MJAE -2019

Maharashtra Journal of Agricultural Economics

ISSN 2348 - 0793
Vol 22 No.1 June 2019

Department of Agricultural Economics & Statistics
Dr. Panjabrao Deshmukh Krishi Vidyapeeth
Akola - 444 104 (Maharashtra)
www.msaeindia.com

ISSN : 2348-0793
June 2019, Volume : 22 (1)

MAHARASHTRA SOCIETY OF AGRICULTURAL ECONOMICS

Maharashtra Journal

of

Agricultural Economics

Maharashtra Society of Agricultural Economics
Department of Agricultural Economics, & Statistics,
Dr. PDKV, P.O. Krushi Nagar, Akola 444104 (M.S.)

Maharashtra Journal of Agricultural Economics

Regd. No. F/1911 (Akola) (Maha.1817/1987)

Website : www.msaeindia.com

E-mail : secretarymsae@gmail.com

ISSN : 2348-0793 Volume 22 (1)

NASS: 2.90 (January, 2019)

Published by

Dr. R.G. Deshmukh, Secretary, Maharashtra Society of Agricultural Economics,
Dr. PDKV, Akola. 444104

Subscription rate for one year :

Individual : Rs. 300/- Institutions : Rs. 600/-
US $ 4/- US$ 8/-

All payments should be made by Cash / Net Banking/ Demand Draft drawn in favour "Secretary MSAE" Payable at Akola

For online Payment through RTGS / Net Banking

A/c No. 6363498894,
A/c Name : Secretary, The Maharashtra Society of Agricultural Economics
IFSC Code : IDIB000A075, Name of Bank : Indian Bank, Akola

Correspondance address :

Department of Agricultural Economics & Statistics
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
444 104 (Maharashtra) India.
www.msaeindia.com

Year **:** June 2019

Printed by
Skyline Computers,
Murlidhar Towers, Ranpise Nagar
Akola – 444 005(M.S.)
Cell – 9890606868
Email : anandsky53@gmail.com

Cover Page Designed by
Milind Traders,
Cell No. 9890213137

EDITORIAL BOARD

JOURNAL OFMAHARASHTRA SOCIETY OF AGRICULTURAL ECONOMICS

EXECUTIVE COMMITTEE (2018-19)		
Dr. Prakash Mahindre	Ex. Director of Agriculture, Maharashtra State	President
Dr. D.B. Yadav	Head, Department of Agril. Economics, MPKV,Rahuri	Vice- President
Dr. J.M.Talathi	Head, Department of Agril. Economics, Dr. BSKKV,Dapoli	Vice- President
Dr. B.N. Ganvir	Head, Department of Agril. Economics & Stat., Dr. PDKV.,Akola	Vice- President
Dr. D.S.Perke	Head, Department of Agril. Economics & Stat., VNMKV,Parbhani	Vice- President
Dr. R.G. Deshmukh	Professor, Department of Agril. Economics & Stat., Dr. PDKV, Akola	Secretary
Dr. S.C. Nagpure	Assistant Professor, (Agril. Econ.), Department of Agril. Economics & Stat, Dr. PDKV.,Akola	Treasurer
Dr. R.K.Rahane	Professor, Department of Agril. Economics, MPKV,Rahuri	Member
Dr.S.S.Wadkar	Professor, Department of Agril. Economics, Dr. BSKKV,Dapoli	Member
Dr.S.R.Nagargoje	Associate Professor, Department of Agril. Economics & Stat., VNMKV,Parbhani	Member
Dr. Vanita K. Khobarkar	Assistant Professor, (Agril. Econ.), Department of Agril. Economics & Stat, Dr. PDKV.,Akola	Member
Dr.Pawan Kumar Sharma	Scientist, Agril. Economics, KVK,Kathua,SKUAST-Jammu	Member
EDITORIAL BOARD (2018-19)		
Dr. D. B. Yadav	Head, Department of Agril. Economics, MPKV,Rahuri	Editor
Dr. R. G. Deshmukh	Professor, Department of Agril. Economics & Stat., Dr. PDKV.,Akola	Co-Editor
Dr.R.K.Arora	Associate Director Extension, KVKs,SKUAST-Jammu	Technical Editor
Dr.Pawan Kumar Sharma	Scientist, Agril. Economics, KVK,Kathua,SKUAST-Jammu	Technical Editor
Dr. S. C. Nagpure	Assistant Professor (Agril. Econ), Department of Agril. Economics & Stat, Dr. PDKV.,Akola	Technical Editor

PREFACE

Maharashtra Society of Agricultural Economics organised National Conference of the Society at Fern Kadamba,Hotel &Spa, Old Goa, on 25th and 26th October, 2018. The high lights of General body meeting are circulated separately. MSAE is conducting 22nd Conference at Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during 21-22, December, 2019. Dr. P.G. Ingole, Dean,Faculty of Agriculture, VNMKV, Parbhani has been nominated as Chairman, Organizing Committee, Dr. D.S.Perke, Head, Department of Agricultural Economics, and Dr. Sachin More, Associate Prfessor (Agril. Econ), VNMKV, Parbhani nominated as organising Secretary and Co-organizing Secretary, respectively. Themes for conference are as (1) Rising (doubling), Farmers Income 2022 and Socio Economics Indicators for Agricultural Development (2) Impact Assessment of Improved Production Techonology (3) Marketing and Pricing Policies of Agricultural Comodities.

I am glad to communicate the MSAE audit upto March 2019 is cleared by CA and Society has no payment pending.

I am thankful to research contributors, Referees and President MSAE who made possible to publish Journal and for suggestions, support provided for completing the task.

Secretary
MSAE

Maharashtra Journal of Agricultural Economics

Aim and Scope of Journal

The Maharashtra Journal of Agricultural Economics is a biennial research journal published by Maharashtra Society of Agricultural Economics. The aim of the Journal is to publish articles related to economics of agriculture, horticulture, livestock production & management, natural resources, environment, agricultural extension and rural development. The Journal invites original full-length research papers, short communications and invited review papersfor publication. The primary objective of the Journal is to publish research articles covering different aspects of agriculture and allied sectors in remotest part of the country.

Author Guidelines

The research article submitted for publication in "**Maharashtra Journal of Agricultural Economics"** should be typed in "Times New Roman" with font size "12" double spacing. The article should have following broad headings

- **Title:**The Title of the article should be in "Title case" with species/local names etc. in italics, bold and center aligned.
- **Author(s) name(s) and affiliation(s):** Authors name(s) should be bold and affiliations in italics. Corresponding author name and email address, phone number should also be mentioned.
- **Abstract**: Every article should contains an abstract of not more than 250 words.
- **Keywords:**Below the abstract, there should be keywords ranging from3 to 5.
- **Introduction:** The article should contain a precise introduction of the subject explaining the related review of literature and objectives of the study in a paragraph.
- **Methodology:** The methodology should be comprehensive, explaining the analytical and statistical techniques used in the study.
- **Results and Discussion:** The results and discussion should be based on the interpretation of the data given in the Table. There is no need to explain all the data presented in the Table.
- **Acknowledgements**: Acknowledgements, if any can be mentioned at the end of the article.
- **References:** Only those references of articles must be given which are actually cited in the article. The style of the references is given below:
- **Conclusion:** The article should end with a conclusion, containing summary of results and final recommendations based on the interpretation of the results.

Research papers:

Tingre, A.S., Deshmukh, R.G., Bhopale, A.A. (2017). Analysis of price volatility and market co-integration of turmeric in major markets of Maharashtra. *Maharashtra Journal of Agricultural Economics*, 20(1): 20-25.

Books:

Olson, K. D. (2014). Farm Management: Principles and Strategies. *Iowa State Press, Ames*. ISBN: 0-8138-0418-3, pp. 416.

Book Chapters:

Pawan Kumar Sharma, Sanjay Swami and Arvind Ishar (2013). Agricultural Marketing System in the Intermediate hills of Jammu & Kashmir. Edited book "Agribusiness potentials in India: Experiences from Hill states." EBH Publishers, Guwahati, India, pp. 557-570.

Conferences/Symposium Abstracts:

Pawan Kumar Sharma, K.S. Risam, Sudhakar Dwivedi and Suraj Parkash. (2015). Farmers Perception about Climate and Resource Use Dynamics in Poonch District of J&K, Proceedings of the 4th J&K Agricultural Science Congress organized at SKUAST-Jammu w.e.f. 28-30 October 2015, pp. 133.

Thesis:

Kumbhar, P.N. (2013). Marketing of mango in South Konkan region of Maharashtra. M.Sc. (Agri) Thesis (Unpublished) submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra.

- **Tables:** The tables should be numbered and must have reference in the text.
- **Figures (if any):** The graphs and figures should be of good quality.
- **Formulas:** The mathematical formulas must be written by inserting an "equation" button in MS Word.

Submission of manuscript and copyright Form

The manuscript can be submitted online at www.msaeindia.com; or through email to at msaejournal@gmail.com as an attachment. A self-declaration certificate by all the authors mentioning that "The submitted work is original" should be submitted alongwith the manuscript.

CONTENT

Enhancing Farmers Income through Diversification in Pune District of Western Maharashtra

M.N. Waghmare* and Y.C. Sale
Department of Agricultural Economics, College of Agriculture, Shivajinagar, Pune - 411 005, Maharashtra
*Corresponding author: marutiwaghmare1@gmail.com
Received: 8th October 2018; Revised: 15th April 2019; Accepted: 2nd July 2019

ABSTRACT

Crop diversification is generally viewed as a shift from traditional grown less remunerative crops to more remunerative crops. The present study was undertaken to estimate the profitability of selected farms through diversification and to improve the livelihood and nutritional security through diversification. The Pune district was purposively selected and information was collected by the cost accounting method with the help of specially designed schedules during the 2014-15. In kharif season, groundnut replaced by soybean while in rabi season, wheat crop replaced by Onion crop, HD-2189 variety of wheat replaced by NAIW-301, local / Vijay variety of chickpea replaced by Digvijay variety. The per hectare productivity of existing crops paddy 23 qtl, soybean 18qtl, groundnut 17.39qtl, wheat 21 qtl onion 210 qtl and chickpea 22.40 q Due to diversification percentage increase in productivity was 28.30, 20.33, 4.60, 64.95, 14.64 and 33.08 in case of paddy, soybean, groundnut, wheat, onion, chickpea crop, respectively. Gross returns from the crop component before diversification was Rs.360670 and after provision of technical knowledge about package of practices, it increased by 62.65 per cent (Rs.586624). As regards percentage increase in milk production from animal component was 2.61 due to diversification.. Gross returns from soybean and milk was increased by 19.15 and 29.38 per cent due to product diversification. Gross returns from the crop component, animal component and product processing increased by 62.65 per cent, 67.92 per cent and 24.34 per cent after diversification. Diversification has shown a positive correlation with profitability.

Keywords: *Diversification, doubling farmers' income, Pune*

INTRODUCTION

Crop diversification is needed to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lesson risk. Crop diversification is generally viewed as a shift from traditional grown less remunerative crops to more remunerative crops. The crop diversification also takes place due to governmental policies and thrust on some crops over a given time. Market infrastructure development and certain other price related supports also induce diversification (GoI, 2016). High profitability and stability in production also induce diversification. With the advent of modern technology, there is continuous surge for diversified agriculture in terms of crops, animals and product diversification on economic consideration. Diversification is the outcome of the interactive effect of resource related factors viz; irrigation, rainfall, soil fertility, technology related factors viz; seed, fertilizers, marketing, storage, processing, household related factors viz; food and price related factors (Birthal *et al.*, 1999; Rao *et al.*, 2006; Birthal *et al.*, 2007; Saxena *et al.*, 2017). The 'On Farm Research Scheme' (OFR) is a component of All India Co-ordinate Research Project (AICRP) on Integrated Farming Systems at MPKV, Rahuri. The experiments have been conducted on farmer's field in six centers of Pune district to estimate the profitability of selected households through diversification and to study the constraints in adopting diversification.

METHODOLOGY

The data of 24 experimental trials under On Farm Research Scheme at Haveli and Maval tehsils of Pune district were collected by the cost accounting method with the help of designed schedule provided by the Project Directorate, Farming System Research Project, Modipuram, Uttar Pradesh. Six villages in two blocks, four farmers in each selected village were selected.

Thus, total 24 farmers were selected for present study. The experimental trials conducted in Kharif 2013 and Rabi-2014 season are presented in Table 1.

Table 1: Diversification conducted in Kharif and Rabi season for the year 2013-2014

Treatments	Interventions on farmers field
Bench marks	Comprehensive survey along with GPS location
Crop diversification	Change the cropping pattern and provided improved variety with chemical fertilizers
Livestock diversification	Supply of Phule Triveni semen for A.I, mineral mixture, goat kids and poultry chicks
Product diversification	Provided grading sieves /ghee making equipments
Capacity building	Arranged training and provided Sugi/Krishi dairy

RESULTS AND DISCUSSION

Existing and diversified cropping pattern of sample farmers

Crop pattern changes increasing tendency towards crop specialization and commercialization of agriculture. The cropping pattern is dependent on several factors such as soil type, climate, resource availability with the farmers, decision making ability of the farmers under situation of changing prices and relative price of output of different crops. Low yield and long duration of existing varieties replaced by improved varieties. Existing and diversified cropping pattern of sample farmers are depicted in Table 2. In kharif season, Groundnut crop replaced by Soybean crop, Darna variety of paddy replaced by Phule samrudhi, local and MACS-123 variety of soybean replaced by JS-335, Panchganga variety of Maize (fodder) replaced by African tall, Grass replaced by Phule Jayawant variety of Hybrid Napier. In case of Rabi season, Wheat crop replaced by Onion crop, HD-2189 variety of wheat replaced by NAIW-301, local / Vijay variety of chickpea replaced by Digvijay variety.

Table 2: Existing and diversified cropping pattern of sample farmers

Existing cropping pattern				Diversified cropping pattern			
Kharif		**Rabi**		**Kharif**		**Rabi**	
Name of crop	Variety	Name of crop	Variety	Name of crop	Variety	Name of crop	Variety
Groundnut	SB-11/ Jalgaon/ Lal banduk	Onion	Puna Fursungi	Soybean	JS-335	Onion	N-2-4-1
Paddy	Darna	Chickpea	Vijay/local	Soybean	JS-335	Chickpea	Digvijay
Soybean	MACS-123	Wheat	HD-2189	Soybean	JS-335	Wheat	NIAW-301
Paddy	Darna	-	-	Paddy	Phule Samrudhi	-	-
Soybean	Local	-	-	Soybean	JS-335	-	-
Grass	Local	-	-	Hybrid Napier	Phule Jayawant	-	-
Maize (fodder)	Panchganga	-	-	Maize (fodder)	African tall	-	-

Effect of diversification on the productivity and returns of different crops

The per hectare productivity of existing and diversified crops have been worked out and compared with each other so as to assess the effect of diversification. The productivity and returns of existing and diversified crops are presented in Table 3.

Table 3: Effect of diversification on the productivity and returns of different crops

Crop	Existing		Diversification		Percentage increase	
	Average Productivity (Qty./ha)	Gross Returns	Average Productivity (Qty./ha)	Gross Returns	Average Productivity	Gross Returns
Paddy	23.00	38800	29.51	72836	28.30	87.72
Soybean	18.00	37500	21.66	56024	20.33	49.40
Groundnut	17.39	28600	18.19	72759	4.60	154.40
Maize (fodder)	263.20	39020	380	43000	44.38	10.20
Wheat	21.00	43200	34.64	66181	64.95	53.20
Onion	210.00	114000	240.75	184815	14.64	62.12
Chickpea	22.40	55400	29.81	77509.43	33.08	39.91
Grass	41.50	4150	-	-	-	-
Hy.napier	-	-	24.00	13500	-	-
Total		**360670**	**-**	**586624.4**		**62.65**

The per hectare productivity and gross returns of existing crops paddy, soybean, groundnut, maize (fodder), wheat, onion and chickpea was 23.00 q and Rs.38800, 18.00 q and Rs.37500, 17.39 q and Rs.28600, 263.20 q and Rs.39020, 21.00 q and Rs.43200, 210.00 q and Rs.14000, 22.40 q and Rs.55400, respectively and after diversification per hectare productivity and gross returns of crop paddy, soybean, groundnut, maize (fodder), wheat, onion and chickpea was 29.51 q and Rs.72836, 21.66 q and Rs.56024, 18.19 q and Rs.72759, 380.00 q and Rs.43000, 34.64 q and Rs.66181, 240.75 q and Rs.184815, 29.81 q and Rs.77509, respectively. With regard to percentage increase in productivity and gross returns, it was 28.30 and 87.72, 20.33 and 49.40, 4.60 and 154.40, 44.38 and 10.20, 64.95 and 53.20, 14.64 and 62.12, 33.08 and 39.91 in case of paddy, soybean, groundnut, maize (fodder), wheat, onion, chickpea crop due to diversification, respectively. Gross returns from the crop component before diversification was Rs.360670 and after provision of technical knowledge about package of practices, it increased by 62.65 per cent (Rs. 586624.40).

Profitability from existing and diversified animal component

Before diversification, there was unavailability of improved semen for improved breed semen for artificial insemination of Phule Triveni. Milk yield was low and farmers were not aware about animal nutrition/ housing/ health/ cattle shed management/ hygienic milk production. The profitability from existing and diversified animal component are presented in Table 4. Before diversification, the per animal per year milk production of cow and buffaloe was 1400 litre and 720 litre, gross returns and net returns was Rs.19600 and Rs.23040 and after diversification i.e. provided improved breed semen for artificial insemination of Phule Triveni the and goat kid of Sangamneri / Osmanabadi, per animal per year milk production of cow, buffaloe and goat was 1562 litre, 851 litre and 210 litre, respectively. The gross returns and net returns from cow, buffaloe and goat were Rs.29687 and Rs.18324, Rs.28914 and Rs.20436, Rs.13000 and Rs.4300, respectively.

With regard to percentage increase in milk production, gross returns and net returns, it was 2.61, 3.41 and 1.49 per cent due to diversification in animal component. Net returns from the animal component before diversification was Rs.25284 and after provision of technical knowledge about package of practices, it increased by 70.31 per cent.

Table 4: Profitability from existing and diversified animal component

(Rs./animal/year)

Animal	Milk (litre/year/ animal)	Gross Returns	Cost of Rearing	Net Returns	B:C ratio
Existing					
Cow	1400	19600	10184	9416	1.92
Buffaloes	720	23040	7172	15868	3.21
Total	2120	42640	17356	25284	2.46
Diversified					
Cow	1562	29687	11363	18324	2.61
Buffaloes	851	28914	8478	20436	3.41
Goat	210	13000	8700	4300	1.49
Total	2623	71601	28541	43060	2.51
Per cent increase over existing					
Cow	11.57	51.46	11.58	94.60	-
Buffaloes	18.19	25.49	18.21	28.79	-
Total	23.73	67.92	64.44	70.31	-

Profitability from product diversification

Technology related factors covering not only seed, fertilizers, marketing, storage but also processing. There was not equipment for grading the foodgrains and for making the ghee from milk. Farmers get the low price for foodgrain and also lack of technical knowledge about value addition. To adopt the product diversification, farmers are provided knowledge for use of grading foodgrain sieve by supply of grading sieves to them and also provided equipment for ghee making for preparation of ghee. The profitability from product diversification is indicated in Table 5.

Table 5: Profitability from product diversification

	Existing			Diversification			Gross returns increased due to product diversification (Per cent)
Name of product	**Quantity of product**	**Price Rs. /kg**	**Total Value (Rs.)**	**Total product obtained after processing**	**Price of the processed product (Rs./kg/lit.)**	**Total Value (Rs.)**	
Soybean	874 kg	27.00	23598	827 kg	34	28118	19.15
Milk	1347 litre	18.00	24262	Ghee : 28.94 kg	366	10592	
				Butter milk : 1040 litre	20	20800	
				Milk by product	-	31392	29.38
	Total		**47860**			**59510**	**24.34**

Before the processing of soybean and milk, the gross returns from soybean and milk was Rs.23598.00 and Rs.24262. After the processing of soybean and milk, the gross returns from soybean and milk was Rs.28118.00 and Rs.31392. Gross returns from soybean and milk was increased by 19.15 and 29.38 per cent due to product diversification. Gross returns from soybean and milk was increased by 23.34 per cent due to product diversification

Livelihood and nutritional security through diversification approach

The livelihood and nutritional security through diversification approach is depicted in Table 6. Generally edible oil, Wheat, Jowar, Paddy, Green gram, Pigeon pea, Potato, Chicken/ Meat, Egg and Ghee were daily consumed by sample households. The expenditure on consumption of paddy is more (26.84 per cent) and followed by edible oil (16.13 per cent), wheat (13.96 per cent), green gram (16.13 per cent), Jowar (10.16 per cent), chicken/meat (6.92 per cent), pigeon pea (6.18 per cent), potato (3.84 per cent), ghee (2.57 per cent) and egg (1.02 per cent)

Table 6: Livelihood and nutritional security through diversification

Items	Quantity used/year (kg)	Price (Rs/kg)	Total Expenditure (Rs)	Per cent
Edible oil	56	85	4760	16.13
Wheat	206	20	4120	13.96
Jowar	100	30	3000	10.16
Paddy	233	34	7922	26.84
Green gram	43	85	3655	12.38
Pigeon pea	25	73	1825	6.18
Potato	42	27	1134	3.84
Chicken/ Meat	7	292	2044	6.92
Egg	60	5	300	1.02
Ghee	3	253	759	2.57
		Total	**29519**	**100.00**

Capacity building on different component

The capacity building on different component indicated in Table 8. Activities involved in capacity building for crop component were training of farmers on field crop production, providing technical knowledge of improved package of practices/ through folders/ krishi dairy, balance use of chemical fertilizers, arranging farmers' visits to various agriculture exhibitions, visits to agriculture college farm, visits to mushroom production plant, visits to biofertilizer production plant, conducting field days, providing improved varieties of crops to selected farmers.

Activities involved in capacity building for animal component were supply of Phule triveni semen for Artificial Insemination, supply of mineral mixture and goat kids of improved breed like sangamneri / osmanabad, providing technical knowledge of animal housing /nutrition/ breed/ health. In case of capacity building for crop component, capacity building for animal component and capacity building for product diversification pre evaluation score (out of 100) before training was 45, 49 and 43 while post evaluation score (out of 100) after training was 73, 75 and 68, respectively.

Gross income before training was Rs.360670, Rs.42640 and Rs.47860 in case of capacity building for crop component, capacity building for animal component and capacity building for product diversification, respectively and after training it was increased by 62.65, 67.92 and 24.34 per cent, respectively.

Constraints in crop, animal and product diversification

The major problems and constraints in crop diversification are primarily due to following reasons.

1. Unavailability of improved variety seed
2. Imbalance fertilizer use by the farmers
3. Unavailability of mineral mixture.
4. Unavailability of improved breed.
5. Lack of technical Knowledge about feeding/ animal nutritional housing

Table 7 Capacity building on different component

Capacity building on different component	Title of training	Pre evaluation score (out of 100) before training	Post evaluation score (out of 100) after training	Gross income (Rs.) before training	Gross income (Rs.) (after 6 months) after training	Gross income increased due to training (Per cent)
Capacity building for crop component	• Field crop production • Visits to various agriculture exhibitions • Visits to agriculture college farm, • Visits to mushroom production plant, • Visits to biofertilizer production plant, conducting field days	45	73	360670	586624	62.65
Capacity building for animal component	• Technical knowledge of animal housing /nutrition/ breed/ health	49	75	42640	71601	67.92
Capacity building for product diversification	• Grading sieve /ghee making	43	68	47860	59510	24.34

CONCLUSIONS

Groundnut crop replaced by Soybean crop, Darna variety of paddy replaced by Phule samrudhi, local and MACS-123 variety of soybean replaced by JS-335, Panchganga variety of Maize (fodder) replaced by African tall, Grass replaced by Phule Jayawant variety of Hybrid Napier. During *rabi* season, wheat crop was replaced by onion; HD-2189 variety of wheat was replaced by NAIW-301 and local / Vijay variety of chickpea was replaced by Digvijay variety. Gross returns from the crop component, animal component and product processing were increased by 62.65, 67.92 and 24.34 per cent, respectively after diversification. The expenditure on consumption of paddy is more and followed by edible oil, wheat, greengram, and jowar. Providing technical knowledge of improved package of practices through folders/ krishi dairy, supply of Phule triveni semen for Artificial Insemination, supply of mineral mixture and goat kids of improved breed like sangamneri / osmanabad, providing technical knowledge of animal housing /nutrition/ breed/ health, Providing grading sieve /ghee making equipment for crop, animal and product diversification.

REFERENCES

Birthal, P.S., Joshi, P.K., Roy, D. and Thorat, A. (2007). Diversification in Indian Agriculture towards High-Value Crops: The Role of Smallholders. IFPRI Discussion Paper 00727, International Food Policy Research Institute, Washington, D.C.

Birthal, P.S., Kumar, A., Ravishankar, A. and Pandey, U.K. (1999). Sources of Growth in Livestock Sector. Policy Paper 9. National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi.

Government of India. (2016) Agricultural Statistics at a Glance. Directorate of Economics and Statistics, Department of Agriculture Cooperation and Farmers' Welfare, Government of India, New Delhi.

Rao, P.P., Birthal, P.S. and Joshi, P.K. (2006). Diversification towards high value agriculture role of urbanisation and infrastructure. *Economic and Political Weekly*, 41 (26): 2747-2753.

Saxena, R., Singh, N. P., Balaji, S.J., Ahuja,U.R., Joshi, D. (2017). Strategy for Doubling Income of Farmers in India. Policy Paper 31. ICAR-National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi.

Doubling the farmers income through cultivation of saffron in Jammu and Kashmir

M.H. Wani*, ArshadBhat and M.Y. Zargar
Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, J&K-190025, Srinagar
*Corresponding author:rgckashmir@gmail.com
Received: 2nd October 2018; Revised: 10th January 2019; Accepted: 25th May 2019

ABSTRACT

The rural economy employs about 60 per cent of India's work force, contributes about 17 per cent of gross domestic product. Average net profit of one acre of land growing cereals is about Rs 5,000 which gives a net profit of Rs 10,000 annually for 7 crore marginal farmers. Furthermore, the minimum support price for food grains is always lower than the real input costs plus minimum profits, resulting in two lakh suicidal deaths in India reported during the last one decade. It in this backdrop the union government has set an ambitious goal to double farmers' income by 2022 to boost the agriculture sector. The present paper has pursued the vision 2020 in Jammu and Kashmir state in respect of most profitable and world famous spice saffron. The highly priced spice is cultivatedin state on an area of 4496 hectares. The crop has attempted to double the farmer's income by providing new technology in the form of growing material in saffron to the farmers, so that their socio-economic condition is uplifted. The results of the study revealedthat not only the productivity of saffron has increased multi-fold but also the income of farmers has increased from Rs 206353 to Rs 605407 by using the new production system module developed by SKUAST-Kashmir.

Keywords: *Kashmir, saffron, farmers' income*

INTRODUCTION

India has made great strides in the field of socio-economic development since independence,and have achieved significant heights in the field of agriculture to double the farmer's income. Agriculture playsa pivotal role in the economy of Jammu and Kashmir. Almost eighty per cent population of the state lives in rural areas and depends on agriculture for their livelihood and sustenance. The development of the state is impossible unless the economic condition of this section of the society improves. The cultivation of saffron is a traditional art. Historically, the cultivation of saffron started around four centuries back in Arabia and Spain. Thereafter, its cultivation spread to Iran, Sweden and India. Now, saffron growing is a great commercial activity. In Indian agriculture, this activity is also known as "Golden Zest". In India, 5,707 hectares of land comes under its cultivation. Its annual production is around sixteen thousand kilograms. The state of Jammu and Kashmir tops the list of the saffron growing states in India. It can be gauged from the fact that out of the total 5,707 hectares of land under its cultivation 4,496 hectares lie exclusively in Jammu and Kashmir. Kashmir is known as the valley of flowers. Among several varieties of flowers grown here, saffron has its own importance and utility (Zarger,2018; Yadav, 2010). The vast stretches of saffron fields give the impression of a newly wedded bride draped in a saffron shawl taking a nap. In Kashmir valley, Pampore, which is situated at a distance of 15 kilometres from Srinagar, is famous throughout the world for its high grade saffron. District Pulwama, the "saffron bowl" of Kashmir, is dominant in saffron production followed by Budgam, Srinagar and Kishtwar districts. The main cultivation areas of saffron in district Pulwama are Khrewa, Samboora, Chandhara andPampore.The average earning from the cultivation of saffron is from 30 to 40 crore rupees. The cultivation of saffron is the second largest activity in the state followed by fruits especially Apple and walnut (Nehvi, 2009; Munia, 2018; Dar, 2017).The productivity of saffron is directly proportional to the following

- Good quality saffron corms (seed) weighing 10-15 gms.
- 700m^3 availability of water required per hectare of saffron.
- Proper apparatus for solar/air drying.

- Efficiency in picking, grading and packing of saffron.

Difficulties faced by the Saffron Growers

Usually the saffron growers face number of problems in the state, the problems not only are related less production compared to the investment, but the infestation of diseases too. During past few decades diseases like corm rot, dry rot, root rot, bacteria rot, ring rot, charcoal rot, mosaic etc. have been reported.Corm rot is considered as the most deadly disease besides marketing is also one of the main constraints. An average saffron grower finds it troublesome to sell the small quantity of his produce. The grading and packing individually is not highly profitable. The cultivator has scarce resources. So, this is necessary that cooperative societies are formed to sell the saffron at remunerative prices. The lack of irrigation facilities and research and developmental activities in the related field for cultivation, sowing of corms, seed protection, soil testing were seen to be a major problem in saffron cultivation because when the seed corm does not gets sufficient irrigation at regular intervals it did not get nurtured and as such does not grow properly to give good returns.

Doubling the farmers income

The farmers are committing suicides, because they are heavily indebted and farming for them is not profitable. There are mainly four approaches that could increase the income of these overdebtedfarmers.

- Increasing the profitabilitythrough better technology like varieties, increased use of quality seed, efficient fertilization, irrigation, etc.
- Incentive structure in the form of remunerative prices for some crops and subsidies on farm inputs.
- Public investments in and for agriculture
- Facilitating institutions

The use of high-yielding inputs, practice of resource efficient cultural practices and mechanization of farms are the means to improve the quantitative and qualitative yields from the farms, and also to reduce input costs, which adds to the incremental farm income (Foster andRosenzweig, 2004). It is in this regard that an attempt has been made to double the Kashmir saffron growing farmer's income by using new production system module in saffron. The production system module is expected to increasesaffron production from 2.5 kg/ha to 6.37 kg/ha from first to fourth year of its production cycle.

Economics of Saffron

Saffron (Crocus sativus) is one of the most important foreign exchange earningcrop among the spices, grown in some pockets of the state of Jammu and Kashmir in India. About 49 per cent of its total produce is exported. Saffron is one of the oldest commodities (spices) of Jammu and Kashmir state. Pampore and its neighbouring areas produce on an average 2,128 kilograms of saffron every year. But during last few years the production is gradually declining, with the result the saffron cultivation is under threat in the state owing to uncertain climatic conditions and insufficient irrigation facilities in these areas. The area, production and the productivity of this famous spice decreased compared to the past two decades when it used to be a good source of earning foreign exchange for the country as a whole. Saffronfinds its use in food, pharmaceutical, cosmetic and perfumery industries and also is used in the textile dyes. Saffron is famous in the world for its fine flavour, colour and medicinal value.

