultural economics is diminishing, there is a growing need for the economics and management of the food sector and the environment. KVKs are promoting crops suitable for agribusiness, so that farmers can earn remunerative price for their produce.

Orientation on Centrally Sponsored Schemes (CSSs)

The present government has introduced number of programmes for welfare of farmers, farm women and agriculture sector as a whole. KVKs are front runners in creating awareness among farmers for better utilization of Centrally Sponsored Schemes (CSSs) and programmes.

The agricultural extension system in the country is heavily burdened with performance of multifarming activities in the field. The system acts as liaison between the researchers and the farmers. Extension personnel are assigned the responsibility of conveying research findings from the scientists to the farmers and feeding back the impressions from the farmers to the scientists. The new dimensions of marketing may overburden them and become an agenda beyond their comprehension and capability. In the light of this scenario the extension personnel are required to be motivated to learn the new knowledge and skills of marketing before assigning them marketing extension jobs to establish their credibility and facilitate significant profit for the farming community. Today advanced and scientific agriculture is considered as professional industry and enterprise. So crop should be grown to earn as much profit as possible. Emphasis should be given on climate-based extension education by devising training programmes, Market-led extension, demonstrations etc to the farmers empowering them to adopt improved technologies for higher yields and other high-tech ventures. For this purpose the farmers need to know the answers to questions like what to produce, when to produce, how much to produce, when and where to sell at what price and in what form to sell their produce. In responding to such questions the extension system should be oriented with knowledge and skills related to the market with the objective to improve the quality of agricultural production to compete in the market particularly in the global market. We have to accept the concept and paradigm of market-led extension and find out the new thrust areas in market-led extension in the interest and welfare of farming community.



Lead Paper - IX

Assessing the impact of Government schemes and programmes in agriculture

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Introduction

The contribution of agriculture in Indian national income has declined from 36.4% in 1982-83 to 13.7% in 2014-15. Agriculture still remains a fundamental sector accounted for about 54.6% of employment in the country. The importance of agriculture is also recognized by the central government, as indicated by the budget 2016-17. There are certain specific steps taken by the government of India in terms of innovative schemes for agriculture and farmers. An amount of Rs. 35,984 crore has been earmarked for agriculture and farmers' welfare with the aim to double farmers' income in next five years. The budget focused on providing farmers the income security and improved access to markets. If we want to achieve second green revolution and long term sustainable agricultural growth, the budgets have to make consistent efforts to address agriculture.

Agriculture is a state subject in India and it must be so, because the policies framed should fulfill the requirements of local farmers and local area. But whether agriculture is taken seriously in state budgets is the question. The states are increasingly become dependent upon central assistance to support agriculture, as they found little resources to spend on agriculture. The central government has a huge responsibility of managing the distribution of food grains at every nook and corner of the country which requires proper maintenance of buffer stocks and effective functioning of public distribution system. Therefore, the majority of the new agricultural initiatives implemented at state levels are mainly through centrally sponsored schemes.

Centrally Sponsored Schemes

Rashtriya Krishi Vikas Yojana (RKVY), National Mission for Sustainable Agriculture (NMSA) including Mission for Integrated Development of Horticulture (MIDH) & National Mission on micro irrigation (NMMI), National Mission on Medicinal Plants (NMMP), Accelerated Irrigation Benefit Programmes (AIBP) & National Mission on Agricultural Extension and Technology (NMAET) are the major centrally sponsored schemes contributing to improve our agriculture at state levels. Even Krishi Vigyan Kendras working at district levels for dissemination of latest agricultural technologies are fully funded by the Indian Council of Agricultural Research. The budget 2016-17 concentrates on increasing area under irrigation to the tune of 28.5 lakh hectares area through 'Pradhan Mantri Krishi Sinchai Yojana' to be implemented in mission mode. The fast implementation of languishing irrigation projects under AIBP scheme, as emphasized in the budget, will bring rainfed area into assured irrigation. The hilly states like Jammu & Kashmir can avail benefits for development of irrigation through introduction of drip and sprinkler irrigation. The Commission for Agricultural Costs and Prices (CACP) announces minimum support price for major crops to ensure remunerative price to the farmers, but somehow we cannot able to extend the benefits to every farmer. The central budget introduced 'Unified Agricultural Marketing e-Platform' to provide a common e-market platform for wholesale markets.

The agriculture & allied sector in the state of Jammu & Kashmir contributes about 19.46% of Gross State Domestic Product. In the budget 2016-17 of J&K, the state proposes an outlay of 15.38% and 6.91% of total revenue and capital expenditures respectively on agriculture. In present scenario, it is of utmost importance to disseminate the knowledge about centrally sponsored schemes in agriculture to the ultimate clientele i.e. farmers. Some of the latest programmes implemented by Indian Government for welfare of the farmers are mentioned as below:

Pradhan Mantri Krishi Sinchai Yojana

The main objectives of the scheme are to

Provide artificial irrigation facility to 6 lakh hectares of arable land.



- Provide drip irrigation to 5 lakh hectares of arable land.
- Investment for irrigation projects to be made directly at field-level.
- Increase water usage efficiency on farms and hence minimize wastage of water.
- Assured irrigation to encompass greater arable land area.
- Adopt advanced technologies for saving water and precision irrigation

Pradhan Mantri Fasal Bhima Yojana

The main objectives of Pradhan Mantri Fasal Bhima Yojana are:

- To provide insurance coverage and financial support to the farmers in the event of failure of any of the notified crop as a result of natural calamities, pests & diseases.
- To stabilise the income of farmers to ensure their continuance in farming.
- To encourage farmers to adopt innovative and modern agricultural practices.
- To ensure flow of credit to the agriculture sector.

Soil Health Card Scheme for every farmer

The main objectives of the scheme are to

- Provide soil health cards to 14 crore farmers in 3 years.
- The card which will carry crop-wise recommendation of fertilizers required for farm lands.

PM Kaushal Vikas Yojana

The scheme is launched by Ministry of Skill Development & Entrepreneurship (MSDE). Skill development in agricultural activities is now covered by Agriculture Skill Council of India (ASCI).

National Rural Livelihood Mission (NRLM)

The scheme of National Rural Livelihood Mission (NRLM) involves:

- A Self Help Group (SHG), of 10-20 women in general (5-20 in difficult areas) is the primary building block of the NRLM institutional design. NRLM would promote SHGs with exclusive women membership.
- NRLM is working with groups of exclusive women membership because it recognizes that women are marginalized in the economy, in polity and in society.
- NRLM will especially focus on women headed households, single women, women victim of trafficking, women with disability and other such vulnerable categories.

Public policy is determined by a range of political institutions, which give policy legitimacy to policy measures. The public extension system is already under severe criticism for its inability to deliver the services. In the light of this, the challenge remains to motivate the extension personnel to learn the new knowledge and skills of marketing before assigning them marketing extension jobs to establish their credibility and facilitate significant profits for the farming community. The present extension system suffers from several limitations of stationery, mobility, travel allowances, personnel development, etc. There is a dire need to upgrade these basic facilities and free the extension cadres from the shackles of the hygiene factors and enthuse them to look forward for the motivating factors like achievement, job satisfaction, recognition etc.

Impact assessment of Government policies

Impact assessment is the process of identifying the future consequences of a current or proposed action. It is used to ensure that projects, programmes and policies are economically viable, socially equitable and environmentally sustainable. In the present globalized world, impact assessment is an important criterion for determining the validity of development activities implemented by the public sector agencies.

Policy analysis is a technique used in public administration to enable civil servants, activists, and others to examine and evaluate the available options to implement the goals of laws and elected officials. The process is also used in the administration of large organizations with complex policies. It has been defined as the process of "determining which of various policies will achieve a given set of goals in light of the relations between the policies and the goals." Policy analysis can be divided into two major fields:



- Analysis of existing policy, which is analytical and descriptive- it attempts to explain policies and their development
- Analysis for new policy, which is prescriptive- it is involved with formulating policies and proposals (for example: to improve social welfare)

Policy analysis uses both qualitative methods and quantitative methods. Qualitative research includes case studies and interviews with community members. Quantitative research includes survey research, statistical analysis (also called data analysis) and model building. A common practice is to define the problem and evaluation criteria; identify and evaluate alternatives; and recommend a certain policy accordingly. There are six dimensions to policy analysis categorized as the effects and implementation of the policy across a period of time. Collectively, "durability" of the policy means the capacity in content of the policy to produce visible effective compatible change or results over time with robustness.

Effects

Effectiveness	What effects does the policy have on the targeted problem?		
Unintended effects	What are the unintended effects of this policy?		
Equity	What are the effects of this policy on different population groups?		

Implementation

Cost	What is the financial cost of this policy (some analysts also include tax credits in this analysis)?	
Feasibility	Is the policy technically feasible?	
Acceptability	Do the relevant policy stakeholders view the policy as acceptable?	

The strategic effects dimensions can pose certain limitations due to data collection. However, the analytical dimensions of effects directly influence acceptability. The degree of acceptability is based upon the plausible definitions of actors involved in feasibility. If the feasibility dimension is compromised, it will put the implementation at risk, which will entail additional costs. Finally, implementation dimensions collectively influence a policy's ability to produce results or impacts.

Techniques used in policy analysis

- 1. Cost-benefit analysis
- 2. Management by objectives (MBO)
- 3. Operations research
- 4. Decision-making based on analytics
- 5. Program evaluation and review technique (PERT)
- 6. Critical path method (CPM).

Evaluation

The success of a policy can be measured by changes in the behavior of the target population and active support from various actors and institutions involved. A public policy is an authoritative communication prescribing an unambiguous course of action for specified individuals or groups in certain situations. There must be an authority or leader charged with the implementation and monitoring of the policy with a sound social theory underlying the program and the target group. Evaluations can help estimate what effects will be produced by program objectives/alternatives. However, claims of causality can only be made with randomized control trials in which the policy change is applied to one group and not applied to a control group and individuals are randomly assigned to these groups. To obtain compliance of the actors involved, the government can resort to positive sanctions, such as favorable publicity, price supports, tax credits, grants-in-aid, direct services or benefits; declarations; rewards; voluntary standards; mediation; education; demonstration programs; training, contracts; subsidies; loans; general expenditures; informal procedures, bargaining; franchises; sole-source provider awards etc.



Steps for conducting a policy evaluation

Policy evaluation is used to examine content, implementation or impact of the policy, which helps to understand the merit, worth and the utility of the policy. Following are National Collaborating Centre for Healthy Public Policy's (NCCHPP) 10 steps:

Planning

- Clarify the policy
- Engage stakeholders
- Assess resources and evaluability
- Determine your evaluation questions
- Determine methods and procedures
- Develop evaluation plan

Implementation

- Collect data
- Process data and analyze results

Utilization

- Interpret and disseminate the results
- Apply evaluation findings

It is not enough to just introduce the technologies without the assessment of their impact on rural and agricultural economy. In this context, the methods for evaluation of Government policies and programmes should be price to assess the impact on farmers and agriculture.



Lead Paper - X

Writing success stories in agriculture

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A success story is an account of the achievement of success by someone or some organization. A success story is the successful-favorable or desired result or outcome of a program. Success story is actually an important marketing tool which usually directed towards potential funding agencies/ external evaluators. It can be used for reporting, which translate into future funding opportunities and provides a real world example.

Aspects to be considered in writing a success tory

- Length
- Purpose
- Intended audience

Tips for writing an effective success story

- Work within a specific theme.
- Assume that the reader knows nothing about your program.
- Remember that you are telling a short story...make it interesting.
- Include sound bites.
- Include photographs.
- Use important figures but with caution

Focus of a success story

- Tells the reader why and how your program was implemented.
- Tells the results or the impact of the program
- Tells the measurable results or how program success was achieved.

Structure of a success stories

The structure of a story is the most important aspect of writing an effective success description of an agricultural event. The main parts which constitute a success story are given below:

- 1. Situation/Background
- 2. Program Activities
- 3. Results/Impact
- 4. Evaluation/Evidence

Situation/Background

The situation/background explains the problem statement and provides answer to the questions like:

- Why does the program exist in the first place?
- What are you trying to achieve?
- Why is this program important to the people?

Program Activities

The program activities provide answer to the questions like:

- What steps did you take to carry out the program-fulfill the program objectives?
- Who is your target audience?
- What were they asked or required to do?



Results/Impact

The results/impact summarized the achievements of a programme and provides answer to the questions like

- What behavior changed?
- What actions are being put into place to ensure your desired results?
- Knowledge-Attitude-Practices (KAP)

Evaluation/Evidences

The assessment of the programme by the initiators of a programme is actually covered under this section which provides answer to the questions like

- How did you measure your success?
- Did you use pre- and post-assessments/ surveys/ testimonials from participants?

Mushroom Production- A success story of Krishi Vigyan Kendra Kathua

An example of success story containing all the essential parts as per the recommended structure is discussed as below:

1. Situation analysis/Problem statement

Mushroom is a highly remunerative enterprise and its cultivation is of recent origin in Jammu and Kashmir State. Kathua district is the gateway of J&K in the extreme south of the state. It lies between 32°17' to 32°55' North Latitude and 75°70' to 76°16' East Latitude. The climate of the district varies widely from subtropical to temperate, which offers huge potential for growing different varieties of mushroom round the year. There is abundant availability of natural resources and agro wastes which are quite suitable for setting up of mushroom units in the district and cultivation of mushroom offers easy and economic conversion of this waste. Almost 70% of the people of Kathua district belong to the category of small and marginal farmers and landless labourers. Traditionally, district Kathua was known to be the producer of Paddy, Wheat and Maize. In spite of growing Paddy- Wheat and Maize on small holdings, the income of the farmers has been declining as a result of rising cost of cultivation. Thus, the income levels of majority of the marginal and small holders are getting low for a sustainable livelihood. There is a complete absence of on-farm employment for a considerable period of time during the year. Moreover, the lack of resources and knowledge about the use of agro waste in mushroom production kept the farmers dependent mainly on the traditional crops for their livelihood. In order to raise their family income, mushroom cultivation emerged to be an effective alternative source of income generation. Mushroom cultivation is therefore offers a profit making technology to the marginal and landless farmers which holds the promise to rejuvenate their sinking economic condition. Any type of land can be used for construction of the mushroom house for crop raising. Farmers recognise the importance of cultivation of mushroom throughout the year as an additional income for higher returns. A significant number of farmers approached Krishi Vigyan Kendra- Kathua for proper guidance. Earlier, apart from the routine agriculture the farmers of the area used to grow only small quantity of white button mushroom which was a seasonal activity.

2. Programmes and activities

Krishi Vigyan Kendra Kathua recognizing the value of mushroom production in uplifting the economy of marginal, small and landless farmers, provided mushroom production a central place in its Annual Action Plans. All types of extension methods have been adopted for enhancing the adoption of mushroom production by the farmers of the district. KVK Kathua conducted number of activities such as trainings to the farmers, farm women, rural youth and skill development programmes, refresher courses for the extension functionaries for taking the skill development on mushroom to the larger dimensions. Demonstrations/On Farm Trials were also conducted at farmers' locations in order to provide hands on experience to the farmers. KVK also organised various activities such as mushroom day/field day and exposure visit to promote mushroom production activities and to motivate the youth/farmer for establishment of low cost mushroom production units for large scale adoption.

3. Results/Impact

The farmers of the district were encouraged to grow white button and oyster mushroom during the month of September to March and milky mushroom during the month of June to August to supplement



their family income. The adoption of mushroom production has shift the economy of farm households through shifts in income and generation of employment. The data were collected from 22 mushroom growers of the district, who are successfully running the enterprise of year round mushroom production with the intervention of Krishi Vigyan Kendra Kathua. Out of the 22 respondents, 8 belong to small, 5 belong to marginal and 9 belong to the category of landless growers. The growers are continuously being engaged in the production of year round mushroom production including white button, milky and oyster. The economics of white button mushroom has been presented in Table 1. Thus, 22 growers have been able to earn annually an amount of **Rs. 39,05,181.00 (Rupees Thirty nine lakh five thousand one hundred and eighty one only)** with an average of Rs. 1,77,508/- per grower (Fig. 1).



Fig. 1: Annual average returns from mushroom production

PARTICULARS	Small (08)	Marginal (05)	Landless (09)
Annual Average compost production (q)	112	98	38
Annual Average mushroom production (q)	795	687	288
Average Gross income from mushroom (@ Rs. 97 per kg)	73140	63204	26496
Average cost (Rs.)	31256	28993	10815
Net Returns	41884	34211	15681
Input-Output ratio	2.34	2.18	2.45
B:C Ratio	1.34	1.18	1.45

Table 1: Economics of White button mushroom in Kathua district

Evaluation/Evidence

With the technical intervention/guidance of KVK-Kathua, the year round cultivation of mushroom has been popularised in most of the villages in the district.