METHODOLOGY

A comprehensive survey of the saffron growing areas was undertaken to assess the impact of production system module in saffron developed by the SKUAS-K, on ground. The impact of new technology was assessed by taking before and after scenario of new technology module adopted by a group of farmers and same group was treated as non-adopters before the adoption of technology so as to have a better assessment of new technology. The information on area production and yield over various periods of time viz., period-I (1983-85), period-II (1993-95), period-III (2002-04) and period-IV (2011-13), respectively classified as TE-I, TE-II, TE-III and TE-IV, to estimate triennium wise average of area, production and yield, was obtained from the published sources of the state and central government. The primary data for ex-ante evaluation was collected directly from the Scientists involved in developing the package, while as for ex-post evaluation data was collected through survey method**.** Published reports by the concerned agency who executed the package in the saffron growing belt were also perused. Economic feasibility analysis was performed for calculating the estimates of potential and realized economic

benefits from the adoption of new production system module in saffron by estimating the net present value (NPV), the internal rate of return (IRR) and the benefit-cost ratio (BCR). The average productivity and input were estimated from the field data in the saffron belt were used for assessment of the level of adoption of the package. India being 2nd in the production of saffron in the world and accordingly the 2nd in its export, the benefits accruing out of the adoption of improved technology get normally transacted to the producers.

RESULTS AND DISCUSSION

Area and production

The area under saffron cultivation increased, declined and again increased by 31.79, -40.50 and 30.38 per cent from TE-I to TE-II ,TE-II to TE-III and TE-III to TE-IV, respectively, against the production registering 31.03, -45.61, 114.03 per cent and yield recording -2.97,-7.39, 64.31 per cent change respectively, during the period under discussion (Table 1).

Table 1: Triennium wise area, production and yield and decadal growth (CGR) of Saffron in J&K

Year	Area (ha)	Production (M.T.)	Yield (Kg/ha)
TE-I	3702	8.70	2.37
TE-II	4879	11.40	2.30
TE-III	2903	6.20	2.13
TE-IV	3785	13.27	3.50
Annual Compound growth rate			
1983-93	2.21	2.03	0.00
1993-03	-5.05	-5.30	-0.42
2003-13	3.28	11.18	7.73

Due to increase in both area and yield during the last decade, the production has also witnessed an increase of 7.07 M.T. The estimated CGR in area, production and yield for three decades, registered in the table 1 demonstrated a significant and positive growth of 3.28, 11.18 and 7.73 per cent respectively, during the decade gone (2003-13) which is a very positive outcome of the advanced production module of saffron developed by SKUAST-K.

Impact of new technology on saffron growers

The adoption of new technology (NAIP production module system) has changed the crop economics. It has led to changes in input use pattern and labour use. The adoption of new technology increased the yield of saffron and the corms pushing the gross and net returns up by 208.7 per cent & 260.5 per cent in ex-ante study and 138.4 per cent &185.5 per cent in ex-post study respectively, thus increases the marketable surplus substantially (Table 2). In addition the cost of cultivation was significantly higher by 50.9 per cent & 76.2 per cent under ex-ante and ex-post studies respectively. The potential of the improved technology could be judged by the fact that its use increased the returns per rupees invested by around 104.8 per cent & 22.6 per cent under ex-ante and ex-post studies respectively (Table 3).

The other socio economic implications were the increase in the employment by 40.6 per cent & 28.3 per cent and domestic consumption by 67.44 per cent under ex-ante and ex-post studies respectively, indicating that the adoption of the new technology improved the socio-economic status of the adopters.

Table 2: Impact of improved production system module on saffron growers (Ex-ante)

Particulars	Improved technology	Traditional technology	(%) Change
Saffron Yield (Kg/ha)	6.05	2.5	142.0
Corms yield (q/ha)	15	9	66.7
Gross returns (Rs/ha)	1060200	343413	208.7
Net returns (Rs /ha)	744000	206353	260.5
Cost of cultivation (Rs /ha)	248008	161974	53.1
Cost of production (Rs /kg)	91245	60468	50.9
Returns per rupee invested (Rs/ha)	4.3	2.1	104.8
Labour productivity (Kg/ha)	0.031	0.016	93.8
Marketable surplus(Kg/ha)	5.978	2.44	143.3
Employment (human days/ha)	308	219	40.6
Domestic consumption (Kg/ha)	0.072	0.043	67.44

Table 3: Impact of improved production system module on saffron growers (Ex-post)

Particulars related to saffron production	Before technology	After Technology	(%) Change
Main Product (kg/ha)			
Stigmas	2.48	4.39	77.0
By Product (kg/ha)			
Stamens	2.45	4.24	73.1
Petals	22.6	34.1	50.9
Corms yield (q/ha)	9	15	150.0
Gross returns (Rs./ha)	343413	818610	138.4
Cost of cultivation (Rs./ha)	161974	313750	86.8
Net returns (Rs./ha)	206353	605407	185.5
Cost of production (Rs./kg)	60468	106529	76.2
Returns per rupee invest ted (Rs./ha)	2.12	2.60	22.6
Labour productivity (kg/ha)	0.016	0.021	31.3
Marketable surplus(kg/ha)	2.44	4.32	77.0
Employment (human- days/ha)	219	281	28.3
Domestic consumption (kg/ha)	0.043	0.072	67.4

Partial budget estimates

Partial budgeting was used to further assess the impact of adoption of improved technology in terms of net economic gains. The results revealed that new technology required more costs on human labour and corms accounting for Rs 84892 ha^{-1}& Rs 154287 ha^{-1} under ex-ante and ex-post studies respectively (Table 4).

Table 4: Partial Budgeting of improved production system module(Ex-ante)

Debit		Credit	
Particulars	**Amount (Rs/ha)**	**Particulars**	**Amount (Rs/ha)**
Increase in cost per hectare		Increase in income per ha	
Corms 3 q@ Rs 13464	40392.0	Saffron yield 3.55 kg@ Rs	469114.8
Human labour 89 man days	44500.0	132145	
@ Rs 500 per day		Corms yield 6 q/ha @ Rs 13464	80784.0
Decrease in income per ha	0.00	Decrease in cost per ha	0.00
Total (Rs.)	84892.0		549898.8
Net change (Rs)	**465006.80**		

However, the credit side shows considerable gains in the form of increased saffron yield to the tune of 3.55 kg & 1.91 kg per hectare and corm yield 6q per hectare respectively under ex-ante and ex-post studies, amounting to the total credit of Rs 549898 ha^{-1}& Rs 475404 ha^{-1} respectively. The net change in returns led to an increased amount of Rs 465006.8 ha^{-1}& Rs 321117 ha^{-1}under ex-ante and ex-post studies respectively (Table 5). Therefore, it could be concluded that the adoption of new saffron technology improved the livelihood by generating additional employment and income.

Table 5: Partial Budgeting of improved production system module (Ex-Post)

Debit		Credit	
Particulars	**Amount (Rs/ha)**	**Particulars**	**Amount (Rs/ha)**
Increase in cost per hectare		Increase in income per ha	
Inputs (Corms)	49514	Main product (Stigmas)	252396
Quantity effect - Increase in corm use 3.54 q/ha @ Rs 13987		*Quantity effect* - Increase in saffron yield 1.91 kg/ha@ Rs 132145	
Price effect	25974	*Price effect*	83958
Pre technology Corm use 6.75 q/ha @ Rs 3848*		Pre technology saffron yield 2.48 kg/ha @ Rs 33854*	
Inputs (Labour)	30008	By product (Corms)	83922
Quantity effect		*Quantity effect*	
Increase in human labour 62 man days @ Rs 484 per day		Increase in corm yield 6 q/ha @ Rs 13987	
Wage effect	20586	*Price effect*	34632
Pre technology human labour 219 man days @ Rs 94* per day		Pre technology corm yield 9 q/ha @ Rs 3848*	
Inputs (Fertilizers)	28205	By product (Stamens)	7398
Organic and inorganic fertilizers		*Quantity effect*	
		Increase in stamens yield (by product) 1.79 kg/ha@ Rs 4133	
		Price effect	5225
		Pre technology stamens yield (by product) 2.45 kg/ha @ Rs 2133*	
		By product (Petals)	4408
		Quantity effect	
		Increase in petals yield (by product) 14.5 kg/ha@ Rs 304	
		Price effect	
		Pre technology petals yield (by product) 22.5 kg/ha @ Rs 154*	3465
Decrease in income per hectare	0.00	Decrease in cost per hectare	0.00
Total (Rs ha^{-1})	154287		475404
Net change (Rs ha^{-1})	**321117**		
Note: * Price differential = Price after technology – price before technology			

Aggregate benefits

The estimates of net present value, internal rate of return and benefit-cost ratio for both ex-ante and ex-post analysis(Jones*et al.*, 2009; Santosh andDas, 2015) are presented in Table 6.

Table 6: Returns from Investment on New Technology

Particulars	Ex-ante	Ex-post
NPV(cr)	161.06	132.8
IRR	112%	110
BC Ratio	39.53	37.27

The analysis showed a significant improvement in yield level in the study area on adoption of new technology. Estimates reveal that on each rupee invested, the benefit-cost ratio was 39.53 & 37.3 and the IRR 112 per cent & 110 per cent, under ex-ante and ex-post studies respectively.

CONCLUSIONS

This study has provided estimates of potential and realized economic benefits from adoption of new technology. The assessment of technology revealed that its adoption not only increase the production of saffron but also ensures an average saffron productivity gain from 2.5 kg/ha to about 6.37 kg/ha (1-2 kg/ha in the first year to 10-12 kg/ha in the fourth year of planting cycle) over the production period of 4 years. Although at micro level the cost of cultivation under new technology was high as compared to old technology, but it benefited adopters in the form of higher productivity and at macro level generated employment opportunities (both skilled and unskilled labour man days).

REFERENCES

Dar, S.H. (2017). Saffron Cultivation in Kashmir valley: Production and Challenges, International Conference on Innovative Research in Science, Technology and Management, Modi Institute of Management & Technology, Dadbari, Kota, Rajasthan.

Foster, A.D. and Rosenzweig, M.R. (2004). Agricultural productivity growth, rural economic diversity, and economic reforms: India, 1970-2000. *Economic Development and Cultural Change*, 52(3): 509-42.

Jones, N., Jones, H., Steer, L. andDatta, A. (2009). Improving Impact Evaluation, Production and Use. (ODI: Working Paper) http://www.odi.org.uk/resources/docs/4158.pdf.

Munia, M. (2018). Production technology of saffron for enhancing productivity, Journal of Pharmacognosy and Phytochemistry 7(1): 1033-1039.

Nehvi, F.A. (2009). Good Practice for Saffron Production in Kashmir, Practical Manual, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir.

Santosh, K., Das, S.S. (2015). Impact of Agricultural Related Technology Adoption on Poverty: A Study of Selected Households in Rural India, Madras School of Economics, Gandhi Mandapam Road Chennai 600 025 India.

Yadav, K. (2010). Saffron Cultivation: Jammu and Kashmir, Agropedia 23, February, 2010.

Zarger, B.A. (2018). Saffron Productivity in Kashmir, Greater Kashmir, Wednesday, September 05, 2018.

Agro-Tourism as a Strategy for Economic Development of Rural areas in Maharashtra: A Case Study of Markanda Village in Gadchiroli District

Pooja H. Haldar*, Pramod P. Wani S.C.Nagpure and Amoolya. S. N
Agricultural Economics and Statistics section, College of agriculture, Nagpur.
*Corresponding author:p.meesty71@gmail.com
Received: 5th October 2018; Revised: 12thJanuary 2019; Accepted: 27th May 2019

ABSTRACT

Agro-tourism is a concept of developing and preparing villagers for creating an alternative source of earning and sustaining their heritages. This kind of tourism develops where agricultural activities and tourists interacts. Realizing this fact, a small village as Markanda of Chamorshi tehsil in Gadchiroli district, situated in southeastern corner of Maharashtra, having geographical area (463.88 ha) and densely covered forest area (179 ha) with agriculturally cultivated area(283.15 ha). The villagers are completely depend ant on agriculture. As agriculture demands only few seasons engagement. So, they dosen't have anything to do in off season. The present result from a study indicate that agricultural tourism has substantial economic impact on local economies. In addition, agro-tourism provides opportunities for diversification and economic incentives for growers, promotes economic development and helps to educate the public about the important contributions of agriculture to the country's economy and quality of life. Hence, the present paper evaluate, analyses and provides a strategy as an alternative source of income to the farmers. This is a positive indicator and path for the growth of rural tourism initiatives around Gadchiroli district. Likewise according to the scenario, growth and future possibilities as well as limitations for agro-tourism, if it is adopted in small parts of Maharashtra state would become a best agro-tourist venture in India.
Keywords: Agro-tourism, rural development, economic development.

INTRODUCTION

Agro tourism is the latest concept in the Indian tourism industry, which normally occurs on farms. It gives an opportunity to the tourists to experience the real enchanting and authentic contact with the rural life, taste the local genuine food, handicraft, culture, music, language and get familiar with the various farming tasks during the visit. Tourists can relax and revitalize in the pure natural environment. Agro tourism is helpful for developing and preparing villagers for creating an alternative source of earning and sustaining their heritages. This kind of tourism develops where the agricultural activities and tourists interacts. It involves various agricultural activities, animal rides and stay at rural surroundings with natural and fresh cuisines. It could a source of developing countries like India.

Since 2004 Agriculture Tourism is operational, it started in Baramati Agri Tourism Center under the guidance of Pandurang Taware. He received the National Tourism Award from the President Of India, for the most innovative Tourism Product. Agri Tourism India (ATDC) is pioneer in the development and marketing of agri tourism concept in India. ATDC, as of 2014, has 218 affiliated farmers and operates agri tourism center in their respective villages in the state of Maharashtra.

A small village as Markanda of Chamorshi tehsil in Gadchiroli district, situated in southeastern corner of Maharashtra, having geographical area (463.88 ha) and densely covered forest area (179 ha) with agriculturally cultivated area(283.15 ha). This village farmers are also get benefitted through agro tourism because of nature's beauty, forest adventures and also because of a historical temple of lord shiva (8th CE of 1200 years old).

Objectives:

1. To study the strategies for agro tourism on agricultural land of selected area.
2. To analyze the agro tourism as a resource to the dwindling growth rate in agriculture sector.
3. To suggest means and ways of uplifting agro tourism towards positive sustenance and economic growth.

METHODOLOGY

Gadchiroli district is purposively selected from Maharashtra state according to forest area and agriculturally cultivable area. The Markanda village is purposively selected according to the number of households and number of farmers doing farming along with allied activities which will attracts the tourists towards the agriculture(fortunately tourists are already attracted towards the village because of historical site and nature's beauty).

The SWOT analysis based on agro-tourism on Markanda village has been initiated by the researcher taking the views and reviews of state officials and the villagersby personal interview and discussion.

The Primary data had collected personally by the researchers from sarpanch,talathi and gram sevak of the village during the year 2017-18. Simple tabular analysis was carried out for the present study.

Case analysis of Markanda village

This village is situated around 45 kilometers from Gadchiroli, a district of southeastern Maharashtraand 184 kilometers from a meteropolitian city Nagpur. Main occupation of the villagers is farming along with allied activities as flower and fruit cultivation, water chestnut cultivation, fishing, boating, dairy and poultry, handcrafts.

To know more about the village, the researchers visited the area and found a historical site of tourist's interest. There is a historical temple of lord shiva of 8th CE(1200 years old) and the temple construction is as same as "Khajuraho" that is why called as "Mini Khajuraho". This temple is situated at the river banks of Wainganga river which beautifies the village.

There are 2 lakes and 4-5 ponds where water chestnut is cultivated and lotus flowers are beautifying the lakes and ponds and this are also used for marketing because, people used lotus for worshipping. There is a Dharmashala near the temple where, the tourists can stay.

RESULTS AND DISCUSSION

The table 1 reveals that, the total 190 farmer were selected for the present study , of this 284 farmers were cultivate agriculture crop followed by Flower cultivation, Fruit cultivation fishing, chess nut cultivation and dairy enterprises.

The table 2 observed that, the total 1.05 lakh to 2.00 lakh were visited towards different tourist area . Of which, 15 per cent t o20 per cent were benefited from the implemented agroturism in the selected area of the present study.

Table 1: Enterprises wise activities according to land holding.

	Total No. of Farmers	Area under cultivation (in ha)	Income from seasonal farming (in lakhs)	Flower Cultivation (in lakhs)	Fruit Cultivation (in lakhs)	Fishining (in lakhs)	Chestnut cultiva-tion (in lakhs)	Dairy and poultry (in lakhs)	Hand crafts (in lakhs)
Marginal (0-1ha)	105	115	75	7	2	5	2	1	5
Small (1-2ha)	55	75	49	9	4	2	-	3	3
Medium (2-4ha)	22	66	44	3	3	-	-	2	-
Large (<4ha)	8	28	19	9	6	-	-	5	-
Total	190	284	187	28	15	7	2	11	8

Table 2: Percent benefited to village through income from tourists.

Year	No. of visitor visited	Income receive from tourist (in Lakhs)	Total Income from farming (in Lakhs)	Percent benefited = income receive (tourist)/total income(Farming)* 100
2011-12	105000	37.50	250	15
2012-13	120000	40.00	200	20
2013-14	117000	25.50	150	17
2014-15	130000	54.00	270	20
2015-16	150000	50.00	250	20
2016-17	180000	57.20	260	22
2017-18	200000	60.00	240	25

CONCLUSION

Based on results, the agro-tourism has more scope to enhancing the activities of the agriculture for indirectly benefit to village farmers.

REFERENCE

Khatoon S . and Mehdi S. A..(,2013) Rural Indian Economics-Supplementing Agriculture with tourism for development, Journal of Indian Research, Vol(1):43-52.

Shrivastava. S.,(2016) Agro-tourism as a strategy for the development of rural areas: Case study of Dungrajya village, southeastern Rajasthan, *India. Journal of medical and dental science research,* vol(3)-6: 35-39.

Shembekar P . and Joshi. M., (2016) A study on growth and future scope for agro-tourism projects in Nagpur district. *GE- International journal of management research*, vol(4)- 4: 2394- 4226.

Taware.P. (2010) Agro tourism: New Revenue stream for farmers thru Rural- Urban Reunion. Financing Agriculture, vol(42):20-21.

Multi Storied Coconut Based Cropping System for Doubling Farmer Income

V.A. Thorat*, A.D. Hake, B.C. Karbhari, J.S. Dhekale, J.M. Talathi
Department of Agriculture Economics, Dr. BalasahebSawantKonkan Krishi Vidyapeeth, Dapoli, Ratnagiri, Maharashtra-415 712,
*Corresponding author: thoratva61@rediffmail.com
Received: 4th October 2018; Revised: 10th April 2019; Accepted: 22nd July 2019

ABSTRACT

The present study attempts to evaluate coconut based cropping system followed by farmers from Konkan region. The study was conducted in Raigad district with 75 old and 15 newly established coconut gardens. The financial feasibility was analyzed by using discounted measures like NPV, IRR, BCR and pay-back period.Per farm total number of plants was 1011. Coconut plants accounted for 8.31 per cent of total plants in coconut garden. Whereas, arecanut spices, banana and pineapple plants accounted for 86.29, 2.4,0.67 and 2.33 per cent, respectively. On an average per hectare cost of maintenance for coconut garden was worked out to Rs.261762.6 per hectare gross return realized were Rs.499000. Out of total gross returns obtained,47.58 per cent returns were obtained from arecanut, followed by coconut 23.55 per cent, black pepper 9.18 per cent other crops nutmeg, cinnamon, banana and pineapple contributed to 7.83 per cent, 1.10 per cent, 8.56 per cent, 2.20 per cent of gross returns respectively. Among all systems of mix cropping the maximum (Rs. 217050.2) cost was incurred in coconut+ arecanut+ black pepper + cinnamon cropping system and minimum (Rs. 147561.9) cost was incurred in coconut+ nutmeg cropping system. Maximum (Rs. 406283.1) returns were obtained from coconut+ arecanut+ black pepper+ cinnamon cropping system and minimum (Rs. 276493) returns were obtained from coconut+ nutmeg cropping system. The maximum net returns(Rs. 189098.5) were obtained from coconut+ arecanut+ black pepper cropping system followed by coconut+ arecanut+ black pepper + cinnamon cropping system(Rs.189033).
Keywords: *Coconut, multi-storied farming, doubling farmers' income*

INTRODUCTION

To alleviate agrarian distress the government of India set a target of doubling farmers income by 2022-23, and adopted number of steps like improving irrigation efficiency, crop insurance, improving market efficiency, promoting organic farming, soil health and soon. To achieve the target it is important that available scarce resource must be utilized to full extent. This encompasses several dimension form production to post harvest management. This includes bridging yield gap crop diversification and intensification (Korikanthimath*et al.,* 1997; Kalathiya *et al.,* 2007; Chinnappa and Nagraj, 2009). Land is a limiting factor and over a period of time there is shift in agricultural land to non-agricultural uses. In view of this it is necessary to make intensive use of cultivable land. A multi storied cropping could serve as a means for intensive use of limited land resource which also adds to farmers' income (Shahaparmath*et al.*, 2003; Lutha *et al.*, 2004 and Patil, 2010). In view of this present study attempts to evaluate coconut based cropping system followed by farmers from Konkan region.

METHODOLOGY

Raigad district from Konkan region is known for cultivation of Coconut. The area under coconut in Raigad district is 3,434 hectare. In view of this Raigad district was selected purposively for the present study. On the basis ofarea under coconut five villages having maximum area under coconut were selected purposively. From each village fifteenfarmers were selected randomly. In addition the data on input utilization during establishment of coconut garden i.e. up to six years were collected from newly established coconut gardens. Total sample comprised of 75 old and 15 newly established coconut gardens.

Estimation of financial feasibility:-

The series of cash inflow and outflow were generated based on past research on coconut and cost and returns obtained in the present study. Following financial measures were used to test financial feasibility of investment in coconut gardens.

Net present value –

Net present value is the present worth of the net cash flowstream.

B_t= Returns in period t
C_t = Cost in period t
r = Discount rate
t = Life of garden
I = Initial investment

Internal rate of return

Internal rate of return is that discounted ratewhich makes the net present value of the cash flow equal to zero.

$$IRR = NPV = \sum_{t=1}^{n} \frac{(B_t - C_t)}{(1+r)^t} - I = 0$$

Benefit cost ratio

Benefit cost ratio is the ratio between present worth of benefits and that of cost.

$$BCR = \frac{\sum_{t=1}^{n} \frac{(B_t)}{(1+r)^t}}{\sum_{t=1}^{n} \frac{(C_t)}{(1+r)^t}}$$

Payback period

Payback period of the project was is estimated by using the following formula

$$P = \frac{I}{E}$$

Where,
P = Payback period in years
I = Investment in rupees
E = Annual net cash revenue in rupees

RESULTS AND DISCUSSION

Land holding and cropping pattern followed by sample farmers

The information regarding average size of holding of sample farmer is given in the Table 1.The irrigated area accounted for 51.58 per cent and un-irrigated area for 48.42 per cent of total operational holding.The cropping pattern followed by sample farmers are depicted in Table 1 revealed that area under coconut was 0.51 ha which accounted to 35.10 per cent of total cropped area.

Table 1: Land holding and cropping pattern followed by sample farmers

Particulars	Area (ha)	Per cent
Irrigated	0.48	51.58
Un-irrigated	0.32	48.42
Total	**0.80**	**100**
Kharif season		
Rice	0.15	10.32
Val	0.003	0.20
Perennial crop		
Mango	0.07	4.81
Arecanut	0.55	37.85
Coconut	0.51	35.10
Spices	0.07	4.81
Banana	0.04	2.75
Pineapple	0.06	4.13
Total	**1.45**	**100**

Frequency of plants in coconut garden

The number of plants of different crops accommodated in coconut garden is given in Table 2. It was observed that, in study area, coconut farmersoften cultivated other crops as mix crop along with coconut.

Table 2: Number of plants in coconutgarden

Crop	No. of Plants	Per cent
Coconut (Numbers)	83.96	8.31
Arecanut (Numbers)	872.09	86.29
Nutmeg (Numbers)	0.28	0.03
Black pepper (Numbers)	22.08	2.18
Cinnamum (Numbers)	1.96	0.19
Banana (Numbers)	6.76	0.67
Pineapple (Numbers)	23.51	2.33
Total	**1010.64**	**100**

In view of this, to assess the area under mix crops as well as coconut, per farm number of plants were estimated. It indicated that per farm total number of plants were 1011. Coconut plants accounted for 8.31 per cent of total plants in coconut garden, whereas arecanut, spices, banana and pineapple plants accounted for 86.29, 2.4,0.67 and 2.33 per cent, respectively.

Cost of maintenance of coconut garden

The coconut palm generally starts bearing after 6th year. Once the coconut tree starts bearing, the growers have to incur the expenditure on different inputs and services which is termed as maintenance cost. Per hectare input utilization for coconut is depicted in Table 3.It can be seen that per hectare input utilized were 123.72 labour days, 4142.04 kg manure, 63.95 kgSuphala, 2.69 kg Urea and5.93 kg SSP. Among the different input used maximum (58.40 per cent) expenses were incurred on human labour followed by manures (38.53%) and fertilizers (2.66%). The expenditure incurred on plant protection was negligible which accounted for 0.38 per cent of total per hectare input value. As regard the use of fertilizers most of the farmers used mixed fertilizers viz. Suphala, which may be because of non-availability of straight fertilizers in local market.

Table 3:Input utilization for maintenance cost of coconut garden

Particulars	Qty.	Rate (Rs.)	Value (Rs.)	Per cent
Labour (man days)				
Male	83.75	203	17001.25	39.53
Female	39.97	203	8113.91	18.87
FYM (kg.)	4142.04	4	16568.16	38.53
Fertilizer (kg.)				
Suphala	63.95	17	1087.15	2.52
Urea	2.69	6	16.14	0.03
SSP	5.93	8	47.44	0.11
Plant Protection (Rs.)			163.89	0.38
		Total	**42997.94**	**100**

Cost of maintenanceof coconut garden

Theper hectare maintenance cost incurred on maintenance of coconut garden is presented in Table 4. It is observed that at on an average per hectare cost of maintenance for coconut garden was worked out to Rs.261762. The contribution of Cost 'A' (Rs.89675.75) which accounted for 40.27percent to total cost. The contribution of Cost 'B' to total cost was 84.47per cent. Out of total per hectare maintenance cost of coconut garden maximum 37.35per cent cost was incurred on rental value of land.

Table 4:Cost of maintenanceof coconut garden

Particulars	Amount (Rs.)	Per cent
Hired labour		
Male	17001.25	7.63
Female	8113.91	3.64
FYM	16568.16	7.44
Fertilizer	1150.73	0.51
Plant Protection	163.89	0.07
Working capital	42997.94	19.31
Depreciation	1000	0.44
Land revenue	100	0.04
Interest on working capital @ 6 %	2579.87	1.15
Cost A	89675.75	40.27
Interest on fixed capital @ 10 %	1000	0.44
Rental value of land	83166.68	37.35
Amortization Value	14255	6.40
Cost B	188097.43	84.47
Family labour		
Male	20678.88	9.28
Female	4922.46	2.21
Supervision charges	8967.57	4.02
Cost C	222666.34	100

Returns from coconut garden

On the basis of per hectare production of coconut and of intercrops, gross returns were worked out. The per hectare gross return realized were Rs.499000 (Table 5).

Table5:Returns from Coconut garden

Particulars	Main Produce (Rs.)	Per cent	By Produce (Rs.)	Per cent	Total Produce (Rs.	Per cent
Coconut	109618.2	22.78	7891.39	44.41	117509.6	23.55
Arecanut	229056.7	47.60	8385.93	47.19	237442.7	47.58
Black pepper	45824.63	9.52	-	-	45824.63	9.18
Nutmeg	39050.32	8.11	-	-	39050.32	7.83
Cinnamon	4013	0.83	1493.29	8.40	5506.29	1.10
Banana	42689.57	8.87	-	-	42689.57	8.56
Pineapple	10977	2.28	-	-	10977	2.20
Total	**481229.4**	**100**	**17770.61**	**100**	**499000**	**100**

Out of total gross returns obtained, 47.58 per cent belonged toarecanut, followed by coconut (23.55 per cent), black pepper (9.18 per cent), whereas other crops such as nutmeg, cinnamon, banana and pineapple contributed to 7.83 per cent, 1.10 per cent, 8.56 per cent, 2.20 per cent of gross returns, respectively. Out of total gross returns, 96.44 per cent were obtained from main produce while only 3.56 per cent returns were obtained from by produce.The cost and returns from different mix crops in coconut garden is presented in Table 6. Among all systems of mix cropping the maximum (Rs. 217050) cost was incurred in coconut+ arecanut+ black pepper + cinnamon cropping system and minimum (Rs. 147561.9) cost was incurred in coconut+ nutmeg cropping system. Maximum (Rs. 406283) returns were obtained from coconut+ arecanut+ black pepper+ cinnamon cropping system and minimum (Rs. 276493) returns were obtained from coconut + nutmeg cropping system.The maximum net returns(Rs. 189098) were obtained from coconut+ arecanut+ black pepper cropping system followed by coconut+ arecanut+ black pepper + cinnamon cropping system(Rs.189033). The foregoing analysis revealed that the combination of 'coconut+ arecanut+black pepper'was the most profitable mix cropping system in coconut garden.

Taking into account the yearly cost of establishment and annual maintenance cost of arecanut garden up to 40 years age of garden, a series of cash inflow (returns) and cash outflow (costs) were prepared. For coconut cash flow statement was prepared for 60 years for black pepper and cinnamon it was prepared for 20 years and for nutmeg 50 years. By using the economic parameters such as net present value, internal rate of return, benefit cost ratio and payback period as per the procedure outlined in chapter on the methodology the financial feasibility of investment in coconut garden was tested and the estimated value of these parameters are represented in Table7.

Table 6: Profitability of mix cropping systems in coconut garden

Cropping system	Cost (Rs.)	Returns (Rs.)	Net returns (Rs.)
Coconut	115277.09	117509.6	2232.51
Coconut+ Arecanut+ +Pineapple	189711.3	354952.2	165240.9
Coconut +Arecanut +banana	210001.6	397641.8	187640.2
Coconut +Arecanut +Pineapple	194927	365929.2	171002.2
Coconut+Arecanut+ Black pepper	211678.4	400776.9	189098.5
Coconut +Nutmeg	147561.9	276493	128931.1
Coconut +Arecanut + Blackpepper + cinnamon	217050.2	406283.1	189033

It was revealed that net present value (NPV) for coconut at 15 per cent discount rate was estimated to R. 22348.36,benefit cost ratio was 1.01, internal rate of return was 16.77 per cent and payback period was 6years. Among the different cropping system NPV was maximum Rs. 58200.9 in coconut+ arecanut+ black pepper cropping system followed by Rs.47683.76 in coconut+ arecanut+ black pepper+ cinnamon and Rs.33978.3 in coconut +arecanut. Benefit cost ratio at 15 per cent discount rate was maximum (1.89) in coconut+ arecanut+ black pepper cropping system followed by 1.87 in coconut+ arecanut+ black pepper+ cinnamon and arecanut+ nutmeg cropping system. It can be concluded that coconut+ arecanut+ black pepper is most profitable cropping system in coconut garden. Internal rate of return was maximum 17.49 per cent in arecanut+ coconut+ black pepper+ cropping system. Payback period was maximum 9 years in arecanut+ coconut while it was minimum 6 years in arecanut+ coconut+ black pepper cropping system.

Table7: Financial feasibility in arecanut garden

Crops	BCR	NPV	IRR	Payback period
Coconut	1.01	22348.36	16.77	6 years
Coconut +Arecanut	1.87	33978.39	16.67	9 years
Coconut+Arecanut+ Black Pepper	1.89	58200.95	17.49	6 years
Coconut+Nutmeg	1.87	28865.31	16.10	7 years
Coconut+ Arecanut+ BlackPepper+Cinnamon	1.87	47683.76	17.12	6 years

The results obtained showed that NPV for all the cropping systems in were positive. The benefit cost ratio was greater than unity and internal rate of return was greater than prevailing interest rate of 15 per cent. As all estimated parameters were found positive indicating that investment in coconut garden is financially feasible.

CONCLUSIONS

The foregoing analysis revealed that multi storied cropping in coconut garden is more profitable as compare to coconut crop. The multi storied cropping in coconut garden also had allowed making intensive use of limited land resource and enhancing the farmer income. It could be the means for doubling farmers' income in Konkan region

REFERENCES

Chinnappa, B.,Nagraj, R.(2009).Establishment and maintenance of arecanut plantations under different water management regimes.*Environment and Ecology*, 27(4): 2112-2122.

Korikanthimath, V.S., Kiresur, V., Hiremath, G.M., Hegde,R., Mulge, R.,Hosmani, M.M. (1997). Economics of mixed cropping of cardamom (ElettariacardamomumMaton) in arecanut (Arecacatechu L.) gardens.*Journal of Spices and Aromatic Crops*,6(2): 107-113.

Kalathiya, K.V.; Dave, S.K.; Mehta, D.R. (2007).Cost and return in different sizes of coconut holding in Valsad District (South Gujarat).*Indian Journal of Agricultural Research*,41(3): 228-231.

Lutha, C.B., Thomas, J. and Aswathy, N. (2004). Cost of production and capital Productivity of coconut in Kerala. *Journal of plantationcops*,32(1): 51-54.

Patil, A.B. (2010). Economics of production and marketing of cashewnut in Ratnagiri District (Unpublished). M.Sc. (Agri.) Thesis, Dr.B.S.K.K.V.,Dapoli.

Shahaparmath, G.B.,Shivanna, H. and Girisha, H.V. (2003).Economic analysis of arecanut based agroforestry models. *Karnataka Journal of Agricultural Sciences*, 16(2): 265-270.

Doubling Farmer's Income: Integrated Approaches

Pramod P. Wani* Pooja H. Haldar and S.C.Nagpure and Shubham R. Khandait
Department of Agricultural Economics and Statistics, College of Agriculture, Nagpur
*Corresponding author:promodwani10@gmail.com
Received: 15th October 2018; Revised: 5thJanuary 2019; Accepted: 20th May 2019

ABSTRACT

The role and factors associated with integrated farming system have been studied as a potential option to improve farmers' income and ensure their sustainable livelihood of different farmers of Maharashtra, Tamilnadu and Haryana based on different research paper with farmers using IFS. The contribution of different combinations of enterprises such as poultry, fishery, sheep and goat and horticulture; with crop and dairy as base enterprises have been analysed for their impact on farmers' total income. The financial benefit of adopting different enterprise combinations analysed through partial budgeting has been found ranging from ` 7880/ha to ` 57530/ha. The heavy investment in the initial years and non-availability of labour were observed as the major constraints in adopting integrated farming system. The farmers can realize the doubling of their income by adding livestock in the farming system and reap the consequent social and ecological benefits.
Key words: Integrated farming system, doubling farmers' income, Maharashtra, Haryana, Tamil Nadu

INTRODUCTION

In India, the farmers maintain different enterprisesfor their complimentary and supplementary nature and for ensuring sustainable livelihood from time immemorial. After the advent of green revolution in late-1960s and economic liberalization in early-1990s, the farmers gradually started focusing on a few enterprises due to several imposing factors including shrinking farm sizes, fluctuating commodity prices, livelihood diversification and shortage of labour during peak agriculture season. It had a severe impact on food and nutritional security of millions of poor farm households. The anguish of farmers is often expressed in terms of their agitation in one or the other part of the country, unwillingness to continue farming and increasing demands of compensating their economic loss. Although suggestions are pouring in from experts and leaders of organisation for strengthening the income base of farmers, the government cannot implement them entirely due to compulsions from socio-economic and political considerationsOne of the options is to evaluate the potential of age-old integrated farming system (IFS) in enhancing income of farm families within thereasonable time period. This paper deals with dairy basedenterprise combinations for their contribution to sustainable livelihood of farm families with incomeenhancement as a major plank.

Objective

1) To Study financial Gains of Adopting Different Enterprise Combinations**.**
2) To examineIncome Enhancement of Farmers from Different Enterprise Combinations.

METHODOLOGY

The study was conducted in three states (Maharashtra, Haryana and Tamilnadu) ,of different district of them, for finding the contribution of total income to the livelihood of farmers who practise integrated farming system. By proportionate random research paper in which 200 farmers practising dairy-based enterprise combinations was identified in several districts. The income from each combination was taken as the dependent variable which was computed from the yield of the component enterprises and price realised by the sample respondents. A correlation analysis was carried out to ascertain the association of income variation from enterprise combinations with other socio-economic parameters. Further, case study approach was followed for calculating the total income contribution through partial budgeting method in 2017. An estimate of income that could be realized from the manure and urine of different animal components in the IFS was made. To understand the trend of farmers in keeping multiple farm enterprises and identify the constraints associated with them, a study within conducted The constraints were identified on the basis of their approaches Finally, a model has been proposed for doubling farmers' income with dairy as a major component of the farming system based

on the identified parameters from the study and the available literature.

RESULTS AND DISCUSSION

Financial Gains of Adopting Different Enterprise Combinations

In adoption of improved agricultural practices for doubling the income of farm families, the farmers are sensitive to the financial gains of the practices. The higher the benefit obtained from the introducedenterprise combinations, the easier it is to persuade the farmers to adopt them in their farms. Though there is no practice of calculating the financial gains of new practices in the study area, the farmers estimate the benefit that they earn from adding the new enterprises comparing it with crops grown by them. Thus, it needs to scrutinize the financial increment of the new practices before disseminating and making the farmers to be aware of the impending benefits. In order to calculate the incremental benefit of adding enterprises, four progressive farmers were interviewed to calculate the net benefit in the study area. When farmers grew only paddy, they got a net benefit of ` 49621/ha by spending ` 52743/ha. When they added new enterprises, farmers realized their incremental benefits. It has been shown in Table 1 on the basis of partial budgeting method. The average daily milk production for two indigenous buffaloes was 10 litres. With the lactation period of 8 months, the total milk production was 2400 litres in a year. However, the dairy enterprise starts giving benefits only after three years. Table 1revealed that incremental net benefit of adopting different enterprise combinations with improved management practices increased by ` 8980 for crop + dairy, ` 14848 for crop+ dairy+ poultry, ` 66916 for crop + dairy + poultry + fishery and ` 65908 for crop + dairy + poultry + sheep/goat. In this exercise, the backyard poultry was considered only for meat purpose, although farmers can keep the same for eggsalso. The cost of family labour was not imputed in costcalculations as farmers traditionally follow farming systems from time immemorial and they become part of natural farming due to complimentary benefits of each enterprise including the contribution of family members. The Table 1 below is a model for a small farmer who possesses one ha land with three to four adult family members (say husband, wife, mother and father) while they are likely to have school-going children. Farmers can apply the total manure from dairy, backyard poultry and small ruminants (sheep and goat) and the soil gets enriched as one ha farm normally requires 12500 kg of farm yard manure every year. The freshwater fish farming with carps can employ one additional labour for only feeding occasionally and harvesting. The adoption of IFS could generate additional income ranging from ` 9,000 to ` 2,00,000 per hectare, depending on inclusion of number and kind ofadditional farm enterprises and their effective combination as reported by Dawood*et al. (*1996), Shanmugasundaram and Balusamy (1993), Rangasamy*et al.*(1995), Meshram*et al.* (2003), Rautaray*et al.*(2005), Murugan and Kathiresan (2005), Ponnusamy(2006), Ponnusamy and Gupta (2009).

Table 1. Partial budgeting indifferent enterprise combinations

Particulars	Enterprise combinations			
	Crop + Dairy	Crop + Dairy + Poultry	Crop+ Dairy+ Poultry+ Fishery	Crop + Dairy + Poultry + Goat/Sheep
Added cost				
System cost	16300	18000	18900	22000
Labour cost	-	-	6000	-
Veterinary cost	2500	2500	3000	3000
Feed cost	37000	39000	49000	50000
Miscellaneous cost (Transport, net, polythene)	4000	4000	14000	4000
Interest @ 8 % for 6 months only	28220	29352	49684	38792
Total added cost (A)	88020	92852	140584	117792
Added return				
Sale of milk	91200	91200	91200	91200
Sale of calf	8000	8000	8000	8000
Sale of chicken		8500	8500	8500
Sale of fish/sheep/goat			99800	56000
Total added return (B)	97000	107700	207500	163700
Net return (B-A)	8980	14848	66916	45908

Two calves 18 months aged (` 15000/-); 10 chicks (` 200/chick); Fish pond with a dimension of 30m×10m×1m can be dug with Govt. subsidy and 300 fingerlings of catla, rohu and mrigal can be purchased @2.50/ fingerling: andfour goat kids @ ` 1000/-

10 litres milk @ ` 38/litre can be sold for 240 days in a year; One calf can be sold in a year. Fish can be harvested five times/ year @ 200kg/harvest and sold @ ` 80/kg. Poultry birds can be sold three times after reaching 2 kg weight @ 200/kg

Economic Assessment of Manure and Urine from Animal Components

Based on the different approaches with farmers practising IFS, it could be observed from Table 2 that large ruminants like cow and buffalo could provide 30 - 35 kg manure and 13- 16 litres urine per day which in fact enriches the soil by way of structure, texture and nutrients, leading to ultimate productivity enhancement. Small ruminants also contribute in a similar fashion. The farmers reported that poultry manure has a higher market demand and returns from its sale. Table 2 in fact provides valuable information for progressive farmersto practise different enterprise combinations in an environment-friendly manner. The market price of one litre of cow urine after purification ranged from ` 100to ` 200/-

Income Enhancement of Farmers from Different Enterprise Combinations

The majority of the respondents operated on a combination of farming enterprises which gave them sustained cash flow to manage many of the farm activities. The total income obtained from all the enterprises owned by the respondents for the past one year was computed as annual gross income of family. The average of total income from six enterprisecombinations was worked out. After that, based on the net income, classification was done. As expected, Crop+ Dairy+ Poultry+ Fishery, Crop+Dairy+ Poultry+ Horticulture, and Crop+Dairy+ Poultry+Sheep and Goat+ Horticulture systems were found to contribute a higher net income to the farm.families, since they were engaged in profit-oriented farming enterprises, including fisheries, vegetables, flowers, sugarcane, etc. Despite their small or medium holdings and small livestock holding, the farmers in study area earned a good income from such enterprises due to their intensive management, including the use of family labour. The substantial additional income could be generated by practising different enterprise combinations based on the location specificity and capability of farmers (Rangasamy*et al.*, 1995; Pushpa, 1996; Sivamurugan, 2001; Rautaray*et al.*, 2005; Murugan and Kathiresan, 2005, Ponnusamy, 2006).

Table 2. Estimation of economic contribution of manure and urine of animals in IFS

Animal	Manure (kg/day)	Urine (litre /day)	Manure (kg/year)	Urine production per year	Manure rate (₹/kg)	Manure rate (₹/year)	Urine rate/kg	Urine rate (₹/year)	Rate of manure (₹/tonne)
Cow	31	15.2	11315	5548	0.70	7920.5	0.70	3883.6	700
Buffalo	33	13.3	12045	4854	0.55	6625	0.52	2519	550
Goat	2	0.80	730	292	0.55	401	0.55	161	550
Piggery	4.3	1.7	1569	620	0.55	863	0.52	322.4	550
Sheep	2	0.92	730	336	0.60	438	0.55	185	600
Poultry	0.03	-	11.0	-	1.60	17.6	-	-	1600

CONCLUSIONS

The adoption of multiple farm enterprises in an integrated manner can ensure a substantial income generation to sustain the livelihood of farmers over the meagre income from self-standing enterprises as revealed from this study. The integrated farming system once very popular among the farming communities started losing its importance after green revolution in late-1960s and then further declined drastically after the economic liberalization in early 1990s. The partial budgeting, economic estimation of manure and urine from animal components and factors associated with total income from different enterprise combinations have shown the directions for policy makers, extension functionaries and progressive

farmers to prepare strategies for doubling farmers' income. Only livestock component would provide the facilitating inputs to enhance the income of farm families. The adoption of IFS is the right approach in this direction and should be supported through institutional, extension, policy and marketing interventions in a system approach.

Implications of the Study

- System mode of production incorporating crop, livestock, fish, horticulture and agro-forestry is a potential option for doubling farmer's income.
- The productivity and total production could be enhanced through supply of quality inputs including seeds, fingerlings, birds for backyard poultry and saplings.
- Empowering farmers with real time access to information and ICT tools and knowledge

REFERENCES

Balusamy, M. (1996) Studies on nitrogen management in lowland rice-fish-azolla integrated farming system. *Ph.D. Thesis*. TNAU, Coimbatore.

Dawood-Sheik, A., Santhi, P., Ponnuswamy, K. and Muthukrishnan, P. (1996) Integrated farming system for lowlands of Cauvery delta zone. *Farming. System*, 13(3-4): 11-14.

Jayanthi, C., Mythili, S. and Chinnasamy, C. (2002) Integrated farming systems – A viable approach for sustainable productivity, profitability and resource recycling under low land farms.*Journal of Ecobiology*, 14(2): 143-148.

Meshram, S.J., Sawardekar, S.V., Dhane, S.S. and Mahale, D.M. (2003) Feasibility of rice-cum-fish culture in coastal saline land of Maharashtra. *Indian Society ofCoastal Agricultural Research*,21(1): 75-78.

Murugan, G. and Kathiresan, R.M. (2005) Integrated rice farming system. *Indian Farming,***55** (5): 4-6.

Ponnusamy, K. (2006) Multidimensional analysis of integrated farming system in the coastal agro-eco system of Tamil Nadu.*Ph.D. Thesis*. NDRI (Deemed University), Karnal, Haryana.

Ponnusamy, K. and Gupta, J. (2009) Livelihood contribution, prospects and problems of aquaculture in integrated farming systems.*Indian Journal of Fisheries,*(4): 317-322.

Ponnusamy, K.Chauhan, A. K. and Meena, Sunita (2017) Testing the effectiveness of PasuSakhi: An innovation for resource poor farm women in Rajasthan. *IndianJournal of Animal Sciences*,87(2): 229-233.

Pushpa, J. (1996) Impact of integrated farming systems on garden land farmers. *Ph.D. Thesis*, TNAU, Coimbatore.

Rangasamy, A.,Venkitasamy, R., Jayanthi, C., Purushothaman, S. and Palaniappan, S.P. (1995) Rice based farming system: A viable approach. *IndianFarming,* 46(4): 27-29.

Rautaray, S.K., Dash, P.C. and Sinhababu, D.P. (2005) Increasing farm income through rice fish based integrated farming system in rainfed lowlands of Assam. *Indian Journal of Agriltural Science,* 75(2): 79-82.

Shanmugasundaram, V.S. and Balusamy, M. (1993) Rice-fish-azolla- An integrated farming system in low lying wet lands. *Farming Systems,*9 (3-4): 105-107.

Sivamurugan. A.P. (2001) Sustainable farming system under irrigated upland situation. *Ph.D. Thesis.* TNAU, Coimbatore.

Trade Performance of Coconut Oil in India

Ramdas R. Padmane*, Saurabh B .Mane, Dr. S. C.Nagpure, D. B.Gavhane*and Pallavi Pawar
Department of Agricultural Economics and Statistics, College of Agriculture, Nagpur
*Corresponding author: ramdaspadmane94.rp@gmail.com
Received: 12th October 2018; Revised: 5th April 2019; Accepted: 2nd May 2019

ABSTRACT

Coconut oil is derived from the seed of palm, Coconut (Cocos nucifera) and origin of coconut is believed to be from the island of western pacific and eastern Indian Ocean.Coconut oil is extracted fromcopra, which is mostly used in daily routine of humans in great extent as it is used in making toilet soaps, laundry soaps, surface active agents, and detergents, hair tonics and cosmetics. In these views, the study was conducted to analyze trade performance of coconut oil in Indiaand required data were collected for the period of 15 years. The annual compound growth rate in terms of quantity and value were positive. Estimates trend of coconut oil quantity and value in India for the period of 2002-03 to 2016-17. From the study it was resulted that growth is slightly fluctuated. On the basis of fitted trend. The growth wasanalyzed the direction of casuality between time and quantity, value of coconut oil trade. The findings indicate a strong relationship between dependent and independent variables.

Keywords: *Coconut oil, Growth Rate Analysis, Instability Index and competitiveness.*

INTRODUCTION

Coconut Palm (*Cocusnucifera* L.) is an important fruit tree in the world, providing food for millions of people, especially tropical and subtropical regions, and with its main uses. It is often called the " Tree of Life", "Tree of Abundance", "Tree of Heaven", "king of Palm", "Kalpavriksha" and by many names. It is also known as lazyman's crop.

Coconut oil is derived from seed of the palm and it is important cooking medium southern part of the country especially in Kerala state. Beside, the oil has varied industrial applications. It is used in manufacture of toilet soaps, Laundry Soaps, Surface active agents and Detergents, hair tonics and cosmetics. coconut oil prices in the international market is very much lower than Domestic price, the quality and attractiveness of consumer packs are important factor to compete in the world market.

Coconut oil is marketed in bulk as well as packs ranging from sachets containing 5ml. to 15 kg. tins. The branded coconut oil is marketed in small packs is mainly marketed as hair oil and body oil. There are several brands known for their superior grade oil which have export market throughout the world.

Need for the study

There have been several regulations in different countries to export of agricultural commodities. These regulations have caused the reduction of coconut oil price exports. These result welfare losses in coconut oil exporting countries as a result of decrease coconut oil production. Welfare losses include decrease foreign revenue, in case unemployment unfavorable terms of trade and loss of revenue to the Government. In addition, this situation increases poverty level, and a reduction in social welfare services which make calls unrest among the people, it is therefore very necessary to know the trends in trade performance of coconut oil, that can help in understanding the kind of impact it will have and its social political consequences, this study therefore attempted to find out the trade performance of coconut oil from 2002-03 to 2016-17.

METHODOLOGY

To study trade performance of coconut oil, the data on export of coconut oil in India was collected from the website of India agristat, Government of India, Coconut Development Board and COIR Board. Thegrowth rate and instability in trade of coconut oil was work out from the period 2002-03 to 2016-17 using Exponential growth function and Instability Analysis. Thus, the compound growth rate of trade of coconut oil for the period from 2002-03 to 2016-17 on trade where calculated using the exponential growth function.

$$Y_{(t)} = ab^t c^u \text{.....(1)}$$

Where,

$Y_{(t)}$= Dependent variable for which growth rate is estimated

a = Intercept

b= Regression co-efficient

t= Time variable

e = Error co-efficient

u= Disturbance term

|The growth rate co-efficient, (b_s)werecomputed by transforming equation (1) to the log linear form as

$$\text{Ln } y_{(t)} = \text{In } a + t \text{ In } b + u$$

The compound growth rates(g) in percentage were computed using the relationship,

CGR= [(Antilog (log b - 1)]×100

The significance of the regression co-efficient was tested using the student's t- test as.

$$t = \frac{\text{bi}}{\text{SE (bi)}}$$

Where,

(b_i) = Regression co–efficient

SE (b_i)= Standard error of the regression of coefficient

t = Calculated t- value

The pattern of growth rates over the years was identified using the bcoefficient. In order to study the variability in the trade of coconut oil, an index of instability was used as a measure of variability. Data on trade of Coconut oil from India during 2003-03 to 2016-17 were used for the study. The coefficient of variation (CV) was calculated using the formula.

$$\text{CV} = \frac{\text{SD}}{\text{Mean}} \times 100$$

The formula suggested by Cuddy and Della value (1978) was used to compute the index of instability.

$$\text{Index of Instability} = \frac{\text{SD}}{\text{Mean}} \times 100 \times \sqrt{1 - R^2}$$

Coefficient of variation was multiplied by the square root of the difference between unity and coefficient of determination (R^2) in the cases where R^2 was significant.

NPC is defined as the ratio of the domestic price to the world reference price of the commodity under consideration of coconut oil is selected for analysis.

NPC = Pd / Pb

Where,

Pd- Domestic Wholesale price of Coconut oil.

Pb-World reference price of the Coconut oil.

If NPC> 1, the coconut crop is protected, compared to the situation that would prevail under free trade and if NPC< 1, the coconut crop is disprotected.

RESULT AND DISCUSSION

Compound growth rate was computed to comprehend the trends in the trade of coconut oil from 2002-03 to 2016-17. In order to study the variability in the trade of coconut oil for the same period an same index of instability was used as a measure of variability. Trade quantity of coconut oil increased from 5515 tonnes in 2002-03 to 17089 tonnes in 2016-17. Export value of coconut oil is increased from 2323 lakhs to 22298 lakhs during same period of time.

Table No. 1. Trade of coconut oil in India during 2002-03 to 2016-17

(Quantity in Tonne, Value in lakh)

Sr. No.	Year	coconut oil	
		Quantity	Value
1.	2002-03	5515	2323
2.	2003-04	5789	2483
3.	2004-05	5520	2740
4.	2005-06	5298	2741
5.	2006-07	3585	2249
6.	2007-08	6732	3263
7.	2008-09	9801	5807
8.	2009-10	5067	3987
9.	2010-11	4273	3969
10.	2011-12	6192	8390
11.	2012-13	6722	8219
12.	2013-14	6674	8510
13.	2014-15	7189	14606
14.	2015-16	6731	13816
15.	2016-17	17089	22298

Source:Coconut Development Board, Indiaagristat, Govt. of India

Looking at the results for overall study period (2002-03 to 2016-17), a higher compound growth rate of coconut oil are 104.36 per cent was observed in case of trade quantity of coconut oil and was significant at 1 per cent probability level. On other hand trade value registered the growth rate of coconut oil 117.19 per cent and it was significant at 1 per cent probability level. Instability indices of coconut oil have318.90 and 27.41, observed in case of trade quantity and trade value, respectively.

Table No. 2.Compound growth rate and instability of export of coconut oil in India

Coconut oil		
Particulars	**Quantity**	**Value**
CGR(%)	104.36**	117.19**
Instability Index	39.58	27.41

Note:* significant at 5% level, ** significant at 1% level

A positive and significant growth rate in coconut oil trade and a high instability index is observed because India's trade in coconut oil has been increasing since 2002-03. However, considerable fluctuations both in quantity and value of trade during a study period could be observed. Growth rate in trade quantity and trade value as shown in fig,

Competitiveness

The export competitiveness of Coconut Oil was analyzed by using Nominal Protection Co-efficient. The competitiveness of market depends upon NPC ratio. When NPC ratio is less than 0.5, market is highly competitive, when NPC ratio is in

between 0.5 to 1, the market is moderately competitive and when NPC ratio is greater than one, then market is non- competitive.

The export competitiveness of Coconut Oil was analyzed using Nominal Protection Coefficient.

Table no. 3. Show that, at an overall level, the NPC average values of coconut oil was worked out 2.17 its indicating moderate export competitiveness of coconut oil. It was observed that the crop was moderately protected during the with average NPC value of coconut oil NPC average value 2.17. The average value of NPC is more than one, and then the market is non-competitive.

Table No. 3. Export competitiveness of coconut oil

Coconut oil			
Year	**Domestic Price(Pd) (Rs/kg)**	**International price(Pb) (Rs/kg)**	**NPC**
2002-03	4835.04	2374.08	2.03
2003-04	5791.2	2331.45	2.48
2004-05	5897.45	2014.59	2.92
2005-06	3290.45	1932.87	1.7
2006-07	883.35	1594.04	0.55
2007-08	889.13	2063.13	0.43
2008-09	946.79	1687.79	0.56
2009-10	1143.91	1270.88	0.9
2010-11	1405.67	1076.59	1.3
2011-12	1382.77	738.02	1.87
2012-13	1337.73	817.86	1.63
2013-14	1727.65	784.25	2.2
2014-15	2057.82	492.19	4.18
2015-16	3493.46	487.18	7.17
2016-17	2120.7	766.39	2.76
Average 2.17			

CONCLUSION

India performance in export of coconut oil is improved significantly during the study period. It is observed that quantity and value of the coconut oil is positive growth. But in a year 2016-17 tremendous growth are found in valuecoconut oil from the above study. It is concluded that India is performing well in export of coconut oil. In case of competitiveness was observed that the crop was moderately protected during the with average NPC value of coconut oil NPC average value 2.17

REFERENCES

Thiripurasundari K. , (2017) Export Performance of jute Industry in India- An Analysis, *International Journal of Current Research and modern Education*, ISSN : 2455- 5428.

Tejaswini A. B., (2012), Export Performance of Desiccated coconut from India, Mysore Journal of agriculture science., 46(2) : 375- 379.

Gurusamy P. and PurinatTamakanith (2015) Export performance of coffee in India-An Analytical study. *International journal of Multidisciplinary Research and development,*2(2): 188-122.

Paul Richard and Lakshmi V. (2017) Export Performance of Copra in India. *Saudi journal of Business and Management Studies*., 2415-6671.

Mendhe, N. P. and A. M. Degaonkar (2010) Export Performance of Indian Chilli. *International journal of Commerce and Business Management*,3: 252-257.

Sedaghat R. (2010). Export Growth and Export Competitiveness of Pistachio. *Agriculture Tropicaetsubtropica,* 43(2).

Rajur, B. C. and B. L. Patil (2013) Export Performance of Chilli- An analysis. *Karnataka Journal of Agricultural sciences,* 26(2): 233-237.

Dairy and organic farming SHGs: An Economic Appraisal

P. G. Chaudhari, S.G. Tale, V.U. Shinde and J.B. Durge
Department of Agricultural Economics and Statistics, ShriShivaji Agriculture College, Amravati, Maharashtra, India
Corresponding author: prafull55chaudhari@gmail.com
Received: 20th August 2018; Revised: 14th January 2019; Accepted: 14th May 2019

ABSTRACT

In India, micro-credit programmes are implemented through group structures which are known as Self-Help Groups (SHGs). SHGs are group of rural poor who have volunteered to organize themselves into a group for eradication of poverty of members. Self Help Groups (SHGs) activities must be given importance to eradicate poverty, increase the economic growth and for better standard of living of the poor people. In view of these, present study has been conducted in Amravati district of Maharashtra state with objectives to study the growth of SHGs and their impact on income and employment.The present study is confined to Amravati district of Maharashtra state. From Amravati districtWarud and Chikhaldaratahsils were selected. From each tehsil, ten SHGs were randomly selected. The selected SHGs were categorized, taking into consideration group activities performed by SHGs.The data on two agriculture based activities viz., dairy and organic farming was collected by personal interview. This indicated that after joining the SHG, per member income increased to the extent of 41.31 per cent. This increase in income was 32.09 per cent in organic farming and 50.53 per cent in dairy unit activity. Within activities of groups, the increase in employment was 21.95 per cent in dairy unit activity and 47.43 per cent in organic farming activity. The investment in different assets increased to the extent of 40.29 per cent after participation in SHG group. Within the activities of groups, the increase in investment was 31.56 per cent in organic farming activity and 46.85 per cent in dairy unit activity. After participation in SHG activities, per member saving increased by 54.7 per cent in dairy unit and 51.63 per cent in organic farming activity.
Keywords:*Compound growth rate, Impact, Income, Employment, Saving, Investment.*

INTRODUCTION

Since independence, the Government of India and State Government have been taking various measures to improve the standard of living of economic position of women. The main source of employment for women is farm labour. But this does not fulfil all their needs. Indebtedness has become the hallmark of the rural life. Participation in self-help groups helps in saving some money out of their daily household expenses. Also, they can avail loan with lower interest rates. This has led a sort of change in the society's view towards woman, in general (Ferozee*t al.*, 2011; Samuel, *et al.*, 2011Naik *et al.*, 2012, Chopde and Bhan, 2015; Chopde*et al.*, 2015; Jagadeeswari, 2015).

Benefits of formation of SHGs

- In dairy unit the manure from animals provides a good source of organic matter for improving soil fertility and crop yields.
- Due to the formation SHGs, the social interaction of the farmers is increased.
- Collective bargaining practice is followed by the groups.
- Due to the formation of the groups, the transport of the produce of the group members from the villages to the market on collective basis and bring about reduction in the cost of transportation.
- Advanced production technology and production planning is followed by the farmers.
- Organic Farming Discourages Environmental Exposure to Pesticides and Chemicals.
- Organic farming will arrest the degradation of the land.
- The self-help market groups formed by farmers have worked wonders with the way that farmers have tried to realise better prices for their produce.
- The SHGs act as a tool to expose farmers to the market reality and also to give them an opportunity to sell their produce on their own and the effort has tasted success.

METHODOLOGY

The present study was undertaken in rural areas, self-help groups of Amravati district, which are engaged in agriculture based activities were selected. The two tahsilswere selected for the study are Warud and Chikhaldara.The primary data were collected with the help of personal interview of self-help groups which are engaged in agriculture based activities to analyse the impact of SHGs on income, employment, expenditure and

savings patterns of SHGs members. Selection of activities: two agriculture activities were selected for this study viz., Dairy and Organic farming. Simple random sampling was used for data collection.20 self-help groups were selected for a study according to agriculture based activities.In order to assess the growth of SHGs in Amravati district a period of 10 years from 2008-09 to 2017-18 was considered.

The compound growth was computed by using the exponential function of the form

$$Y = ab^t$$

$$CGR = [antilog (logb-1)] \times 100$$

Where,

Y= No. Of SHGs
a= Intercept
b= Regression coefficient
t= Time period

Simple tabular analysis was used to study the impact of SHG on income, employment, consumption and investment of SHG members.

RESULTS AND DISCUSSION

The results of the present study are given below with pertinent discussion as growth self-help groups in Amravati district and impact of SHG on income, employment, consumption and savings of members are clearly presented. The many SHGs are engaged in agricultural based activities like dairy, poultry and organic farming independently and with group members after joining SHGs.

The year wise data from the year 2008-09 to 2017-18, on the number of self-help groups linked under the SHG-Bank Linkage Programme are presented in Table 1. The compound growth rate of credit linked self-help groups in talukas viz., Chandur Bazar, Morshi, Chandur Railway, Dhamangaon Railway, Nandgaon (KH.), Warud, Bhatkuli, Dharni, Chikhaldara (Sipna), Chikhaldara (Jagur) and Daryapur was 5.43,4.11,13.47,5.96,10.68,6.32,15.84,4.01,10.19, 9.004 and 4.32 respectively. The overall analysed compound growth rate of SHG credit linked in Amravati District was 9.87.