Horizontal Expansion of mushroom production

The Front Line Demonstrations conducted by KVK have resulted in a stimulating effect in motivating the farmers of the district in adoption of mushroom production as a supplementary source of income. KVK Kathua could able to make an exceptional impact in improving the livelihood status of farming community of the area through proven relevant interventions in the field of mushroom production. The success of mushroom production also encourages other farmers, farm women, rural youth of the area to grow mushroom successfully and profitability. The data revealed that there has been a sizeable increase in the annual production of mushroom grower increased subsequently, after the initiation of programmes of KVK Kathua. During the year 2010-2011, seventy five (75) beneficiaries were covered under different activities conducted by Krishi Vigyan Kendra Kathua but in the subsequent years their number rose to 125 till 2017. The subsequent increase in productivity as well as the numbers of mushroom growers triggered the adoption of mushroom cultivation as a remunerative enterprise by the small, marginal and landless farmers in Kathua district, as depicted in Fig. 2.





Fig. 2: Outcome of KVK Kathua in respect of mushroom production

The benefits of growing and selling mushroom have enabled farmers to buy agriculture inputs, household goods, pay school fees of their wards. The farmers have invested in expanding their mushroom production by establishing low cost mushroom production unit. The movement initiated by KVK, Kathua for popularising mushroom production in Kathua district, has yielded results in the form of increased number of farmers taking up mushroom cultivation as a major income generating activity. The extension methodologies of KVK Kathua in this regard paved the way for transforming the mushroom cultivation from a state of rare commodity in Kathua district into a commodity of trade.

Economic Empowerment of Farm Women

KVK Kathua has planned to ensure participation of women in mushroom production activities through the provision of training programmes and formation of groups, thus ensuring the economic empowerment and maintenance of nutritional status of farm families (Fig. 3).



Fig. 3: Women empowerment through mushroom production



Oral Presentations

MSAEJMU-53

Soil Health Card- A tool for agri revolution

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griculture since ages is the mainstay of the Indian population. The story of Indian agriculture has been a spectacular one, with a global impact for its multi-functional success in generating employment, livelihood, food, nutritional and ecological security. Agriculture and allied activities contribute about 30 per cent to the gross domestic product of India. The green revolution had heralded the first round of changes. India is the second largest producer of wheat, rice, sugar, groundnut as also in production of cash crops like coffee, coconut and tea. India is now eyeing second Green Revolution in eastern India. The need for enhanced investment in agriculture with twin focus on higher quality productivity and welfare of farmers is rightly emphasized from time to time by the Prime Minister Narendra Modi. In the entire scenario, importantly the Narendra Modi government has laid emphasis on the awareness campaign and enhanced agri-knowledge for the farming community. But besides the measures to improve minimum support price and assistance like improved irrigation and rural electrification, the incumbent NDA regime has laid emphasis on the Soil Health Card Scheme. Launched by the central government in February 2015, the scheme is tailor-made to issue 'Soil card' to farmers which will carry crop-wise recommendations of nutrients and fertilizers required for the individual farms. This is aimed to help farmers to improve productivity through judicious use of inputs. In the words of the union Agriculture Minister Radha Mohan Singh, this path-breaking initiative would create a golden opportunity for the farmers to improve the productivity of their crops and also go for diversification. This will certainly contribute significantly to ensuring food security of the country. Awareness of soil health position and the role of manures would help in higher production of foodgrains in eastern India too and this would help tackle the decline in production in central and peninsular India. Keywords: Soil Health Cards, revolution, awareness.

MSAEJMU-55

Impact assessment of knowledge on paddy production- A case study under ATMA in Budgam of Kashmir Valley

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The study was conducted to assess the impact of ATMA in District Budgam of J&K with the view to explore the technology transfer, its sustainability and the impact in terms of change in the knowledge which helps to provide feedback to the stakeholders of the programme for its improvement. A sample of 150 trained farmers and 50 untrained farmers from two selected blocks of district Budgam were selected by purposive cum random sampling technique. The majority of farmers covered under the ATMA programme were of middle age group, having middle standard qualification, medium family size (5-8 members) and medium experience in farming (16-25 years). There was significant relationship between age, education, experience in farming, sources of information with knowledge. There has been considerable improvement in knowledge of new technologies and farm practices among the trained farmers. The services rendered by the Department of Agriculture were regular training programmes during cropping season (83.33%), supply of written material during training (82.22%), protection from exploitation of middlemen (65.56%) and conducting demonstrations on farmer's field (61.82%). The ATMAs are expected to support the state extension system by making it more broad-based and participatory for planning, implementing and monitoring the extension activities of a district. The purpose of this component was to test new approaches to technology transfer, new organizational arrangements, and operational procedures. For evaluation of field level impact of ATMA model, beneficiaries (target farmers) of both trained and un-trained were compared.

Keywords: Paddy production, Impact, ATMA, Knowledge, Technological interventions



A critical study on dairy management practices in Konkan region of Maharashtra

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he present study was conducted in Ratnagiri, Sindhudurg, Raigad and Thane districts of Konkan region of Maharashtra state, with the objectives of profile characteristics of the dairy farmers, adoption behaviour of dairy farmers about recommended dairy management practices, relationship between personal, socio-economic and psychological characteristics of dairy farmers with adoption behaviour of recommended dairy management practices, document the existing dairy management practices followed by dairy farmers, assess the training needs of the dairy farmers and suggest the strategies to improve milk production in Konkan region. It was observed that personal and socio-economic, psychological characteristics, majority of the mango growers had self- education up to 'secondary' (26.50%), with 'medium' family size (57.00%), experience in dairying (72.00 per cent), with 'average' annual income Rs 198465/-, average number of milch animals 8, average milk production 3880 liter, average availability of water of 3 months, average land holding up to 2 ha, 'medium' social participation (71.00%), zero number of training received from 76.50 per cent dairy farmers, 'medium' economic motivation (66.50%), medium management orientation (68.50%). The personal, socio-economic and psychological characteristics of the respondents namely, annual income, number of milch animals, milk production, availability of water, economic motivation and management orientation had showed positive and significant relationship, while self-education, family size, experience in dairying, land holding, social participation and training received had exhibited non-significant relationship with adoption behaviour of recommended dairy management practices. Dairy farmers offered the suggestions such as better milk price for the producers and concentrate should be made available at cheaper rate. The dairy farmers were not satisfied on milk price; this might be due to high expenses such as, higher rate of concentrates, expensive veterinary services, incidence of diseases etc. It is highlighted that if investigator and policy makers successfully work on suggestion suggest by dairy farmers who really put for steps towards good dairy enterprise. Keywords: Adoption behaviour, Training needs, Profile characteristics.

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Production of matured and tender coconut in Ratnagiri district- An economic analysis

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he present study entitled "Production of matured and tender Coconut in Ratnagiri District -- An Economic Analysis" was undertaken to estimate comparative cost, returns and profitability of coconuts and its disposal pattern with a 80 coconut growers. Results revealed that, the per hectare inputs utilized for matured coconut orchards were 287.95 human days, 17.27 quintals of manures, 183.45 kg of N, 56 kg of P, 80 kg of K, Rs.679 for plant protection chemicals and Rs.2251 for irrigation charges, whereas for tender coconut orchards per hectare input utilized were 135.49 human days, 19.96 quintals of manures, 195.26 kg of N, 56.4 kg of P, 80.47 kg of K, Rs. 736 for plant protection chemicals and Rs. 1335 for irrigation charges. The per farm yield of matured and tender coconut were 5328.78 and 1050.83 nuts respectively and per hectare gross returns realized were Rs.148315 from matured nuts and Rs.171713 from tender nuts orchard. It is also revealed from the study that the coconut orchard has good scope for tender nuts production than matured nuts for supplementing the farm income. The bearing trees (X_1) , manures (X_3) , nitrogen (X_4) irrigation cost (X_7) and labours were the major recourse used in the production process. value of coefficient of multiple determinations (R^2) was 0.89 indicated that 89 per cent variations in coconut production were explained by variables included in the function. The sum of production elasticity was 0.954, indicating decreasing returns to scale in coconut production. It is also revealed that the elasticity coefficient for bearing trees (X_1) , manures (X_3) , were positive and statistically significant at 5 per cent level. However, irrigation factor was found positive and statistically significant at 1 per cent level of probability indicated significant effect on production of the coconut orchard. Keywords: Costs, returns and profitability, efficiency



Agricultural issues and farmers

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griculture plays a pivotal role in the Indian society. Although its share in the Gross Domestic Product (GDP) is about one-fifth, agriculture and allied activities remain the major sources of livelihood for about half of the Indian population. Further, its forward and backward linkage effects increase the growth in the non-agriculture sector. Therefore, agriculture not only contributes to overall growth of the economy but also reduces poverty and hunger by providing livelihood and food security in the country and, thus, it is the most inclusive growth sector of the Indian economy. Driven by hopes of a good monsoon, the Centre set an ambitious target of producing a record 270.10 million tonnes of foodgrains for 2016-17. The Finance Minister's 2017-18 Budget speech has placed the farmers' welfare and the rural economy on top of the ten distinct themes to foster the broad agenda of the government, i.e., to "Transform, Energise and Clean India" (TEC India). In last year's Budget speech also, agriculture and the rural economy was on top of the agenda for the government and the Ministry focused on 'income security' of farmers to double their income in five years. "We need to think beyond food security and give our farmers a sense of income security. The government will, therefore, reorient its interventions to double the income of the farmers by 2022," the minister said in Parliament. There are about 14 crore farm holdings in India, and four in ten Indians rely directly on farming for their livelihoods. Considering the farmers as the 'backbone of country's food security', the last year's Budget focused on agriculture and farmers' welfare. Keywords: Issues, GDP, Income

MSAEJMU-86

Effective access of information and communication technologies in agriculture

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pplication of new information and communication technologies (ICTs) for rural and agricultural development has been advancing quite rapidly over the last decade. The Information and Communication Technologies are being increasingly used by the governments to deliver its services at the locations convenient in the agriculture sector. The rural ICT applications attempt to offer the services of central agencies to the citizens at their village door steps. These applications utilize the ICT in offering improved and affordable connectivity and processing solutions. A large number of rural E-Government applications, developed as pilot projects, were aimed at offering easy access to agriculture schemes and improved processing of government-to- farmers transactions. Most of the projects have seen developments in the Internet technology and dropping costs of PCs as opportunity to reach remote locations. They used the existing telecom infrastructure and the Internet access through ISPs as inexpensive connectivity solution. They tried to package in all possible information services for the rural peoples as a single point access through PC based kiosks connected to ISPs. Some projects have experimented with the wireless technology to reach the remote locations. The role of ICT in agricultural development is going to be significant in future initiatives for transforming agricultural research for development worldwide. A toplevel view of advances in ICT in the agriculture reveals that more and more rural people are using community radio, mobile phones and the Internet. In some contexts, farmers have used video through Internet applications to gain advice on crops, animal husbandry, the threats posed by weather, pests and diseases, markets and prices and in the process enhance their access to and use of NARS-derived technology. Market information covers the nature of the market in terms of size, value and growth rate, the divisions between sectors and competing suppliers. Also addressed are product specifications; grading and packing standards; consumer and market preferences (taste, colour, size, season); typical prices and



seasonal price patterns; quality premiums and marketing channels; prognosis on future prices and changes occurring in the supply chains for the market; names, address of key contacts particularly buyers, agribusiness and traders plus. New ICTs such as smart phones are also bringing another revolutionary change, the ability for the multiple actors and stakeholders in agricultural production and market chains to participate, as a community, in information management. Greater efficiencies in terms of time, cost and quality of services and products can be attained in farming by using these technologies. The only way to provide information in this context is to use new ICTs that overcome the limitations of broadcast, passive communication and can provide on-demand, customized and active communication. **Keywords:** Information, Communication and Technologies

MSAEJMU-100

UMEED & KVK intervention- A hope for the empowerment of rural women of Jammu district

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JKSRLM (Jammu Kashmir state rural livelihood mission), a flagship programme under the ambit of NRLM supported by GOI initiated its activities J&K in the year 2013. UMEED- the hope, is a scheme under JKSRLM, focuses on the poverty reduction through self-help group formation and aims at encouraging rural women to make small savings so that the SHG's eventually become bankable at reduced rate of interest and helps for livelihood security. The study focuses on the efforts of Krishi Vigyan Kendra, Jammu towards providing livelihood security to the women beneficiaries under the umbrella of UMEED self-help groups, operational in three villages, viz. Rehal, Mathwar (sagy) and Garhi of Bishnah, Bhalwal and Marh Block of Jammu district. The sample comprised of 60 women from the area under intervention for two years w.e.f 2014-16. During this coarse, a number of skill development training programme (ranging from 2-6 days) such as processing and preservation of locally available fruits and vegetables, medicinal produce etc., scientific cultivation practices of medicinal plants such as, Harad, Amla, Lemon grass floriculture etc were provided to the group members in order to train them to set up their own enterprise by availing financial assistance from the SHG's fund and UMEED assistance. At the same time certain groups were trained in the rural crafts which could easily find place in local market. The results of the study revealed that an overall 80% of the women viewed the trainings to be beneficial for them. About 18% of them have adopted cushion making as a commercial activity and sold their product with good profit margins. Almost 15% of the beneficieries adopted the cultivation of cash crops like Marigold, Harad and Amla production and their processing thereof and earned monetary benefits. Thus, the intervention of KVK Jammu not only helps women for increased in income generation but also is bringing a desired impact in the socio economic status of women.

Keywords: Credit, cooperation, marketing, rural women

MSAEJMU-122

A successful case of farmer earning money round the year through marigold cultivation

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Floriculture has been a major thrust area for diversification of horticulture. Growing of flowers and ornamental crops is a rapidly expanding global enterprise. Floriculture is an important and upcoming trade with potential both in domestic as well as export markets. Growing of flowers and ornamental crops is a rapidly expanding global enterprise in today's world. This sector provides employment to millions. The floriculture continues to generate employment opportunities to people in rural areas. An area under flower cultivation can support a family consisting of 5-6 members. Marigold flower cultivation is getting increasingly popular among farmers. It is an important and popular flower of India and ranks third in



number after roses and chrysanthemum. The commercial cultivation of marigold is a source of income and employment to marginal farmers as well as large farmers. The nature has endowed the state of J&K with a Variety of agroclimatic conditions ranging from subtropical to temperate. The farmers of State can take the advantage of growing off -season produce and disease free quality free planting material. Flower if properly grown can yield 15-20 times more returns than cereals and other crops. Jammu city is also called as city of temples so there is ample scope of floriculture as an enterprise because large quantity of flowers are daily required for worship of God in the form of garlands and loose flowers. Kathua district is the gate way of Jammu and Kashmir. The district comprises of three agriculture subdivision namely Billawar, Basohli and Hiranagar. The climate of district varies from subtropical to temperate. Marigold is successfully cultivated round the year in district Kathua.At present when the rural youth is deviating from agriculture and village culture, a youth from village Pathwal is emerged as role model for those youngsters for whom agriculture is only the option. The present study is the successful journey of Raman Kumar. He is about 35 years old, a resident of village Pathwal, Tehsil Hiranagar district Kathua, has a land of about 3 hectare. He used to grow wheat, paddy and mustard by conventional method using the seeds of local and poor yielding varieties. He came in contact with KVK in one of farmer training programme and shared the problem of low production in cereal crops with the scientists of KVK. He was motivated to go for diversification in the form of commercial floriculture. After that he had actively participated in several training courses on commercial floriculture and kept in touch with the scientist of KVK and always tried the new techniques for enhancing the net profit from his farm. With the technical guidance of KVK he started the journey of marigold cultivation in 2014. KVK has provided quality seed and planting material to him. In first year he raised the marigold in 7 kanal and after getting the net profit of R s. 80,000/- in year, he converted his maximum portion of land in marigold cultivation. Besides this his wife also got an opportunity of job by helping him in making garlands. He sold the one garland @ Rs. 20-25/- and save Rs. 800-900 per day after selling these garlands. He felt that the problem of poverty and indebtedness in his life was due to traditional cropping system and rising cost of cultivation of traditional crops. Now he solved the problem of poverty by introducing the marigold cultivation in his cropping system after gaining the knowledge from KVK. Now the most important event in his life is that he achieved the level of zero indebtedness and made the investment of surplus money on children education and houseshold goods. Keywords: Money, marigold flower, cultivaion

MSAEJMU-130

Farmer 'FIRST': Enhancing economic opportunities

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griculture sector today is witnessing a decline in net income. This in turn is leading to a large number A of farmers quitting the sector in the country. The government of India is now seriously addressing all these issues related to the declining farm income. Prime Minister Narendra Modi has already announced to double the farmers' income by 2022. Recently, the ICAR has also launched Farmer 'FIRST' programme (FFP). The FFP moves beyond increasing productivity to enhance farmer's income by incorporating suitable different modules. Under the Crop based module the focus is on introduction of new high yielding, hybrid climate resilient varieties, seed production by the farmers themselves and ensuring timely availability of seeds. In the Horticulture based module focus is on introduction of fruit plants, seed production and nursery management, vegetables and fruit production and post-harvest management with the adoption of new technology to enhance the income of the farmers. The Livestock based module focuses on increasing production and productivity of the livestock available with the farmers as well as introduction of new breeds, milk production units, fisheries and rural backyard poultry. Similarly the Enterprise based module emphasizes income generating activities like seed and other inputs production along with the promotion of allied activities like bee keeping, mushroom cultivation, goatry, vermi compost production, handicraft, food processing and value addition. In this module the youths, landless labourers and the women constitute an important target group. The Natural Resources Management module interventions like natural resources management, application of resource conservation technologies like line sowing, water harvesting, promoting climate resiliency and many others are promoted The Integrating Farming System (IFS) based module stresses on diversification. The basic objective of the FFP is to enhance farmers' scientist interface thereby enriching knowledge and facilitating a continued



feedback. It will also identify and integrate economically viable and socially compatible technological options as adoptable models for different agro-ecological situations. The project also aims to develop modules for reducing drudgery of farm women income enhancement and livelihood security. It will also study performance of technologies and perception of farmers about agriculture as a profession in the rural settings besides building a network of linkages of organizations around the farm households for improving access to information, technology input and market with an ultimate aim of institutionalization of the Farmer 'FIRST' process.