The pattern of growth of SHGs in the Amravati district from 2008-09 to 2017-18 has been presented in the Table 1. In the year 2008-09, the total number of SHGs formed during the year was 1114 which continuously rose in their numbers up to 2017-18. In the year 2017-18 the total number of SHGs formed during the year was 2958. The formation of SHGs increased at the compound growth rate of 9.87 per cent during the period 2008-09 to 2017-18. This was achieved because of the efforts of the NGOs and the government agencies and the policies that were taken up by government. The government witnessed the improvement in the life of the poor because of the SHG.

Table 1: Growth of Self Help Groups in Amravati District (2008-09 to 2017-18)

Year	Chandur Bazar	Morshi	Chandur (Rly.)	Dhamangaon (Rly.)	Nandgaon (KH)	Warud	Bhatkuli	Dharni	Chikhaldara (sipna)	Chikhaldara (jagur)	Daryapur	Amravati District
2008-09	204	152	-	170	-	-	77	178	91	-	242	1114
2009-10	210	161	102	180	110	150	85	192	100	-	251	1541
2010-11	245	172	120	187	128	150	99	198	120	136	268	1823
2011-12	277	182	150	199	149	170	108	218	141	162	281	2037
2012-13	280	184	175	205	175	170	131	220	160	186	290	2176
2013-14	300	196	195	215	190	200	175	225	172	192	301	2361
2014-15	300	196	220	230	205	225	201	235	191	192	317	2512
2015-16	310	201	240	250	215	215	221	245	201	220	330	2648
2016-17	320	215	265	273	230	220	237	251	201	249	341	2799
2017-18	329	226	280	287	260	234	259	257	211	262	353	2958
CGR (%)	5.43***	4.71***	13.47***	5.96**	10.68***	6.32***	15.84***	4.01***	10.19**	9.004**	4.32**	9.87***

Source: MahilaArthikVikasMahamandal, Amravati.
Significant at 1 %(***), Significant at 5 %(**) and Significant at 10 %(*)

The impact of SHG association on the different economic parameters of the members of dairy unit activity is presented in Table 2. Employment had increased from 468.8 man days per annum before SHG association to 570.8 man days per annum after SHG association. Similarly, income was increased from Rs.22016.30 to Rs.32456.30. savings was increased from Rs.2436.6 to Rs.3716.6, consumption had increased from Rs.17691.4 to Rs.25230.4 and investment was increased from Rs.20128 to Rs.28947 following the member's association with the SHGs. The per cent change in employment, income, saving, consumption and investment was 21.95, 50.53, 54.7, 46.09 and 46.85 respectively.

Table 2: Financial impact of dairy SHGs on the members

Parameters	Mean		Mean Differe-nce	% Change
	Before	After		
Employment (mandays)	468.8	570.80	102	21.95
Income (Rs.)	22016.3	32456.3	10440	50.53
Saving (Rs.)	2436.6	3716.60	1280	54.7
Consumption (Rs.)	17691.4	25230.4	7539	46.09
Investment (Rs.)	20128	28947	8819	46.85

The impact of SHG association on the different economic parameters of the members of organic farming activity is presented in Table 3. Employment had increased from 380.00 man days per annum before SHG association to 548.5 man days per annum after SHG association. Similarly, income was increased from Rs.21388.00 to Rs28273.00, savings was increased from Rs.2484.6 to Rs.3727.5, consumption had increased from Rs.19153.00 to Rs.24619.00 and investment was increased from Rs.19011.00 to Rs.24992.00 following the member's association with the SHGs. The percentage change in employment, income, saving, consumption and investment was 47.43, 32.09, 51.63, 28.25 and 31.56, respectively.

Table 3: Financial impact of organic farming SHG on the members

Parameters	Mean		Mean difference	% change
	Before	After		
Employment (mandays)	380	548.5	168.5	47.43
Income (Rs)	21388	28273	6885	32.09
Saving (Rs)	2484.6	3727.5	1242.9	51.63
Consumption (Rs)	19153	24619	5466	28.25
Investment (Rs)	19011	24992	5981	31.56

The overall impact of SHG association on the different economic parameters of the SHG members is presented in Table 4. Employment had increased from 424.4mandays per annum before SHG association to559.65 mandays per annum after SHG association. Similarly, income was increased from Rs. 21702.15to Rs.30364.4, savings was increased from Rs. 2460.6 to Rs. 3722.05, consumption had increased from Rs. 18422.2 to Rs.24924.7 and investment was increased from Rs.19569.5 to Rs.26969.5 following the member's association with the SHGs. The percentage change in employment, income, saving, consumption and investment was 34.69, 41.31, 53.16, 37.17 and 39.21 respectively.

Table 4: Overall impact of SHG on economic parameters of the members

Parameters	Mean		Mean difference	% Change
	Before	After		
Employment (mandays)	424.4	559.65	135.25	34.69
Income (Rs)	21702.15	30364.65	8662.5	41.31
Saving (Rs)	2460.6	3722.05	1261.45	53.16
Consumption (Rs)	18422.2	24924.7	6502.5	37.17
Investment (Rs)	19569.5	26969.5	7400	39.21

CONCLUSIONS

After joining the self-help group they were engaged in agricultural based activities like dairy, poultry, vermicompost and organic farming which improves their standard of living.The analysis of year-wise data from the year 2008-09 to year 2017-18 for 11 talukas in Amravati district viz, Chandur Bazar, Morshi, Chandur Railway, Dhamngaon Railway, Nandgaon (KH.), Warud, Bhatkuli, Dharni, Chikhaldara (sipna), Chikhaldara (Jagur) and Daryapur revealed that credit linked SHGs grew at a rate of 5.43, 4.11, 13.47, 5.96, 10.68, 6.32, 15.84, 4.01, 10.19, 9.04, and 4.32 respectively. Overall growth of SHGs in Amravati district was 9.87 per cent.The overall employment of the members was increased by 135.25man days, income was increased by Rs.8662.5, saving was increased by Rs.1261.45, investment was increased by Rs.7400.00 and consumption was increased by Rs.6502.5. The Improvement in savings was observed across all the categories of members.The overall per cent change in employment, income, saving, consumption and investment was 34.69, 41.31, 53.16, 37.17 and 39.21 respectively.

REFERENCES

Chawla, S. and Bhan, C. (2015). Self-help groups: A tool of rural womeneconomicupgradation. *Agriculture Update*, 10(3): 200-205.

Chopde, K.D., Kadam, M.M. and Bondhare, V.O. (2015). Role of self-help groups in rural credit for women empowerment. *International Research Journal of Agricultural Economics & Statistics* 6(1): 160-163.

Feroze, S.M., Chouhan, A.K. and Chakarvaty, A.K. 2011.Microfinance and Income from Dairy in Haryana; An Impact analysis.*Indian Journal of Animal Sciences*, 81(9):971-976.

Jagadeeswari, B.Y. 2015. Empowerment of SHGs Women members in Cuddalore District through Aajeevika-NRLM Scheme by MahalirThittam. International Journal of Business and Administration Research Review 2(9):126-135.

Naik, R.M., Tandel, B.M. and Chauhan, N.M. (2012).Empowerment of rural women through Self-Help Groups.*Agriculture Update*,7(3&4): 342-345.

Samuel, J.,Kunnal, L.B. and Ashalatha K.V. 2011. Impact of Microfinance on the Upliftment of rural women-an economic analysis Journal of Rural Development 30(2):127-141.

Envisioning Himalayas through Apple Value Chain: An Initiative for Doubling Farmers' Income

S.A. Wani*, Farheen Naqash and F.A. Shaheen
School of Agricultural Economics &Horti-Business Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, J&K-190025, Srinagar
**Corresponding Author: dr.shabirwani@rediffmail.com*

Received: 10th August 2018; Revised: 10th January 2019; Accepted: 9th May 2019

ABSTRACT

Himalayas in general and Jammu and Kashmir State in particular is diversifying towards horticulture sector. Among the temperate fruits, apple is coming up in a big way through horizontal and now vertical expansion. Shift from paddy and other field crops towards apple is more governed by the comparative advantage principle coupled with shortage of water at summer season, where latter requires at lesser levels. The state has high productivity levels at country level but falls behind when compared with advanced countries producing same crops. There exists a huge potential to increase the farmers income through specific interventions along the value chain. The paper based upon primary as well as secondary information comes up with a policy strategy in forms of interventions and infrastructure investments along the apple value chain which will help to double the apple growers' income.

Keywords: *Himalayas, Apple Value Chain, Farmers Income, Interventions, Jammu and Kashmir*

INTRODUCTION

During the first few five year plans, priority was assigned to achieve self-sufficiency in food-grains production. However over the years, horticulture emerged as an important and growing sub sector of agricultureoffering a wide range of choices to the farmers for crop diversification(Weinberger and Thomas, 2007).Jammu & Kashmir State is well known for its horticultural produce both in India and abroad. The state offers good scope for cultivation of horticultural crops, covering a variety of temperate fruits like cherry,pear, peach, plum, apricot, almond&walnut in general and apple is considered most important in particular(Lone, 2014). About 76 million tonnes of apples were grown worldwide in 2012, with China producing almost half of this total (49%). The United States, with more than 5% of world production is the second-leading producer. Other important global players were Turkey (3.8%),Poland (3.8%),and India (2.9%).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.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), and Netherlands (40.40 t/ha). 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 achieved the highest productivity (13 t/ha) followed by Himachal Pradesh (5-6 t/ha) and Uttarakhand (2.16 t/ha) (NHB, 2012).

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 the state. Average yield of commercially important apple cultivars per unit area is the highest in the country ranging between 10-13 t/ha, but compares poorly with yields of 20-40 t/ha in horticultural advanced countries. Climatic and other agro-ecological factors of Kashmir valley are ideally suited to the cultivation of many apple varieties.Around 5-6 lakh families comprising of about 30 lakh people are directly or indirectly associated with apple cultivation and generating an income of 5000crores annually for the state(Economic Survey, 2015).

Apple industry in the state has emerged as an important sector for diversification towards horticulture and has established its credibility in doubling farm income through increased productivity, generating employment and in enhancing exports, besides providing household livelihood security. Apart from the government schemes, the more profound factor for diversification of valley's agriculture towards apple sector is driven by comparative advantage principle. Furthermore, a growing consumer awareness about healthy eating, and established perceptions about apples as a healthy and flavorful fruit coupled with increasing income, the Indian market for apples has huge growth potential. It also provides ample opportunities for sustaining large number of agro industries which generate substantial employment opportunities.

Apple is known in India as a most significant commercial fruit crop. However, in the production tract,the low quality of apple is linked with traditional and age-old practices of cultivation; 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, processing & cold chain and inefficient factor inputs are some other bottlenecks along with, weak production and supply chain, poor marketing strategies, low transparency in the marketing system which have turned the terms of trade against producers(Hakeem*et al.,*2006). There is a need to revisit apple policy in the state in evolving strategies, identifying options and exploring innovative institutional mechanisms.It requires new interventions, policies and implementation plans at ground level to further multiply farmer's income.Some of the interventions include: (1) Technological interventions, (2) Pollinizers and pollination management (3)Re-engineering cold/supply chain, and (4)Apple processing.

METHODOLOGY

The present paper is based on the combination of secondary and primary data collected from various sources and studies followed by quantitative and qualitative assessment for comprehensive analysis to come up with a policy paper on doubling farmers' income through various interventions in apple value chain in J&K state. For apple growers' survey,Baramulla district of the Kashmir valley was selected purposively for having maximum area (24952 ha) and production (423637 MT) during year 2014-15. Moreover, district experiences tremendous inclination of the farming community towards diversification of agriculture through apple cultivation. One block *viz.* Pattan with the largest area/production from the selected district was selected to ensure wider coverage of the sample. Multistage Random Sampling was used to select the 100 farmers from 5 villages with 20 randomly selected farmers from each village. Primary data collection was followed by the personal interview method using pre-structured schedules.

Controlled Atmospheric (CA) storage was found to be an important link in the apple value chain which has come up in recent past and the economics of CA storage was worked out by selecting two CA storage units out of eight functional stores at Industrial Growth Center (IGC) Lassipora,Pulwama district. Costs and returns from the CA store units were determined to know whether it pays a farmer to store his farm produce.As a sequel to present study, processing being an important link in the apple value chain was also evaluated.For the present study, mega apple juice plantlocated at Industrial Estate at outskirts of Srinagar capital city was purposively selected to evaluate theeconomics of apple juice processing in the value chainand its impact on farmers' income.Three years cross sectional data was collected from the processing plant, Budgam for the reference years 2011-12 to 2013-14, to avoid any abnormal production period.

Multiple regression analysis was carried out to know the factors influencing the apple production. Production function was estimated on per hectare basis to measure returns to various factors of production. Some of the non-strategic collinear variables were dropped from the analysis to improve the precision of regression parameter. Based on the goodness of fit (R^2), the linear regression model of the following form was used:

$$Y = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + U_i$$

Where,

Y = Gross revenue from apple cultivation (Rs ha^{-1})

β_0 = Intercept

β_i = Regression coefficient of i^{th} independent variable (i = 1…..n)

X_1 = Expenditure incurred on fertilizers (Rs ha^{-1}.)

X_2 = Expenditure incurred on plant protection (Rs ha^{-1})

X_3 = Expenditure incurred on manures (Rs ha^{-1})
X_4 = Expenditure on irrigation (Rs ha^{-1})
X_5 = Expenditure incurred on total labour (Rs ha^{-1})
U_i = Random term (i = 1…..n)
The significance of regression coefficient was tested by employing student't' test as follows:

$$t\,cal. = \frac{\beta_i}{SE\,(\beta_i)}$$

Where,
SE (β_i) = Standard error of regression coefficient

RESULTS AND DISCUSSION

Situation Analysis of Apple

Trends in area, production and productivity of apple

The Area, production and yield of apple at the world level has recorded compound growth rate of 2.4, 3.5 and 1.1 per cent per annum from 1973-74 to 2011-12 respectively. During the same period the area, production and yield of apple in Asia recorded the growth rate of 3.9, 6.3 and 2.4 percent per annum respectively, while as India recorded the growth rate of 2.4, 3.5 and 1.1 per cent, respectively (Table 1).

Table 1: Region wise compound growth rates in apple (1973-74 to 2011-12)

Regions	Area	Production	Yield
India	2.4**	3.5*	1.1
	(0.044)	(0.090)	(0.088)
Asia	3.9*	6.3*	2.4*
	(0.181)	(0.093)	(0.133)
World	1.2	2.4*	1.2
	(0.088)	(0.044)	(0.088)

** Significant at 1% level &** Significant at 5% level of significance.*

Dynamics of apple industry in Jammu& Kashmirstate revealed that area increased by 5 percent from 1980-981 to 2010-11, while as production by 6.5 percent during the same period. Inspite of many fold increase in area and production, yield has remained almost stagnant at around 9 metric tonnes during the past two decades. However, by concerted efforts of farmers, yield has picked up and during the year 2010-11 it was recorded more than 13 metric tonnes per hectare. Area under apple has witnessed a continuous increase since 1980s. During 1980-81, area under this crop was 60,286 hectare, which increased to 1,41,717 hectare in 2010-11. Production of this fruit crop also exhibited the same pattern and increased by more than three times.

Table 2: Exponential growth rates of area, production and yield of apple in J&K

	Area	Production	Yield
1981-82 to 1990-91	1.5*	2.7***	1.2***
1991-92 to 2000-01	2.8*	3.0*	0.2***
2001-02 to 2010-11	5.2*	6.5*	1.3***
1981-82 to 2010-11	2.8*	4.0*	1.2*

*Significant at *1 per cent, ** 5 per cent, *** 10 per cent level of significance*

Exponential growth rate of area, production and yield of apple in J&Kfrom 1981-82 to 2010-11 are summarized in Table 2.Data has been divided into three sub-periods from 1981-82 to 2010-11.i.e 1981-82 to 1990-91,1991-92 to 2000-01and 2001-02 to 2010-11,besides overall period from 1981-82 to 2010-11.This decomposition of periods were considered appropriate to estimate the structural changes that have taken place in respect of area, production and productivity. The area, production and yield witnessed growth momentum of 2.8%, 4% and 1.2% respectively during the overall period. During the bygone decade apple industry of state showed an overriding performance by achieving higher trajectory in area expansion besides production and productivity (Malik and Choure, 2014).

Production and demand estimates of apple in J&K

Apple production was at a level of 17.5 lakh tons in 2011-12. With expected additional production from new plantation that will come to fruit in the next five years and productivity increases, production is conservatively estimated to rise to 29.2 lakh tons, an increase of 11.7 lakh tons over the current level. Marketing solutions have to plan to take into account the increased market arrivals of about 65 per cent.

Table3. Estimated production of apple by 2017-18

Particulars	2011-12	2017-18	Increase
Land under apple (ha)	154720	189190	34470
Productivity (MT/ha)*	11.31	13.7	2.4
Production (Lakh MT) (at current state of practice)	17.5	25.9	8.4
Additional production with yield improvement (Lakh MT)	--	3.32**	3.32
Total production (Lakh MT)		29.22	11.72

**Effective average yield of plantations in fruiting - 15.6 MT/ha -2011-12; Effective average yield of plantations in fruiting 16.7 MT/ha – 2017-18; ** assumption of 15% increase in yield over 75% of acreage with improved practices*

Demand for apple table fruit is likely to be strong. Changing food habits as captured by the NSSO in its MPCE surveys show that consumption basket is changing all over the country. There is increased consumption of fruits and processed fruit products, and the increases have been secular over the last ten years. Imported apples that are expensive by about two fold more than domestic apples find a ready market. The per capita availability even at the increased production level of 2017-18 is likely to be about 15 fruits in a year. If 20% of the population wants to consume an apple for 75 days in a year, the production will not be adequate.

Table 4. Demand estimates of apple for India

20% of population	240 million	240 million
No. of consumption days per year	60	75
Per capita consumption per year (@150 gms/day)	9kg	11.5kg
Total consumption	2.16 MT	2.76 MT
Estimated production of table fruit (80% of total)	2.34 Million tones	
Current imports	0.30 Million tones	

Livelihood Potential in Apple Farming

India's workforce is expected to surge from 775 million in 2008 to 950 million by 2026. With an upsurge in dual-income families, rising income levels and globalization, Indian consumers are diversifying their food basket to include a broader array of foods. During early 1990s, non-staple foods including dairy products, meats, edible oils, fruits, and vegetables have been the fastest growing food categories in India (Pingali and Khwaja, 2004).Apples are full of healthy antioxidants, fiber, vitamins and minerals. One medium sized apple contains 95 calories and 4.4 g of dietary fiber, besidesbeing a good source of potassium, phosphorus, calcium, manganese, magnesium, iron and zinc, vitamins (A, B1, B2, B6, C, E, K, folate, and niacin) with no fat, sodium or cholesterol.Therefore, with growing consumer awareness about healthy eating, the Indian market for apples has huge growth potential. Furthermore, the potential expansion of distribution networks to medium-sized cities offers another untapped opportunity. To meet this rapidly growing demand through domestic supply, India must either increase its area under apple cultivation or improve yields by adopting improved cultivation systems.

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 (Malik and Heijdra, 2011;USAID, 2008). Diversification towards apple crop in Himalayas increases farmer's income many fold andgenerates more gainful employment on account of following:

- Apple cultivation generates 400-500 man days per hectares as against only 100-150 in field crops.
- Apple crop has 8-10 times more productivity than field crops.
- Apple farming is climate resilient and can be grown on wasteland and dry lands successfully.
- Water shortage for agronomic crops like rice, wheat, maize and niche crops like saffron etc.triggered shifts from agronomic crops to apple cultivation in J&K,as fruit turned many fold more remunerative as compared to agronomic crops.
- Adoption of advanced technologies like high density plantation will require large quantities of quality plant material and other infrastructure, leading to the employment of youth in public/ private nurseries.

- Further opportunities for employment, through adoption of advanced cold chain, grading and packing system and other post-harvest handling activities, will also increase.

Returns from Apple Farming and Factors

Returns from bearing orchards were calculated on per hectare basis so as to present the actual picture of the economics of apple growing orchards. Results revealed that orchards exhibited gross returns of Rs 7,03,125 and net returns of Rs 4,94,063 (Table 5). Average production per hectare was 1875 boxes of apple, where one box contains 18 kg of fruit. Net returns from apple can be increased if the extension services are strengthened to educate the farmers about proper input use which was found below merit during the course of investigation. Average production cost per kg was found to be Rs 6.19 with the cost benefit ratio of 1: 3.39.

Table 5: Returns from apple orchards and regression coefficient estimates

Returns from apple orchards during bearing stage		Regression coefficients explaining determinants on revenue		
Particulars	**Cost (Rs ha^{-1})**	**Independent variables**	**Estimated coefficients**	**P-value**
Total production cost (Rs.)	208397	Fertilizers	0.36	0.015 *
Average production (kg)	33750	Pesticides	9.03	0.045 *
Gross returns (Rs.)	703125	Manures	1.30	0.000 *
Net returns (Rs.)	494728	Irrigation	0.05	0.983
Production cost per kg(Rs.)	6.17	Labour	0.24	0.008 *
Output/input ratio	3.37	Adjusted R sq.	0.92	

*.*Significant at 5% level of significance*

Estimates of regression function depicted in Table 5 revealed that plant protection chemicals and manures were the most significant and positive determinants of revenue from apple cultivation. Irrigation at the farm level also had a positive contribution to the improvement of revenue fromapple; however its coefficient turned statistically insignificant. Pesticide level was found an important determinant of apple revenue due to the fact that more application of pesticides reduces the chance of losses in apple on scientific lines. Analysis further revealed that the irrigation and the labour component were also used efficiently on the farms. Positive and significant coefficients indicated that revenue from the apple cultivation can be generated more by using efficiently these factors. Value of coefficient of adjusted R^2 shows that the exogenous variables specified in the model explained major variation (92.10%) in total revenue.

Technological interventions

Replanting / Rejuvenation Program through High Density Orcharding

About 40 to 50% of the area under apple in J&K State needs replanting as they are more than 50 years old. Replanting will increase the production and productivity level of old orchards. Replanting involves introduction of new plants in between two rows of existing old trees and gradual removal of old trees once the new plants start giving yield. Rejuvenation may be done relatively on mid-age trees, whose root portion is good but the scion portion damaged or left unattended for many years and on such trees which have a lower quality and yield.

High productivity can be achieved through shifting from conventional method of planting to High / Ultra High density in replanting / rejuvenation program. Most of the developed countries have already shifted to High / Ultra High density planting and achieved yields of about 40-50 MT/ha and in USA about 100 MT/ha (Zbanca and Negritu, 2013). Studies have shown that two types of High density planting i) 500 plants/ha with a potential yield of 35 MT/ha and ii) 1000 plants per ha with a potential yield of 47.5 MT/ha can be introduced in J&K state. Thus with a gradual shift towards high density apple orcharding in the state, quantum jump (200%) in farmers' incomecan be achieved (Table 6).The most common cultivated variety in the valley is that of Delicious group of apples (70% is that of Red Delicious and Royal Delicious). Delicious varieties are alternate bearers, susceptible to scab disease, sensitive to weather change and late bearing cultivars that cannot attract the off-season premium of early cultivars. There is a need to diversify into other exotic varieties of apple like Honey Crisp, Gale Mast, Scarlet Gala, Red Cameo, Royal Empire, Red Fuji, Coe Fuji, Oregon Spur II, Early Red Cameo, etc. and overcome some of the problems associated with Delicious group of varieties.The

new varieties need to be imported and introduced in the State in large scale instead of increasing area under Delicious group of apple. While introducing new varieties, the requirements of early varieties, spur bearing self-pollinating varieties especially for high density plantations, better types of pollinator varieties for inter-planting should be considered.

Table 6: Increase in income and requirement of plants for conversion of 33% apple orchards with high density

Particulars	Figures
Area (ha) 2014-15 under Kashmir	1,44,733
Area (ha) to be converted to HDP (33%of current area)	48,000
Change in density with use of HDP (trees/ha)	1,000
Plant requirements for five years (in lakhs)	4,80,000
Net income from traditional apple orchards(Rs ha^{-1})	5,00,000
Expected net returns with high density orcharding(Rs ha^{-1})	15,00,000

Source: Division of Fruit Science& Authors Evaluation, SKUAST-Kashmir

A general problem is scarcity of quality planting material and there is huge gap between the demand and supply of certified planting material. It is also necessary to discourage the farmers to purchase the planting material of unknown quality from unregistered nurseries.A study conducted by NABARD estimates a planting material requirement for new planting and replanting for the next 5 years at 227.12 lakh. Certified planting material produced in the state is just 2 lakh/annum from 69 Govt. Nurseries and 164 Registered Private Nurseries.Hence, there is a huge gap between the demand and supply of certified planting material, which needs to be addressed.

Farm Inputs

Majority of the farmers (above 80%) faced problem of proper irrigation facilities especially during spray season and fruit maturity period (July/August). Although, Kashmir is having abundant water resources, still the growers are facing water scarcity. It is the weak water resource management and improper channelization which is responsible for this important problem, otherwise state could harvest a very good quality fruit which could increase farmer's income substantially. Moreover, lack of resources generally faced by marginal farmers' results in lower investment for better production technologies. There is a need for creation of durable resources through contract/co-operative /corporate farming to cater such needs of the growers.

Problem of disease and pests are threat to apple industry and with this growing menace farmers' harvest less than thirty per cent grade first (A) apple as against more than 50% in Himachal Pradesh and 80% in Europe. A study conducted in Jammu & Kashmir revealedthat the fungicides and insecticides availablein the market are not effective to rectify the problems. Other common glitches are poor adoption of spray schedule, advent of unregistered agencies/ spurious fungicides**,** loan market linked with pesticide trade and resistance & resurgence, defective pruning &training, imbalanced nutritional doses etc. Most of the apple growers belong to smallholder category in the state of Jammu & Kashmirandlack of resources results in lower investment for better production technologies. In absence of better production technologies and contract/corporate and co-operative farming,small holding size of the farm culminates into decline in the productivity and quality of the output. All these problems in farm inputs if addressed can easily double farmer's income even with traditional apple orcharding.

Pollinizers and Pollination Management

Pollination is a prerequisite for fruit and seed set. As fruits and/or seeds are the economic products of most of our crop species, pollination plays a vital role in realizing optimal yield.Insect pollination underpins apple production but the extent, to which different pollinator guilds supply this service, particularly across different apple varieties, is unknown. Such information is essential if appropriate orchard management practices are to be targeted and proportional to the potential benefits pollinator species may provide. Researchers have found that more than 97% of insects that visit apple fruit blossoms are honey bees. The optimal number of hives/ha for apples has been researched since the mid 1970s, with recommendations of 1-12 hives/ha (Delaney and Tarpy 2008). There are about 20,000 species of the native bees in spite of honey bees that act as pollinators. Some of the research work has revealed that pollination by native bees play an important role in crop pollination. SKUAST-K has taken initiative to identify these native pollinators

and utilize them in pollination management.Before planting new trees in an orchard a farmer should make effective combinationand location of apple pollinizer verities and pollinators for optimal yield and quality. Many of the commercial varieties of apples planted in Kashmir valley are self-incompatible and require cross-pollination with pollen from a compatible pollinizer variety. Orchardists must ensure sufficient pollinizer varieties throughout the orchard and that the bloom period of the pollinizers and the king blossom of apple trees overlap. The standard requirement is for 20% of trees to be pollinizers and the normal minimum requirement is 11% if trees are planted in a strict geometrical arrangementwhich will help to gain maximum fruit set. Some important pollinizers include: Manchurian (crab tree), Snowdrift, Golden delicious, Red gold, Scarlet-Siberian and Spartan etc.Honey bees are the most economically valuable pollinator worldwide, and many high-value crops such as almonds and broccoli are entirely reliant upon pollination services by commercial beekeepers. As per the SKUAST-K studies on 'Pollinizers and Pollination Management', there is potential to increase yield by 28% in apple due to combination of pollinizer and pollinators in orchards. It has been also found and also researched elsewhere in advanced countries that it not only help in increasing the productivity levels but also gives better quality and shelf life to the fruit. Better quality and shelf life are very important attributes for getting premium price in market. So the intervention of pollinizers and pollination management will increase farmers yield by productivity gains as well as quality produce.

Re-engineering cold/supply chain

Advances in controlled atmosphere (CA) technology have had a dramatic effect on apple storage logistics and opened up markets hitherto unavailable for fresh and processed apple products. This is an advantage not fully shared by apple in state whose shelf life extension by CA is much high in order to regulate supply and reduce mismatch in demand. The peak harvest season witnesses a glut in the market and depresses the price realization. This is caused by the absence of viable infrastructure to pack, transport and store apple in a manner designed to preserve quality and release the same in the market when the prices are attractive. Most of the outflow of the apples takes place during September to December, being the period of peak harvesting arrivals. The farmers will benefit from arrangements that reduce the peak arrivals during September to December, and delay the marketing till March-June of the next year. This will be possible if adequate storage facility suitable for apples is created and more importantly the holding capacity of farmer is increased through credit for stored apple.

There are 18 operational Cold Storages (CS) with a total capacity of 49769 MT in the state of Jammu & Kashmir, all of which are located in Jammu. These cold storages are multipurpose with a part of their capacity (say 30%, being about 15000 MT) used for storage of apples. There are 8 Controlled Atmosphere (CA) storages in the Kashmir valley with a total capacity of 42000 MT. The average capacity utilization is 60% during peak season and the annual average capacity utilization is estimated to be around 40%. The capacity is not fully utilized due to lack of awareness about grading, packing and storage as well as prevailing trading systems in the valley that focus on immediate sale after harvest. Due to seasonal nature of apple and no other commodity being stored in CA stores, capacity utilization is low. Better scientific cultivation practices, training, pruning, pre-harvest foliar sprays, proper harvesting and handling practices are likely to improve the availability of produce suitable for CA Storages. Although the importance and benefits of proper sorting, grading and packing is known to some of the growers, the same is done manually before bringing it to the market yards. Different grades are mixed up in manual sorting and grading which adversely affects the price realization to the growers and also reduces the bargaining power of the growers due to mixing of different grades. None of the market yards in the valley are equipped with any sorting, grading and packing facilities. Electronic sorting, grading and packing facilities are available with the CA Storages in the valley (Wani*et al,* 2015).