Keywords: FFP, Opportunities, production, income

MSAEJMU-133

Sheep and goat rearing- Source of sustainable livelihood security for small holders of Ladakh

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adakh is a cold arid desert region of Jammu and Kashmir, with an annual precipitation of around ∠100mm. Summers are short with maximum temperature 35°C followed by long windy autumn and winter of freezing temperatures as low as -25°C. The high wind velocity with a low precipitation rate, low humidity, low oxygen tension and fluctuating temperature makes the climate most inhospitable to crop based livelihood activities. Hence economy of the farmers mainly depends upon the livestock especially Sheep and Goat engaging more than 90% population. Further, sheep and goat rearing is the only source of livelihood among nomadic and semi nomadic tribals of various regions of ladakh. The estimated sheep and goat population of the Ladakh region is 6.39 lacs, out of which sheep population is 02.83 lacs and goat population is 3.56 lacs including 2.16 lacs pashmina goats mainly possessed by changpa tribe of Leh and for whom Pashmina production is the main source of income. Majority of these small holder farmers belong to below poverty line and sheep and goat rearing has been the source of their livelihood, social and nutritional security. The experience of sheep and goat rearing ranged from 10-20 years in 42% and 20-30 years in 48% of the respondents. The family size were 6-8 members in majority of the cases (42.5%) followed by 18% having 2-4 members. Sheep and goat rearing was found to be the most preferred occupation among 90% of the farmers compared to other species of livestock like; cattle, yak, horses, camels and poultry. The mortality of sheep and goat was reported mostly due wild animal attacks, feed and fodder scarcity during harsh winter, contagious caprine pleuropneumonia (CCPP) etc. Other constraints expressed were lack of marketing channels, role of middlemen and inclement weather etc. Therefore, it demands to location and rearing system based strategic approach including value addition of products to enhance farm economics.

Keywords: Sheep, goat, livelihood, population, income

MSAEJMU-139

A perspective on technology and development of agricultural sector in Himachal Pradesh

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This paper examines the scenario of agricultural development in the hill state of Himachal Pradesh, which is the mainstay of around 90 percent of the rural masses in the state. The main aim of the paper is to portray the trends in different parameters of agricultural development. This paper is based upon secondary time series data collected over a period of 25 years from 1980-81 to 2014-15. The state has made remarkable achievements in terms of human resource and economic development and is regarded as the model for development of other hilly states of the country. Perusal of results put forth that that state has made spectacular progress in the production of fruits, vegetable crops and livestock products. However, the



foodgrain production recorded slower performance over the years. The study highlights the progress made in terms of various technological components over a period of time. It was found that lack of irrigation has been the major limiting factor in the adoption of improved technology and use of fertilizers. The farm mechanization also recorded a slow pace due to hill topography and lack of machinery and tools suitable for hilly conditions. This calls for making efforts to create irrigation facilities and strengthening inputs supply, hill-specific technology and marketing infrastructure.

Keywords: State Domestic Product, Land holdings, Cropping pattern, Crop production, Sources of irrigation, Technological indicators

MSAEJMU-145

Role of public and private sector in Indian vegetable seed industry

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Indian seed industry is the 5th largest seed industry of the world having an estimated turnover of Rs. 15,000 crores out of which 18% share worth 2000 crores is of vegetable seed industry. Its main functions include seed production, certification (Field standards and seed standards), processing, testing, Seed distribution, and marketing and storage. India has witnessed tremendous progress in vegetable production, especially during the post green revolution period due to the development of improved vegetable varieties/hybrids/ technologies and developmental policies of the government for systematic research coupled with their adoption by the farmers. The area (2.84 million ha), production (16.5 million t) and productivity (5.8 t/ha) of vegetables in 1950-1951, shown a tremendous increase to area of 8.5 million ha, production of 146.5 million t and productivity of 17.3 t/ha in 2010-11 the country. Phenomenal increase in area (2.99 folds), production (8.88 folds) and productivity (2.98 folds) of vegetables in our country during the last 6 decades has been achieved. The progress made in area, production and productivity of vegetable crops can be attributed to the solid foundation laid by public seed sector lead by NSC, SSC and SAU's under the flagship of IARI and its various institutes. Under All India Coordinated Vegetable Improvement Project emphasis has been given to 24 vegetable crops and 423 varieties have been identified and recommended for release for cultivation in different agro-climatic zones. Significant growth of private sector begins only after the introduction of new seed policy in 1988, which ushered in a liberal business climate. Currently there are over 500 companies together, few multinational and these tend to focus on low volume high value crops with the principle efforts being placed on hybrid culture. At present around 80% of the vegetable seed has been produced by private sector. There is a complimentary relationship between both the sectors as private sector thrives on the research and development of public sector for genetic resources of vegetable crops and its utilization for hybrid seed production and marketing. Therefore, there is an urgent need to better serve the farmers by removing the various productivity constraints through technological interventions. Robust PPP are needed strengthen the public- private linkages to realize the full potential of huge vegetable seed sector of India as well as of south-west Asia. Keywords: Seed, vegetable, industry, production

MSAEJMU-151

Transgenics: An approach in integrated pest management

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Since first transgenic plant resistant to insects was produced some 27 years ago, a number of novel resistance genes of different origin were discovered and used for plant transformation. It has a significant role in improving efficacy, cost-effectiveness and in expanding the markets for the bio insecticides. A transgenic plant is a normal plant with one or more additional genes from diverse source. These transgenic plants produce insecticidal and antifeedant proteins continuously in the plants under field conditions (Meeusen and Warren, 1989). The use of genes encoding endotoxins from *Bacillus thuringiensis* is now a well-established technology for producing transgenic plants with enhanced



resistance to the larvae of lepidopteran insect pests (Duke, 2011). In India, *Bt* cotton was the first GM crop technology to enter the market while as *Bt* brinjal is the first GM food crop in India. Several studies have demonstrated the potential of insect-resistant genetically modified (or biotech) crops in increasing crop productivity and reducing insecticide-use on plants in the developing countries (Krishna and Qaim, 2008). There are three main strategies for management of insect resistance to *Bt* crops: Refuge, pyramiding and gene stacking.

Keywords: Transgenics, Bacillus thuringiensis, Pest, Crop.

MSAEJMU-167

Commercial goat farming- A profitable enterprise for marginal and small farmers

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oat farming enterprise is gaining momentum in India. Goats play an important role in the rural Geconomy at national level. More than 70 percent of the landless agricultural laborers and marginal and small farmers of the rural India rear them. Goats are also among the main meat-producing animals in India, whose meat (chevon) is readily preferred irrespective of caste, creed and religion. They produce a variety of products, mainly meat, milk, skin, wool and manure. The socio-economic value of goat rearing as compared to other livestock species has been immense for the poor farmers. The low input, high fecundity, easy marketing and unprejudiced social ear acceptance of their products are few of many advantages of this enterprise that provides assured higher income. Due to its good economic prospects, goat rearing under intensive and semi-intensive system for commercial production has been gaining momentum for the past couple of years. High demand for goat meat and its products with potential of good economic returns have been deriving many progressive farmers, businessmen, professionals, ex-servicemen and educated youths to take up the goat enterprise on a commercial scale. However, the productivity of goats under the prevailing extensive production system is very low. It is mainly because the animals are reared on natural vegetation on degraded common grazing lands, wastelands, stubbles and tree lopping. Even these degraded grazing resources are shrinking continuously. Moreover the improved production technologies/ management practice in the farmers 'flocks are very low. Therefore, rearing of goats under intensive and semi-intensive system using improved production and processing meat, technologies for commercial production will be needed for realizing their full potential Growth and distribution. The trend of commercialization in goat production deriving entrepreneurs looking for higher productivity and profitability seems desirable. More commercialization would encourage intensification of goat production hitherto highly extensive system depending only on grazing in degraded common lands. Commercialization might not only help in increasing the productivity of goats by having better access to critical inputs and technical knowledge, but may also relieve some pressure from the grazing lands. Animals in commercial production system would have to depend on alternative sources of fodder like agro-forestry, tree leaves and partial/ complete stall-feeding reducing the dependency on common grazing lands. Moreover, the commercial goat entrepreneurs would also be better placed in meeting the quality standards necessary for exports of goats and their products to large expanding international markets. Therefore, along with the extensive production system, the trend of commercialization of goat enterprise needs to be encouraged. Intensification and commercialization of goat enterprise is also important because of shrinking of resources for extensive grazing. Commercialization will help in it increasing the goat productivity to some extent and bridging the demand-supply gap. It seems to be a better option for increasing productivity and production from goats, but it will have its own associated problems and challenges like high incidence of diseases in large flocks, if not managed properly. The losses due to diseases and parasites could be minimized by using recommended preventive goat health calendar and management practices.

Keywords: Commercial, enterprise, goat farming, profitable.



Status of cooperative societies engaged in rural development in India

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India is an agrarian society and half of its population resides in villages. Rural sector is the major contributor to the overall GDP of the nation and hence lack of development in villages means lack of development in India. Co-operatives cover more than 97% of Indian villages and share a major credit in the growth of the rural sector, thus contributing to the overall economy of India. Government each year spends lakhs to crores of rupees on rural development. But co-operatives working in rural areas are playing a noteworthy role in this. After independence, the role of cooperative societies grew to encompass socioeconomic development and eradication of poverty in rural India. It became an integral part of the five-year plan and a fundamental part of our economy. Co-operatives provide over 100 million jobs around the world, 20% more than multinational enterprises. Rural credit cooperatives came into existence essentially as an institutional mechanism to provide credit to farmers at the affordable cost and address the twin issues of rural indebtedness and poverty. Economic and financial reforms initiated in early 1990's were focused mainly on commercial banks which have pan-India and international operations. Cooperative banks were kept outside the reforms since these banks had a limited area of operations, simple banking products and low volume of business and insignificant share in the total assets and liabilities of the Indian banking system. So this gives the clear indication of the scope of cooperative society also Employment opportunities in this area

Keywords: Population, development, GDP

MSAEJMU-208

Evaporative cooling: A low-cost technology for preservation of fruits and vegetables

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orticultural products are stored at lower temperature because of their highly perishable nature. There are many methods to cool environment. Hence, preserving these types of foods in their fresh form demands that the chemical, biochemical and physiological changes are restricted to a minimum by close control of space, temperature and humidity. The major problems which may occur during storage is the change in the quality parameters of the produce such as; the color, texture and freshness. Evaporative cooling is a well-known system to be efficient and economical means for reducing the temperature and increasing the relative humidity in an enclosure and thus increasing the shelf life of horticultural produce. Thus, an evaporative cooling is a low cost technology for storage of fruits and vegetables. Keywords: Horticultural produce, perishable, evaporative cooling, low-cost technology.

MSAEJMU-209

Mushroom cultivation and bee-keeping: The vibrant sources of employment

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Ultivation of mushroom has been in vogue for almost 200 years. However, commercial mushroom /farming in India has started recently. Growing mushroom under controlled condition is of recent origin. Its popularity is growing and it has become a business which is export-oriented. Today the mushroom cultivation has been taken up by the states like Haryana, Rajasthan, Uttar Pradesh, etc, while



earlier it was confined to the states like Himachal Pradesh, J&K and Hilly areas. Mushroom is an excellent source of protein, vitamins, minerals, folic acid and also is a good source of iron for anaemic patients. Beekeeping on the other hand is growing at a faster rate and it has been mentioned in old scriptures, however the scientific methods of beekeeping started only in the 19th century. After Indian independence, beekeeping was promoted through various rural development programs. In this review the author stresses on the fact that both mushroom production and beekeeping can be a vibrant sources for eradicating the growing problems of unemployment and both can grow to become a large scale industry. Moreover, these can be the vibrant sources of employment and income-generation especially for women. Mushrooms can be an additional as well as a major source of income for the farmers of any sector and beekeeping is as equally important as mushroom cultivation. Beekeeping will not only generate additional income in terms of Honey or Bee wax or other miscellaneous bi-products but also bees are the major pollinators, hence beekeeping can grow to become a large industry to be used especially in the orchards which has already started in foreign countries. The author suggests the setting up of Mushroom societies and self help groups that will help the Bee-keeping and Mushroom unit holders in financing and marketing for their produce which will help in encouraging others to take up this business which will in turn help in solving the unemployment. Moreover, there is a major need of adopting and making technological interventions besides creating awareness among the farmers.

Keywords: Mushroom cultivation, Bee-keeping, Adoption, Technological interventions, Employment source, Income source.

MSAEJMU-219

Terrace gardening of vegetables for urban people

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X ith ever increasing pressure building on land and its cost in the urban areas, there is hardly any space to raise vegetables. So if one wants to grow vegetable domestically the only alternative is the terrace that provides ideal space for raising vegetables. The terrace gardens supplies chemical free fresh vegetables that are relished for their taste and flavor. The practice not only saves money but precious time also. It cools the house and surrounding microclimate with increased production of O_2 and reduction of CO₂. Above all, the biggest gain is to get healthy and chemical free vegetables even in the off season. In an urban house a terrace of 25-35 feet can provide enough space for raising vegetables for a family of 4 people. Terrace vegetable gardening comprises of pot/container raising of vegetables, raised beds vegetable cultivation and vertical gardens. Nutrition and moisture, pruning and orientations are important aspects of terrace gardening. The leafy vegetables like coriander, fenugreek, amaranthus, basil and spinach beet can be grown directly in the pots/containers and raised beds. Small seeds should be sown mixed with sand or powdered manures. Line or zig-zag motion could be followed for seed sowing. To facilitate easy germination of seed the pots or containers should be covered with organic mulching material. This material also preserves heat and moisture. When germination has started the mulch should be removed. Always keep a vigil on the seedling growth. If any disease like damping off is seen, drench the soil with Bavistin and to control tiny insects Chlorpyriphos should be used.

Keywords: Terrace gardening, vegetables, pruning, orientation

MSAEJMU-238

Livelihood opportunity for tribal farmers of Rajouri by sustainable utilization of anardana, a naturally growing wild pomegranate (*Punica granatum*)

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A nardana is dried seed of wild pomegranate (*Punica granatum*) which grows wild in uncultivated lands and pastures in hilly intermediate areas which are moderately warm and comparatively less cold during winters. The seed of the fruit is dried along with pulp, mostly sun dried and stored. Bits of



pomegranate pulp remain on the seeds as they dry, so the slightly sticky seeds with a fruity, mildly sweet and tangy taste are used as a souring agent in Indian cuisine. This crop is available in plenty in hills of Rajouri district and few pockets with predominant tribal population are known for its quality organic anardana. More than 200 quintals of anardana, mostly organic, is sold out of the district every year (Anonymous, 2016). Tribals, collect this crop from hills and nearby forests and sell in the local market for cash or in exchange for their daily need groceries. The price of anardana has increased from Rs.150/- per kilo in 2013-14 to Rs. 350/- in 2016-17, an increase of more than 130 per cent. It has been observed that income from this product ranges between 2000/- to 23000/- per tribal family. The studies conducted for the last three years revealed that major cause for increase in price has been decrease in productivity due to anar butterfly (Deudorix isocrates), with losses ranging from 10 to 80 per cent, and decrease in plant population. Since the crop is mostly harvested by tribals of the area and is a source of income to the community, ever decreasing plant population of the crop and losses due to insect pest may lead to permanent loss of a source of income of the tribals. For sustainable source of income and proper utilization of the crop, there is need of eco-friendly scientific interventions so as to maintain the plant population and minimize losses, by organic means, due to anar butterfly. There is another need of trainings on scientific and hygienic drying of crop for better marketing and increased shelf life. If the crop is utilized judiciously, the trade of the crop may be a livelihood opportunity and a permanent source of income for the tribals of the area.

Keywords: Anardana, tribals, livelihood, Rajouri

MSAEJMU-242

An economical viable adaptive strategy for food security in *kandi* areas in the era of climate change

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he sub-montane region of the outer Himalayas fringing shivalik hills is popularly known as *bhabar* or *kandi.* It is characterized by 10-30 km wide sloping belt extending over app.1700 km in length intermittently from State of Jammu & Kashmir in west to Teesta River in East (Sikkim). The major land management problems faced in Kandi include excessive runoff, soil erosion, land degradation and erratic rainwater distribution in temporal and sequential period. The groundwater table in the region is deep. Streams of the area carry huge amount of debris material during rainy season due to fragile geological conditions. Economically, the farmers of this area are poor with small holdings. This is especially true in case of marginal and small farmers. The principal crops are wheat and maize along with oilseed crops like Toria, Mustard and pulses like Mash, Moong and Lentils. The fodder crops like Bajra and Oats are also grown. The cropping intensity of the region is 154 per cent. The present study was carried out in three districts viz., Jammu, Samba and Kathua with an objective to study the consumption pattern of wild edible plants, their role in income generation and livelihood and food security keeping in view the weather vagaries. The results revealed that wild edible species are more resilient to climate change, compared to cultivated species. The phases of food stress on cultivated crops are more and likely to increase due to climate change. Forest edible plants are being used by people of kandi area and other ethnic groups for domestic consumption, sale and nutritional security. Species like Dioscorea belophylla (tarad) and flowers of Bauhinia purpurea (Kachnar) bearing pink blooms in autumn are edible and are traded as vegetable; Carissa opaca (garna) are sold as fruit and value added products like pickles and juices. Leaves of Senna tora (Hedma) are cooked as vegetable and also pickled. Zizyphus nummularia (desi ber) and Syzygium cumini (Jamun) have edible fruits. Therefore, wild edible fruits provide a viable option for food security and income generation in kandi areas of Jammu.

Keywords: Kandi areas, crop, species



Entrepreneurship development of village through mushroom cultivation

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his is the case study of village Saran falling under Marh block of Jammu district whose economic and L social transformation has been taking place because of adoption of button mushroom cultivation. At present out of 200 farm families about 48 farm families are commercially engaged in mushroom cultivation for the last 7 to 8 years besides cultivation of traditional rice, wheat and vegetable crops. Some landless families are also engaged in mushroom cultivation. All the mushroom growers in the village prepare their own wheat straw compost ranging from 10qts to 50 qts every year by efficiently utilizing different by-products of their field mainly wheat straw. Some farmers now also purchase readymade spawned compost bag from the nearby states of Punjab and Himachal @ Rs 100 per bag. Mushroom growers due to different trainings and exposure visits take two crops of mushroom from October to march every year. Regarding marketing, mushroom growers of the village jointly hire private transport vehicle and sell their produce at Narwal Mandi, Jammu at wholesale rates ranging from Rs 125 per kg to 150 per kg depending upon market rates. During festivals and weeding season villagers of nearby villages directly purchase mushroom from their homes which reduces their transport charges. Mushroom growers reported that their expenditure ranges from Rs 40 to 50 per mushroom compost bag and on average earn Rs 150 to Rs 200 per bag thereby earning a net profit of more than 200%. Mushroom growers in the village reported that they don't have to sacrifice their other routine activities for mushroom cultivation because they complete picking, cleaning and bagging of mushroom early morning hours and more over it is a whole family enterprise for them and source of nutritional diet for them. Mushroom growers reported that they earn Rs 50,000 to 2 lakhs from mushroom enterprise every year depending upon the number of mushroom bags. Some farmers are also engaged in cultivation of dhingri mushroom during summer season and also planning to start processing of mushroom for preparation of mushroom pickle. At the end of season, mushroom farmers use the spent compost bags as an organic manure in their fields especially vegetable fields their by promoting organic farming also. The mushroom growers reported that the Agriculture department of state govt played a key role in their success by encouraging them to go into mushroom cultivation by providing assistance in the form of training, field visits and proper follow up. This village is now acting as potential model mushroom village in the area and source of inspiration for the fellow farmers especially youths and their achievement should be publicized more by Agriculture University and Agricultural department so that more and more farmers may attract towards this sustainable income generating activity.

Keywords: Entrepreneurship, mushroom, training & economic transformation.



Role of farmers and farm women in integrated pest management in Kathua District

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The studies were conducted to assess the knowledge level of Farmers on Integrated Pest Management. The studies were conducted across different locations comprising of six villages namely, Haripur saini, Sultanpur, Sunjwan, Rajbagh, Chainpura and Pathwal based on proportionate Random sampling to assess the knowledge level of Farmers on Integrated Pest Management. The data were collected through personal interviews using a questionnaire. Most of the women and men farmers were 30 to 60 years old, married and had a high school level education. Most were aware of pesticide health hazards and 60% reported that they sometimes experienced illness after spraying. About more than half had attended some form of pest management training programmes. Most believed that pesticide applications would increase yields of all crop and 40% farmers and farm women believed that other IPM practices like cultural control, mechanical control and biological control are ecofriendly and don't have adverse effect on people's health and environment. The mean knowledge percentage of the farm women on pest management was relatively low as compared to man.

Keywords: Integrated pest management, pesticides, knowledge level



Poster Presentations

MSAEJMU-40

Role of statistics in economics

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Statistics is a science of numerical information which employs the processes of measurement and collection, classification, decision making, analysis and communication of results in a manner which is understandable and verifiable by other. Important phenomena in all branches of economics can be described, compared and correlated with the help of Statistics. Statistics plays a vital role in the field of economics and are used in various problems in microeconomics, macroeconomics, business, finance, forecasting, data quality and evaluation. Statistics of consumption tell us of the relative strength of the desire of a certain section of the people and its variations from time to time. We can study the manner in which people spend their income over various items of expenditure, namely, food, clothing, house rent, etc by using statistical analysis while as statistics of production describe the wealth of a nation and compare it year after year showing thereby effect of changing economic policies and other factors on the level of production. In the current study we have discussed most of the techniques used in the field of economics that is sufficient for us to conclude the vital role of statistics in economics. **Keywords:** Statistics, economics, production, wealth

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Training need of dairy management practices in Konkan region of Maharashtra

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he present study was conducted in Ratnagiri, Sindhudurg, Raigad and Thane districts of Konkan region of Maharashtra state, with the objectives the training needs of the dairy farmers and suggests the strategies to improve milk production in Konkan region. In all, 200 dairy farmers were selected from eight tehsils from selected four districts. Personal interview technique was used for data collection. The personal, socio-economic and psychological characteristics of the dairy farmers namely, self-education, family size, experience in dairying, annual income, number of milch animals, milk production, availability of water, land holding, social participation, training received, economic motivation, management orientation were considered as independent variables, while adoption behaviour were selected as dependent variable for the present study. The adoption behaviour consisted four parameters namely, knowledge, and skill was measured with the help of specially developed scale, while extent of adoption and attitude towards dairy farming was measured with developed scheduled. Overall adoption behaviour of dairy farmers towards recommended dairy management practices was found 'medium' (71.50 per cent), while nearly equal number, i.e. 17.00 per cent and 11.50 per cent of the dairy farmers were in 'low' and 'high' of adoption behaviour, respectively. Majority (96.52 per cent) of the respondents needed training on 'clean and hygienic milk production', followed by 94.78 per cent of the respondents required training on 'care and management of calf and heifer', 87.52 per cent on 'feed and fodder management' whereas, 85.21 per cent of the respondents needed training on 'health care management', 51.30 per cent on 'care and management of breeding bull. It is highlighted that if investigator and policy makers successfully work on suggestion suggest by dairy farmers who really put for steps towards good dairy enterprise. Keywords: Adoption behaviour, knowledge, training needs, dairy management Practices.



Approach of farmers towards watershed development programme

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The present study was conducted in Mahad and Poladpur tabils of Raigad district of Konkan region. The sample was constituted 160 respondents drawn from sixteen villages of two tahsils. The respondents were interviewed with the help of a specially designed schedule. The ex-post-facto research design was used for the present study. The analysis of data revealed that majority of the respondents belonged to 'middle' age category and more than half of the respondents had 'medium' family education status having marginal to small land holdings and 'medium' annual income. Majority of the respondents did not have source of irrigation, 'fair' cropping pattern and majority of the respondents possess bullocks in case of livestock possession. Majority of respondents had 'medium' extension contact and social participation. Most of them received training on "Watershed Awareness Programme" Regarding extent of participation of farmers in the watershed development programmeit was found that majority (71.25 per cent) of the respondents had medium extent of participation in the Integrated Watershed Management Programme. In case of individual participation in Integrated Watershed Management Programme activities, overall full participation was observed in activities like awareness programme campaign, giving consent to the programme, meeting with local bodies, determining the needs, participation in group meetings, determining the different treatment for community land as well as private, determining different training programmes/Exposure tours, finalizing different livelihood activities, determining the locations for entry point activity, identification of different types of employments, deciding on different livelihood activities, strengthening of existing bunds, maintenance, restoration and development of assets in community land and selection and planting of forest tree species for community land. The majority (54.37 per cent) of the respondents had medium level of knowledge about Integrated Watershed Management Programme. Majority (81.87 per cent) of the respondent possessed the knowledge about 'Selection of watershed committee chairman and secretary'. Regarding suggestions for better implementation of Integrated Watershed Management Programme majority of the respondents (42.50 per cent) expressed activities of water harvesting programme are taken up on large scale.

Keywords: Transfer of Technology, watershed programme and community land.

MSAEJMU-66 Aspirations of the students undergoing lower education in agriculture

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he present study was conducted in Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (M.S). The sample constituted 280 students, who have completed second year and entered in final year of agriculture polytechnic. The respondents were interviewed with the help of specially designed schedule. Majority of the respondents had basic education of 10th standard, 'rural 'family background and had 'high' family income. Majority of them had 'small' land holding and 'farming' as their main occupation while academic performance those students was good. Majority of the students had 'medium' knowledge of agriculture schemes, 'medium' participation in co- curricular activities. Majority of the students had 'medium' level of aspiration. Most of the students aspired to secure administrative position in agriculture departments. One fourth of students had aspired to start 'farming' for the source of self employment and 'to earn income of more than Rs. 50,000/- per month. Important social aspirations of the students were 'to provide every support regarding improved agriculture to the needy villagers. It was observed that the characteristics namely, family income, family occupation and knowledge about schemes related to agriculture had positive and significant relationship with aspirations of the students whereas, the characteristics namely, basic education, land holding had shown negative and non-significant relationship with aspirations of the students. Family background, academic performance and participation in cocurricular activities had positive and non-significant relationship with aspirations of the students.'Use of computer in agriculture' (77.14 per cent), 'Video conferencing' (75.35 per cent) and 'Organization of



training for preparation of project proposals for different enterprises' (74.64 per cent) were the suggestions given by the students, so as to fulfill the aspirations. **Keywords:** Aspiration behaviour and Knowledge.

MSAEJMU-67

Attitude of rural youths towards agriculture

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The present study was conducted in Sawantwadi and Kankavli tahsils of Sindhudurg district from Maharashtra and Chikkodi and Athani tahsils of Belgaum district from Karnataka respectively. The sample constituted 120 rural youths from both the regions. The respondents were personally interviewed with the help of a specially designed schedule. It was found that the rural youths from both the regions were belonged to medium size of family, had medium annual income, had low social participation, medium extension contact, medium mass media exposure, medium cosmopolitenes and medium level of economic motivation. The rural youths from both the regions was more or less same. Extension contact and economic motivation had a positive impact on the attitude of rural youths from Maharashtra, while in case of Karnataka social participation and awareness of agricultural schemes had positive impact on their attitude.'Organic farming should be done' and 'Cost of inputs should be minimized by the concerned agencies' were the major suggestions reported by the rural youths from Maharashtra, while the majority of the rural youths from Karnataka suggested that 'sufficient electric power should be provided regularly'. **Keywords:** Attitude behaviour, extension contact and economic motivation.

MSAEJMU-68

Participation of farm scientists in transfer of technology in Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

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The present investigation was conducted in jurisdiction of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli with the main objective of measure the contribution of farm scientists in transfer of technology. In all, 120 farm scientists were selected for the study. Majority (66.66 per cent) of the farm scientists had medium level contribution in transfer of technology, followed by 18.34 per cent of the farm scientists had low level contribution and 15.00 per cent of the farm scientists had high level contribution in transfer of technology. More than three-forth of the farm scientists were participated through training programmes (80.83 per cent) newspapers (76. 67 per cent) and farm publications (75.83 per cent) for transfer the farm technology. The majority (40.84 per cent) of the farm scientists belonged to young age group, more than half (59.16 per cent) of the farm scientists had completed Doctoral degree, while 39.17 per cent of farm scientists were Master's of Science, maximum number (70.83 per cent) of the farm scientists were Assistant Professors. Most (83.75 per cent) of them belonged to the 'medium' income level and undergone training at national level for medium duration. Majority (64.17 per cent) of the farm scientists were from 'rural', area and most of (88.34 percent) them had a medium level of participation in professional organization, nearly half (49.16 per cent) of the farm scientists perceived fair organizational climate while 39.17 percent of them opined 'good' organizational climate. Majority (80.00 per cent) of the farm scientist had medium level of job satisfaction and majority (89.16 per cent) of them had medium level of achievement motivation.Majority89.16 per cent of the farm scientists had experienced the constraints 'non-availability of funds' and 'no sufficient manpower to distribute the work' (74.16 per cent). Majority (85.83 per cent) of the farm scientists suggested that 'sufficient funds should be provided for conducting transfer of technology' and 'need multidisciplinary team for extension work' (72.50 per cent). Keywords: Transfer of Technology, Farm Scientist and Organizational climate





Preference pattern and satisfaction level of agrowon daily readers from Ratnagiri District

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The present study was conducted mainly with the specific objective to Preference Pattern and Satisfaction Level of Agrowon Daily Readers from Ratnagiri District. The study was conducted in four tehsils namely, Dapoli, Khed, Chiplun and Rajapur of Ratnagiri district which were selected randomly. Twenty villages from these four tehsils were selected for the study. From each village 5 daily Agrowon readers selected randomly, thus 100 readers of Agrowon daily newspaper selected by taking personally interview. It was observed that the majority of the respondents had 'middle school' level education, 'above ten years' farming experience, 'marginal' land holding, 'medium' annual income, 'medium' extension contact, 'medium' progressiveness, 'medium' mass media exposure, 'medium' reading habit, 'medium' preference pattern and it was given 'first preference for agriculture', 'news as writing skill', 'news agency as source of information' and 'medium' satisfaction level and it was 'most satisfied with the name of the newspaper', 'accuracy of the message', 'appropriateness of illustrations'. The characteristics of independent variables namely, farming experience, land holding, annual income and extension contact had non-significance with satisfaction level. More than two fifth of the respondents had problem of 'Irregularity in the distribution of Agrowon'daily,'Use of scientific and difficult terms', 'articles not oriented towards average farmers', 'success stories from Konkan region are less in number', 'Information on Government schemes related to agriculture is not published timely'. Major suggestions given by the Agrowon daily readers had majority of the respondents expected 'more' information about Konkan agriculture, followed by 'special edition for Konkan region', 'experience of farmers from Konkan region will be included', 'Detail and complete information should be given'. It may be concluded that published information on Agrowon daily newspaper are beneficial to farmers. It covered specific information about Konkan region agriculture and hence it is beneficial to Agrowon readers of Konkan region.

Keywords: Preference pattern and satisfaction level.

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Correlates of social development of Andh tribal

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he study is mainly based on the descriptive research design namely Exploratory Research Design. The study was conducted in Malegaon, Barshitakli and Patur Tahsil of Washim and Akola districts of Vidarbha in Maharashtra State respectively. The district has 13 tahsils and tribe community particularly 'Andh' mainly inhabits in these tahsils. It was revealed that the significant relationship of socio-economic status and extension contact (r = -0.151417 and -0.12437 at 1% and 5% level of probability respectively) with social development. Due to wrong perception of information about the various developmental programmes of government resulted in inadequate and incorrect adoption of various aforesaid tasks. Hence, significant relationship of socio-economic status and extension contact with social development was observed. The path coefficient reported revealed that the variables, namely SES (-0.179); Extension contact (-0.099); age (-0.098) have exerted maximum but negative direct effect. The other variables namely family size (0.097); occupation (0.090); social participation (0.069) also exerted the recognizable direct effect but it was minimum and positive. In case of education (-0.024) and annual income (-0.019) also exerted the recognizable direct effect but it was comparatively minimum and negative. Hence these two variables should be given due importance while deciding the social development of 'Andh' tribal respondents in study area.

Keywords: Social development, adoption, tribal respondents



Poultry industry in India

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Poultry is one of the fastest growing segments of the agricultural sector in India today. India is now the world's third largest egg producer and the fifth largest producer of broilers. Broiler production in 2016 is around 42 million tons which is approx. 8 per cent more than last year. The demand for processed chicken meat is growing between 15 to 20 per cent per year. Egg production in 2016 is approximately 80 billion eggs, upto 5per cent more than last year. While the production of agricultural crops has been rising at a rate of 1.5 to 2 per cent per annum, eggs and broilers has been rising at a rate of 8 to 10 per cent per annum. The four southern states- Andhra Pradesh, Karnataka, Kerala and Tamil Nadu- account for about 45 per cent of the country's egg production, with a per capita consumption of 57 eggs and 0.5 kg of broiler meat. The eastern and central regions of India account for about 20 per cent of egg production, with a per capita consumption of 18 eggs and 0.13 kg of broiler meat.