Requirements of storage in 2017-18 for even 25% of incremental market arrivals is likely to be about 3 lakh tons. A study after examination of production and market clusters has proposed creation of cold store capacity of 1.6 lakh tons and CA store capacity of 3 lakh tons. This will form less than 10% of the grade A and B apples produced in 2017-18. However, the proposed storage investments should be seen as proof of the concept which will induce more private investments riding on increased demand for

storage. Refrigerated transport using reefer vans will be a necessity when the fruits are stored in CA stores. Under such situation we have to introduce 20 such reefer vans with a capacity of 10 tons each. When their functionality is established, more private sector investments will flow in refrigerated transport. Twenty seven automated sorting, grading and packing facilities each with capacity to handle 2 tons of apple per hour are also required. When linked to CA stores or cold stores these lines would offer a complete packing cum storage solution to farmers. (NABCONS, 2013)

Table 7. Seasonal outflow andwholesale price behaviour of applefrom the Kashmir(2013-14)

Inter-val	Volume of outflow	Outflow share (%)	Wholesale price behaviour (Rs./box)	Interpretation/ Strategy
Sep.-Dec	11,48,000	82.0	550	• Peak arrival • Demand/supply mismatch & price stagnation& supply needs to be reduced by 30 to 40% • Beneficiaries, Cold/CA stores of Azadpur,Kundli, Badali and Industrial growth centers of Panipat/Sonipat, Haryana • Creation of processing, cold chain, Pack houses facilities etc in producing areas.
Jan-Feb.	1,33,000	9.50	850	• Late harvest arrival and a part of stored arrival • Beneficery apple farmers and importers from China & USA
Mar-Jun	42,000	1.50	1200	• Arrival from CA stores of Kashmir • Beneficery apple farmers and importers from China & USA
Jul-Aug	77,ooo	7.00	450	• Early harvest arrival with less consumer acceptibilty and cultivars need to be replaced early maturing exotic varities • Beneficery importers from China & USA

Source: Network Project on Market Intelligence, SKUAST-K (Production 2013-14, 14 lac MT;per apple box 18 kg)

It was observed that both absolute and relative price variability decreased for apple crop after the promotion of cold storages in Pulwama market for the entire period. However, increased arrivals were witnessed particularly during the storage period. After setting up of cold storages, the tendencies of price fluctuations were minimal. This indicated that with the promotion of cold storages, fluctuations in prices were reduced and this has helped in achieving the price stabilization in the long run-an important intervention to double apple grower's income (Table7).

Role of apple processing on farmers income

Nearly 30 per cent of total produce of apple crop going waste due to pre-harvest drop, making total annual quantum of such fruit about 0.25 million MT (Shah, 1999). The apples which are wasted due to pre-harvest drop, under development of colour, inferior grade and other reasons are utilized for the purpose of processing. These apples cannot be marketed as they give negative returns to growers. Due to non-availability of adequate processing facilities in the state, such fruits do not find an appropriate out let in the market. Though there have been multi-dimensional efforts to increase the production of apple in the state but processing sector has not received proper attention(Shaheen and Gupta 2004).

APEDA has identified Kashmir as Agri- Export Zone for apple. Two major processing plants are presently operating in Kashmir with a total annual installed capacity of 70,000 MT to process raw apple culls. The processing plant, owned by Jammu & Kashmir Horticulture Processing and Marketing Corporation (JKHPMC) is located at the hub of apple producing area, viz. Sopore of Baramulla district. The plant with installed capacity of 10,000 M.T. was established by CADBURY, India Pvt. Ltd. in early eighties and was purchased by JKHPMC in nineties. The other processing plant with an annual installed capacity of 60,000 MT was established in the year 1999, by a private entrepreneur, viz. FIL Industries at Rangreth, Budgam.

The market intervention scheme run by government to procure low grade fruits from farms and supply the same at subsidized prices to processors was discontinued few years before leading to closure of some units. The current tendency of Grade C apples being mixed with better grades has to be discouraged by providing a market for these apples. Local processing plants

for juice extraction (that avoid high transport cost of raw material) and centralized plants for making juice concentrates might provide a solution. But this needs to be backed up by a procurement chain that offers viable prices to farmers and ensures that landed cost of raw material is reasonable in the hands of processors. Some transport subsidy to bring the grade C apples to the plants might become necessary in the initial years when the investment cost overhang on new plants is still high. The potential is for the establishment of 11 processing plants for a total capacity of 2.8 lakh tons in different districts (Table8) (NABCONS, 2013).

Table 8 Potential of apple processing in Jammu & Kashmir

District	Potential of processing (MT)	Units proposed
Baramulla	183,000	40,000 MT- 4 units
Kupwara	44,000	20,000 MT- 2 units
Anantnag	17,500	10,000 MT- 1 unit
Kulgam	20,000	20,000 MT- 1 unit
Shopian	32,700	20,000 MT- 1 unit 10,000 MT- 1 unit
Pulwama	23,500	20,000 MT- 1 unit
Total	320,700	40,000 MT- 4 units, 20,000 MT- 5 units &10,000MT-2 units Total 280,000 MT

Source: NABCONS, 2013

For the present study mega apple juice plant located in Budgam district was purposively selected to evaluate the economics of apple juice processing in the value chain because from last two years public sectorJKHPMC plant is non-functional. Three years cross sectional data was collected from the processing plant for the reference years 2011-12 to 2013-14, to avoid any abnormal production period.On an average, plant realized a net return of Rs. 213.02 lacs per annum. The highest net return of Rs.270.21 lakh was in the year 2011-12, while it was lowest (Rs. 158.97 lakh) in the year 2013-14. The price of final product (CAJ) was Rs. 2151.21 lakh (Table 9). Overall, the results indicate that the processing unit had not fully utilized the installed capacity. Utilization of the plant to its installed capacity will not only reduce the cost of CAJ production and increase the net returns, but also will benefit the producers (orchardists) by utilizing their apple culls(Rosa, 1998).

Table 9 Economics of apple processing (Rs. in lacs)

Particulars	2011-12	2012-13	2013-14	Average
Capacity utilized (%)	73.21	66,55	60.50	66.75
Apple juice recovery	2583.66	2123.11	1746.86	2151.21
Total processing cost	2313.45	1913.23	1587.89	1938.19
Net returns	270.21	209.88	158.97	213.02

Source: Field survey, 2015, 25 %yield loss due to lack of processing @Rs 8 kg amounts to loss of Rs 1.25 lac per hectare

Revenue-centric opportunities could be grabbed by establishing processing unit's at large scale at district level reducing overall wastage to its minimum. Semi processing units could be established by government agencies/entrepreneurs nearer to apple producing areas. Small scale food parks can be developed at various center points of districts areas facilitating packaging, semi processing, grading, and value addition of apple. Such food parks could also become the centers for imparting know-how of marketing and communicating modern technologies through exhibitions. This could bring in and encourage local involvement, provided such practices are undertaken on sustainable basis(Sharma *et al.,* 2010; Sidhu, 2005).

CONCLUSIONS

Apple production and marketing is an important economic pursuit and source of livelihood to 30 lakh people of the state of J&K. 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 ofapple 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 sector level in close coordination with the government. Revamped applesector has to be planned with a mix of investments, capacity building, technologicalinnovations and committed institutional leadership and each intervention will definitely create a galaxy to double farmer's income.

REFERENCES

Delaney, D.A. & Tarpy, D.R. (2008). 'The role of honey beesin applepollination'. Beekeeping Note 3.03. Apicultural Program Department of Entomology North Carolina State University.

Economic Survey.(2015). *Directorate of Economics and Statistics*, Jammu and Kashmir Government, Srinagar, pp. 876.

Food and Agriculture Organization (FAO).(2014). *Production Year Book*. Food and Agricultural Organization of the United Nations. Rome.

Hakeem, A.H., Peer, F.A., Tantray, A.M. and Ghani, I. (2006). Adoption level of production recommendations in apple cultivation by fruit growers of Baramulla district. *SKUAST Journal of Research*,8: 168-174.

Lone, R.A. (2014). Horticulture sector in Jammu and Kashmir economy. *European Academic Research*,2(2): 2405-2432.

Malik, V.K. and Heijdra, H. (2011). *A value chain analysis of apple from Jumla*, Ministry of Agriculture & Cooperatives, Department of Agriculture.

Malik, Z.A. and Choure, T. (2014). Horticulture growth trajectory evidences in Jammu and Kashmir (A lesson for apple industry in India). *Journal of Business Management & Social Sciences Research*,3: 7-10.

NABARD Consultancy Services.(2013). *.A proposal for strengthening the apple value chain in Jammu and Kashmir*. NABCONS, Corporate Office, Bandra Kurla, Mumbai, pp. 29.

NHB.(2012). *Indian Horticulture Database-2012*, National Horti.Board (NHB) Ministry of Agriculture, Government of India.

Naqash, F. (2015). A value chain analysis of apple in Jammu and Kashmir. *MSc. Thesis submitted to Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar*,pp. 1-94.

Pingali, P and Khwaja, Y.(2004). Globalisation of Indian diets and the transformation of food supply systems. ESA Working Paper No. 04-05. Agricultural and Development Economics Division, The Food and Agriculture Organization of the United Nations.

Rosa, S. (1998). Outlook for concentrated apple juice production and trade in selected Countries, World Horticulture Trade and US Export Opportunities. 4: 26-32.

Shah, G.H. (1999).Present status and future potential of fruit processing industry in J&Kstate, paper presented at seminar on '*Fruit Processing in J&K*' organized by FICI NewDelhi and J&K SIDCO on 5-6-1999, held at International Convocation Centre, Srinagar(J&K).

Shaheen, F.A. and Gupta, S.P. (2004). Economics and potentials of apple processing industry in Kashmir Province of Jammu and Kashmir. *Agricultural Marketing* XLVII (3): 31-34.

Sharma, K.D., Pathania, M.S. and Harbans, L. (2010). Value chain analysis and financial viability of agro-processing industries in Himachal Pradesh. *Agricultural Economics Research Review*,23: 515-522.

Sidhu, M.S. (2005). Fruit and vegetable processing industry in India – An appraisal of the post - reform period. *Economic and Political Weekly,* July 9, 3056-3061.

USAID.(2008).*The Albanian apple value chain: FSKG case study*, Micro Report 120, pp. 59.

Wani, S.A., Wani, M.H., Bazaz, N.H. and Mir, M.M. 2015. *Commodity profile of apple*, Network Project on Market Intelligence-SKUAST-K, Shalimar, pp. 40

Weinberger, K. and Thomas A.L. (2007). Diversification into horticulture and poverty reduction: A research agenda. *World Development*,35(8): 1464-1480.

Economics of Production and Marketing of Turmeric in Amravati District

S.V. Wakale*, S.M. Sarap, S.A. Kanse and M.S. Naware
Department of Agricultural Economics and Statistics, Shri Shivaji Agriculture College, Amravati, Maharashtra, India
*Corresponding author: svwkk1197@gmail.com
Received: 12th September 2018; Revised: 2nd February 2019; Accepted: 12thApril 2019

ABSTRACT

The study examined the marketing system and the major constraints in marketing of turmeric in the Amravati district of Maharastara.For the present study, 90 turmeric cultivators were selected from Morshi, Warud, Tiwsa tehsils of Amravati district. Two villages were selected purposively from each tehsil. From each village 15 farmers were selected randomly. The selected farmers were classified into three categories viz., small, medium, large according to their land holding. The primary data was collected from the farmers by survey method.Out of four channels, More than one third (38.89 per cent) of the farmer sale turmeric through channel III(Producer→Village trader→Wholesaler→Consumer).
Keywords: *Turmeric, Marketing system, marketing channels*

INTRODUCTION

India is popularly known as the "Spice Bowl of the World" for production of variety of spices with superior quality. Turmeric is called as Indian saffron and it is one among the important commercial crop grown in India.Scientifically, it is known as *Curcumalonga* and belongs to family *Zinziberaceae*. Many researchers have analysed the production and marketing of turmeric, keeping in view its importance in farm economics (Begum*et al.*, 2019; Chinnadurai*et al.*, 2018; Dhanalakshmi *et al.*, 2018; Kadte *et al.*, 2018and Kiruthika, 2013). A number of cultivars are available in India and are known mostly by the name of region where they are cultivated. The important varieties in India are: Alleppey Finger (Kerala), Erode and Salem turmeric (Tamil Nadu), Rajapuri and Sangli, turmeric (Maharashtra) and Nizamabad Bulb (Andhra Pradesh). In Maharastra, the important varieties cultivated are RajapuriKaradi, Lokhandi, Gadhavi, Waygaon, Aarmoor, Selum and Krishna. In India, turmeric is grown to small extent in all states, but major are lies in Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, Kerala and Maharashtra. These states contributed 72 percent of area under turmeric and 82 per of total turmeric production of the country. India's share in the world trade in spices is around 19.8 per cent. Total area of turmeric in India during 2016-2017 was 193400 ha and production was 1052100 MT with productivity 5.44 MT per hectare respectively. (Ministry of Agriculture & Farmer Welfare, Govt. of India.)

The area under turmeric in Maharashtra was about 10700 ha. during 2016-2017 and production was 177900 MT with productivity 16.63 MT per hectare (Ministry of Agriculture & Farmer Welfare, Govt. of India). Sangli ranks first in turmeric production followed by Satara district and in Vidarbha the turmeric is most probably grown in the Wardha, Chandrapur, Amravati and Washim district. In Amravati district, it has been reported that the crop has occupied an area of about 281 ha. with production of 3200 MT during 2016-2017. (District Superintendent Agriculture Officer, Amravati).

The crop is intensively grown in Warud, Morshi and Tiwsa tehsil of Amravati district. In view of its importance for the area it has been decided to undertake the study on this crop considering the main aspect of economics of production and marketing of turmeric.

METHODOLOGY

Data were collected from farmers, village traders, wholesalers and retailers, about the price spread, labour charges, transportation costs, commission charges, other charges if any and also the price received by them.A schedule was designed for data collection keeping in view the objectives of the study. The selected farmers were personally contacted and data were collected from them in the schedule for the year 2016-2017. Survey method was followed for the data collection.

Price spread

Price spread = Consumers price – price received by farmer

$$P_s = C_f - P_f$$

Where,

P_s= Price spresd
C_f= Consumers price
P_f = price received by farmer

Producer's share in consumer's rupee

Producer's share in consumer's rupee (P_s) expressed as follows:

$$P_s = \frac{P_f}{P_c} \times 100$$

Where,

P_f = Net price received by the producer

P_c = Price paid by the consumer

Problems faced byturmeric growers

For turmeric cultivation, farmer's problems were taken into consideration by interviewing them through questionnaire.

RESULTS AND DISCUSSION

Marketing channels of Turmeric

In the preceding section, economic aspects viz., costs and returns in the production of turmeric crop selected for study have been discussed. But the process of production is not completed till the product reaches into the hands of final consumer. As such various aspects pertaining to marketing of these turmeric crop viz., channels of distribution, price spread, producer's share in consumer's rupees etc. have been studied and discussed.

Disposal pattern of turmeric through different channels

The disposal pattern of turmeric through different channels followed by the respondents is presented in Table 1.

Table 1: Disposal pattern of turmeric through different channels

Marketing channels	Quantity (q)	Percent to total
Channel I	45.40	(1.88)
Channel II	394.80	(16.31)
Channel III	1182.10	(48.82)
Channel lV	798.90	(32.99)
Total	**2421.20**	**(100.00)**

The quantity sold and their percentage is given in Table 1. From the table it is evident that channel III (Producer→Village trader→Wholesaler→Consumer) was the most common channel used by the farmers and about 48.82 per cent of their marketed surplus was transacted through channel III.

The other commonly used channel was Channel-IV (Producer→Village trader→Wholesalere→Retailer→Consumer) as 32.99 per cent of the marketed surplus was transacted through this channel. Channel-III and channel IV does not operate in weekly or local markets, the village trader collected dried turmeric from different villages especially those were not well connected to major markets of the district.

In channel II (Producer→Village trader→ Consumer) about 16.31 per cent of their marketed surplus was transacted. Channel-I (Producer→ Consumer) was the least used among all the channels and its share was only 1.88 per cent of the marketed surplus. Channel I and channel II indicate that farmer sold his produce in local market or in village.

Distribution of farmer according to marketing channels

Marketing channels are the routes through which produce move from producer to consumer. The following important channels of distribution have been observed while studying the marketing of turmeric under study area.

Channel I: Producer→ Consumer.

Channel II: Producer→Village trader→ Consumer.

Channel III: Producer→Village trader→Wholesaler→Consumer

Channel IV:

Producer→Village trader→Wholesaler→Retailer→Consumer

The distribution of farmer according to marketing channels is presented in table 2

Table 2: Distribution of farmer according to channels

Marketing Channels	No. of Turmeric Growers	Qty. Sold (q)
Channel l (Producer to Consumer)	4.00 (4.44)	45.40 (1.88)
Channel ll (Sale through Village Trader)	24.00 (26.67)	394.80 (16.31)
Channel lll (Sale through Wholesaler)	35.00 (38.89)	1182.10 (48.82)
Channel lV (Sale through Retailer)	27.00 (30.00)	798.90 (32.99)
Total	**90.00 (100.00)**	**2421.20 (100)**

Figures in parentheses indicate percent to total

Channel I and channel II indicated that farmer sold his produce in local market or in village. Channel III and Channel IV indicate farmer sold their produce in Agriculture Produce Market Committee. Table 2revealed that more than one third of the farmer sold turmeric through wholesaler as first sale point (38.89 per cent). The quantity sold through wholesaler i.e. channel III to total quantity sold workout to 48.82 per cent followed by Channel IV, channel II and channel I is 32.99 per cent, 16.31 per cent and 1.88 per cent respectively.

During the course of investigation it was observed that channel III i.e. Producer→Village

trader→Wholesaler→Consumer, is the major channel of distribution and overall 35 (38.89 per cent) farmers sold their produce by this channel.

Marketing cost of turmeric

The estimated cost of turmeric marketing is presented in Table 3.

Table 3: Marketing cost and market margin of turmeric(Rs./q)

Particulars	Channel I	Channel II	Channel III	Channel IV
Marketing cost incurred by the producer				
Cost of gunny bag	26.38	28.42	27.97	29.10
Grinding	413.70	-	-	-
Cost of packing	246.36	10.69	11.08	10.33
Labour charge	25.44	24.93	25.16	25.56
Weighing charges	3.55	3.78	3.52	3.76
Transportation	72.29	-	-	-
Total marketing cost	787.72	67.82	67.73	68.75
Selling Price of Producer	15224.66	7647.79	7796.54	7742.04
Net Price received by Producer	14436.94	7579.97	7728.81	7673.29
Marketing Cost Incurred by Village Trader				
Storage	-	10.42	9.50	9.09
Weighing charges	-	3.75	3.66	3.61
Hamali	-	12.79	11.80	13.75
Loading unloading	-	18.07	18.98	18.80
Transportation	-	59.06	60.28	61.84
Total marketing cost	-	104.09	104.22	107.09
Selling price of village trader	-	8145.77	8191.12	8052.25
Margin of village Trader	-	393.89	290.36	203.12
Marketing Cost Incurred by wholesaler				
Storage	-	-	9.04	8.7
Transportation	-	-	106.59	107.35
Loading and unloading	-	-	19.21	19.33
Weighing charges	-	-	3.63	3.72
Hamali	-	-	13.94	11.74
Market cesses fund	-	-	4.28	4.19
Total marketing cost	-	-	156.69	155.03
Selling price of Wholesaler	-	-	8561.69	8412.07
Margin of wholesaler	-	-	213.88	204.79
Marketing Cost Incurred by Retailer				
Shop rent	-	-	-	33.62
Transportation	-	-	-	51.21
Labour charge	-	-	-	24.93
Weighing charges	-	-	-	3.78
Hamali	-	-	-	13.74
Total marketing cost	-	-	-	127.28
Selling Price of retailer/purchase price of consumer	-	-	-	8852.45
Margin of retailer	-	-	-	313.10
Total marketing cost incurred by producer, village trader, wholesaler and retailer	787.72	171.91	328.64	458.15
Total margin	-	393.89	504.24	721.01

Out of four marketing channels, highest marketing cost incurred by producer was Rs.787.72 in case of channel I and highest selling price of producer was seen in channel I, i.e. Rs. 15224.66. The village trader incurred marketing cost of Rs. 104.09 while, the margin of village trader was Rs. 393.89 in channel II (Table 3).

In channel III the marketing cost incurred by producer was Rs. 67.73, marketing cost incurred by village traders was Rs.104.22.The margin of village traders was Rs. 290.36. Wholesaler incurred marketing cost Rs. 156.69 and received the margin of Rs.213.88.

In channel IV, the marketing cost incurred by producer was Rs. 68.75. The village trader

incurred marketing cost of Rs. 107.09 and received the margin of Rs.203.12. The wholesaler incurred marketing cost Rs. 155.03 and received the margin of Rs. 204.79. The retailer incurred marketing cost Rs. 127.28 and received the margin Rs.313.10. It can be concluded that highest total marketing cost was observed in channel I i.e. Rs. 787.72 because farmer himself process and sell their produce to the consumer and highest total marketing margin was observed in channel IV i.e. Rs. 721.01.

Producer share in consumer's rupee

Out of four marketing channels, shown in table 5.13 channel I is the direct channel i.e. producer-consumer. The Producers share in consumer's rupee was calculated and presented in Table 4.

Table 4: Price spread in marketing of Turmeric (Rs./q)

Particulars	Total Price			
	Channel I	Channel II	Channel III	Channel IV
Net Price received by Producer	14436.94 (94.83)	7579.97 (93.05)	7728.81 (90.27)	7673.29 (86.68)
Total Marketing cost incurred by producer, village trader wholesalerand retailer	787.72 (5.17)	171.91 (2.11)	328.64 (3.84)	458.15 (5.18)
Total market margin of village trader, wholesaler & retailer	0.00 (0.00)	393.89 (4.84)	504.24 (5.89)	721.01 (8.14)
Selling price of retailer/Purchase price of consumer	15224.66 (100.00)	8145.77 (100.00)	8561.69 (100.00)	8852.45 (100.00)

Figures in parenthesis indicates percentage

It is revealed from the table 4 that, the net price received by producer in channel I, channel II, channel III and channel IV wasRs.14436.94, Rs.7579.97, Rs7728.81 and Rs.7673.29 per q respectively. The producer's share in consumer's rupee was highest in channel I i.e. 94.83 per cent followed by channel II, channel III and channel IV viz.93.05, 90.27 and 86.68 per cent respectively. The total market margin was higher in channel IV was Rs. 721.04 (8.14 per cent) because there are large number of intermediaries in the channel, followed by channel III and II wasRs. 504.24 (5.89 per cent), Rs. 393.89 (4.84 per cent), respectively. Though the producer's share in consumer's rupee was highest in channel I i.e. (94.83 per cent) as compared to other channels and also the net price received by producer is highest in channel I i.e. Rs.14436.94 per quintal. Hence selling of turmeric through channel I by turmeric grower was found more remunerative than otherchannels in study area.

Problems in production and marketing of Turmeric

The entire selected turmeric grower interviewed for the problems they are facing while production the Turmeric. The information regarding the important problems faced by the growers is presented in table 5

Among the major problems reported in turmeric production, the major was non-availability of human labour, as expressed by 64 farmers (71.11 per cent), followed by inadequate supply of electricity, expressed by 52 farmers (57.77 per cent),high cost of fertilizer, expressed by 48 farmers (53.33 per cent),lack of financial facility expressed by 38 farmers (42.22 per cent) and lack of processing facilities expressed by 32 farmers (35.55 per cent).

Table 5:Problem faced by farmers in turmeric production

Constraints	No. of farmer (N=90)	Percentage to total farmers
Non availability of irrigation Water	16	17.77
High cost of fertilizer	48	53.33
Inadequate knowledge about processing	8	8.88
Irregular supply of fertilizers	25	27.77
Non- availability of manure	28	31.11
Lack of financial facility	38	42.22
Inadequate supply of electricity	52	57.77

Table 6: Problem faced by farmer in Marketing of Turmeric

Constraints	No. of farmer (N=90)	Percentage to total Farmers
Lack of marketing Facility	65	72.22
High transportation cost	58	64.44
Involvement of large no. of intermediaries	48	53.33
Unfair practices during open auction	37	41.11
Lack of storage facility	24	26.66
Lack of market intelligence	25	27.77
Non-remunerative price	51	56.66

Lack of marketing facility, high transportation cost, non-remunerative price, involvement of large no. of intermediaries, unfair

practices during open auction were the major problems reported by farmers in the marketing of turmeric expressed by 65, 58, 51,48 and 37 farmers, respectively.

REFERENCES

Begum, M.E.A., Miah, M.A.M., Rashid, M.A., Islam, M.T., Hossain, M.I. (2019). Economic analysis of turmeric cultivation: evidence from Khagrachari district. Bangladesh Journal of Agricultural Research, 44(1): 43-58

Chinnadurai, M., Kavitha, V., Angles, S. and Sangeetha, R. (2018).Economics of turmeric cultivation in Erode district of Tamil Nadu. Agriculture Science Digest, 38(4): 293-296.

Dhanalakshmi, K., Chitra, K., Manimekalai, R., Balisasikumar, C. and Vijayakumari , K.K. (2018). Production and economics of turmeric cultivation. International Journal of Current Microbiology and Applied Sciences, 7(11): 3496-3502.

Kadte, A.J., Perke, D.S. and Kale, P.S. (2018). Economics of turmeric production in Sangli district of Maharashtra, India. International Journal of Current Microbiology and Applied Sciences, 6(Special Issue): 2279-2284

Kiruthika, N. (2013). The economics of production of turmeric in India: a case study of erode district of Tamil Nadu. Journal of Innovative Research and Solutions, 1(1): 2320 1932.

Supply and Value Chain of Papaya (*Carica papaya*) for increasing the income Bilaspur District of Chhattisgarh

A.K. Koshta, Bhekh Ram* and V. K. Choudhary
Department of Agricultural Economics, Indira Gandhi Krishi Vishwavidyalaya, Raipur 492012, Chhattisgarh
*Corresponding author email: chadravanshi.bhekh@gmail.com
Received: 10th August 2018; Revised: 10th January 2019; Accepted: 9th May 2019

ABSTRACT

Despite papaya production are not getting remunerative price to the farmers and there is big gap between price received by producer and price paid by consumer for papaya. To enhance the income of papaya farmers, there is need to channelize the value added in the study area. Eight main alternative channels were identified for marketing of papaya in Bilaspur district among them channel-VII (producer – collector– wholesaler– retailer – consumer) accounted 32.35 per cent of production and found to be the largest volume of papaya sold. Collectors/assemblerswere the main receivers of produce and accounted to be 48.81 per cent share. The gross marketing margin was the maximum in channel-II (producer-processer-retailer) and found to be 98.33 per cent. Producer's share in consumer's rupee was noticed to be highest in Channel -I (producer-consumer) and accounted to be 95.85 per cent and net market margin was 94.69 per cent.
Keywords: *Supply chain, producers, consumers and marketing*

INTRODUCTION

Papaya (*Carica papaya*) is the third most important fruit crop in India next to mango & banana. The ripened fruits are a rich source of carbohydrates, minerals (Ca, P and Fe), Vitamin (carotene, thiamine, riboflavin, etc.) fibber and ascorbic acid, In addition, papaya is a source of the digestive enzyme papain,Universal papaya production in 2010 was approximate at 11.22 million tonnes, rising at an annual rate of 4.35 percent between 2002 and 2010. India is the largest producer 56.393 lakh tonnes of papaya globally its share 44.4 % and 1st rank of production in 1.33 lakh hectares area(FAOSTAT 2016). Out of total area under fruit crops, papaya was cultivated in 12.41 thousand hectares area and production was2.76 lakh metric tonnesin Chhattisgarh State which accounted to be 12% of the total fruit production of the state in 2015. The papaya growers are not receiving the remunerative prices of the ripen fruits due to various problems associated in marketing of papaya (Sagar*et al.*, 2012). Therefore, the present study tried to understand the supply and value chain of Papaya.

METHODOLOGY

The study was confined to Bilha block of Bilaspur district. Papaya growers were scattered and they were few in numbers in the villages. So, the snowball sampling technique was adopted for selection of villages and papaya growers. There were 60 papaya growers undertaken from 22 villages. The primary data was collected from the papaya producers, wholesaler, retailer and processer through personal interview method with the help of well-prepared schedule and questionnaire for year of 2015-16.

The Total Gross Marketing Margin(TGMM) was useful to calculate producer's gross margin (GMMP) which indicates the proportion of price paid by the consumer and how much proportion of price received by farmer/producer (Deliya and Thakor, 2006; Sagar*et al.*, 2012 and Asale*et al.*, 2016).

Producers' gross margin is the proportion of the price paid by the end consumer as given below:

Producer's share in consumer's rupee

GMMP = 1- TGMM

Where,PS = Producers' share, P_x = Producers' price of papaya, Pr = Consumer price, MM = Marketing margin.

RESULTS AND DISCUSSION

Cost of cultivation of papaya

Cost of cultivation of papaya is worked out and presented in Table 1. It reveals that overall cost of input used of papaya was found to be Rs/ha 110345.28 (80.62%), which varies from Rs./ha 102140.85 (82.05%), 105996.91 (80.22 %) and 112303.23 (82.05 %) at small, medium and large farms, respectively. The most costly input for cultivation of papaya was planting material which was accounted to be 21.73 per cent.

Table 1: Cost of cultivation of papaya in sampled farms (Rs./ha)

Particulars	Small	Medium	Large	Overall
Variable cost				
Human labour				
Family labour	13275.00 (10.66)	10148.48 (7.68)	8811.16 (6.44)	9421.48 (6.88)
Hired labour	9406.25 (7.56)	12284.85 (9.30)	16323.99 (11.93)	15035.39 (10.98)
Total human labour	22681.25 (18.22)	22433.33 (16.98)	25135.15 (18.36)	24456.87 (17.87)
Machine charge	7062.50 (5.67)	6625.25 (5.01)	6703.80 (4.90)	6720.42 (4.91)
Plant cost (1.8 X 1.8m)	29127.08 (23.40)	29403.03 (22.25)	29895.49 (21.84)	29744.72 (21.73)
Manure & Fertilizer cost	21175.00 (17.01)	23858.59 (18.06)	24641.69 (18.00)	24212.24 (17.69)
Plant Protection Chemicals	11129.17 (8.94)	12191.92 (9.23)	13893.11 (10.15)	13363.03 (9.76)
Irrigation charges	5105.21 (4.10)	5090.91 (3.85)	5125.65 (3.74)	5117.87 (3.74)
Miscellaneous	830.50 (0.67)	968.50 (0.73)	1050.30 (0.77)	1017.47 (0.74)
Interest on working capital	5030.14 (4.04)	5425.38 (4.11)	5858.04 (4.28)	5712.67 (4.17)
Sub total	102140.85 (82.05)	105996.91 (80.22)	112303.23 (82.05)	110345.28 (80.62)
Fixed cost				
Land revenue	12.00 (0.01)	12.00 (0.01)	12.00 (0.01)	12.00 (0.01)
Depreciation on implements	107.50 (0.09)	365.00 (0.28)	425.00 (0.31)	387.71 (0.28)
Rental value of owned land	20200.00 (16.23)	23383.84 (17.70)	24199.52 (17.68)	23719.37 (17.33)
Interest on fixed capital	2031.95 (1.63)	2376.08 (1.80)	2463.65 (1.80)	2411.91 (1.76)
Sub total	22351.45 (17.95)	26136.92 (19.78)	27100.18 (19.80)	26530.99 (19.38)
Total (A+B)	**124492.30 (100)**	**132133.84 (100)**	**139403.41 (100)**	**136876.26 (100)**

Figures in parenthesis was percentage to the total cost of cultivation

Economics of papaya in sampled farms

The economics of papaya,including yield, cost and return of papayais presented in Table 2. The average yield of papaya was the maximum in large and found to be 765 q/ha followed by medium 750 q/ha and small farms 720.00 q/ha. The average price was 502.57, 504.60, and 510.80 for small medium and large farmers respectively. The maximum cost of cultivation occurred in large farms Rs. 124492.30.

Disposal Patten of papaya

The total production per farm was highest in large farms i.e. 1238.71 q/farm. The farmer under small size was used more for farm consumption i.e. 0.93 % than that of farmers under

medium and large farms size. Marketable surplus was highest in large farms i.e.1238.71 q/farm followed by medium (412.50 q/farm) and lowest in small farms (216.00 q/farm) in Table 3.