Keywords: Poultry Industry, broiler production, egg production, broiler meat

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Knowledge of integrated pest management practices by

soybean growers

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he present investigation entitled "Knowledge and adoption of integrated pest management practices by sovbean growers" was carried out in purposively selected Buldhana Panchayat Samiti of Buldhana district in Maharashtra state. An exploratory design of social research was adopted for the study. A random sample of 150 soybean growers from 10 villages was drawn and the data were collected with the help of structured interview schedule. The Present investigation indicated that relatively higher proportion of soybean growers (51.33%) were found in the middle age group of 36 to 50 years possessing semi-medium size of land holding (2.10 to 4.00 ha), cultivating soybean crop on 1.01 to 2.00 ha of their land, having annual income up to Rs. 1, 06,000/-. More than half of the soybean growers (57.33%) belonged to medium category of availability of inputs, utilizing formal sources of information such as Agril. Assistant and Gramsevak regularly by half of the respondents, whereas, in informal sources majority of the respondents were utilizing proprietor of Krishi Seva Kendra in IPM practices of soybean crop. Majority of the soybean growers belonged to medium category of economic motivation, scientific orientation and risk preference (72.00%), (70.00%) and (67.33%) respectively. With regards to knowledge of soybean growers about IPM practices, it was revealed that large majority of soybean growers (96.66%) were aware about the use of healthy/ improved seeds, use of resistant varieties (90,00%), keep close watch on crop with regular survey of crop, if the pest level is above ETL, use of suitable insecticide with recommended dose/ha. None of the soybean growers had knowledge about biological control practices except use of 5% NSE for management of pests and favourable ecosystem for development of entomopathogenic fungi to control lepidopterous pests. Majority of the soybean growers (67.33%) possessed medium level of knowledge regarding integrated pest management practices of soybean.

Keywords: Soybean IPM, ecosystem, improved seeds, entomopathogenic fungi, epidopterous.





Education: A prerequisite for nurturing entrepreneurship

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ducation is indispensable for skill development and fundamental to Entrepreneurship and innovation. The ability to innovate and generate commercially valuable new products and processes can only take place in environments that encourage experimentation and value addition. The importance of education for social progress and economic development is undisputed. In this respect, the nature and role of education in catalyzing Entrepreneurship, especially in the highly skilled and knowledge-driven sectors is a topic requiring special attention. One major determinant for growth of Entrepreneurship is the availability of adequate number of skilled human resources, people who can take advantage of the opportunities provided by a growing economy at the local, national and global levels. Entrepreneurs feel that there is a need to recreate real-life situations in the classroom with the help of examples and illustrations so that students are able to get a 'concrete feel' of various aspects of the outside world. At the same time, many entrepreneurs also feel that the starting point for reforming teaching methods and encouraging variety in career options, must be at the school stage itself, where the pressure to learn by rote and to join typically stereotypical career paths are huge. Right from the school stage, pedagogy should encourage original thinking and not rote learning. One specific suggestion from several entrepreneurs is to introduce manuals in school curricula on 'How Things Work', on various practical aspects of everyday living. Further, there is a need to significantly increase Business Incubation for Entrepreneurship (BIE) by comprehensively exploring policy issues pertaining to increasing quantity, improving quality and enhancing financing. While valuable work has been done by incubators, there is huge scope for them to become entrepreneurial themselves in terms of ready and organic adaptability to the market, development of business processes and infusion of greater dynamism.

Keywords: Entrepreneurship, innovation, importance of education

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Importance of ICT in agriculture development

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Information and Communication technologies (ICTs) have been the important and fastest mode of communication between farmers, Govt. Agencies and Extension Functionaries. Government agencies has been planning and working hard to deliver its services at the locations convenient to farmers and for easy accessibility using any media. The rural ICT applications attempt to offer services to the citizens as per their need and demand, at their fingertips. There has been constant improvement in the modes using which rural mass and farming community in particular are able to utilize the power of ICT for their knowledge and solutions. In the era of mobile revolution Apps are one of the best modes using which farmers may gain the solutions as per their need. Government agencies and private partners have developed no. of Apps. in the Agriculture Sector for utility of the rural mass. The commons Apps are M-Kisan App, Farm-o-pedia; crop Insurance, Agri Market, Pusa Krishi, Kisan Suvidha, Kisaan Market, Krishi Gyan, Smart crop, Kisan Yojana, IFFCO Kisan etc. Survey was undertaken for assessing the knowledge of above said Govt. created apps for agriculture, in the Govt. Departments, Extension functionaries, and farmers. It was found that Officials, Extension functionaries were having very less knowledge and the farmers were having negligible knowledge about these Apps and its working, which has been a matter of concern. Even the officials were reluctant to download and test the Apps. It was concluded that efforts needs to be put in for creating awareness about these Apps among all stakeholders and farmers in general so that the idea for which these were developed, is fulfilled and all the requisite benefits are enjoyed by the target group.

Keywords: ICT, apps, download.





Indigenous technical knowledge (ITK) and their role in sustainable

grassroots innovations

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ndigenous Technical Knowledge (ITK) has immense potential for innovation, especially at the I grassroots level. India is a country populated by a number of indigenous communities, most of which have their own set of unique traditional knowledge and technology base. Many of these knowledge and technologies are at par with the modern knowledge and technology system and have been provided the indigenous communities with comfort and self sufficiency. These traditional knowledge and technologies have played a significant role in the overall socio-economic development of the communities. A study on some of the aboriginal knowledge and technologies, with special reference to the concept of indigenous technical knowledge, prevalent among a number of indigenous communities was carried out and the significance of the same in innovation has been evaluated. The study was conducted within the framework of "sectoral system of innovation". A wide range of diverse sectors including agriculture, animal husbandry, fishing and textile were considered for the purpose of the study as all these sectors are imperative in Indian context. During the course of the study, it has been observed that there is an instant need to document and preserve the indigenous technical knowledge of different communities, many of which are at brink of extinction. There is a lack of proper alliance between the practice of indigenous and modern knowledge. There are serious issues related to intellectual property rights. An appropriate association between the traditional and modern knowledge and technology system has immense potential to benefit the society.

Keywords: Sectoral system, innovation, intellectual property right

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Women as entrepreneurs in India

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In today's world, women entrepreneurs are playing very vital role and they have become important part Lof the global business environment and it's really important for the sustained economic development and social progress. Women entrepreneurs may be defined as the women or group of women who commence and operate the business venture. In India, though women are playing key role in the society, but still their entrepneurial ability has not been properly tapped due to the lower status of women in the society. Like a male entrepreneurs a women entrepreneur has many functions. Women entrepreneurship is gaining importance in India in the wake of economic liberalization and globalization. The policy and institutional framework for developing entrepreneurial skills, providing vocation education and training has widened the horizon for economic empowerment of women. However, women constitute only one third of the economic enterprise. There exists a plethora of successful business women entrepreneur both in social and economic fields in India. They are performing well. Government of India has also introduced National skill Development Mission in 2009 in order to provide skill training, vocational education and entrepreneurship development to the emerging work force. However, entrepreneurship development and skill training is not the only responsibility of Government and therefore other stakeholders need to should r the responsibility. In Hindu scriptures, woman has been described as the embodiment of Shakti. But in real life she is treated as Abla. Women are leaving the workforce in droves in favor of being at home. The increasing presence of women in the business field as entrepreneurs has changed the demographic characteristics of business and economic growth of the country. Women owned business enterprise are playing a more active role in society and the economy, inspiring academics to focus on this interesting phenomenon. This paper focus on the problems, issues, challenges faced by women entrepreneurs, how to overcome them and to analyze policies of Indian government for and problems faced by them while pursuing their business. Keywords: Women entrepreneurs, skill training, vocational education and entrepreneurship.



Farm mechanization to enhance farm income

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Tuman population is on the rise. To meet the predicted world demand for food, the agriculture sector needs focused interventions. Among the various interventions, farm mechanization is one of the importantinterventions. Agricultural mechanization helps in increasing production, productivity and profitability in agriculture. Mechanized harvesting, for example, was a key factor in increasing cotton production in the last century. It has been reported that efficient farm machinery helps in increasing productivity by about 30% besides, enabling the farmers to raise a second crop or taking multi crop cuts. The engineering inputs like Tractor, Modern Plough, and different type of drills, tillers and harrows have already proven their worth. The efficiency of modern plough is such that modern plough is about 200 to 300% more efficient than indigenous plough. Use of Maize planter and ferti cum seed drill save quantity of seed required per hectare besides placing the seed at proper depth and space thereby increasing the yield. The chances of the crop lodging at maturity when strong winds blow are also diminished as the seed is placed at proper depth. The use of techniques like drip and sprinkler irrigation save a lot of water, reduce the conveyance losses, supply water directly to the root zone. The Laser Land Leveling (LLL) technique is also very important one. At the field level also there are variations in soil moisture, nutrient status and other parameters in the fields. The LLL gives us the inter field variations and then plan as per the field conditions. The technique of LLL has been reported to increase about 3-4 per cent of net cultivable area as there are fewer requirements for bunds and channels. Several studies conducted in different parts of India have shown that mechanization has helped in increasing production, productivity, generation of income and employment. The use of machines like tractor and bulldozers can enable the farmers to bring more and more area under cultivation. Even a good considerable amount of uncultivable land can be brought under cultivation. The time saved by the use of machinery can be utilized for other purpose. The use of machinery increases the efficiency of the worker and raises the output per worker. Farm mechanization can also solve various other problems like silting, water logging and fear of death of draught animals due to over burden of work load. This in turn can play a part in transforming the Indian agriculture from subsistence to commercial. Rural livelihoods in many parts of country are still under considerable strain and the economy and environment in many parts of the country is not in a good position. Agriculture forms the core of rural livelihoods having a major influence on livelihood outcomes.

Keywords: Farm mechanization, farm income, important intervention, engineering inputs.

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Agricultural entrepreneurship for income generation

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A griculture represents the primary sector of the Indian economy providing employment to about 51% of the total population with 14-15 per cent contribution to the country's Gross Domestic Product. Unfortunately despite so much contribution, it suffers from a high degree of unemployment as well as under-employment. This farm or agricultural unemployment in the country is prevailing in the form of seasonal unemployment, disguised unemployment and chronic and usual status unemployment. A very high degree of disguise unemployment occurs in Indian agriculture for cultivators as well as labourers and it is a characteristic of developing economies where more of labour intensive work is done. It refers to situation condition where more workers are engaged in an occupation than are actually needed and is primarily traced in the agricultural and the unorganized sectors of the economy. Because of the seasonal nature of agricultural operations and in the absence of other suitable alternatives, the surplus labour keeps on engaging in seasonal activities thus causing disguised unemployment. It also becomes a perfect case of more peoples' doing a work which could have been done by lesser number of people in the same time frame. The Indian Government has taken several measures to curb disguised unemployment and unemployment as a whole. Under the Agricultural Startups scheme started by Government of India, skill



based training is provided to the youth to help them in setting up their own enterprise combined with a friendly tax regime. They can go ahead with their dream ventures taking advantage of the friendly ecosystem of easy registrations, liberal finance tax benefits and a simplified regulatory system. Youths setting up their own enterprises will not be job seekers but will be job providers. For this the government has relaxed many norms so that they can get hassle for loans from the financial institutions with moratorium in repayment and tax rebates in the initial years. The Government of India has launched a central sector Scheme viz. Agri-Clinics and Agri-Business Centre (AC&ABC) in 2002 to attract education vouth in agriculture sector for creation of different self employment ventures so that they become job providers along with provision of extension services to the farmers. Under this scheme a loan at very low interest is provided to them. Under the scheme different types of ventures that have already been established by agriculture graduates and other technically trained persons. These include soil and water testing laboratories, seed processing units, setting up of vermi composting units mushroom production centers, Hatcheries, setting up of information technology kiosks, Food processing and value addition units. Agri-entrepreneurship can thus play a pivotal role in the transformation of subsistence farming into a profitable venture by creating more jobs, shapes entrepreneurial opportunities, bringing competition ultimately improving farm productivity.

Keywords: Agri-entrepreneurship, unemployment, agribusiness

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Socio-economic profile of people rearing crossbred karakul sheep in Kargil (J&K)

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he people of Ladakh rear a variety of livestock such as sheep, goat, horses and yaks, which provide L them with various goods and services. Sheep plays an important role in the hilly and other inaccessible areas, where it is difficult for other livestock to thrive and contribute to the income of poor communities. Sheep rearing is the core activity of rural masses of Kargil and plays a vital role in socio-economic upliftment of weaker section of the society. Of the 2.83 lakh sheep population in Ladakh region, Kargil possesses 179306 (63.35%) and among which more than 1/3rd are cross bred Karakul sheep. These sheep are medium sized with average adult body weight of male and female found to be 57.00 + 0.01 and 47.50 +0.01 kg, respectively. The breed shows good performance under these harsh climatic conditions and thrives best in cold arid region, scarce vegetation and low humidity area and plays a vital role in livelihood support in the area. The breed is being used by the breeders/farmers for fibre as well as meat production and is having good market especially during winter and during festivals. The study revealed that all the farmers belonged to schedule tribe (Muslims) community and within the age group of 40-60 years. Maximum breeders had education level of middle to matric standard. The mean flock size was 27.23. Farmers were also found to rear other livestock species such as local cattle, cross-bred cattle, goat and back-yard poultry with varied number. The mean total annual income from all sources among the Karakul breeders was recorded as Rs 1,50000/- including other sources, agriculture and livestock (Rs 30000/-, 55000/- and 37,505/-) respectively. However, the income from sheep only was merely Rs.20000-25000/. Animals are housed only during night in the houses which are constructed nearby or inside the dwelling house. Animals are maintained on semi-intensive feeding system and fed on an average 1.5 kg of greens/bhusa/dried alfa-alfa per sheep per day especially during winters when animals cannot be taken out. Animals are mostly treated by paravets. Vaccinations and deworming are being practiced by the farmers on regular basis.

Keywords: Socio-economics, crossbred sheep





Possibilities of ornamental fish culture in Jammu and Kashmir State for unemployed educated youth

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he main objective of the study is to improve the livelihood of fish farmers and an employment L opportunity for unemployed educated youth. Ornamental fish culture is not well developed or even not done in Jammu and Kashmir State. There is enormous scope of ornamental fish culture in Jammu and Kashmir as there are more than 10-15 species of ornamental fishes. In order to make this culture popular the technology needs to extend to common fish farmer and entrepreneurs. The methodology will be adopted to boost the culture and production in private sector small infrastructure could be constructed which will help to grow it into an industry. The suitable zones will be found in all the nooks and corners of the State. Ornamental fish species will be selected native to Jammu and Kashmir State and their breeding and feeding technology will be developed and the same shall be popularized among fish farmers and young entrepreneurs who want to take up ornamental fish culture on commercial lines. The technology which is already in place and new technology will be developed with small infrastructure at fish farm level and on spot training and demonstration will be done to fish farmers and entrepreneurs. The results of the programme will be given wide publicity through extension wing of Department of Fisheries, Jammu and Kashmir Government and Sher-e-Kashmir University of Agricultural Sciences and Technology-Kashmir through training programmes, seminars, pamphlets etc. It can be concluded that the programme will help in the up-liftment of socioeconomic condition of fish farmers and will also create employment opportunities for masses in rural areas particularly unemployed educated youth of the state. Keywords: Fish culture, unemployed educated youth

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Mushroom as a potential source of nutraceuticals

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ushrooms are highly nutritive, low-calorie value food with good quality protein, vitamins and minerals. A wide range of activities including antitumor, cardiovascular and antimicrobial are reported in mushrooms. In developing countries like India mushroom progress is a boon in the field of food, medicine and in generating employment. By virtue of having high fibre, low fat and low starch, edible mushrooms have been considered to be ideal food for obese persons and for diabetics to prevent hyperglycemia. India is home to the largest number of people with diabetes in the world. Mushrooms have become attractive as a functional food and as a source for the development of drugs and nutraceuticals responsible with their antioxidant, antitumor and antimicrobial properties. Mushroom is excellent sources of folic acid, the blood building vitamin that prevent anaemia. The active constituents found in mushroom are polysaccharides, dietary fibre, oligosaccharides, triterpenoids, peptides and proteins, alcohols and phenols, and mineral elements such as zinc, copper, iodine, selenium and iron, vitamins, amino acids etc. In country like India most of the people live below the subsistence level and suffer from protein deficiency. To combat this situation extensive research and cultivation of edible mushrooms in our country is imperative. India's potentials for mushroom cultivation, its ecological diversities, biodiversities, climatic and geographical diversities, and vast man power which are congenial, lead India as a major player in global scenario of mushroom production.

Keywords: Mushroom, pharmaceutical, nutraceutical, diabetes, constituent, diversity



Role of integrated farming system in sustainable agriculture

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n India, more than 80% of the farming community belongs to marginal and small farmers involving only **1**32.5% of the total operational area. The income from seasonal field crops alone is hardly sufficient to sustain these small farmers' family. With the gradual decline in farm income, it has become increasingly difficult to produce enough food and other farm produce for the subsistence of their family. Under such circumstances, to ensure regular income for decent farming, farmers have to undertake some land-based enterprises to complement existing farming activity. This will help to get more income leading to social based economic upliftment To sustain a positive growth rate in agriculture, a holistic approach is the need of the hour. The goal of sustainable agriculture is to conserve the natural resource base, protect the environment and enhance prosperity for a longer period. The farming system is a set of agro-economic activities that are interrelated and interact among themselves in a particular agrarian setting. While in Integrated Farming System (IFS) is one of the potential approaches, which emphasizes the judicious combination of anyone and more of such enterprises and effective utilization of available resource with the small and marginal farmers. It also ensures the recycling of the available resources, by-products and farm wastes within the farm itself. IFS activity is focused around a few selected inter-dependants, interlinking production systems, based on crops, animal, and related subsidiary professions. It is a rich source of species diversity helps in soil building preserves and improves ecological conditions essential to long-term sustainability. IFS approach with location-specific models offer gainful employment and are highly profitable and sustainable.

Keywords: Integrated farming, sustainable agriculture, farm income, IFS

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Sericulture industry: Current status, problems and prospects

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C ilk known as "Queen of Textiles" is the most elegant textile in the world with unparalleled grandeur, D natural sheen, and inherent affinity for dyes, high absorbance and durability. Asia is the major producer of silk in the world with China being largest producer and chief supplier of silk to the world markets while India ranks second in silk production having a share of about 15.49 per cent in the global production. Sericulture is an eco friendly agro-based, labour intensive rural cottage industry that provides livelihood and plays a vital role in socio-economic development of rural masses of the country in general and Jammu and Kashmir in particular. In the state of J&K it provides employment to 25500 rural families as a subsidiary occupation, by producing about 860 MTs of silk cocoon and generating an income of about 1100 lakh annually by cash (Anonymous, 2015). The paper analyzed the current status, pattern of growth in production and employment and also the agribusiness potential of sericulture. The study is based entirely on secondary data gathered from various published sources of government agencies like Department of Sericulture, J&K Government, Economic Survey (various issues), etc. The paper has highlighted that despite attaining a significant growth in the country and in the state with respect to cocoon production, silk production and employment and income generated through sericulture activity yet the growth figures for earnings from exports and imports turned out to be negative for the country which indicates that the industry needs to be geared up in terms of modernization of mulberry cultivation, popularization of low cost technologies adequate and timely supply of disease free laying, etc. So it can be concluded that there is no deny to the fact that the sericulture industry has occupied a prominent place in the industrial development in Jammu and Kashmir but still its performance and progress is not up to the mark which may be due to many factors such as, non-availability of quality mulberry leaves, unscientific rearing techniques, poor quality of seed, competition from other crops, lack of proper extension activities and also the marketing, financial and other constraints, which act as an obstacle in various fields of sericulture activities. Hence efforts are needed to overcome the problems of this sector not only to increase the employment opportunities but also to promote exports.

Keywords: Employment, production, growth, mulberry and sericulture.



Agriculture sector: A source of livelihood

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A griculture is pivotal sector for ensuring food and nutritional security, sustainable development and elimination of poverty. Small and marginal farming communities are in competent to sustain their families. Therefore, they engage in multiple sets of activities to augments their cash flows at macro-level the agriculture works as key sectors for livelihood. Agriculture and animals husbandry are major source of livelihood for small sized farmers but for marginal and labours have to go with available options for their livelihood security. The small sized farmers were more diversified in farming and non-farming activities than marginal farmers. Further, the small sized farmers were more diversified towards food+cash crops +livestock/poultry combination and marginal farmers with cash crops alone. Especially, project based approach, value oriented training to women self help groups and FLDs found competent for livelihood security. During off season, rural to urban and urban to urban migration develops positive influence on migrants that resulted more investment in agriculture. It can be said that agriculture is the best livelihood source for farming communities.

Keywords: Agriculture, livelihood, FLDs

MSAEJMU-159 Use of information and communication technologies (ICTs) by the farmers of hilly areas

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In hilly areas of J&K farmers live in less accessible and isolated villages and dissemination of information to them is very difficult. In this situation ICTs could be accepted to cater the needs of the farmers to a great extent. Information sources play the key role in disseminating the various innovative technologies to the farmers. Effective communication from different sources and channels are the essence of extension which provides information and knowledge to the farmers. Keeping in mind the importance of Information and Communication Technologies (ICTs) in the transfer of agricultural technologies, a study on "Use of Information and Communication Technologies (ICTs) by the Farmers of Hilly Areas" was conducted in Reasi District of Jammu and Kashmir which was selected purposively. Out of 12 C.D. Blocks, 4 C.D. Blocks namely Reasi, Arnas, Pouni and Painthal were selected randomly. A sample of 20 per cent (T20) farmers was selected randomly from selected villages. Hence, a total of 120 respondents were finally selected for recording their responses for study purpose. An index was developed for studying the use of ICTs by the respondents. It was found that the majority of farmers were having television and mobile phones and they were using them for the entertainment and agricultural information regularly. It was found that television was considered as the most credible source of information followed by the radio, extension literature and newspaper.

Keywords: ICTs, Communication, Innovative Technologies, Hilly Areas



Mushroom production technology: Issues and challenges in India

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griculture continues to be the main strength of Indian economy. With the variety of agricultural crops grown today, the country has achieved food security by producing about 260 million tonnes of food grains. However, the struggle to achieve nutritional security is still on. Mushrooms are one such component that not only uses vertical space but also help in addressing the issues of quality food, nutrition, health, and environmental sustainability. Mushroom farming today is being practiced in more than 100 countries, China alone produced more than twenty types of mushrooms at commercial scale. But in India growth of mushroom production industries are poor. China produces more than 60 percent of world mushroom whereas India contributes only 3-5 percent. In India mostly commercially grown mushrooms are- White button (Agaricusbisporus), Oyster mushroom (Pleurotus spp.), Paddy straw mushroom (Volvariellavolvacea), milky mushroom (Calocybeindica) etc. Button mushroom contributes about 70 percent of total mushroom production in India. There are several reasons behind the poor growth of mushroom production industries in India like awareness, poor knowledge of advanced production technologies, fear in consumption due to poisonousness or allergies effects etc. Increase in princess of raw material, less availability, and poor supply of good quality mushroom spawn. Short of govt. policies and promotion for mushroom cultivation in the country. Training programmes and farmer fairs to increase awareness related to mushroom cultivation and their problems like pest and diseases incidences, maintenance of environmental conditions during crop period etc. Increase in self-life of mushroom through different preservative techniques and value-added products of mushroom help in the promotion of mushroom production and supply for a long term.

Keywords: Mushroom Production, food grains, environmental sustainability

MSAEJMU-166

Livelihood status of MGNREGA beneficiaries in Eastern Vidarbha

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GNREGA is one of the most important schemes funded by central government all over the country. Huge investment was made for better livelihood security by providing guaranteed employment to rural poor. So, the study was undertaken with an objective to study the Livelihood Status of MGNREGA Beneficiaries within the four districts of Eastern Vidarbha region of Maharashtra specifically, Bhandara, Gondia, Gadchiroli and Chandrapur. For the study total thirty-two villages were selected and a sample size of 320 beneficiaries. Data were collected in face to face situation on a pre-structured interview schedule. The results indicated that before joining MGNREGA only 25.62 per cent beneficiaries reported continuation of education of girl children, but after joining MGNREGA work 50.31 per cent beneficiaries reported increased the percentage of continuation of education of girl children. In respect of material possession there was a significant increase in possession of mobile phones from 2.50 per cent to 69.06 per cent. The renovation work of house was undertaken by 23.43 per cent beneficiaries and 12.18 per cent beneficiaries, reported to have undertaken the extension of house. The level of trust in the society and the local leaders also improved among the beneficiaries. Prior to implementation of MGNREGA, the membership of SHGs was 9.68 per cent; it was increased to 26.25 per cent after the participation in MGNREGA. In nut shell there is significant impact on the livelihood support to the beneficiaries of MGNREGA. The level of impact was of low medium category, among 40.32 per cent beneficiaries, while 29.37 per cent reported high medium level of impact on livelihood support. Keywords: Livelihood status, education, MGNREGA



Make in India: Prospects and challenges

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Make in India is an initiative program to encourage Multinational Companies and domestic companies to manufacture their products in India and is conceptualized by the prime minister of India, Mr. Narendra Modi on 25 September 2014 to attract investments from business around the world. The campaign is completely under control of the central government of India. The major objective behind this initiative is to focus upon the heavy industries and public enterprises while generating employment, empowering secondary and tertiary sector and utilizing the human resources at presenting in India and to ensure that manufacturing sector which contributes around 15% of the country's Gross Domestic Products is increased to 25% in next few years. The analysis shows two dimensions of arguments. One side is optimistic nature which expecting more investment by free flow of capital. On the other side, it has criticized as the economy; it is adopting what look like neo-Nehruvian ideas. Instead, Modi should focus on making business as easy and honest as possible, avoiding artificial props, curbing inflation and fiscal deficits, ensuring a realistic exchange rate, and letting the market decide which sectors should flourish. Investors from everywhere will then rush in to make in India.

Keywords: Manufacturing, GDP, Economy, Investment, Employment

MSAEJMU-189

Advances in seed germination of temperate fruit crops: A review Ambika Bhandari, Amit Jasrotia, V.K. Wali, Parshant Bakshi, Kiran Kour and Deepji Bhat Division of Fruit Science, Faculty of agriculture, SKUAST-J

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C eeds of temperate fruit species need a long time to germinate as a result of their requirement of Stratification or cold treatment. Therefore, fast and uniform germination techniques are desirable and important for fruit tree propagation and especially for breeding studies. The combinations of benzylaminopurine (BAP) and gibberellic acid (GA₃) on *in vitro* embryo germination of apricot, peach, and wild cherry have tried as substitute to seed cold pre-treatment. Seed priming in stone fruits is helpful in enhancing germination and subsequent seedling growth. Similarly, for enhancing seed germination in walnut various pre-sowing treatments such as soaking in water for 14, 19, 24 days or in solutions of GA₃ (50ppm, 100 ppm, 200ppm) thiourea (1000 ppm, 2000 ppm) and their combinations have been advocated with sufficient degree of success. In apple seed germination and survival of seedlings as affected by gibberellic acid under cold arid conditions clearly indicated that apple seed treated with GA₃ 500 ppm for 40 hours had better seed germination. To meet the growing demand of planting material (grafts), nursery has to produce more number of rootstocks with graftable size in a shorter time. It is, therefore, highly essential to accelerate the seed germination and growth of seedlings with pre-sowing treatments to attain graftable size earlier and reduce the nursery cost. Therefore, enhancement of seed germination is important in propagation and breeding programmes, as well as for testing and using germplasm. Keywords: Seed, dormancy, seed germination, growth regulator

MSAEJMU-197

Novel and emerging technologies in processing of agricultural produce

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By the turn of the century, consumers have been more demanding, sophisticated and discretionary. They want much safer, high-quality, and convenience foods. there is a growing interest in non-thermal processes for food processing and preservation. Advanced technologies such as high-pressure processing, pulsed electric fields, and ultrasound are being applied to develop gentle but targeted processes to further


improve the quality and safety of processed foods. These technologies also offer the potential for improving existing processes as well as for developing new process options. Furthermore, by adding new process dimensions (such as hydrostatic pressure, electric fields, ultrasonics, supercritical CO2) to the conventional process variables of temperature and time, they facilitate enlargement of the availability of unit operations. The aim of this review is to discuss the impact of the most promising novel food preservation technologies in terms of energy efficiency, water savings and reduced emissions. The emergence of non-thermal technologies allows producing high quality products with improvements in terms of heating efficiency and, consequently, in energy savings. Effective combinations of two or more hurdles may be choosen once the mode of action and cellular targets are known. Novel processing technologies are increasingly attracting the attention of food processors once they can provide food products with improved quality and a reduced environmental footprint, while reducing processing costs and improving the added-value of the products. Non-thermal methods allow the processing of foods below temperatures used during thermal pasteurisation, so flavours, essential nutrients, and vitamins undergo minimal or no changes. Novel non-thermal technologies such as pulsed electric fields (PEF), pulsed light treatment (PLT), high pressure processing (HPP) and ionizing radiation (IR) among others have the ability to inactivate microorganisms at near-ambient temperatures avoiding thermal degradation of the food components and consequently preserving the sensory and nutritional quality of the food product. Keywords: Food processing; Non-thermal processing; High pressure, nutritional quality, Hurdles.

MSAEJMU-206

Hydroponics-An eminent technology of green fodder production for dryland areas

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A griculture and animal husbandry in India are interrelated. Mixed farming and livestock rearing are the fundamental parts of the rural population; hence there is an increased demand for fodder and feed in our country. With the very limited land allocation of 5% of gross cropped area for the fodder cultivation, severe droughts and water scarcity in various parts of the country, production of adequate green fodder for feeding the large livestock population has become an enormous challenge. At present India faces a net deficit of 63.5% green fodder and expected as 64.87% net deficit in green fodder by 2025. Hydroponics is a technology to grow plants without soil and minimum water as compared to conventional fodder production system with short duration of time period. The green fodders are an important element in feed for dairy animals. Per day dairy animals are producing up to 12-15 liters milk and it can be maintained by feeding good quality green fodders. The inclusion of green fodders in ration of dairy animal's decreases amount of concentrate feeding and thus increases profit and gives helping hands to farmers for their economic betterment. This technology results in a reduction of fodder scarcity and shows the way towards the sustainable development of agriculture and livestock production.

Keywords: Hydroponics, water scarcity, green fodder, livestock, economic development.

MSAEJMU-207

Golden rice- A rich source of vitamin A

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Golden rice is a variety of *Oryza sativa* rice which is produced through genetic engineering to biosynthesize beta-carotene, a precursor of pro-vitamin-A in the edible parts of rice. Golden rice was created by Ingo Potrykus of the Institute of Plant Sciences at the Swiss Federal Institute of Technology, working with Peter Beyer of the University of Freiburg. The project started in 1992 and the scientific details of the rice were first published in *Science* in 2000. It was considered a significant breakthrough in biotechnology as the researchers had engineered an entire biosynthetic pathway. Golden rice was developed as a fortified food to be used in areas where there is a shortage of dietary vitamin A. Although



golden rice was developed as a humanitarian tool, it has met with significant opposition from environmental and anti-globalization activists. The original Golden rice was called SGR1. After the *Golden Rice* prototype obtained in the year 1999 and which accumulated around 1.6 μ g/g of β -carotene in the grain, new lines were generated by using tissue-specific promoters in the gene constructs. This led to *first Golden Rice* 1 (GR1), which produced up to an average of 6 μ g/g of β -carotene. The latest development by Syngenta scientists is GR2, which produces 31μ g/g and more β -carotene. Which lines will be used in the end will depend on the final outcome of the ongoing research. **Keywords:** Golden Rice, vitamin

MSAEJMU-210

Current status and future prospects of fruit breeding

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India is bestowed with a wide range of agro climatic and soil conditions, therefore, almost all types of fruits can be grown in one or the other parts of the country. India is the second largest producer of fruits where horticultural crops occupy about 6.7% of gross area, contributing about 18% of gross value of agricultural output and 52% of export earnings in agriculture. Early farmers selected the best looking plants and seeds and saved them to plant for the next season. By using science of genetics breeders use that knowledge to develop the improved varieties with the desired traits. Long gestation period, high heterozygosity, often cross pollination, excessive fruit drop, parthenocarpy and low seed number restricting the availability of hybrid seedlings for evaluation are the challenges in crop improvement. Clonal selections have been attempted in a number of fruit crops and these efforts have resulted in the development of promising varieties in mango, papaya, banana, grape, guava, sapota, etc. Keywords: Fruit breeding, agro climatic, soil conditions, gross value, hybrid seedlings

MSAEJMU-215 Extension and implementation of quality seed technology by J&K Farmers

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Quality seed is the most important input because it has direct bearing to the production. Seed are not only the repository of the genetic potential of crop species but are also the carrier of other technologies. Therefore, the availability of high quality seeds of appropriate crops and varieties to farmers need to be ensured through sound seed distribution system. Production can be enhanced by 15-20% in different varieties by the use of quality seed. Marginal and small farmers mostly depend on farm-saved seeds which have low yield potential. This leads to decrease in seed replacement rate (SRR) and consequently low productivity. The use of improved high yielding crop varieties seed is an important avenue for reducing hunger food insecurity J&K. The benefits of modern agriculture technology are yet to each to the majority of the farmers. The adoption of new technology and innovations has not been an easy task and it is usually not spontaneous. The technology has to be taught and learned-adopted to be experience. There is huge gap between the scientific recommendation of technologies and adoption level of rural farmers. Moreover strong strategies are needed for adaption of agricultural systems to balance the uncertainty of climate through better technologies and management of crop and varieties. There is need for more trainings and education to change the attitude of farmers and enhance their confidence about the use of improved and quality seed technology in agriculture.