Table 2: Yield, cost and return of papaya of the sample farm (Rs./ha)

Particular	Small	Medium	Large	Overall
Average Yield (q)	720.00	750.00	765.00	758.58
Average price (Rs./q)	502.57	504.60	510.80	509.07
Cost of cultivation	124492.30	132133.84	139403.41	136876.26
Cost of production/q	244.40	261.19	434.73	252.42
Gross return (Rs.)	361854.17	378454.55	390762.47	386174.30
Net return(Rs.)	242041.75	251798.95	257292.70	255046.35
Input output ratio	1:2.91	1:2.86	1:2.80	1:2.82

Table 3: Disposal pattern of Papaya q/farm

Farm Size	Total production	Home consumption	Marketable surplus
Small	216.00	2.00	214.00
	(100.00)	(0.93)	(99.07)
Medium	412.50	2.00	410.50
	(100.00)	(0.48)	(99.52)
Large	1238.71	2.00	1236.71
	(100.00)	(0.16)	(99.84)
Overall	718.12	2.00	716.12
	(100.00)	(0.28)	(99.72)

Note: Figures in parenthesis indicated percentage of total production

Identification of Value Chain partners in papaya

In the study area there were four marketing intermediaries i.e. collectors, wholesalers, retailers and processer involved in papaya trading (Figure 1).

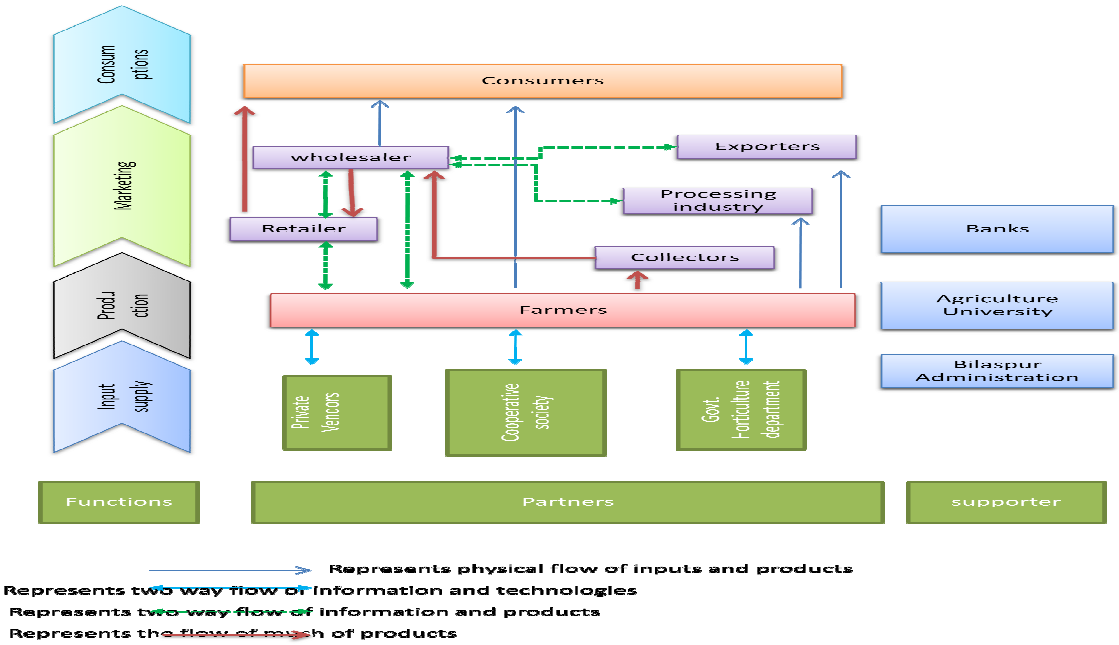


Figure 1. Papaya value chain map in Bilaspur district

Performance of value chain partners

Eight main alternative channels were identified for papaya marketing which is demonstrated in the flowchart. It was estimated that 716.12 quintals per farm of papaya were supplied by producer It has been found that main receivers of papaya from producers were collectors/assembler, wholesaler and retailer with an estimated percentage share of 48.81, 27.63 and 11.20 respectively.

Marketing channels of papaya

I. Producers -Consumers (40.38Qts)
II. Producers -Processer -Retailers -Consumers (22.30Qts)
III. Producers -Retailers -Consumers (80.22Qts)
IV. Producers -Wholesalers -Processer-Consumers (12.27Qts)
V. Producers -Wholesalers -Retailers -Consumers (185.8Qts)
VI. Producers-Collectors –Retailers-Consumers (94.61Qts)
VII. Producers-Collectors-Wholesalers-Consumers (23.26Qts)
VIII. Producers-Collectors-Wholesalers-Retailers-Consumers (231.7 4Qts)

Quantity of papaya sold by producer at sampled farms

The quantity of produce was increasing with farm size in case of collectors, where it was decreasing with increasing farm size of holding in case of retailer and wholesaler. It implies that processer was more popular among larger farms. The quantity of papaya sold to consumer was highest 14.76 t atmedium farms. The quantity sold to collectors was highest 52.69 per cent at medium farms. In wholesalers and processer papaya sold highest 31.63 and 4.17 per cent at large farms (Table 4).

Table 4: Quantity of papaya sold by producer to different marketing functionaries of the sample household

Farm size	Consumer		Collectors		Retailers		Wholesalers		Processer		Total	
	q/ha	q/farm	q/ha	q/farm	q/ha	q/farm	q/ha	q/farm	q/ha	q/farm	q/ha	q/farm
Small	151.03	45.31	348.31	104.49	214.00	64.20	0.00	0.00	0.00	0.00	713.33	214.00
	(12.23)	(12.23)	(48.83)	(48.83)	(30.00)	(30.00)	(0.00)	(0.00)	(0.00)	(0.00)	(100.00)	(100.00)
Medium	91.31	50.22	393.23	216.28	89.56	49.26	172.26	94.74	0.00	0.00	746.36	410.50
	(14.76)	(14.76)	(52.69)	(52.69)	(12.00)	(12.00)	(23.08)	(23.08)	(0.00)	(0.00)	(100.00)	(100.00)
Large	56.31	91.18	366.01	592.65	68.02	110.15	241.58	391.18	31.84	51.56	763.76	1236.71
	(7.37)	(7.37)	(47.92)	(47.92)	(8.91)	(8.91)	(31.63)	(31.63)	(4.17)	(4.17)	(100.00)	(100.00)
Overall	70.41	66.66	369.26	349.56	84.11	79.63	209.08	197.93	23.60	22.34	756.47	716.13
	(9.31)	(9.31)	(48.81)	(48.81)	(11.12)	(11.12)	(27.64)	(27.64)	(3.12)	(3.12)	(100.00)	(100.00)

Note: Figures in parenthesis indicated percentage of total production

Table 5: Price received by producer's from different marketing functionaries

Farm size	Consumer	Collectors	Retailers	Wholesalers	Processer	Average price
Small	820.00	405.62	436.30	0.00	0.00	502.56
Medium	832.51	435.49	462.17	510.61	0.00	504.60
Large	823.10	449.05	463.62	524.83	662.54	510.80
Overall	824.67	443.07	457.48	522.79	662.54	509.07

Price received by producers from different marketing functionaries

The price received by producers from different intermediaries is shown in Table 5. Papaya grower sold their produce at Rs 824.67 per quintal price. Collectors/ assembler were directly involved in purchase of papaya just harvesting the crop. They purchased most of the quantity of produce at Rs. 443.07 per quintal.

Marketing margin and price spread of papaya in Bilaspur district

The difference between price paid by consumer and price received by producers is price spread and the share that goes to the different functionaries in the market is marketing marginin (Table 6). In Channel-I, It was simplest marketing channel in which no market intermediaries were involved and producer sold directly to consumer and get highest market margin Rs. 610.04 fallowed by processer wholesaler collectors and retailer 460.77, 342.36, 262.64 and 249.95 respectively.

Producer's share in consumer's rupee under different marketing channels

Out of all the intermediaries involved in marketing of papaya, producer's share in consumer's rupee has been found to be highest in Channel -I (95.85 per cent) whereas it was found to be lowest in Channel IV i.e. (4.57 per cent). It was estimated as 38.16, 34.27, 30.08, 29.20, 26.72, 5.94 and 4.57 per cent for Channel VII, Channel V, Channel VI, Channel VI, Channel VIII Channel II and Channel III (Table 6).

Table 6: Marketing cost incurred by producer and different partners in different channels in Bilaspur district(Rs./q)

Channels		Weighing Cost	Loading & Unloading Cost	Transportation Cost	Commission charge	Packing charges	Miscellaneous	Total Cost
Channel I	Producer	0.4	5	14	0	12.5	2.3	34.2
Channel II	Producer	0.4	5	0	0	14.32	1.62	21.34
	Processer	3.6	7.3	35.7	0	890	3.2	939.8
	Retailers	0	10.67	3.5	0	17.2	3.22	34.59
Channel III	Producer	0.4	5	9.2	0	12.5	0	27.1
	Retailers	0.73	10.67	0	0	17.2	3.22	31.82
Channel IV	Producer	0.4	12.4	0	0	14.32	1.62	28.74
	Wholesalers	0.56	0	0	30	0	3.55	34.11
	Processer	3.6	7.3	35.7	0	890	3.2	939.8
	Retailers	0	10.67	3.5	0	17.2	3.22	34.59
Channel V	Producer	0.4	5	14.6	0	12.5	0	32.5
	Wholesalers	0.56	10.67	0	30	0	3.55	44.78
	Retailers	0.73	10.67	0	30	17.2	3.22	61.82
Channel VI	Producer	0.4	5	14.6	0	12.5	0	32.5
	Collector	0	0	0	30	0	2.31	32.31
	Retailers	0.56	10.67	0	30	0	3.55	44.78
Channel VII	Producer	0.4	5	14.6	0	22.3	0	42.3
	Collector	0	0	0	30	0	2.31	32.31
	Wholesalers	0.56	10.67	8.2	30	0	3.55	52.98
Channel VIII	Producer	0.4	5	14.6	0	22.3	0	42.3
	Collector	0	0	0	30	0	2.31	32.31
	Wholesalers	0.56	10.67	8.2	30	0	3.55	52.98
	Retailers	0.73	10.67	0	30	17.2	3.22	61.82

Average cost of papaya processer

Papaya processer are playing important role with regards to change their farm of papaya and earned comparatively more profit than that of other papaya value chain partners at Table 7. At the time of adding the value in papaya namely tutty-fruity and papaya jam.

Table 7: Average cost of papaya processer

List of expenses	cost per quintal	Per cent share
Average papaya purchase price	662.67	10.76
Sugar (1 qu.)	3200	51.97
Citric acid	130.3	2.12
Gas	1200	19.49
Labour (3 man days)	450	7.31
Store rent	13.3	0.22
Tax paid	300.53	4.88
Other cost	201.54	3.27
Total cost	6157.67	100.00

Marketing margins of papaya in different channels

Marketing margins of papaya in the eight channels for each group of market player are shown Table 8. Total Gross Marketing Margin (TGMM) is the highest in channel II and IV which was about 98.33 and 98.32 per cent respectably. Without considering any intermediaries in channel I producers sell directly to consumer producer's share (GMMP) is highest 100 per cent and lowest 6.68 per cent in channel IV because of the involvement of many middlemen in these channel. Processer has got the highest gross marketing margin 80.86 and 77.15 per cent in channel II and VI respectively, whereas wholesalers and collector have got the highest gross marketing margin 49.43 and 20.38 per cent in channel VII and lowest 6.42 and 14.46 per cent in channel IV and VI respectively. Retailer have got highest gross market margin 77.84 per cent in channel VIII and lowest 9.41 per cent in channel IV.

Table 8: Marketing margins and price spread (Rs. /Quintal) under various identified marketing channels

Channels	Marketing partners	Price paid	Marketing cost	Total cost	Price received	Market margin	Profit margin	Producer share in consumer 's rupee (%)
Channel I	Producer	180.43	34.2	214.63	824.67	644.24	610.04	95.85
Channel II	Producer	180.43	21.34	201.77	662.54	482.11	460.77	5.94
	Processer	6157.67	939.8	7097.47	10300	4142.33	3202.53	
	Retailers	10300	34.59	10334.59	10800	500	465.41	
Channel III	Producer	180.43	27.1	207.53	457.48	277.05	249.95	30.08
	Retailers	457.48	31.82	489.3	1430.62	973.14	941.32	
Channel IV	Producer	180.43	28.74	209.17	522.79	342.36	313.62	4.57
	Wholesalers	522.79	34.11	556.9	851.54	328.75	294.64	
	Processer	6346.67	939.80	7286.47	10300.00	3953.33	74.40	
	Retailers	10300	34.59	10334.59	10800	500	465.41	
Channel V	Producer	180.43	32.5	212.93	522.79	342.36	309.86	34.27
	Wholesalers	522.79	44.78	567.57	820.3	297.51	252.73	
	Retailers	820.3	61.82	882.12	1430.62	610.32	548.5	
Channel VI	Producer	180.43	32.5	212.93	443.07	262.64	230.14	29.20
	Collector	443.07	32.31	475.38	620.3	177.23	144.92	
	Retailers	620.3	44.78	665.08	1406.2	785.9	741.12	
Channel VII	Producer	180.43	42.3	222.73	443.07	262.64	220.34	38.16
	Collector	443.07	32.31	475.38	620.3	177.23	144.92	
	Wholesalers	620.3	52.98	673.28	1050.2	429.9	376.92	
Channel VIII	Producer	180.43	42.3	222.73	443.07	262.64	220.34	26.72
	Collector	443.07	32.31	475.38	620.3	177.23	144.92	
	Wholesalers	620.3	52.98	673.28	820.3	200	147.02	
	Retailers	820.3	61.82	882.12	1500	679.7	617.88	

Table 9: Marketing margins of partners in different marketing channels of papaya in Bilaspur district

Particular	Channe l I	Channel II	Channel III	Channel IV	Channel V	Channel VI	Channel VII	Channel VIII
TGMM	78.12	98.32	87.39	98.33	87.39	87.17	82.82	87.97
GMMp	100.00	9.41	22.16	6.68	27.38	21.43	30.20	19.90
GMMc	-	-	-	-	-	14.46	20.38	13.43
GMMw	-	-	-	6.42	23.80	-	49.43	15.16
GMMr	-	9.76	77.84	9.76	48.82	64.11	-	51.51
GMMpr	-	80.83	-	77.15	-	-	-	-
NMMP	94.69	11.16	20.98	7.67	27.89	20.62	29.69	19.50
NMMc	-	-	-	-	-	12.98	19.53	12.82
NMMr	-	11.27	79.02	11.39	49.37	66.40	-	54.67
NMMw	-	-	-	7.21	22.75	-	50.79	13.01
NMMpr	-	77.57	-	73.73	-	-	-	-

Processer has got high NMM 74.17 and 73.73 in channel II and IV. Collector was not sold the papaya direct to consumer they sold to wholesaler or retailer so they has not got more NMM as compare to other intermediaries they got highest NMM 19.53 per cent in channel VI and lowest 12.82 per cent in channel VIII.

CONCLUSIONS

The main value chain partners were input suppliers, papaya producers, wholesalers, retailers, collectors, exporters and consumers.The overall cost of input used for papaya was found to be Rs. 110345.28 per ha (80.62 per cent) which varied from Rs. 102140.85 to 112303.23 per ha at small, medium and large farms.The overall input-output ratio in the papaya cultivation was found to be 1:2.82. its maximum in small farms, 1:2.91, followed by medium farms, 1:2.86 and minimum in large farms with ratio of 1:2.82. Small farms have more home consumption (0.93 q/farm) as compared to medium and large farms. Marketable surplus was highest in large farms 1238.71 q/farm followed by medium 412.50 q/farm and 216.00 q/farm small farms respectively.The marketable surplus of produced was 216.00, 412.50 and 1238.71 for small medium and large group farms respectively.Eight main alternative channels were identified for papaya marketing. It was estimated that 716.12 quintals per farm of papaya are supplied in market by overall sample respondents in Bilaspur district. The main receivers from producers were collectors, wholesaler and retailer with an estimated percentage share of 48.81, 27.63 and 11.20 per cent respectively.Channel-VIII (producer – collector– wholesaler– retailer – consumer) carried out the largest followed by channel-V (producer– wholesaler– retailer – consumer), and channel VI (producer – collectors – retailer - consumer that carry a volume of 231.7, 185.8 and 94.61quintal per farm in that order.In Bilaspur district on an overall the quantity of papaya sold by farmer to consumer, collectors, wholesalers, retailers and processer was estimated at 9.31, 48.81, 11.22, 27.64 and 3.12 per cent of the study area.

REFERENCES

Asale, A., D. Yhanes and T. Buke (2016).Onion market chain analysis in Humbo District of Wolaita Zone, Southern Ethiopia.*International Journal of Scientific Research Engineering Technology*, 2(1):7-16.

Deliya, M. and Thakor, C. (2006).Differentiator in Marketing of Fresh Fruits and Vegetables from Supply Chain Management Perspective in India.*Journal of Research in Commerce & Management in India*,1: 40-42.

FAOSTAT.(2016). accessed on 10.05.2017 at http://www.fao.org/faostat/en/#home.

Sagar, S.B., Parmar, H.C. and Darji. (2012). Economics of Production of Papaya In Middle Gujarat Region Of Gujarat, India, *Global Journal of Biology, Agriculture & Health Sciences*,1(2): 10-17.

Price Analysis of Tomato for Major Markets of Maharashtra

A.S. Tingre*, A.A. Bhopale and R.G.Deshmukh
Department of Agricultural Economics & Statistics,
Dr. PanjabraoDeshmukh Krishi Vidyapeeth, Akola- 444 104 India
*Corresponding author: anandtingre@gmail.com
Received: 18th October 2018; Revised: 4thFebruary 2019; Accepted: 12thJune 2019

ABSTRACT

The present study aimed to study price movement of tomato i.e. seasonal variation, price volatility and co-integration among the major tomato markets in Maharashtra. For study purpose the data related to monthly average prices of tomato were collected from major markets of Maharashtra State viz. Pune, Aurangabad, Nagpur and Nashik for the period 2007-2016. Moving average method was used to study seasonal variations. The econometric tools like ADF test, Johansen's Multiple Co-integration test, and ARCH-GARCH model were used to study price volatility and co-integration among selected markets. The results of the study showed that the prices of tomato were higher during the months of June to July in selected markets. The higher prices were recorded during the year 2007, 2008, 2010 and 2016. The selected tomato markets having long run equilibrium relationship for the prices of tomato and there exists co-integration among them. The volatility shocks in the prices of tomato were quite persistent in the selected markets.

Keywords: *ADF test, ARCH- GARCH, Co-integration, price movement, price volatility, seasonal variation*

INTRODUCTION

Tomato is one of the most important protective food crops of India. The area under cultivation and production in India (2015-16) is 7.74 lakh hectares and 18.73 lakh tonnes (Horticultural Statistics at a Glance 2017). The major tomato producing states are Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Telangana, Odisha and West Bengal. India is one of the largest producers of tomatoes in the world, second only to China. Around 11% of the total world produce of tomatoes is cultivated in India.

Andhra Pradesh still holds the top position in tomato production, even after creation of Telangana. Andhra Pradesh share was 18% of all India produce. Karnataka is the second largest producer of tomatoes. Recently, Madhya Pradesh has shown remarkable growth in tomato production and now occupies third position in the list of largest tomato producing states. In Maharashtra, tomato is grown over an area of 44.24 thousand hectares and production of 10.22 thousand MT for the year 2015-16. The markets of Tomato in Maharashtra are co-integrated and they influences on prices of each other. For better marketing of any agricultural commodity the information regarding seasonality, seasonal variations, price volatility, price movement across the state and country, etc. is necessary. Analyzing the past trend in the price of commodities is also useful in understanding the present scenario and to formulate appropriate strategies to improve the marketing system. Therefore the present study has undertaken with the specific objectives to study the seasonal variations and cyclical variations in prices of tomato and to assess the price volatility and co-integration among the major tomato markets in Maharashtra.

MATERIALS AND METHODS

The data related to monthly average prices of tomato were collected for major tomato markets of Maharashtra state viz. Pune, Aurangabad, Nagpur and Nashik for the period 2007-2016 from AGMARKNET website of Government of India. Most widely used method of measuring seasonal fluctuations i.e. method of moving average was used to calculate seasonal indices. The residual method of estimating cyclical movement in time series was used for estimating cyclical indices, after eliminating the seasonal variation and trend components. Before analyzing any time series data testing for stationarity is per-requisite (Bollerslev, 1986; Engle and Granger,1987; Gosh, 2011; Granger, 1969; Johansen, 1988; Mukim*et al.*, 2009). The stationarity of time series data of selectedspot market prices of Tomato are tested by applying the Augmented Dickey-Fuller

test (ADF). Johansen's Multiple Co-integration test is employed to determine the long rum relationship between the prices of selected markets of tomato. In order to know the presence of price volatility the ARCH-GARCH analysis was carried out.

RESULTS & DISCUSSION

Seasonal indices for tomato prices

The mismatch between round the year consumption and seasonality in the production of crop leads to seasonal variations in prices of agricultural commodities. These variations may be purely due to seasonal production, poor storage facilities and retention power of tomato growers. The seasonal indices of monthly average prices of tomato in Pune, Aurangabad, Nagpur and Nashik markets were worked out to study seasonal variations, which are presented in Table 1.

Table 1: Seasonal indices of tomato prices for selected markets

Month	Pune	Aurangabad	Nagpur	Nashik
Jan	100.06	85.04	78.27	89.81
Feb	62.94	50.13	45.17	78.94
Mar	68.83	58.57	47.11	63.68
Apr	79.78	73.13	64.87	70.03
May	91.86	98.27	80.73	96.53
Jun	135.70	178.13	126.01	159.00
Jul	189.88	180.61	185.87	167.15
Aug	119.84	107.14	112.94	114.60
Sep	92.49	92.43	95.54	94.63
Oct	95.60	98.37	105.06	90.44
Nov	105.66	108.03	103.93	98.29
Dec	91.41	83.13	84.46	82.89

During June-July,highest price indices were observed in all the markets(Table 1). Prices began to decline slightly during August - October. Price indices were lowest in February-March in all markets. This is due to heavy arrivals and post harvest glut in the market.

Cyclical indices for tomato prices

Cyclical variations in prices were analysed in order to know the variations in prices over the years. The cyclical indices for tomatoprices were worked out and are presented in Table 2.

It is observed that the cyclical variations were observed in the prices of tomato in the selected markets. The higher prices were noted in the years 2007, 2008, 2010 and 2016. The rise in prices might be attributed to less production due to bad weather and stock in the hands of middlemen.

Table 2: Cyclical indices of tomato prices for selected markets

Year	Pune	Aurangabad	Nagpur	Nashik
2007	133.39	124.94	110.63	121.58
2008	118.21	116.92	113.69	102.36
2009	70.67	92.34	71.11	99.97
2010	114.76	115.54	164.84	131.78
2011	76.43	92.59	85.78	87.64
2012	109.97	77.74	92.02	97.38
2013	76.31	91.16	79.47	95.10
2014	84.62	83.89	77.44	62.83
2015	101.23	104.77	97.91	98.55
2016	114.42	100.07	107.08	102.77

Stationarity in price series

The results for testing the unit roots in tomato price series by Augmented Dickey-Fuller (ADF) test to check whether tomato prices are stationary in all selected markets (Table 3). It is observed that at level with lag 1 the ADF value for Pune market is less than the critical value at 1 % level of significance indicated the existence of unit root which implied that the price series of Pune is stationary. The table further showed that at first order difference with lag 1 the ADF values of Aurangabad, Nagpur and Nashik market were lower than the critical value indicated that the price series of these markets become stationary.

Table 3: ADF test results of tomato Prices for selected markets

Market	Level (ADF)	Critical Value (1%)	Stationary at
Pune	-8.175	-4.037	Original series
Aurangabad	-6.037		1st order
Nagpur	-8.017		1st order
Nashik	-6.734		1st order

Presence of price volatility

To assess the presence of price fluctuations in the prices of tomato in Pune, Aurangabad, Nagpur and Nashik markets, ARCH-GARCH analysis was carried out and the results are presented in Table4.

The sum of Alpha and Beta (á+b) indicated

ARCH and GARCH effect for the given market. It was observed that among the markets, the sum of Alpha and Beta is nearer to 1 i.e. 0.96, 1.11 and 1.008 for Aurangabad, Nagpur and Nashik markets, respectively, indicated that the volatility shocks in the prices of tomato are quite persistent for a long time in these markets.

Table 4: Results of ARCH-GARCH analysis of tomato prices for selected markets

Parameter	Pune	Aurangabad	Nagpur	Nashik
Alpha (á)	0.982	1.038	1.134	0.931
Beta (b)	-0.191	-0.078	-0.023	0.077
Sum of á & â	**0.791**	**0.96**	**1.111**	**1.008**

Market Co-integration

Johansen multiple co-integration trace test was applied for indicating the long-run relationship between the price series of selected markets. Co-integration is used instead of regular regression method because of its capacity in dealing with non-stationary series. The most popular co-integration method, developed by Johansen (1988) is applied. The test shows whether the selected tomato markets are integrated or not. The results of the test were presented in Table 5.The results of Co-integration test showed four co-integration equations were significant at 5% level of significance which implied that there existed co-integration among the markets.

Table 5: Results of multiple co-integration analysis of tomato prices

Hypothesized No. of CE(s)	Eigen Value	Trace Statistics	Critical Value5%	Prob.**	No. of Co-integrating Equation CE(s)
None*	0.34732	119.4321	63.8791	0	4
At most 1*	0.225618	69.93855	42.91525	0	
At most 2	0.189127	40.27848	25.87211	0.0004	
At most 3	0.128539	15.95977	12.51798	0.0128	

CONCLUSIONS

In order to minimize the price risk and to protect price security of farming community for tomato crop of Maharashtra state which is very volatile commodity in terms of market prices, it is suggested that the long term procurement policy should be adopted to maintain price stability throughout the year by declaring the MSP and procurement by Nodal agencies at least for major markets of the state.

REFERENCES

Bollerslev, T. (1986).Generalized Autoregressive Conditional Heteroscedasticity.*Journal ofEconometrics*,31:307-27.

Engle, R.F. and Granger, C.W.J. (1987).Cointegration and Error Correction: Representation,Estimation and Testing," *Econometrica*, 55(2): 251-276.

Gosh, M.(2011). Agricultural policy reforms and spatial integration of food grain markets in India. *Journal of Economic development*,36(2): 15-36.

Granger, C.J. (1969). Investigating Causal Relationships by econometrics models and cross spectral methods, *Econometrica*, 37: 425-435.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors, Journal of Economic Dynamics and Control, 12, 231-254.

Mukim, M., Singh, K., Kanakaraj, A. (2009). Market integration, transaction costs and the Indian wheat market: A systematic study. *Economic & Political Weekly*,XLIV(22): 149-155.

Performance of SHGs Engaged in Soybean and Orange Production

P.G. Chaudhari, D.H. Ulemale , R.K. Patil and V.M. Gedam

Department of Agricultural Economics and Statistics, Shrishivaji Agriculture College, Amravati, Maharashtra, India
Corresponding author: prafull55chaudhari@gmail.com
Received: 14th September 2018; Revised: 4th March 2019; Accepted: 2nd June 2019

ABSTRACT

Self-Help Groups (SHGs) are group of rural poor who have volunteered to organize themselves into a group for eradication of poverty of members. Self Help Groups (SHGs) activities must be given importance to eradicate poverty, increase the economic growth and for better standard of living of the poor people. In India micro-credit programmes are implemented through group structures which are known as SHGs. In view of these, present study has been conducted in Amravati district of Maharashtra state with objective to study the economics of activities performed by SHGsand impact of SHGson income, investment, consumption, saving and employment. From Amravati district Warud and Nandgaon (KH) tahsils were selected. From each tahsil, ten SHGswere randomly selected. The selected SHGswere categorized, taking into consideration group activities performed by SHGs. The data on two agriculture based activities viz., Soybean production and orange production was collected by personal interview. This indicated that after joining the SHG, per member income increased to the extent of 41.32 per cent. This increase in income was 50.5 per cent in soybean production and 32.17 per cent in orange production activity. Within activities of groups, the increase in employment was 38.17 per cent in soybean production activity and 35.3 per cent in orange production activity. The investment in different assets increased to the extent of 41.38 per cent after participation in SHG group. Within the activities of groups, the increase in investment was 36.8 per cent in soybean production activity and 45.95 per cent in orange production activity. After participation in SHG's activities, per member saving increased by 62.11 per cent in soybean production and 64.26 per cent in orange production activity.
Keywords: *Impact, Income, Employment, Saving, Investment.*

INTRODUCTION

Since independence, the Government of India and State Government have been taking various measures to improve the standard of living of economic position of women. The main source of employment for women is farm labour. But this does not fulfill all their needs. Indebtedness has become the hallmark of the rural life. Participation in self-help groups helps in saving some money out of their daily household expenses. Also, they can avail loan with lower interest rates. This has led a sort of change in the society's view towards woman, in general.

Self-Help Group (SHG) is now a well-known concept, as it was almost a two-decade old. It is reported that the SHGshave a role in hastening country's economic development. SHG shave now evolved as a movement.Mainly, members of the SHGsare women. Consequently, participation of women in the country's economic development is increasing. They also play an important role in elevating the economic status of their families. This has led boost to the process of women's empowerment (Joshi, 2004; Samuel *et al.*, 2011 and Tawale&Pawar, 2011).

Nearly 560 banks like NABARD, Bank of Maharashtra, State Bank of India, Co- operative Banks, Regional rural banks, the Government institutions like Maharashtra Arthikvikasmahamandal (MAVIM), District Rural Development Agency (DRDA), Municipal corporations and more than 3,024 NGOs are collectively and actively involved in the promotion of SHG movement. The present study was conducted to workout the economics of activities performed by SHGs and to assess the impact of SHG on the economic status of group members.

METHODOLOGY

Selection of the study area

The present study was undertaken to study the self-help groups of Amravati district, which are being engaged in agriculture based activities. Two tahsils were selected for thestudy namely, Warud and Nandgaon (KH).

Data source and Sampling

The primary data were collected with the help of personal interview of self-help groups which are engaged in agriculture based activities to analyse the impact of SHGson income, employment, expenditure and savings patterns of SHGsmembers and to study the economics of activities performed by SHGs. Selection of activities: two agriculture activities were selected for this study viz., soybean production and orange production. Simple random sampling method was used for data collection.20 self-help groups were selected for the present study according to agriculture based activities.

Analytical tools

Simple tabular analysis was used to study the economics of activities performed by SHGsand to study the impact of SHG on income, employment, consumption and investment of SHG members.

RESULTS AND DISCUSSION

The results in respect of working of self-help groups in Amravati district and their impact on income, employment, consumption and savings of members are discussed in this chapter.The cost of cultivation of Soybean was Rs. 43768.11per hectare (Table1).Among the different items of expenditure, human labour accounted for 24.5 per cent of the total cost. The other items of expenditure were bullock labour (7.41 per cent), seeds (7.04 per cent), machinery charges (13.27 per cent) and fertilizers(2.12 per cent).The share of interest on working capital and fixed capital was 3.81per cent and 1.81 per cent, respectively of the total cost.

The gross income from soybean was Rs.61920.49per hectare (Table 2). Per hectare cost 'A', cost 'B', and cost 'C' was Rs. 30006.4, Rs. 40978.11 and Rs. 43768.11, respectively, whereas per hectare income at cost 'A', cost 'B' and cost 'C' was Rs. 31914.08, Rs. 20942.38 and Rs. 18152.38, respectively.It was evident that the cultivation of soybean was profitable with B.C ratio at cost 'A', cost 'B' and cost 'C' was 2.07, 1.50, and 1.45, respectively.

Table 1:Cost of Soybeancultivation

Particulars	Units	Units used	Total cost (Rs.)	Per cent to Cost C
Hired labour				
Male	Days	19.10	3718.00	8.50
Female	Days	41.90	4213.50	9.62
Total	Days	61.00	7931.50	18.12
Bullock labour	Pair days	6.60	3242.20	7.41
Machinery	Hours	6.70	5804.70	13.27
Seed	Kg	71.70	3082.30	7.04
Manure	Trolley	2.00	4000.00	9.14
Fertilizer	Kg	110.69	925.07	2.12
Nitrogen	Kg	41.01	302.81	0.70
Phosphorus	Kg	60.23	447.30	1.02
Potassium	Kg	9.44	174.94	0.40
Irrigation Charges	Rs.		1415.70	3.24
Crop protection	Litre		434.00	1.00
Incidental charges	Rs.		465.09	1.06
Repairing Charges	Rs.		486.70	1.11
Land Revenue	Rs.		137.40	0.32
Depreciation	Rs.		414.50	0.95
Interest on working capital @6 % p. A.	Rs.		1667.23	3.81
Cost A	Rs.		30006.40	68.55
Rental value of land (1/6 of gross value of produce – land revenue)	Rs.		10182.68	23.26
Interest on fixed capital @ 10 % p.a.	Rs.		789.02	1.81
Cost B	Rs.		40978.11	93.62
Family labour				
Male	Days	8.00	1510.00	3.45
Female	Days	12.80	1280.00	26.84
Total	Days	20.80	2790.00	6.38
Cost C	Rs.		43768.11	100.00

Table 2: Economics of Soybean production

Particulars	Value
Yield (q/ hectare)	17.40
Price (Rs./q)	3486.50
Gross income (Rs.)	61920.49
Cost concept (Rs.)	
Cost 'A'	30006.40
Cost 'B'	40978.11
Cost 'C'	43768.11
Net Return (Rs.)	
At Cost 'A'	31914.08
At Cost 'B'	20942.38
At Cost 'C'	18152.38
Benefit-cost Ratio	
At Cost 'A'	2.07
At Cost 'B'	1.50
At Cost 'C'	1.45

The cost of maintenance of orange orchards was worked out to be Rs.161174.65 per hectare (Table 3). The cost 'A' was Rs. 91886.48 contributing 57.02 per cent share in the cost 'C'. In cost 'A', the major item of cost was hired male labour i.e. Rs. 30020.00 contributing 18.62 per cent share in the cost 'C'. The expenditure on bullock labour was worked out to be Rs. 6650.00per hectare,contributing 4.12 per cent share in the cost 'C'. The expenditure on manure, irrigation and plant protection were worked out to Rs. 9720.00, Rs.4350.00 and Rs. 8900.00 which accounted 6.04, 2.70 and 5.52 per cent share, respectively in cost 'C'.

Table 3: Cost of maintenance of Orange Orchard (per hectare)

Particulars	Units	Units used	Total cost (Rs.)	Per cent to Cost C
Hired labour				
Male	Days	150.10	30020.00	18.62
Female	Days	69.50	6950.00	4.31
Total	Days	219.60	36970.00	22.94
Bullock labour	Pair days	13.30	6650.00	4.12
Machinery	Hours	3.50	1400	0.87
Manure	Trolley	32.40	9720.00	6.04
Fertilizer				
N	Kg	296.50	3854.5	2.40
P	Kg	165.40	3638.8	2.25
K	Kg	304.00	5472.00	3.40
Irrigation charges	Rs.		4350.00	2.70
Crop protection	Litre		8900.00	5.52
Incidental charges	Rs.		832.00	0.52
Repairing Charges	Rs.		524.00	0.32
Land Revenue	Rs.		176.5	0.11
Depreciation	Rs.		4460.00	2.76
Interest on working capital @6 % p. A.	Rs.		4938.68	3.06
Cost A	Rs.		91886.48	57.02
Rental value of land (1/6 of gross value of produce – land revenue)	Rs.		46216.67	28.68
Interest on fixed capital @ 10 % p. A.	Rs.		5410.00	3.36
Amortization cost	Rs.		11102.00	6.89
Cost B	Rs.		154614.65	95.92
Family labour				
Male	Days	20.80	4160.00	2.59
Female	Days	24.00	2400	1.49
Total	Days	44.80	6560.00	4.08
Cost C	Rs.		161174.65	100

In the cost 'B' the major items of expenditure were the rental value of land and the amortization cost which worked out to be Rs. 46216.67 and Rs.11102.00 in order to constituting 28.68 and 6.89 per cent share in the total cost 'C', respectively.

The gross return was found to be Rs.278356.00per hectare as depicted in Table 4.Net returns obtained from orange at cost 'A', cost 'B', and cost 'C' was Rs.186469.5, Rs. 123741.4 and Rs. 117181.4 per hectare, respectively.

The benefit cost ratio indicates the return from each rupee investment in orange production. The B.C ratio obtained at cost 'A', cost 'B' and cost 'C' was 3.03, 1.79, and 1.72, respectively.

Table 4: Economics of Orange production

Particulars	Value
Yield (q/ha)	195.40
Price (Rs/q.)	1424.00
Gross income (Rs.)	278356.00
Cost concept (Rs.)	
Cost 'A'	91886.48
Cost 'B'	154614.65
Cost 'C'	161174.65
Net Return (Rs.)	
At Cost 'A'	186469.50
At Cost 'B'	123741.40
At Cost 'C'	117181.40
Benefit-cost ratio	
At Cost 'A'	3.03
At Cost 'B'	1.79
At Cost 'C'	1.72

The impact of SHG association on the different economic parameters of the soybean producers is presented in Table 5. Employment was increased from394.0 man days per annum before SHG association to534.5 man days per annumafter SHG association. Similarly, income was increased from Rs.16619.00 to Rs. 24604.00, savings was increased from Rs.2266.5 to Rs.3628.5, consumption had increased from Rs.15150.00 to Rs.17298.00 and investment was increased from Rs.15456.00 to Rs.20694.00 following the member's association with the SHGs. The per cent change in employment, income, saving, consumption and investment was 38.17, 50.50, 62.11, 14.96 and 36.80, respectively.

Table 5: Financial impact of soybean SHGs on members

Parameters	Mean		Mean Difference	% Change
	Before	After		
Employment (mandays)	394.00	534.50	140.50	38.17
Income (Rs.)	16619	24604	7985	50.50
Saving (Rs.)	2266.50	3628.50	1362	62.11
Consumption (Rs.)	15150	17298	2148	14.96
Investment (Rs.)	15456	20694	5238	36.80

The impact of SHG association on the different economic parameters of the orange producers is presented in Table 6. Employment had increased from521 man days per annum before SHG association to701.5 man days per annum after SHG association. Similarly, income was increased from Rs.89643.5 to Rs. 119306.9, savings was increased from Rs.2278.0 to Rs.3672, consumption was increased from Rs.27960 to Rs.30428 and investment was increased from Rs.60928.00 to Rs.88786.00 following the member's association with the SHGs. The percent change in employment, income, saving, consumption and investment was 35.3, 32.17, 64.26, 8.93 and 45.95 respectively.

Table 6: Financial impact of orange SHGs on members

Parameters	Mean		Mean Differ-ence	% Change
	Before	After		
Employment (mandays)	521	701.5	180.5	35.3
Income (Rs)	89643.5	119306.9	29663.4	32.17
Saving (Rs)	2278	3672	1394	64.26
Consumption (Rs)	27960.5	30428	2467.5	8.93
Investment (Rs)	60928	88786	27858	45.95

CONCLUSIONS

After joining the self-help group they were engaged in agricultural based activities like dairy, poultry, vermicompost and organic farming which improve their standard of living.The per hectare cost of cultivation i.e. Cost 'C' of SHGsfor soybean was Rs.43768.11, whereas Cost 'A' was Rs.30006.4 which accounted for 68.55 per cent of the total cost and Cost B was Rs. 40978.11; sharing 93.62 per cent to the total cost. The major items of working expenditure on soybean farms were Rental value of land (23.26%), hired human labour (18.12%), machine power (13.27%), seed (7.04%) and bullock

labour (7.41%).Per hectare gross income received by Income at costs 'A', 'B' and 'C' was Rs. 31914.08, Rs. 20942.38 and Rs. 18152.38 respectively. B.C ratios at costs 'A', 'B' and 'C' were 2.07, 1.50, 1.45 respectively. It indicates the profit at cost 'A' is maximum followed by profits at cost 'B' and cost 'C'.Per hectare cost of maintenance of orange production by SHGswas Rs. 161174.65, while per hectare yield was 195.4. The major items of the cost were hired human labour, plant protection charges, manures and fertilizers. The share of hired human labour was 22.94 per cent of cost 'C'.It was found that, per hectare yield and gross return of orange obtained were 195.4 quintals and Rs. 278356.00, respectively. B:C ratio at cost 'C' was 1.72.The overall employment of the members was increased by 160.5man days, income was increased by Rs.18824.2, saving was increased by Rs.1378, investment was increased by Rs.16548 and consumption was increased by Rs.2307.75. The Improvement in savings was observed across all the SHGsfrom soybean production was Rs. 61920.49. categories of members.The overall per cent change in employment, income, saving, consumption and investment was 36.74, 41.34, 63.18, 24.5511.94, and 41.38 respectively.

REFERENCES

Joshi, M. (2004).Empowering rural women through watershed project.*Kurukshetra*, 52(9): 19-24.

Samuel, J.,Kunnal, L.B. and Ashalatha, KV. (2011). Impact of Microfinance on the Upliftment of rural women-an economic analysis.*Journal of Rural Development*, 30(2):127-141.

Tawale, J.B. and Pawar, B.R. (2011).Cost, returns and profitability of soybean production in Maharashtra.*International Research Journal of Agricultural Economics & Statistics,* 2(2): 174-176.

Temporal Changes in input-output prices and cost of cultivation of cotton in Vidarbha

S.A. Borde*, S. S. Thakare, N. J. Chikhale
Department of Agricultural Economics and Statistics,Shri, Shivaji Agriculture College, Amravati- 444 603. Maharashtra India
*Corresponding author: shivraj.borde@gmail.com
Received: 2nd October 2018; Revised: 10th January 2019; Accepted: 25th May 2019

ABSTRACT

In this study an attempt has been made to study changes in input- output price, their parity and income from cotton, in Vidarbha region of Maharashtra state. The present study used cross sectional cum time series data of Vidarbha region for cotton for ten years i.e. from 2006-07 to 2015-16. Every year, 50 farmers were selected for the present study to study the change in input utilization over period of time and the extent of changes in input prices. Simple tabular analysis was carried out by using standard cost concept. The study revealed that prices of all inputs showed an increasing trend during the period 2006-07 to 2015-16. The compound growth rate of input prices for cotton was highest for wages rate (23.29 / annum) followed by fertilizer price (22.71 per annum) the study also reveals that, the gross return for cotton crop has recorded an increase of 338.43 per cent during the period of study. This is attributable to the increase in the prices of main product. The cost of production of cotton has increased from ₹2021.04 in 2006-07 to ₹ 4079.00 in 2015-16.

***Keywords**: Compound growth rate, cotton, parity, temporal changes*

INTRODUCTION

Cotton is a very important fibre crop of global importance with a significant role in Indian Agriculture, Industrial development, employment generation and improving national economy. Cotton known as white gold or king of fibre and plays a prominent role in Indian economy. In India, it is grown annually on 122.35 lakh hectares with 377 lack bales of an average production. Even though India ranks first in area in the world, it occupies third position in production and low position in productivity. The average productivity of cotton in India was 523.83 kg/ha, while in Maharashtra it is grown in an area of 4206.6 hectares with production of 6048.8 tonnes and productivity is only 244 kg/ha. Cotton is one of the important cash crops of Vidarbha. In Vidarbha it is grown in an area of 23,424 hectares with production of 31,765 Tonnes of an average production and productivity is 262 kg/ha which is comparatively lower than India's cotton productivity.

METHODOLOGY

Study area and sample

The Agricultural Price and Cost (APC) scheme under the guidance of government of Maharashtra provides valuable data about agriculture in Maharashtra. The data maintained by APC is made use of in the present study. The APC make use of a three stage stratified random sampling procedure with tehsil as the primary unit, cluster of three villages as the secondary unit and operational holding within the cluster as the third and ultimate unit. The present study used cross sectional cum time series data of Vidarbha region for cotton crop for the ten years i.e. from 2006-07 to 2015-16. Every year 50 farmers were selected for each crop for the present study.

Index of input prices

To study the temporal changes in input and output prices and cost of cultivation, the simple tabular analysis was carried out by using standard cost concept. The input prices are composite indices of prices of individual items of inputs. The indices were constructed using the cost of cultivation data for the period of last ten years with average of first triennium ending as the base year. First, the price indices of inputs of seed, labour, bullock, fertilizer, farm yard manure, capital, pesticide, depreciation on implements and rental value of own land were constructed (Alshi*et al.* 1983; Gurjar& Varghese, 2005; Pawar&Pawar, 2006; Shendage *et al.*2009; Shende&Thakare, 2011; Shelke*et al*, 2016 and Nayak& Shankar, 2017).

The composite indices of input prices for Cotton were constructed as

$$\text{Index of Input Price} = \sum_{i=1}^{9} S_i \left(\frac{P_{it}}{P_{io}} \right)$$

Where,

Si = average share of i^{th} input in total input cost. P_{it}/P_{io} is the price index of i^{th} input in the t^{th} year using average of first triennium as the base year, i=1stands for Human wage index, i=2 Bullock wage index, i=3 Fertilizer price index, i=4 FYM price index, i=5 seed price index i=6 Interest rate index, i=7 Pesticide expenditure index, i=8 Depreciation charges index, and i=9 Rental value of land index.

Changes in input and output prices and cost of cultivation

The data were subjected to tabular analysis to study the changes in input and product prices, cost and returns for cotton. Simple tabular analysis was used to analyze the temporal changes in the cost of cultivation of selected crops. Cost structure of each crop was be analyzed by working out the share of each item of cost in the total cost of cultivation. The changes in the structure of cost of cultivation of crops was be assessed by comparing the cost structure of each crop during the latest years with that of early years. The share of total temporal change as assignable to individual cost components was also ascertained.

The cost of production of the grain yield on per quintal basis was be worked out after the apportionment of total cost of cultivation between the main product and the by-product in proportionate to their contribution to the gross value of output. The cost of production per quintal is obtained by dividing the cost of cultivation attributable to the main product by the grain yield on unit area basis. The compound growth rate of values between the initial year and the later year has also been worked out by using formula

$$Y = a.b^t$$

Where, Y = Quantity / prices of inputs / yield / prices of output / value of output / cost of production. a = Intercept b =Regression coefficient, t = Time variable

From the estimated function the compound growth rate was worked out by –

CGR (r) = [Antilog (log b) – 1] x 100

Where, r = Compound growth rate

RESULTS AND DISCUSSION

Changes in input and output prices

Transformation of agriculture from subsistence to profitable farm business is a techno-organizational process, the success of which largely depends on the relative prices of various inputs and outputs. Therefore, it would be interest to examine the changes in prices of inputs and outputs.

Compound growth rates of input and output prices

The rate of growth of average input prices and output prices for cotton crop at current prices are presented in Table 1. The prices of all inputs showed an increasing trend during the period 2006-07 to 2015-16. The compound growth rate of input prices for cotton was highest for Wages rate (23.29 per cent per annum) followed by prices of Fertilizer price (22.71 per cent per annum) and Farm Yard Manure (21.95 per cent per annum). The per cent growth rates in seed prices and bullock labour prices were observed to be 13.37 per cent and 9.31 per cent per annum respectively. The output prices increased at an annual compound rate of 21.28 per cent per annum for cotton during the period under study.

Table 1: Compound growth rates of input and output prices at current and constant prices

Items	Current Prices	Constant Prices
Input Prices		
Wages rate (₹ /ha)	23.29***	8.74***
Bullock labour price (₹ /ha)	9.31*	-0.34
FYM price (₹ /ha)	21.95***	11.18***
Fertilizer price (₹ /ha)	22.71***	11.88***
Seed price (₹ /ha)	13.37***	3.36***
Output Price (₹ /ha)	21.28***	10.58***

****, **, *denotes significant at 1%, 5% and 10% level, respectively*

The result presented in Table 1 also showed that the compound growth rates of F.Y.M prices and Fertilizer price rate for cotton at constant prices is increased at an annual rate of 11.18 per cent and 11.88 per cent respectively.

Parity between prices received for products and prices paid for inputs

Parity prices for farm products are those prices which would give the same purchasing power to the producer as prevailed in the base year. In order to examine the parity between the prices received for output and prices paid for agricultural inputs, parity indices were computed by deflating output price indices by the input price indices.

Parity between output price index and input price index for cotton

The data on input-output price indices for cotton crop is presented in Table 2 It is evident from the table that between 2006-07 to 2015-2016, the input price index for cotton increased by 6 per cent, while the increase in output price was only 5 per cent.

Table 2: Parity* between output price index and input price index for cotton

Years	Input price index	Output price index	Parity index
2006-2007	89.07	85.64	96.15
2007-2008	106.65	98.77	92.61
2008-2009	87.70	115.59	131.80
2009-2010	98.59	73.38	74.43
2010-2011	106.99	131.36	122.78
2011-2012	116.73	95.00	81.38
2012-2013	97.62	93.02	95.29
2013-2014	123.08	106.77	86.75
2014-2015	86.52	100.21	115.82
2015-2016	100.38	94.89	94.53

**Base year- Average of triennium Ending -2006-2007 to 2008-2009*

Further, the output-input price parity were decreased during year 2006-2007, to 2007-2008, 2009-10 and from 2011-12, to 2013-14, and 2015-16, increased in the subsequent years, indicating there by in the year 2008-09, 2010-11, 2014-15, and 2006-2007 to 2007-08 and 2009-10, 2011-12, 2012-13, 2015-16 the output price were lower than input price and term of trade was unfavourable for cotton growers. However, the term of trade was favourable for the cotton growers in the remaining years.

Changes in cost of cultivation of cotton

The changes in the cost of cultivation of Vidarbha are presented in Table 3. The total cost of cotton has gone up from ₹ 18254.84 per hectare in 2006-07 to ₹ 78575.88 per hectare in 2015-16 depicting an increase by 4.30 times during a period of study. The increase has occurred in all major items of cost like hired human labour, family labour, bullock labour, machine labour, seed, fertilizer, farm yard manure, insecticide, rental value of owned land and interest on working capital but the costs of interest on fixed capital and depreciation cost was found to have declined. The cost of human labour, machine labour, seeds, fertilizer and cost of human labour has increased at a faster rate. Among operational cost items, hired human labour (22.52) recorded the maximum share followed family labour (13.52) and bullock labour (8.10) in the increase in cost of cultivation over time.

Out of the total increase of ₹ 60321.04 in the total cost of cultivation per hectare the operational cost items contributed about 76.91 per cent and the remaining 23.09 per cent by fixed cost items. The increase in fertilizer, farm yard manure and insecticide charges has been to the tune of 6.76 per cent, 4.97 per cent and 3.22 per cent respectively of the total increase in cost of cultivation.

The relative shares of different inputs in the cost of cultivation of cotton at two points of time are also given in Table 3The share of operational cost has remained around 77.08 per cent in 2015-16, which was higher than that in 2006-07. But within operational cost, the share of machine labour in the total cost increased from 1.76 per cent in 2006-07 to 4.40 per cent in 2015-16 and the share of bullock labour in the total cost decreased from 13.07 in 2006-07 to 9.26 in 2015-16. The decrease in the share of bullock labour is on account of substitution by machine labour also the share of fertilizers in the total cost increases from 6.65 per cent in 2006--07 to 6.74 per cent in 2015-16, (Gurjar and Varghese 2005 reported that the share of fertilizer in total cost decreased from 12.57 per cent in 1981-82 to 7.27 per cent in 1999-00 for wheat crop in Rajasthan) though the absolute cost due to fertilizers and bullock labour has increased over the years. Out of the fixed cost items, the rental value of land accounted highest share (i.e. 17.82 per cent) which is followed by land revenue and taxes.

The extent of change in physical inputs and their prices along with changes in physical output and their prices and gross return for cotton over time is given in Table 4. It is remarkable to note that the seed rate in physical term has come down for cotton crop over the years. There for, the positive change in the cost of seed could be exclusively attributable to large increase in the prices of seed over time. The prices of seed increased at a high rate, it may be due to introduction of BT cotton in Vidarbha region from the years 2001-02. As far as fertilizer is concerned, the positive change in the cost of cultivation of cotton was mainly due to the increase in physical quantity of fertilizer applied for cotton. The large increase in the share of cost in cotton due to bullock labour is attributable to increase in wage rate as the use of bullock labour has declined for cotton.

Table3: Changes in cost of cultivation of cotton

Particulars	Cost of cultivation				Change in 2015-2016 Over 2006-2007		Share in total Change (%)
	2006-2007		2015-2016				
	₹ /ha	Per cent	₹ /ha	Per cent	₹ /ha	Per cent	
Operational costs							
Hired human labour	4125.45	22.60	17712.16	22.54	13586.71	329.32	22.52
Family labour	1771.95	9.71	9924.42	12.63	8152.47	460.08	13.52
Bullock labour	2386.02	13.07	7274.80	9.26	4888.78	204.89	8.10
Machine labour	320.48	1.76	3458.57	4.40	3138.09	979.18	5.20
Seed	2392.25	13.10	5590.05	7.11	3197.8	133.67	5.30
F. Y. M	940.05	5.15	3935.09	5.01	2995.04	318.60	4.97
Fertilizer	1214.14	6.65	5294.05	6.74	4079.91	336.03	6.76
Insecticides	465.82	2.55	2411.43	3.07	1945.61	417.67	3.22
Incidental charges	167.61	0.92	1427.07	1.82	1259.46	751.42	2.09
Repairs	147.85	0.81	671.85	0.86	524	356.41	0.87
Interest on working capital	237.10	1.30	2863.53	3.64	2626.43	1107.73	4.35
Sub-total (A)	14168.72	77.62	60563.02	77.08	46394.3	327.44	76.91
Fixed Cost							
Land revenue and taxes	227.15	1.24	51.35	0.07	-175.8	-77.39	-0.29
Depreciation	213.66	1.17	1142.87	1.45	929.21	434.90	1.54
Rental value of Land	3168.68	17.36	13923.52	17.72	10754.84	339.41	17.82
Interest on fixed capital	476.63	2.61	2895.12	3.68	2418.49	507.41	4.01
Sub-total(B)	4086.12	22.38	18012.86	22.92	13926.74	340.81	23.09
Cost C (A+B)	18254.84	100	78575.88	100	60321.04	330.44	100

Table 4: Extent of changes in inputs and output

Particular	2006-2007 (base year)	2015-2016 (current year)	Percent change in 2015-2016 over base year	Growth rate per annum (%)
Quantity of inputs				
Seed (Kg/ha)	1.77	2.81	58.75	-0.86
Fertilizer (Kg/ha)	86.51	108.44	25.34	5.57*
Manure (q/ha)	18.90	31.11	64.60	10.29***
Human labour (hrs/ha)	832.74	1026.73	23.30	4.5***
Bullock labour (hrs/ha)	132.43	108.52	-17.79	1.69
Prices of inputs				
Seed (₹ /kg)	977.77	2066.66	131.52	9.00
Fertilizer (₹ /kg)	14.02	34.85	248.57	20.87
Manure (₹ /q)	50.00	75.00	50.00	11.71
Human labour (₹ /hrs)	3.67	17.24	369.75	3.05
Bullock labour (₹ /hrs)	17.60	69.60	295.45	19.27***
Yield (q/ha)				
Main product	9.62	19.07	98.23	18.05***
Price of output (₹ /q)				
Main product	1983.94	4351.63	119.34	2.51
Value of output (₹ /ha)	19116.33	82242.23	330.22	20.57***
Gross return	19116.33	82242.23	330.22	20.57***
Cost of production (₹ /q)	2021.04	4079.00	101.83	7.96***
Minimum Support Price	1770.00	3800.00	123.53	9.64***

****, **, *denotes significant at 1%, 5% and 10% level, respectively*

The gross return for cotton crop has recorded an increase of 338.43 per cent during the period study. This is attributable to the increase in the prices of main product. The cost of production of cotton has increase from ₹ 2021.04 in 2006-07 to ₹ 4079.00 in 2015-2016. In terms of annual growth rate of the estimated parameters of cotton during the period, the cost of seed has increased by 9.00 per cent per annum. Due to increase in the cost of seed the physical quantity of seed has declined i.e. -0.86. The price and physical quantity of manure has increased 11.71 and 10.29 per cent per annum simultaneously while the minimum support prices had increase 9.64 per cent per annum which recorded an increase of 123.53 per cent over the period of time.

Changes in cost

The cost of production per unit of output depends on the per hectare cost of cultivation and yield. For computing the cost of production at constant factor prices, the unit cost of production at current prices was deflated by an input price index series taking initial triennium ending average as the base year.

Changes in cost of production of cotton

The cost of production at current and constant prices for cotton is presented in Table 5. The Table revealed that, the increase in yield in the years 2009-10 to 2013-14 and in year 2015-16 resulted in substantial fall in the cost per unit of output of cotton at current prices. Again in years 2006-07 to 2008-09 and in 2014-15 a fall in yield per hectare brought about a further sharp escalation in/unit cost output.

The examination of cost of production at constant price did not indicate any clear trend. The remaining variation in cost could be explained in term of yield fluctuation over the rear. It was further observed that, whenever there was any improvement in the yield, it brought down the cost of production.

The average cost of production varied from ₹ 2021.04 with an average yield of 9.62q in the year 2006-2007 to ₹ 4239.70/q with an average yield 12.84q in the year 2011-2012. This clearly indicates that technological breakthrough in the cultivation of cotton has not compensated the cost push inflation. Therefore /unit cost of output did not decline over time. It has been hypothesized that with the improvement in productivity of crops the production function must shift upward and cost of production at constant prices must decline. The analysis revealed that the cost of production did not decline. Thus it can be concluded that the technological development in cotton has not shown its impact in reducing the cost of production in Vidarbha.

Table 5: Cost of Production of cotton

Years	Cost C per qat Current price (₹)	Input price index	Cost C per qat constant price (₹)	Yield/ ha. (q)	MSP at constant prices
2006-2007	2021.04	89.07	2269.05	9.62	1770.00
2007-2008	2475.77	106.65	2321.40	7.78	1800.00
2008-2009	2278.04	87.70	2597.54	11.61	2500.00
2009-2010	2729.76	98.59	2768.80	13.93	2500.00
2010-2011	3465.85	106.99	3239.41	13.95	2500.00
2011-2012	4239.70	116.73	3832.06	12.84	2800.00
2012-2013	3591.39	97.62	3678.95	26.97	3600.00
2013-2014	3318.29	123.08	3414.25	19.21	3700.00
2014-2015	4030.87	86.52	4658.89	15.11	3750.00
2015-2016	4079.00	100.38	4063.56	19.07	3800.00
CGR (%)	7.96***		7.88***		9.64***

****, **, *denotes significant at 1%, 5% and 10% level, respectively*
Cost C indicates the total of operational cost and fixed cost i.e. cost A + Cost B

Changes in cost and returns from cotton

The data on cost and returns from cotton at different point of time are presented in Table 6. The result reveals the gross income from cotton increased at an annual rate of 21.22 per cent per annum from 2006-07 to 2015-16. The increase in gross income may be attributed to increase in output price as well as increase in output price as well as increase in yield of main product. However, the rate of increase in cost of cultivation /ha was 17.38 per cent. This resulted in an improvement in the net income/ha of cotton crop over the years. This was further reflected by output-cost ratio, which increased from 1.050 in 2006-2007 to 1.244 in 2015-2016. However, from the year 2010-11, 2013-2014 and in 2014-2015 the output-cost ratio was very impressive mainly due to high productivity/unit area.

Table 6: Changes in cost and return from cotton

Year	Input price index	Output price index	Gross income /ha	Cost C/ha	Net income /ha	Input-Output ratio
2006-2007	89.07	85.64	19124.85	18213.80	911.05	1.050
2007-2008	106.65	98.77	18054.88	16230.55	1824.33	1.112
2008-2009	87.70	115.59	30961.69	24974.54	5987.15	1.240
2009-2010	98.59	73.38	42513.70	33820.75	8692.95	1.257
2010-2011	106.99	131.36	65701.85	42561.25	23140.60	1.544
2011-2012	116.73	95.00	69713.14	50962.17	18750.97	1.368
2012-2013	97.62	93.02	92557.55	72900.68	19656.87	1.270
2013-2014	123.08	106.77	100462.3	57813.99	42648.31	1.738
2014-2015	86.52	100.21	77140.34	50788.87	26351.47	1.519
2015-2016	100.38	94.89	83849.24	67379.22	16470.02	1.244
CGR (%)	0.83	0.62	21.22***	17.38***		3.27**

****, **, *denotes significant at 1%, 5% and 10% level, respectively*

The input price index for cotton crop increase at an annual compound growth rate of 0.83 per cent per annum while the output price index increase at annual rate of 0.62 per cent per cent per annum.

CONCLUSION

It can be concluded that prices of all inputs showed an increasing trend during the period 2006-07 to 2015-16. The compound growth rate of input prices for cotton was highest for wages rate (23.29 / annum) followed by fertilizer price (22.71 per annum) the study also reveals that, the gross return for cotton crop has recorded an increase of 338.43 per cent during the period of study. This is attributable to the increase in the prices of main product.

REFERENCES

Alshi, M.R., Kumar, P. and Mathur, V.C. (1983). Technological change and factor share in cotton production: A case study of Akola cotton. *Indian Journal of Agricultural Economics*, 38(3):407- 415.

Gurjar M.L. and Varghese, K.A. 2005.Structural changes over time in cost of cultivation of Major Rabi Crops in Rajasthan. *Indian Journal of Agricultural Economics*, 60(2): 249-263.

Nayak, A.K. and Shankar, E. (2017). An economic analysis of production of Bt cotton in Adilabad district of Telangana state. *International Research Journalof Agricultural Economics& Statistics*,8(2): 222-228.

Pawar, D.B. and Pawar, B.R. (2006).Effects of cotton hybrids and farm sizes on economics of cotton production under rainfed condition.*Journal of Cotton Research and Development*, 20(2): 306-309.

Shelke, R.D., Bhogaonkar, M.M. and Chavan, R.V. (2016).Cost, returns and profitability of Bt-cotton production in beed district.*International Journal of Commerce& Business Management,*9(1): 58-61.

Shendage, P.N.,Yadav,D.B.,Waghmare, M.N. and Jadhav, K.L. (2009).Input-output prices, their parity and Income from major cereals in Maharashtra.*Agricultural Situation in India*, LXV(11): 675-682.

Shende N.V. and Thakare, S.S. (2011). Structure changes in cost of cultivation of selected crops in Vidarbha. *The Asian Economic Review*, 53(3): 457-472.