Keywords: Extension, implementation, quality seed, production



Economic perspectives for maintaining soil heath

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S oil health is a measure of a soil's ability to support life, withstand adverse environmental stresses, and acts as a core component of a resilient ecosystem. Soil quality is "the capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health." Farmer may only manage for soil health if there is a private benefit to the farmer that is greater than the cost of the practices. A variety of conservation programs help encourage adoption of these practices through the provision of technical and financial assistance. To help ensure cost-effective use of program resources for soil health practices, more information is needed on how much farmers benefit from soil health, how shifting the emphasis from soil conservation to soil health influences farmer motivation to adopt soil health practices, how much it costs farmers to implement soil health practices. This study will also lay emphasis on possible economic motivations of farmer to maintain soil health and also soil conservation techniques will be economically evaluated. **Keywords:** Soil health, Resilient, Soil quality, Economics.

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Training needs and use of ICTs by broiler poultry farmers in Reasi and Udhampur districts of Jammu

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he study ascertained Small Scale poultry farmers needs on improved training programmes and accessible ICT's in Reasi and Udhampur districts of Jammu and Kashmir. Fifty-two (52) poultry farmers were randomly selected from two operational districts under KVK, Reasi. Farmers training needs, and accessibility to ICT's were analyzed in the selected group. Results revealed that the percentages of poultry farmers that need training on various poultry production techniques were different as marginal farmers (>500) wanted to know more about government schemes and subsidies whereas small scale poultry farmers (500-2000) were more concerned with feeding and housing and on the other hand farmers with larger flocks (2500 and more) wanted to know more about prevention of diseases and marketing strategies. Findings also showed that (19%) of the poultry farmers (mainly large farms) hired labour (1 to 2 persons) for their business, (60%) prefer to work themselves or use their family members or close relatives for carrying out various farm operation while (21%) of the respondents employed both labours and family together (Table.1). Farmers were keen to attend training programme, exposure visits and disease check camps. In terms of ICT needs most of poultry famers belong to age group of 22-37(Table.1) and were having mobile phones with 27% having smart phones and some of them were even connected to poultry buyers and scientists through whatsapp poultry groups. Mostly the unemployed youth and retired personals were interested in opting poultry farming as an enterprise. It is recommended that seminar/workshops, vocational and one day training programme should be regularly organized for the poultry farmers' on the best practices, ICT's that can lead to a sustainable broiler farming enterprise. Keywords: ICT, training programmes, poultry farmers



Marigold cultivation: boosting the farmers' income

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loriculture has become one of the important high value agricultural industries in many countries of the world. Total area under flower crops in India is more than190,000 hectares. In most parts of the country flower growing is carried out on small holdings, mainly as a part of the regular agriculture systems. Marigold and gladiolus are two important flower crops in Jammu, Samba and Reasi districts of Jammu region. The cultivation of commercial flowers in open and polyhouses fits well into the strategy to boost income and employ farmers gainfully. Flowers, if properly grown can yield 15-20 times more returns than cereals and other crops. The global exports for floriculture products stood at US\$ 17.614 billion in the year 2012. The developed countries of Europe, America and Asia account for more than 90% of the total world exports in floriculture products. The Netherlands continues to dominate the world floricultural exports. It was estimated that in 2012 almost 47% (US\$ 8.337 billion) of world floriculture exports came from the Netherlands. In India, floriculture industry comprises of flower trade, production of nursery plants and potted plants, seed and bulb production, micro propagation and extraction of essential oils. Though the annual domestic demand for the flowers is growing at a rate of over 25% and international demand was around Rs 90,000 crore. According to the report of the APEDA, India's total export of floriculture was Rs. 423.43 crore in 2012-13. These enterprises being labour intensive provide gainful employment to rural artisans and other seeking employment. In Reasi district of Jammu & Kashmir, farmers started marigold cultivation under the guidance of Krishi Vigyan Kendra. To disseminate the technology frontline demonstrations were laid on various farmers fields. After the demonstrations many farmers adopted the technology for commercial cultivation. Shail singh, a prominent farmer of the floriculture now not only earning well, but has become an example for the others who feels that agriculture cannot provide good income.

Keywords: Marigold cultivation, farmers economic, flower crops

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Production of rice in India: A robust statistical approach

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In this study, an attempt has been made to estimate the parameters in order to obtain the relationship between production of rice and agricultural inputs. The study was based on secondary data of production of rice as endogenous variable with respect to area under rice (Mha), consumption of NPK (thousand ton), quality seeds of rice (lakh quintals), consumption of electricity (GWh), actual rainfall (mm), pesticide consumption (MT), sale of tractors in no., sale of power tillers in no. as exogenous variables. A statistical and an economical analysis have been done through Ordinary least squares (OLS) and quantile regression method by using Cobb-Douglas production function. Results indicated that coefficients estimated through OLS could be misleading in the presence of outliers, influential observations, multicollinearity and autocorrelation. Econometric analysis results revealed that all the variables were contributed positively in order to increase the production of rice through elasticity as well as marginal physical product. But the results of statistical analysis showed that the variables area under rice, quality seeds of rice, actual rainfall, sale of power tractors and sale of power tillers were positively significant whereas the variables consumption of NPK, electricity consumption and consumption of pesticide were negatively significant. Moreover, on the basis of AIC (-87.4896) and SBIC (-76.8872) 0.75th quantile regression model comes out to be best in order to increase the production of rice.

Keywords: Ordinary least square, outliers, quantile regression, production of rice, elasticity, marginal physical product.



Factors influencing perceived training need of the horticulture extension personnel in Jammu region of Jammu and Kashmir

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raining is an important process of capacity building of individual to improve his performance in his L endeavor. The first and foremost activity for planning a good training programme is to assess the training needs. Training needs for extension personnel can be defined in term of gap between their actual performance and desired performance. Training for extension personnel had defined in terms of knowledge, skills, attitudes and attributes. Training need assessment generally depend upon two important factors viz bio-data and level of extension personnel. Thus, keeping in mind the importance of training and training needs a study on factors influencing perceived training need of horticulture extension personnel in Jammu region of Jammu and Kashmir was taken. Total population of the horticulture extension personnel (Horticulture development officers and horticulture technicians) in Jammu division was 304. Out of which 200 horticulture extension personnel were selected through proportionate stratified random sampling method.Linear regression model was employed to find out the factors influencing the training need of the horticulture extension personnel. Variables age, education, family back ground, service length, trainings attended, information utilization sources, information dissemination sources and knowledge were taken to know the affect on training need. The result of the finding reveals that training attended and information utilization sources were significantly affecting the training need with t-value 2.436 and -2.274, p-value.016 and.024, respectively. On other hand variables age, family back ground, education, service length, information dissemination sources and knowledge had non-significant effect on the training need of the horticulture extension personnel.

Keywords: Training, Training need, Need assessment

MSAEJMU-232

An overview of papaya and its health benefits

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he papaya (*Carica papaya L*) is the most economically important fruit in the Caricaceae Family. Papayas grow in tropical climates and are also known as *papaws* or *pawpaws*. Papaya is native to Mexico. However, it grows naturally in the Caribbean and Florida too. According to the Food and Agriculture Organization of the United Nations (FAO), India produces the most papayas-over 5 million tons in 2015. The possible health benefits of consuming papaya include reduced risk of heart disease, diabetes, cancer, aiding in digestion, improving blood glucose control in people with diabetes, lowering blood pressure, and improving wound healing. It can be added to salads, smoothies, and other dishes. There are many health benefits to consuming fruits and vegetables, and papaya is no different. However, there are benefits related specifically to papaya, and some are quite surprising. It helps in lowering the asthma problem, Papayas contain an enzyme called papain that aids digestion; in fact, it can be used as a meat tenderizer. Papaya is also high in fiber and water content, both of which help to prevent constipation and promote regularity and a healthy digestive tract, Papayas contain an enzyme called papain that aids digestion; in fact, it can be used as a meat tenderizer. Papaya is also high in fiber and water content, both of which help to prevent constipation and promote regularity and a healthy digestive tract. Papayas may be very helpful for the prevention of atherosclerosis and diabetic heart disease. Papayas are an excellent source of the powerful antioxidants, Vitamin C and vitamin A (through their concentration of pro-vitamin A carotenoid phytonutrients). These nutrients help to prevent the oxidation of cholesterol. The different products make from papaya are; dried papaya powder, papaya wine, papaya tea, papaya candy, papaya pickle and papaya dried powder is used in making biscuits.

Keywords: Papaya, health benefits, vitamins



Marigold cultivation: A potential enterprise for transforming lives of

farmers in Jammu

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Marigold cultivation is now a profitable enterprise to the farmers, but the socioeconomic data and information of this flower are very scarce. Therefore, the study was conducted to identify agronomic practices, analyze relative profitability, and B: C ratio. Primary data were collected from 50 randomly selected farmers from R.S. Pura and Nagrota blocks of Jammu district. The results indicated that 45% farmers cultivated open pollinated varieties and only 55% farmers' cultivated hybrid variety of marigold. The costs of marigold cultivation per hectare were Rs 31000 and 60000, respectively. Marigold cultivation in district Jammu is on increase. Various Governments Incentives along with efforts of University and regular interventions of Krishi Vigyan Kendra Jammu has resulted in quantum Jump in production and productivity of marigold in the area. The benefit cost ratio of 2.87 and 4 is also very encouraging which will help in promotion of this crop in the district.

Keywords: Marigold, B: C ratio, cultivation cost

MSAEJMU-235

Economic analysis of anardana in Jammu Region of J&K

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The present study of Anardana was conducted in four major Anardana producing blocks of district Rajouri i.e. Manjakote, Rajouri, Doongi and Kalakote. For this 15 Anardana growers from each major producing block were randomly selected along with village trader, wholesalers, and retailers respectively. The data were collected with the help of specially tested schedule by personal interview method, using Purposive sampling Technique. The study involved various methods for the analysis of production, Censored Regression Analysis, Marketing margins and Marketing efficiency. The study revealed the various marketing channels of Anardana along with its constraints and effectively resulted in understanding the marketing situations along with its contribution towards farmer's economy. Keywords: Anardana, marketing.

MSAEJMU-240

Knowledge domains of respondents about improved maize production technologies in Jammu region of Jammu and Kashmir State Suraj Parkash¹ and Rajinder Peshin²

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Knowledge is one of the important components of behaviour as such it plays an important role in the covert and overt behaviour of an individual. Knowledge as defined in this study included those behaviours and test situations which emphasised the remembering either by recognition or recall of ideas, material or phenomena. Knowledge (awareness knowledge-emphasis laid) is the first stage in the innovation-decision process by which a farmer takes decision to either adopt or reject a technology. The study was conducted in five districts namely Doda, Kathua, Poonch, Rajouri and Udhampur of Jammu region of Jammu and Kashmir. A sample of 220 maize growers was selected by multi-stage random sampling from 22 villages from 11 tehsils of 5 selected districts. Data were collected by using personal



interview method. A knowledge test was developed with items related to different maize production technologies. It was measured with the scores obtained by the maize growers in the test. A score of '1' was given to correct answer and zero score was assigned to incorrect answer. Majority (47%) of the respondents had medium level of knowledge, 38 percent had low level of knowledge and only 15 percent had high level of knowledge. There was significant difference in mean knowledge score between farmers of districts Udhampur-Doda, Poonch-Doda, Doda-Kathua and Rajouri-Kathua. More awareness programmes should be organized to increase knowledge level of maize growers regarding maize cultivation practices which will help to enhance the production of maize in the state. **Keywords:** Knowledge level, Production technologies, maize

MSAEJMU-241

Technological and extension yield gaps in maize crop under rainfed ecology in Rajouri District of Jammu and Kashmir State

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aize (Zea mays L.) is one of the most important crops in world agricultural economy grown over an area of 177 million hectares with a production of 967 million tonnes (KPMG, 2014). India ranks fourth in area and sixth in production of maize. Maize is the major crop of hilly districts of J&K State and plays an important role in the livelihood of the people. In J&K maize is predominantly grown as rainfed crop during kharif season and forms a staple food of vast majority of rural households, beside its use as livestock feed and fodder. In J&K, future increases in maize production to meet domestic demand will have to rely on improvements in yield per hectare rather than on the expansion of maize production area. In the Jammu region 75 per cent cultivated area is rainfed (DES, 2011). The productivity of maize at the national level for 2014-15 was 2.56 tonnes/ ha whereas for the same period it was 1.49 t/ ha in J&K state (AICRP on Maize, 2016). To boost the production and productivity of maize crop in the district, Krishi Vigyan Kendra (KVK) Rajouri is conducting front line demonstrations (FLDs) on maize crop. The main objective of the FLDs is to demonstrate and popularise the improved production technologies among the farmers. A study was conducted on 262 front line demonstrations on maize crop for five consecutive years (2012-13 to2016-17) in district Rajouri. There was a wide yield gap between the potential, demonstration and farmers yields in maize mainly due to technology and extension gaps. The results of the study revealed that the average yield of demonstration plots and farmers plot (check) were 24.17 g/ha and 17.52 g/ha respectively. On overall average bases 38.22% higher grain yield was recorded under demonstration plots than farmers' plot. The technological yield gap and extension yield gap during the study period varied to the extent of 19.70 to 48.20 q/ha and 1.58 to 10.30 q/ha respectively. The overall technology gap, extension gap, and technology index in maize crop were 35.25 g/ha, 6.69 g/ha and 58.96% respectively. Keywords: Maize, Technology gap, Extension gap and Technology Index

MSAEJMU-245 Bringing farmers of Pir Panjal into main stream agriculture through ICT

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Information Communication Technologies (ICTs) enables the creation, handling and transfer of information across different regions and areas. ICT can play an important role in promoting agricultural development. ICTs enable performing tasks quickly, competently and systematically, facilitating the flow of large volumes of information to a large number of people across different areas. Recently information and communication technology (ICT) has provided a possible path to enrich this agricultural sector. An



innovation that integrates ICTs into the dissemination of agricultural information to farmers is website. Accessing agricultural information through websites continue to be a major impediment for raising agricultural productivity among far-flung and hilly areas. The electronic communication has been considered as a main source for development of people. A survey of adoption pattern of ICT in the Pir Panjal agricultural system showed that websites constitutes the most benefitted and adopted ICT facility by the agricultural researchers, extension agents, in-service candidates and rural farmers. This study examines an electronic way of communication and investigates the impact of ICTs for agricultural development in rural community, which in turn affects their productivity and increase in the volume of agricultural production. It discusses about the advanced and modern electronic media. ICTs have positive supplements on agricultural development which leads to improvement in the quality and quantity of agricultural production. Conversely lack of access to ICTs can result low agricultural productivity in Pir Panjal regions. This study also scrutinizes the characteristics of ICT usage among researchers, students and farmers of hilly areas

Keywords: ICT, website, media

MSAEJMU-259

Mobile internet and agriculture of Chenab valley

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he objective of this work is to study on the awareness regarding behaviour, intention and effect of mobile internet in agriculture, marketing and weather information among farmers in Chenab Valley. Mobile communication and the mobile Internet can provide agro-economic advantages for enterprises and organisations as they can be used anytime and anywhere. As an affordable and accessible means of communication, rural communities are realizing the potential of mobile internet to create economic opportunities and strengthen social networks. Mobile internet effectively reduces the "distance" between individuals and institutions, making the sharing of information and knowledge easier and more effective. The technological, social and economic complex effect system puts a pressure on the spreading of business applications. Nowadays these applications are more and more successful in areas such as agriculture, different parts of the food industry, extension services, precision agriculture and logistics. Mobile based services for farmers and other stakeholders being delivered through different organisations have been brought together under a single umbrella, namely, mKisan portal of the Ministry of Agriculture, Government of India. Mobile internet access via smartphones can lead to a 50 per cent increase in a small farmer's revenue in India, especially if the correct inputs are used, said Vodafone in a new report, christened "Towards a more equal world: the mobile internet revolution. The rapid development of the Indian domestic mobile market over the last years is the basis for the wide spread use of new broadband mobile services and applications. This system can contribute to the development of agriculture in Chenab Valley and can support production, commerce, services and product tracing. The study showed that farmers did not properly use mobile internet for connected market, while majority of the farmers even did not have contact numbers of agriculture officers as well as meteorological department to get latest information of weather.