Indian Livestock Sector with special reference to Buffalo Dairying for Increasing Farmer's Income

Dr. K. K. Kundu*, Parveen Kumar Nimbrayan
Dept. of Agricultural Economics, CCSHAU, Hisar- 125004
*Corresponding author: Kundu.dr@gmail.com
Received: 5th October 2018; Revised: 18th January 2019; Accepted: 26th May 2019

ABSTRACT

Dairying in India has been a source of sustainable income, tool for poverty alleviation by creating livelihood opportunities, insurance for livelihood security and instrument of bringing about a social change in the lives of the farmers.There is an immense scope to channelize the milk production through organized structure of meeting the domestic demand of the liquid milk and value added products. Meeting the nutritional requirement of the population throughout the country by making available quality milk and milk products to the consumers is possible only when more milk producers join the organized sector. Production of buffalo milk was increase in last year and growth rate was also show increasing order. Doubling of farmer's income by 2022 is quite challenging but it's is need of the hour, achieved with focused interventions and strategies. Dairying has vast potential to support in increasing farmer's income.Share of farmer's income from cultivation has risen from 45.8 per cent in 2002-03 to 47.9 per cent in 2012-13. Livestock development represents a proposing opportunity to enhance farmer's income, especially in the less developed regions. The distinct level livestock income varies from across regions and states and therefore, clustering approach with proper policy formulation

INTRODUCTION

Animal Husbandry has been integral component of Indian Agriculture due to its multi farious contribution in form of nutrient rich food products, clothing, drought power, income and employment. Livestock sector contributed 4 per cent to total gross value added (GVA) and 26.7 per cent to agricultural GVA in 2014-15.Crops, livestock and fisheries registered a growth of 2.93, 6.11 and 5.13 per cent per annum respectively during the decade2004 – 05 to 2014-15.Livestock sector never attained a negative growth in any year during past 36 years, lowest growth rate just 1 per cent in year 2003-04. An engine of growth of agriculture sector and can be relied upon the risk mitigation and loss minimization in worst condition. Best insurance against agrarian distress as the source of sustained income and generate incomes more frequently then crop sector. It is one of the promising for enhancing farmer's income and dairying contributes significantly to livestock sector as milk production has grown more than 4 per cent per annum during 1980-81 to 2011-12.In the past two and half decades, i.e. 1980-81 to 2014-15 with the economic growth (6%) and agricultural growth(3%) India attained self sufficient in food production and also reduction in rural poverty to some extent. But, the prevailing agrarian distress in agriculture sector due to low or non-remunerative crops output prices and rising input costs has shown that enhancing agricultural income from crops alone is not sufficient to alleviate farmer's distress. Hence, livestock sector be promoted as allied enterprise for doubling farmers income.

METHODOLOGY

The secondary data were collected from 1997-98 to 2012-13. Simple tabular analysis were carried out for meaningful conclusions.

RESULT AND DISCUSSIONS

Livestock sector is mainly dominated by dairy production system. In green revolution successful states, crossbreeding cattle has replaced the indigenous cattle population due to the stress of higher milk production has led to ignorance of the Buffaloes for milk production. Thus, the sustainability of dairy production system is in question with ever rising human population and milk demand. Buffalo population increasing continuously but rate of increase has slowed down after 2007. The proportion of females (about 79 to

85 %) is the highest for buffaloes followed by CB (about 73 to 85) and indigenous cattle (49 to 59% only).Cattle population has stagnated during 1997 to 2007 and thereafter declined marginally (Table1).

Table 1: Buffalo and cattle population in India, 1997-2012 (In millions)

Category/year	1997	2007	2012
Buffalo	**89.91**	**105.34**	**108.70**
Females	*71.29 (79.29)*	85.74 *(81.40)*	*92.60 (85.19)*
Cattle	**198.88**	**199.07**	**190.90**
Crossbred cattle	20.10 *[10.11]*	*33.06 [16.61]*	*39.73 [20.81]*
Females	14.75 *(73.41)*	*26.22 (79.30)*	33.76 *(84.97)*
Indigenous cattle	178.78 *[89.89]*	166.01 *[83.39]*	151.17 *[79.19]*
Females	88.58 *(49.55)*	89.23 *(53.75)*	89.22 *(59.02)*

Source: BasicAnimal husbandry Statistics (Various issues); 19th livestock census 2012-GoI

Figures in parentheses () indicate proportion of females to respective total of population.

Figures in square brackets [ ] indicate proportion of cross bred and indigenous population to total cattle population.

Role of Livestock Sector in India

The live stock sector has demonstrated a significant growth in past ten years, with in milk production increasing at a rate of 4.8 per cent per annum, reaching 155 million MT in 2015-16 and 165 million MT in the recent period. Per capita availability of milk has increased from 233 grams per day to 337 grams. India ranks first in milk production, accounting for 18.5 per cent of world production. India holds about 57 per cent of world's buffaloes and 16 per cent of cattle population and has 300 million bovines (40 million exotic and crossbred, 151 million indigenous and 109 million buffalo).About 72 per cent (216 Million) are female population and 28 per cent are male population as per livestock census 2012.Of the total female bovine population – crossbred, indigenous and buffalo population comprises of 16, 41 and 43 per cent respectively. Female bovine population has grown at CAGR of 1.85 per cent during 2003 to 2012 and female crossbred indigenous and buffalo population grew at a CAGR of 6.1 and 2 per cent respectively.

Livestock in general and dairying in particular play a vital role in the Indian economy and also in the socio-economic development of millions of rural household. Dairying is an important economic activity accounting for about 67 per cent of the value of output of livestock sub-sector in agriculture which is higher than the value of output of wheat and paddy together. In India 85 per cent of farmers are marginal and small and own about 75 per cent of bovines in the country but only own 45 per cent of farm land. Livestock sector contributes significantly to rural income-about 26 per cent in case of poorest farmers(less than 1 Ha) and about 12 per cent in case of all classes of farmers.

Table 2: Farm Income (Rs. / annum)

Income Source	All India	Haryana
Farming	36960 (47)	94411 (54)
Livestock	9943 (13)	32678 (19)
Nonfarm Business	6138 (08)	5201 (3)
Wages and Salaries	24847 (32)	41873 (24)
Total Annual Income	77888 (100)	174163 (100)

Figures in parentheses indicate the percentage share of income component in total income.

Source- Situation assessment Survey of Farm Households 2012-13, conducted by the National Sample Survey Organization's Office (NSSO)

The share of livestock in farm household income was 13 per cent in all India level and 19 per cent in Haryana against the 47 and 54 per cent respectively from the farming in the year 2012-13(Table 2).

Dairy Sector in India

Of total milk production in India 46 per cent is either consumed at producer level or sold to non producer in rural area. Balance 54 per cent of the milk (Marketable Surplus is available for sale to consumers in urban centre).38 per cent of the milk is handled by organized and the remaining 62 per cent by the unorganized sector. However most of the developed nation 90 per cent of the surplus milk is processed through organized sector. It is essential to provide rural milk producer with greater access to the organized sector and ensure remunerative prices to milk producers to adopt dairying as a source of livelihood.

At present three drivers of demand-population growth, urbanization and income growth are very strongly in operation due to which

the demand for milk is expected to continue to rise. Indian dairying has a large and growing domestic market, consumption of milk has been rising, commensurate with increase of purchasing power of people, increasing urbanization, changing food habits and lifestyles and demographic growth. Share of milk expenditure to total food expenditure is 20 per cent in urban and 19 per cent in case of rural population (consumer expenditure surveys, NSSO, Govt. of India).State governments are giving utmost priority to dairy sector by providing assistance for milk producers for improving the livelihoods of rural communities with goal of DFI. Schemes like NDF 1, NPBBDD, RGM, RKVY, NLM, and LHNDC are being implemented.

Dairying in doubling farmer's income

About 70 million rural households are engaged in dairying, one of every two rural household with women playing a vital role. The reasons for adaptability of dairying are low capital investment, short operating cycle and steady returns makes dairying a preferred livelihood activity among the small and marginal farmers.Further, lack of other lucrative and alternate employment opportunities make dairying the only viable option. Dairying most important subsidiary activity, even when the cultivation fails due to vagaries of nature. It also contributes to the livelihood of the poor in many ways- income from products, insurance against droughts, emergency cash requirement, household nutrition, fuel for cooking, manure for crops and draught power for farming. Share of farmer's income from cultivation has risen from 45.8 per cent in 2002-03 to 47.9 per cent in 2012-13, share of income from livestock/dairying was the one that grew the most from 4.3 per cent to 11.9 per cent, the contribution from both non- farm business and wages and salaries declined over this period.

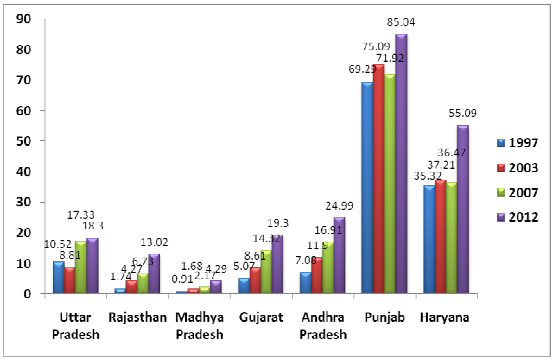


Figure 1. Crossbred Cattle Population (in Millions) in high milk producing states of India.

Table 3: Percentage Contribution of Agriculture & Livestock in Total Gross Value Added (GVA)

Year	GVA at Constant Prices (2011-12)		
	GVA – Agri-culture	GVA - Livestock	
	% to total GVA	% to total GVA	% to Agriculture
2011-12	12.1	4	21.8
2012-13	11.5	4	22.6
2013-14	11.4	4	22.6
2014-15	10.3	4	24.3
2015-16	9.3	4	25.7

Livestock sector (4 % of total GVA) is growing faster than any other agricultural sub-sector with its share increased from 21.8 per cent to 25.7 per cent of agricultural GVA during 2011/12 to 2015-16 (Table 3). By 2020, this sub-sector is predicted to produce more than half of total agricultural output. Except buffalo, the population of other livestock viz. cattle, sheep, goat and pig has decreased. The annual growth rates of buffalo population during various livestock census increased by 1.3, 1.7, 1.5 and 0.6 per cent respectively (Table 4).

Table 4: Indian Buffalo Population

Year	Numbers (Million)	Year	Annual growth (%)
1992	84.2	1992-97	1.30%
1997	89.9	1997-03	1.70%
2003	97.9	2003-07	1.50%
2007	105.3	2007-12	0.60%
2012	108.7		

Table 5: Ten States with more Buffaloes (Millions)

States	Buffaloes
Uttar Pradesh	30.625
Rajasthan	12.976
Andhra Pradesh	10.623
Gujarat	10.386
Madhya Pradesh	8.188
Bihar	7.567
Haryana	6.085
Maharashtra	5.594
Punjab	5.160
Karnataka	3.471

Buffalo is prominent in Haryana, Punjab, Gujarat, UP and AP, where they contribute between 54-85 percent to total milk (Table 5).

Table 6: Production of Buffalo Milk

Production (MT)			Growth Rates	
2001-02	2010-11	2016-17	2001/02 - 2010/11	2010/11-2016/17
45.40	62.35	80.38	3.22	3.70

The total milk production was about 165 million tons in 2016-17, in which Buffaloes share was 49 per cent. The buffalo milk has increased from 45.40 million tons in 2001-02 to 80.38 MT during 2016-17 with an annual growth rates of 3.22 per cent during 2001/02 to 2010/11, while 3.70 per cent during 2010/11 to 2016/17 (Table 6).Yield gaps in buffalo milk production needs to be bridged. The productivity of buffaloes is highest in Haryana followed by Punjab.Meghalaya is the state where buffalo productivity is about 65 per cent lower than national average.Uttar Pradesh, having about 26% of total in-milk female buffalo, is having per animal productivity only 4.44 litres per day; (about 50% of the best producing state)

Buffalo Meat Production System:

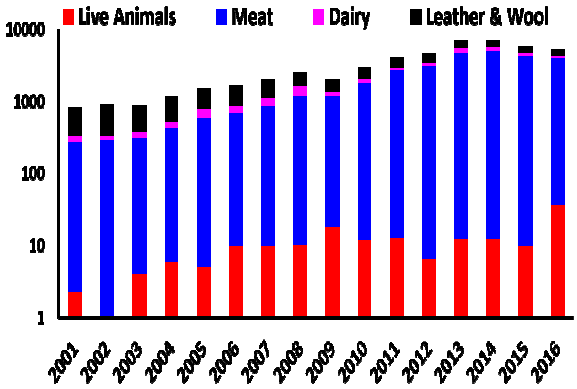
Buffalo meat production can be classified into three major value chains:Large-scale production for export, municipal slaughter house system for domestic consumption and More prevalent model is informal smallholder "backyard" slaughtering in remote areas (is characterized by slaughter for one's own consumption or for sale of surpluses to local markets)

Table 7: Production of Meat ('000 Tonnes) in India

Particulars	**2001-02**	**2010-11**	**2016-17**
Cattle	340.75	211	329.34
Buffalo	413.93	805	1611.01
Goat	401.01	846	942.91
Sheep	191.94	369	485.53
Pig	139.74	402	387.55
Poultry	364.06	2193	3263.81

The meat production from buffalo significantly increased from 413 Thousand tonnes in 2001-02 to 1611 thousand tonnes in 2016-17.

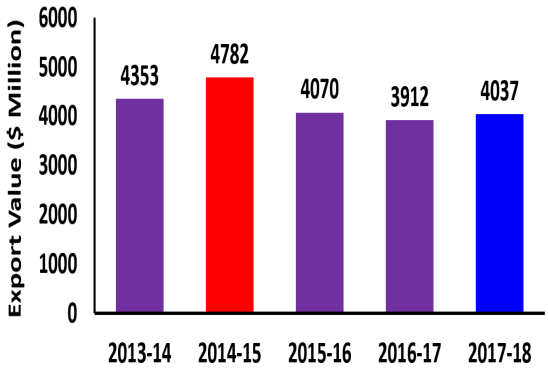
Export of Livestock and Livestock Products ($ Million)



Globally livestock products account one-fifth of global trade of agricultural products. However, India does not have significant presence in global livestock trade. It shares only 0.3 per cent world exports and 0.4 per cent imports.

Export Trend of Buffalo Meat

In India, bovine meat has been a major export commodity with around 70 per cent share in the total livestock exports value. Also, its value share has increased more than twice in 2016 than that in 2001. Buffalo meat export has lion share.



Enhancing Buffalo Economy in India

1. Breeding Strategies: It should be based on the resource position of farmers, which is by and large, poor.
2. Ensuring Clean Production System of Meat and Milk: For promoting exports and also for Indian consumers.
3. Enhancing Value Addition, Processing and Market Linkage: Preventing wastage of products due to contamination, unfair trade practices and elimination of intermediate agencies in marketing will further enhance

the profit margins. (e.g. Presently only 30% of the milk is sold through the organised sector.)

Table 8: Buffalo Milk: A Source of Extra Nutrients

No.	Constituents	Buffalo milk	Cow milk
1	Water (g/L)	820	870
2	Total solids (g/L)	172	125
3	Lactose (%)	5-5.5	4.8
4	Protein (%)	4-5 (4.1)	3-4 (3.3)
5	Fat (%)	6-9.5 (6.7)	3.6-4
6	Cholesterol (mg/g)	0.65	3.14
7	Conj. Linoleic Acid (mg/g fat)	6.1	5.5

Table 9: Buffalo Milk has More Nutrition

Minerals	Contents in milk (mg/100g)	
	Buffalo	Cow
Calcium	169	119
Chloride	75	105
Magnesium	31	13
Phosphorus	117	93
Potassium	178	152
Sodium	44	49
Citrate	180	175

- Double Lactoperoxidase activity
- β- lactoglobulin : more thermally stable
- Larger fat globules size (4.16-4.6 µm)
- Higher buffering capacity (25-30% more)
- More Vitamin A, E and B_{12} (4 folds more)

Factors Affecting Income of Dairy Farmers

- **Productivity of milch animals-** there is a need to focus on increasing productivity of animals thereby increasing the profit per animal.
- **Input Cost-** By focusing on reducing production cost through providing input at reasonable low cost and enhancing productivity.
- **Transparency in Milk procurement system-** Digitalization of entire milk procurement system with increased faith of farmers in organized sector.
- **Access to organized sector-** Prices of milk received to organized sector are generally higher and continuous, this will enable farmers to get higher returns.
- There is a need to eliminate all forms of waste in entire milk supply chain and focus on factors that deliver value to consumers and higher returns to farmers.
- Dairying in India is highly labor intensive and therefore, need for automation that would improve profitability, milk quality , animal welfare, etc.
-

CONCLUSIONS

Livestock sector particularly dairying in India has been a source of sustainable income, tool for poverty alleviation by creating livelihood opportunities, insurance for livelihood security and instrument of bringing about a social change in the lives of the farmers.Buffalo has contributed, is contributing and will continue to contribute in Indian Agricultural Economy for livelihood security, and food & nutritional security. **Buffalo asa "Black Gold"** but if given the opportunity to exploit its full potential, will be "Black Platinum". Let us explore its full potential for sustainable gain in Indian Economy.There is an immense scope to channelize the milk production through organized structure of meeting the domestic demand of the liquid milk and value added products. Meeting the nutritional requirement of the population throughout the country by making available quality milk and milk products to the consumers is possible only when more milk producers join the organized sector.Doubling of farmer's income by 2022 is quite challenging but it's is need of the hour , achieved with focused interventions and strategies. Dairying has vast potential to support in increasing farmer's income.Livestock development represents a proposing opportunity to enhance farmer's income, especially in the less developed regions. The distinct level livestock income varies from across regions and states and therefore, clustering approach with proper policy formulation. The focus areas should be reducing input cost, mixed farming, increasing productivity, strengthening livestock, fisheries, and dairying, value addition through packaging branding and agri services, direct marketing, integrated farming. The Government has decided to setup a Kisan Kalyan Pradhikaran to take measures to make agriculture remunerative and enhance agricultural productivity to mitigate the physical, financial and psychological distress of farm house holds and landless works.

REFERENCE

Government of India. 2014. Annual Report, Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India, New Delhi.

Patel, R.K. 1993. Present status and promise of dairying in India. Indian Journal of Agricultural Economics **48**(1): 1-33.

Sharma, V.P. 2004. Livestock economy of India: current status, emerging issues and long-term prospects. Indian Journal of Agricultural Economics **59**(3): 512-553.

Antibacterial Efficiency of Curry Leaves

Arti Heer, Vikas Sharma*, Sahil Gupta and Madhulika Bhagat

Division of Biochemistry, Faculty of Basic Sciences, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Main Campus Chatha, Jammu-180009, India

School of Biotechnology, University of Jammu, Baba Saheb Ambedkar Road, Jammu-180006, India

**corresponding author:* vikas.skuast@gmail.com, 9469752697

Received: 5th October 2018; Revised: 15th January 2019; Accepted: 27th May 2019

ABSTRACT

Murraya koenigii (curry-leaf) is a small aromatic tree belonging to the family Rutaceae that contain several medicinal properties such as antimicrobial, antidiabetic, antioxidant, antifungal, larvicidal, anti-inflammatory, anticarcinogenic and hepato-protective. Currently, in addition to antibiotics and chemically synthesized drugs, the trend to look out for alternative medicines such as natural or herbal medicines is increasing because they may have fewer side effects or toxicity owing to their natural sources. In the present study, antibacterial potential of M. koenigii was evaluated againstBacillus subtilis (MTCC2389), Staphylococcus aureus (MTCC7443), Escherichia coli (MTCC2127), Klebsiella pneumoniae (MTCC7162) and Micrococcus luteus (MTCC4821) via agar well diffusion method. Chloramphenicol was used as a positive reference and DMSO as a negative control. The minimum inhibitory concentration (MIC) was determined using broth micro dilution method (ranging from 62.5–2000 µg/mL). Results showed that the methanolic extract of the planthas potential to inhibit some pathogenic bacteria as it showed remarkable zone of inhibition against S. aureus (17.6±0.12 mm) followed by B. subtilis (16±0.15 mm), M. luteus (15.5±0.12 mm) and K. pneumoniae (15±0.15 mm). Thus, curry leaves could be effective for prevention of bacterial infections and may be considered as an alternative to antibiotic regimens.

Keywords: *Curry leaves, antibacterial, agar well-diffusion,minimum inhibitory concentration*

INTRODUCTION

Murraya koenigii (Linn.) found almost throughout India up to an altitude of 1500 m., is much cultivated for its aromaticity and is used in South India as a natural flavouring agent in various curries. The major chemical constituents of the plant are carbazole alkaloids, coumarins and flavonoids (Nayak *et al*., 2010). *M. koenigii* leaf extracts exhibit hypoglycemic and hypolipidemic effects in experimental animals (Kesari *et al*., 2007; Lawal *et al*., 2008). Methanolic extracts possess anti-oxidative (Gupta and Prakash, 2009), anti-diarrheal / anti-inflammatory (Gupta *et al*., 2010) and immunomodulatory (Shah *et al*., 2008; Adebajo *et al*., 2006; Mandal *et al*., 2010) efficiency. Leaves reduced blood cholesterol and glucose levels in mice (Xie *et al*., 2006).The leaves of the plant showed remarkable *in vitro* cytotoxic effect against human cancer cell lines of breast, colon and lung origin (Sharma and Hussain, 2013). The extract of curry leaves was screened to detect potential antimicrobial activity against strains of *E. coli, B. cereus, S. aureus, B. subtilis, K. pneumonia, S. epidermidis, P. aeruginosa, S. faecalis* and *C. albicans.* The results showed that most of the bacterial strains (except *E. coli, B. cereus* and *S. faecalis*) had intermediate effect at low concentration of leaf extract (Argal *et al.,* 2011).The present investigation was undertaken to evaluate the antibacterial effect of the methanolic extract of curry leaves on selected clinically pathogenic bacterial isolates.

METHODOLOGY

Determination of antibacterial activity

Qualitative analysis for evaluating antimicrobial activity of test material was carried out by agar–well diffusion method (Feyza *et al.,* 2009) with modification. Two gram positive(*Bacillus subtilis,* MTCCC 2389and *Staphylococcus aureus,*MTCC7443)andthreegram negative(*Micrococcus luteus,* MTCC4821; *Escherichia coli,* MTCC2127and *Klebsiella pneumoniae,* MTCC7162) bacterial strains were used

in the present study.20 mL of sterilized nutrient agar was inoculated with 100 µL of bacterial suspension (10^8 CFU/mL) and then poured on to sterilized petri plates. The agar plates were left to solidify at room temperature. A well of 6 mm diameter was aseptically bored into the agar plates and 20 µL of the essential oil (diluted with DMSO, 1:1) was added in each well.Chloramphenicol (10 µg) was used as a positive reference to determine the sensitivity of bacteria and DMSO as negative reference. The plates were kept at 4 ^oC for 2 h to allow the dispersion and then incubated at 37 ^0C for 24 h.

Determination of MIC by broth dilution method

Broth dilution technique was used to determine the minimum inhibitory concentration of the test material against bacterial strains. One millilitre of nutrient broth was kept in each tube and autoclaved. The extractdiluted with DMSO (1:1) was filtered with 0.22 µm filter disk before use and then added to each tube to keep the final concentration ranging from 62.5 µg/mL–2000 µg/mL. The test bacterial suspension was added into each tube to yield bacterial density of 10^6 CFU/mL and the inoculated tubes were incubated at 37 ^oC for 24 h. Tubes containing nutrient broth without essential oil served as positive control, whereas those without bacteria as negative control. After incubation, 50µL of 0.2 mg/mL *p*-iodonitrotetrazolium violet (INT) was added in each tube to indicate the bacterial growth. The tubes were again incubated for 30 min at 37 ^oC. Development of pink colour in the tube (due to reduction of dye) indicated the bacterial growth whereas tubes without colour indicated no active bacterial growth. The lowest concentration at which no bacterial growth was observed (as indicated by colour) corresponded to the minimum inhibitory concentration (MIC). All the assays were performed in triplicate.

RESULTS AND DISCUSSION

The results of thepresent research work revealed that methanolic extract from the leaf part of*Murraya koenigii* has potential to inhibit some pathogenic bacteria as it showed remarkable zone of inhibition against *S. aureus* (17.6±0.12 mm)followed by *B. subtilis* (16±0.15 mm), *M. luteus* (15.5±0.12 mm) and *K. pneumoniae* (15±0.15 mm) (Table 1).Mathur *et al.,* 2010 demonstrated that the methanolic extract of curry leaves inhibited *Staphylococcus aureus,Staphylococcus epidermidis*, *Streptococcus uberis*, *Pseudomonas aeruginosa*, *Escherichia coli, Corynebacterium gravis* and *Bacillus cereus.*Many plant leaves have antimicrobial principles such as tannins, essential oils and others aromatic compounds. Plants are an important source of antimicrobial products, most of them with efficiency against diverse organisms including fungi, yeast, bacteria, insects, nematodes and other plants. The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. India is a varietal emporium of medicinal plants and is one of the richest countries in the world with regard to genetic resources of medicinal plants. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial agents has led to the screening of several medicinal plants for their potential antimicrobial activity. In the present study, we have focused on curry leaves of Jammu region that would play a vital role in discovering potential drugs for treating bacterial infections.

Table #1: Antibacterial analysis of *Murraya koenigi* leaves

Extract	**Conc. (mg/mL)**	**Bacterial strains**				
Methanolic	100 mg/mL (10µl)	*B. subtilis* MTCC 2389	*M. luteus* MTCC 4821	*S. aureus* MTCC 7443	*E. coli* MTCC 2127	*K. pneumoniae* MTCC 7162
		Zone of inhibition (mm)				
		16±0.15	15.5±0.12	**17.6±0.12**	14.6±0.15	15±0.15
MIC	62.5 µg/ml-2000 µg/ml	250	500	500	500	250
Positive control CMP^+	1mg/mL (10 µl)	36±1.3	35.6±1.2	26.2± 0.9	35±1.1	35±1.3
Negative control DMSO	10 µl	-	-	-	-	-

Values indicating maximum zone of inhibition of test component are given in bold numbers

CMP^+: Chloramphenicol; DMSO: Dimethylsulfoxide Mark (-) indicates no activity

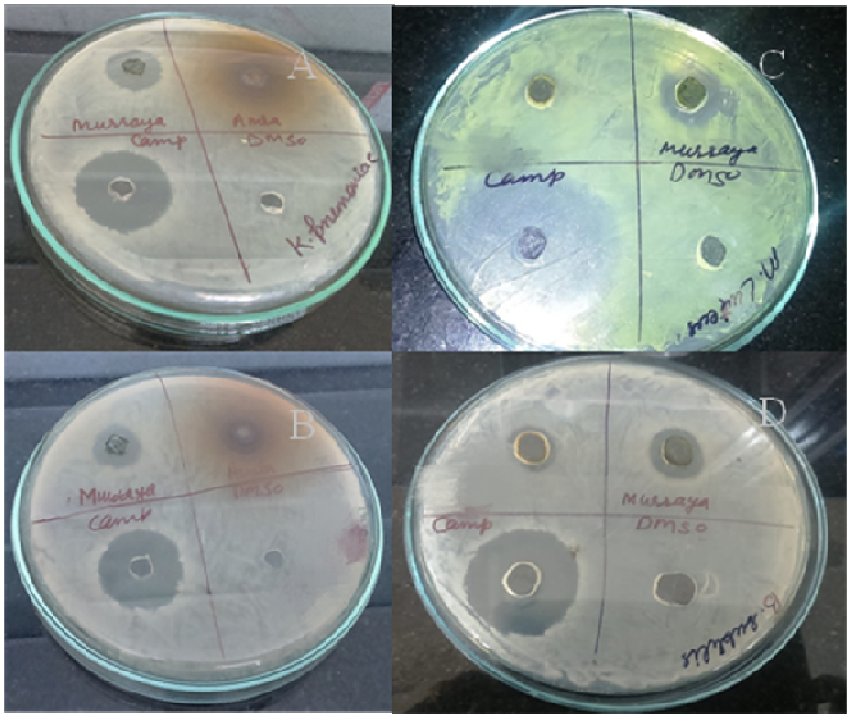


Plate # . Antibacterial effect of *Murraya koenigii* against (A)) *Klebsiellapneumoniae* (B) *Staphylococcus aureus* (C) *Micrococcus luteus* (D) *Bacillus subtilis*

REFERENCES

Adebajo, A.C., Ayoola, O.F., Iwalewa, E.O., Akindahunsi, A.A., Omisore, N.O., Adewunmi, C.O. and Adenowo, T.K. (2006). Anti-trichomonal, biochemical and toxicological activities of methanolic extract and some carbazole alkaloids isolated from the leaves of *Murraya koenigii* growing in Nigeria. *Phytomedicine*13: 246–254.

Argal, M.S., Kumar, S., Choudhary, H.S., Thakkar, R.M., Verma, S.K. and Seniya, C. (2011) The efficacy of *Murraya koenigii*leaf extract on some bacterial and a fungal strain by disc diffusion method. *Journal of Chemical and Pharmaceutical Research*3: 697-704.

Feyza, O., Belma, A., Sahlan, O. and Senol,A. 2009. Essential oil composition of antimicrobial and antioxidant activity of *Satureja cuneifolia*. *Food Chemistry*112(4): 874-879.

Gupta, S. and Prakash, J. (2009). Studies on Indian green leafy vegetables for their antioxidant activity. *Plant Foods for Human Nutrition*64: 39–45.

Gupta, S., George, M., Singhal, M., Sharma, G.N. and Garg, V. (2010). Leaves extract of *Murraya koenigii* for anti-inflammatory and analgesic activity in animal models. *Journal of Advanced Pharmaceutical Technology and Research*1: 68–77.

Kesari, A.N., Kesari, S., Singh, S.K., Gupta, R.K. and Watal, G. (2007). Studies on the glycemic and lipidemic effect of *Murraya koenigii* in experimental animals. *Journal of Ethnopharmacology*112: 305–311.

Lawal, H.A., Atiku, M.K. and Khelpai, D.G. (2008). Hypoglycaemic and hypolipidemic effect of aqueous leaf extract of *Murraya koenigii* in normal and alloxandiabetic rats. *Nigerian Journal of Physiological Sciences*23: 37–40.

Mandal, S., Nayak, A., Kar, M., Banerjee, S.K., Das, A., Upadhyay, S.N., Singh, R.K., Banerji, A. and Banerji, J. (2010). Antidiarrheal activity of carbazole alkaloids from *Murraya koenigii* Spreng (Rutaceae) seeds. *Fitoterapia*81: 72–74.

Shah, A.S., Wakade, A.S. and Juvekar, A.R. (2008). Immunomodulatory activity of methanolic extract of *Murraya koenigii* (L) Evidence-based complementary and alternative medicine 11 Spreng. leaves. *Indian Journal of Experimental Biology*46: 505-509.

Sharma, V. and Hussain, S. (2013). Cytotoxic properties of *Alstonia scholaris, Murraya koengii* and *Musa paradisiaca* against human cancer cells. *Bioinfolet*10: 597-598.

Xie, J.T., Chang, W.T., Wang, C.Z., Mehendale, S.R., Li, J., Ambihaipahar, R., Ambihaipahar, U., Fong, H.H. and Yuan, C.S. (2006). Curry leaf (*Murraya koenigii Spreng*.) reduces blood cholesterol and glucose levels in ob/ob mice. *The American Journal of Chinese Medicine*34: 279–28