Keywords: Internet, apps, metrology

MSAEJMU-261

Scope of entrepreneurship in fruit production

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The recent WTO agreement shave paved way for agricultural development and diversification as have provided the scope for establishment of new Agri business ventures across the country. As such, due to this, has increased the opportunities for new ventures in agriculture, horticulture, floriculture,



sericulture, animal husbandry and veterinary, fishery, etc. The advancement and innovation in the marketing and adoption of various marketing innovation schemes marks the development and boosting of horticulture sector. With the advancement in horticulture sector and the increase in the productivity in the same sector, leads to the increase in the scope of horti-processing industries hence leads to the scope of the horti-entrepreneurship development. The importance in the Indian economy can be seen that it accounts for 30 percent of Indian agricultural GDP from only 8.50 per cent of the cropped area. With this fact, it provides a vast scope for establishments of the horti-entrepreneurship ventures across the country. It provides better employment opportunities all through the year. Its activities generate diverse entrepreneurship avenues for the youth in primary or secondary processing, food preservation, value addition to development of hi valued products. There is an ample scope for attracting the new young budding youth and women into the food processing ventures in order to earn their livelihood at large extent. In short, it provides scope for attracting and encourages the most of budding entrepreneurs in food processing, cottage industry, self help groups, cooperatives and small industry sectors. **Keywords:** Horticulture, GDP, entrepreneurship, food processing

MSAEJMU-273

Sericulture industry: Current status, problems and prospects

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C ericulture is one of the important potential agro- based rural industries in the world. Asia being the largest producer of silk with China leading in its production as well as supply while India ranks second in silk production in the world after China having a share of about 15.49 per cent in the global production (Anonymous, 2013). It is a labour intensive rural cottage industry that plays a vital role in socio-economic development of rural masses by providing gainful employment opportunities to poor, small, marginal, landless farmers, agricultural labourers, women and weaker sections of the society as it needs low capital investment and provides returns within short gestation period. In the state of J&K it provides employment to 25500 rural families as a subsidiary occupation, by producing about 860 MTs of silk cocoon and generating an income of about 1100 lakh annually by cash. The paper analyzed the current status, pattern of growth in production and employment and also the agribusiness potential of sericulture. The study is based entirely on secondary data gathered from various published sources of government agencies like Department of Sericulture, J&K Government, Economic Survey (various issues) and websites. The paper has highlighted that despite fluctuations in growth, the production of silk, employment generated through sericulture activity has improved over the years. The study also explored that the earnings from export and import fluctuated over the years. The Sericulture industry no doubt has occupied a prominent place in the industrial development in Jammu and Kashmir but still its performance and progress is not up to the mark which may be due to many factors such as, non-availability of quality mulberry leaves, unscientific rearing techniques, poor quality of seed, competition from other crops, lack of proper extension activities and also the marketing, financial and other constraints, which act as an obstacle in various fields of sericulture activities.

Keywords: Employment, production, growth, mulberry and sericulture.

MSAEJMU-275

Agribusiness: Tool for rural development in India

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A griculture has always been India's most important economic sector. It plays strategic role in the process of economic development of a country. India economy is dependent on agro-based activities about 65 per cent of a population living in rural areas is dependent on agriculture for their livelihood. According to the classical economist that agriculture as the engine of economic growth means agriculture is the only activity capable of generating a surplus large enough to stimulate growth in other sector of the economy. The developing country like India the per capita real income is low emphasis is being laid on



agriculture and primary industries. The principle characteristic of these backward economics are low income, low rate of saving and investment, insufficient capital and traditional techniques together with low productivity, predominance of agriculture over population, disguised unemployment, inadequate communication and transportation facilities and social inhabitation (Pathak, 2009). It is therefore needs a boost towards rapid development and productivity in linkages with the agro-based industries. It is a pre-requisite for economic progress, agribusiness development programs deserved priority. **Keywords:** Agribusiness, rural development, income

MSAEJMU-276

Role of R-software in econometric modelling

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conometrics deals with the measurement of economic relationships. It is an integration of economics, mathematical economics and statistics with an objective to provide numerical values to the parameters of economic relationships. The relationships of economic theories are usually expressed in mathematical forms and combined with empirical economics. The econometrics methods are used to obtain the values of parameters which are essentially the coefficients of mathematical form of the economic relationships. The statistical methods which help in explaining the economic phenomenon are adapted as econometric methods. The econometric relationships depict the random behaviour of economic relationships which are generally not considered in economics and mathematical formulations. R software is a standard tool for modelling economic phenomena. R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and Mac. One of the important feature of R- software is that it is an Open Source and freely available on website http://cran-project.org. R language is essentially a functional language for all practical purposes of data analysis and graphics. However, in case some specific situations data analyst is forced to develop his own functions according to his requirements. In this paper, an attempt has been made to explain the applications of this software in econometric modelling. Fitting of linear and nonlinear models and fitting of Cobb-Douglas production function have been discussed.

Keywords: R-software. Modelling, Cobb-Douglas production

MSAEJMU-278

Mushroom cultivation- a profitable enterprise for farm women

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Mushroom growing is an agricultural activity and is grown out of agriculture waste. Use of such waste for mushroom production is a better and profitable ecofriendly way of waste disposal. Mushroom farming can be apt by farm women for entrepreneurship without sacrificing their house hold activities. Women can adopt mushroom cultivation as a profession by growing different types of mushroom through out the year. A grower can get crop of white button mushroom from September to March, Dhingri from December-April/May and Paddy straw/ Milky mushroom from June to September without resorting to heating and cooling of the mushroom house. It provides livelihood to many poor families in way or other because of cheap and easily available raw material and low capital investment which is affordable for everyone to take mushroom farming as an profitable enterprise. This activity gives opportunities to women folk and house wives to make them financially independent. Mushroom cultivation can prove a high income generating enterprise than any other horticultural produce due to widening of its demand and supply gap.

Keywords: Mushroom, enterprise, farm women



Management of bakanae (foot rot) disease in paddy

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Paddy is the important cereal crop grown by the farmers in Kathua District during Kharif season. Bakanae is a serious disease of Paddy and every year causing huge economic losses due to low yield. Therefore, KVK-Kathua conducted on Farm- Trials at different locations to assess the efficacy of carbendazim through seed treatment and seedling dip treatment on disease incidence. The results of OFT revealed that seed treatment with carbendazim 50 WP @ 2g/kg seed + seedling dip in carbendazim @ 0.2% increased the yield to the tune of 50.00% over farmers practice and 76.42% reduction in disease incidence of Bakanae (foot rot). Seed treatment with carbendazim 50 WP@ 2g/kg seed also resulted increase in yield to the tune of 22.9% and less incidence over farmers practice. **Keywords:** Paddy, bakanae, on-farm trial

MSAEJMU-280

Status and distribution of anthracnose disease of beans in Doda district of J&K

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Trench bean is an important vegetable and pulse crop in India. French bean also known as rajmash or rajma (Hindi) or haricot bean or kidney bean or common bean or snap bean, navy bean. Jammu Division of J&K contributes 3,886 tonnes from an area of 317 ha. The crop suffers heavy losses because of a number of diseases and the most prominent among them is Anthracnose of French bean caused by Collectotrichum lindemuthianum. Anthracnose is mainly a seed-borne disease caused by a fungus which has a wide host range on many legume species. This disease can cause serious losses in bean crops in temperate and subtropical zones. Therefore, assessment of losses caused by them and their management is of paramount importance. Eight different locations of Doda district of Jammu and Kashmir state were surveyed and bean anthracnose was encountered in all the bean growing areas. Observation were recorded at seedling, flowering and pod bearing growth stage of crop and by using 0-9 scale Maximum disease incidence of 25.0, 40.5 and 60.9 per cent was observed during seedling, flowering and pod bearing stages at Jathi followed by Assar (15.4%, 36.6% and 55.3% at seedling, flowering and pod bearing stage respectively) and the minimum disease incidence was found at Chinta (10.0% at seedling, 20.9% at flowering and 40.0% at pod bearing stage). In terms of severity maximum disease was found at Jathi (15.0, 23.7 and 39.5 per cent at seedling, flowering and pod bearing stage respectively) and minimum disease was found at Chinta (6.9% at seedling, 13.9% at flowering and 22.2% at pod bearing stage). Keywords: Beans, disease, fungus

MSAEJMU-283

Study of trend of milk, poultry and fish production in India

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In story of National growth there are reasons to focus attention on agriculture and allied sectors, which will continue to play a significant role in providing employment, generating income and sustainable livelihood for growing population in India. Among several enterprises of agriculture, fresh milk production, poultry production and fish production are important secondary enterprises. In India, mixed



crop livestock farming system is predominant. Dairy enterprise has become an important secondary source of income for millions of rural farm families. It is also assumed the most important sector for providing employment and generating income, particularly for marginal and women farmers. About 15.46 million farmers have been brought under the ambit of 165835 village level dairy cooperative societies up to March 2015 (Economic Survey Volume II, Page 180). India continues to be the largest milk producer in world. During the years 2014-2015 and 2015-2016, the milk production registered an annual growth rate of 6.27%. Thus, the per capita availability of milk is around 337gm/day in 2015-2016.Total poultry population in our country is 729.21 million (as per 19th livestock census) and egg production is around 82.93 million during 2015-2016. The per capita availability is around 66 eggs/ annum (2015-2016). India is the second largest producer of fresh water fish in the world. Fish production has increased from 41.57lakh tonnes in 1991-1992 to 107.95 lakh tonnes in 2015-2016.

Keywords: Dairy, Mixed cropping, Per capita, Employment, Income.

MSAEJMU-284

Role of statistics and statisticians in the national development with special reference to Jammu and Kashmir statistical system

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In this paper, we have discusses the importance of statistics and statisticians in national development with emphasize that government at all levels should embark on building a very viable information system in order to have adequate statistical information for designing a formidable evidence based policy. Given the relevant statistics cited from both Jammu & Kashmir statistical database, this study identifies that no meaningful national development can take place without empowering the national statistical system. In national development, the aspirations of a policy is to attain national goals and to achieve a fair measure of success in the goals, there is need to map out strategic plans, set up machinery for execution of the plans and monitor the implementation process, this is exactly the point at which the role of statistics and statisticians is vital and relevant.

Keywords: National Development, Statistical system, Statistical data, Statistics in J&K.

MSAEJMU-285

Pradhan Mantri Fasal Bima Yojna- Revolution for Indian agriculture

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A griculture in India is subject to variety of risks and threats occurring from rainfall irregularity, temperature fluctuations, snowfall, storm, floods and drought etc. These risks or we can say threats are worsen by price fluctuation, lack of proper markets and financial services including credit and insurance. These risky factors not only jeopardize the farmer's livelihood and incomes but also destabilize the feasibility of the agriculture sector which in turn weakens the chance to solve the problem of poverty of the farmers. The farming community in India consists of more than 120 million farmers of which about 20 per cent avail crop loans from financial institutions and only three fourth of those are insured. The remaining 80 per cent (96 millions) are either self-financing or depend upon informal sources for their financial requirements. Union Cabinet has approved the 'Pradhan Mantri Fasal Bima Yojana'- a path breaking scheme for farmers' welfare on 13 January 2016. There will be a uniform premium of only 2% to be paid by farmers for all Kharif crops and 1.5% for all Rabi crops. In this scheme in case of annual commercial and horticultural crops, the premium to be paid by farmers will be only 5%. The premium rates to be paid by farmers are very low and balance premium will be paid by the Government to provide full insured amount to the farmers against crop loss on account of natural calamities. There is no upper



limit on Government subsidy. Even if balance premium is 90%, it will be borne by the Government. It has given tremendous encouragement to the farmers which led them make efforts for higher production. **Keywords:** Risk, uncertainty, insurance, premium, farming community

MSAEJMU-289

Knowledge level of potato farmers and its determinants

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research study was undertaken to determine the level of knowledge of farmers on recommended Potato cultivation practices in two purposively selected districts of Tripura. One highest and one lowest Potato producing district was selected for undertaking the present study. Further one block and one village was selected purposively from each of these districts. A sample of 144 respondents was selected randomly for data collection with the help of a pre-tested structured schedule. Data were collected from the respondents by conducting personal interview. Findings revealed that majority (58.33%) of the respondents belonged to the middle age (35-50 year), 43.75 per cent of them belonged to scheduled caste and 91.67 per cent of them had nuclear type of family. Majority (33.33%) of the respondents had education up to primary and secondary school level and all respondents sold their produce in nearby market only and 66.67 per cent of them had annual income in the range of Rs. 30,000 to Rs.70, 000. It was also revealed that 83.33 per cent of them had medium level of extension contact whereas 56.25 per cent of them moderately used various information sources. Knowledge index of the potato farmers was found to be 73.31%. It was also found that all potato growers had knowledge of recommended potato planting method but only 10.42 per cent of them had knowledge on recommended Potato disease management practices. The variables age, land holding size, marketing orientation, annual income, extension contact and sources of information utilized by the farmers were found important in influencing the knowledge of farmers about recommended practices of Potato cultivation.

Keywords: Potato farming, recommended practices, knowledge, determinants.

MSAEJMU-293

Participatory approaches and modern agricultural practices in sustainable development

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E merging evidence for the success on farms of resource-conserving technologies and practices must not tempt agricultural professionals into making prescriptions about what constitutes sustainable agriculture. Sustainability is a complex and contested concept, and so precise definitions are impossible. The dominant scientific paradigm of positivism has served us well over three to four centuries, but it is not well suited to contexts where uncertainties are high, and problems are open to interpretation. Many methodological and philosophical alternatives to positivism have arisen from both the "hard" and "soft" sciences. These indicate that new understanding and solutions can only arise with wide public and scientific participation. But the term "participation" has become fashionable with many different interpretations, some hindering rather than supporting sustainability. New systems of learning are needed, using participatory methods and criteria for trustworthiness. These have profound implications for agricultural professionals, who must now actively create a whole new professionalism. Sustainable development not only creates employment on the local level, but is also a source of safe food, a basic condition of the preservation of landscape diversity, a counter-weight to population decline in rural areas, a corner stone of agricultural tourism, and a factor that enables the implementation of other environmental



and social functions of space which enhance the quality of life, such as ecosystem functions, aesthetic functions, cultural functions and recreational functions. Introduction of Modern agricultural technologies through participatory approaches has made an outstanding role for achieving the goals of sustainable agriculture.

Keywords: Participatory approaches, sustainable development.

MSAEJMU-302

Lavender cultivation in district Doda: An upcoming entrepreneurship

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avender is an aromatic flowering plant in the mint family Lamiaceae. Many members are cultivated exclusively in temperate climate as ornamental plants for gardens and landscape use, as culinary herb and commercially for extraction of essential oil. The most cultivated species is Lavender augustifolia. It is often referred as Lavender and there is colour named for the shade of flowers of this species. Lavender flourishes well on dry, well-drained sandy or gravely soil in full sun. It needs a little fertilization and good air circulation. This is a drought resistant cash crop. It has a great potential in rainfed temperate area of Doda District. Natural gravely soils with pH of 6-8 are best suited for its cultivation. Keeping in view its economic importance suitability of growth in rainfed areas, its cultivation has been motivated in around 25 number of villages by the Department of Floriculture. Doda with technical know-how and guidance from Krishi Vigyan Kendra, Doda. The total estimated area under Lavender cultivation is around 10 hectares. The average oil extraction is around 40 kg from one hectare of area and price of 1kg lavender oil varies from 6000-10000/- depending upon the demand and quality of oil. It is a perennial crop which gives quality oil for 10 years. It can be maintained by mild pruning during winter season which is done by the farmers of the district. The commercial flowering starts after second year of planting. It is being adopted by farmers but needs incentives under centrally sponsored schemes keeping in view its vast potential under rainfed temperate areas and its economic returns. For tackling the problem of unemployment among rural youth, some incentives must be provided by the state Government for establishing Lavender nurseries and the extraction and packaging of oil at the local level. The various agencies can come together to boost its marketing on large scale. It can prove to be most profitable enterprise to boost the farmer's income in the district of Doda.

Keywords: Lavender, Entrepreneurship, floriculture

MSAEJMU-308

Mitigation measures for frost damage in subtropical fruits of Shivalik foothills of Himachal Pradesh- Ways and means to improve livelihoods of farming community

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ue to global climate change the occurrence of frost is frequent in recent years. Frost is often experienced in many parts of Himachal Pradesh in subtropical zone, valley and foothills during December to early February, whereas the extent of frost damage is less in case of properly managed orchards. For the last several years there has been frequent frost damage to subtropical fruits. According to surveys conducted on frost damage in winter out of 27 mango growing orchards only 2 orchards survived the onslaught of frost. Trees between age group of one and twenty years suffered a loss of 60 per cent. The damage was 100 per cent in Dashehari cultivar, while it was least in Chausa variety. The frequent frost injury has been noticed in the years 2002, 2008 and 2012. The frost damage to mango plantations has been severest in the year 2008, where Regional Horticulture Research Station, Dhaulakuan (Ponta-Dehradun



valley) observed 50 per cent loss of full grown plantations of Dashehari, Amarpali and Mallika whereas 2 years old trees of Dashehari and Amarpali noticed mortality of 75 per cent. Beside mango frost damage, young plantations of citrus, litchi, guava and aonla have reported 50-70% loss, while in papaya the loss was 100 per cent. In HP at present frost damage is considered as a natural calamity which is beyond the control of common mango grower and frost cycle is repeated after every 4-5 years. In the year 2012 alone, weather vagaries costed the mango and litchi growers a loss of upto 10 crores in foothills of Shivalik Himalayas. Ad-hoc recommendations have been given to mango farmers to mitigate the loss of frost damage in mango, which included least soil cultivation during frost period, removal of all floor vegetation (weed, cover crops, etc.) around the tree in advance of frost occurrence, plastic cover to warm the soil and increase protection, covering the young plants. Recently in developed countries especially Israel, modern methods for protecting crops against frost by combination of under-plant sprinkler, fogger (Lal Topi) wind machine and surface irrigation with micro irrigation system has been developed. In India, these modern technologies have been developed in collaboration with Israel which needs to be further experimented under Shivalik foot hills and valley conditions to check frost damages in mango and other subtropical fruits. Dr. Y.S. Parmar University has envisioned testing these technologies in important mango and litchi experiment stations and farmers' fields. These will be discussed in detail.

Keywords: Mitigation, Shivalik foothills, subtropical fruits.



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