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CONTENT

ARIMA Model for Forecasting of Area, Production and Productivity of Rice in Chhattisgarh plain zone of Chhattisgarh State

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ABSTRACT

Crop acreage estimation and crop yield forecasting are two components, which are crucial for proper planning and policy making in the agriculture sector of the country. This research is a study model of forecasting area, production and productivity of rice in Chhattisgarh plain zone of Chhattisgarh. Data for the period of 2002-03 to 2017-18 were analyzed by time series methods. Auto Correlation Function (ACF) and Partial Auto Correlation Function (PACF) were calculated for the data. Appropriate BoxJenkins Auto Regressive Integrated Moving Average (ARIMA) model was fitted. Validity of the model was tested using standard statistical techniques. For forecasting area, production and productivity ARIMA (1, 3, 2), (1, 3, 2) and (1, 3, 2) model respectively were used to forecast ten leading years. The results also shows area forecast for the year 2027 to be about 2883009 hectare, production forecast to be about 5087281 tonnes and productivity forecast to be about 1.65 tonnes per ha.

Keywords: *Forecasting, Area, Production, Productivity, Rice, ARIMA*

INTRODUCTION

Rice is among the three leading food crops of the world, with maize and wheat being the other two and it is one of the most important cereal crop of India occupying an area of 43.39 million hectare with an annual production of 104.32 million tonnes with an average productivity of 2404 kg/ha (2015-16). India is the second largest producer and consumer of rice and accounts for 22.3% of global production. (Source: Annual Report 2015-16, Ministry of Agriculture and Farmers Welfare). Rice plays a vital role in the national food security and would continue to remain so because of its wider adaptability to grow under diverse ecosystems. Rice contributes 40.8% of total food grain and remains the principal source of livelihood for more than 58% of the population.

Rice scenario in Chhattisgarh

Chhattisgarh had set a target to produce 9.5 million tonnes (MT) of food grai n in the crop season 2020-21, up by about three per cent from the output achieved in the previous year. The state had, however, failed to meet the target in the last crop season. As against the target of 9.32 MT, Chhattisgarh produced 9.2 MT of foodgrain. The acreage would remain unchanged as kharif crops would be taken in 482,000 hectares. The sowing area of paddy in the state, which was once known as rice bowl of the country, had decreased by 5.27 per cent. This would not affect output as the emphasis would be on increasing productivity. A target to produce 8.44 MT of rice had been set. In the previous year, 8.34 MT of rice was produced.

In 2018, Chhattisgarh produced 10.5 million tonnes of paddy crop. With an average annual rainfall of around 1,207 mm, the net sown area of the state is 47.75 lakh (4.7 million) hectares, which is 34 percent of the state's total geographical area. Rice is grown on 68.8 percent of the total agricultural land in the state. The yield for summer paddy productivity in

2017-18 was 2,767 kg per hectare, while it was 1,482 kg per hectare for the kharif paddy in the same year, according to data released by the state agriculture department. The increase in summer paddy sowing area is a matter of concern for the state owing to the water woes in major parts of the state during summer.

METHODOLOY

This study was based on secondary data of rice crop for forecasting area, production and productivity of rice in Chhattisgarh plain zone. The area, production and productivity data for rice crop data collected for the period from 2002-03 to 2017-18 from various sources like Directorate of Economics and Statistics, Crop report and Chhattisgarh state website etc.

Projection for the output of Rice in Chhattisgarh plain zone of Chhattisgarh State was carried out using ARIMA Model.

ARIMA Model: Auto Regression Integrated Moving Average was the most general class model for forecasting time series. The ARIMA model was denoted by ARIMA (p,d,q).

Where,

p – stand for the order of the auto regressive process

d – is the order of the data stationary and

q – is the order of the moving average process.

The general form of the ARIMA (p,d,q) can be written as:

$\Delta^d y_t = \delta + \varphi_1 \Delta y_{t-1} + \varphi_2 \Delta^d y_{t-2} + \text{----} + \varphi_p \Delta^d y_{t-p} + e_{t-1}\, \alpha e_{t-1} - \alpha_2\, e_{t-2}\, \alpha_q\, e_{t-2}$ ....(1)

Where,

Δ^d= denotes differencing of order d, i.e. $\Delta y_t = y_{t-1}$

$\Delta y_t = y_{t-1}$

Δy_{t-1}........... ...y_{t-p} are past observations (lags)

δ, φ_1................$\varphi_p$are parameters (constant and coefficient) to be estimated similar to

regression coefficients of the Auto Regressive process (AR) of order "p" denoted by AR(P) and written as:

$Y = \delta + \varphi_1\ y_{t-1} + \varphi_2\ y_{t-2} + \text{----} + \varphi_p y_{t-p} + e_t$..(2)

Where,

$e_t$is forecast error, assumed to be independently distributed across time with mean φ andvariance φ_{2e} , e_{t-1} , e_{t-2}………………………..e_{t-q}

θ_1………θ_q are moving average (MA) coefficient that needs to be estimated .

MA model of order q, i.e. MA (q) can be written as

$y_t = e_t - \theta_1 \theta_{t-1} - \theta_2 \theta_{t-2}$………………$\theta_q \theta_{t-q}$……………………………………..…(3)

The estimated procedure of the model consists of four steps, namely: identification, estimation of parameters, diagnostic checking and forecasting.

Identification step

The identification step involves the use of the techniques to determine the values of p, q, and d. These values are determined by using Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF).

Estimation of Parameters

At the identification stage one or more models are tentatively chosen that seem to provide statistically adequate representations of the available data. Then we attempt to obtain precise estimates of parameters of the model by least squares as advocated by Box and Jenkins. Standard computer packages like R program.

Diagnostic checking

After selecting a specific ARIMA model and estimating its parameters, the adaptability of the model is verified. A simple test is to see if the residual estimated from the model is white noise. If it is not, we must start with other ARIMA models. The residual were analyzed using Box-Ljung Statistic.

Forecasting

One of the reasons for the popularity of ARIMA modeling is its success in forecasting. In many cases, the forecasts obtained through these methods are more reliable than those obtained through traditional econometric models, especially for short-term forecasts. Autoregressive integrated moving average process model is a method to describe the relationship between time series variables and their past values. The ARIMA model is mainly used to generate the best weighted average forecast for a single time series (Rahulamin and Razzaqu, 2000). Use tests to test the accuracy of pre- and post-event predictions: such as mean square error (MSE) and mean absolute percentage error (MAPE) (Markidakis and Hibbon, 1979).

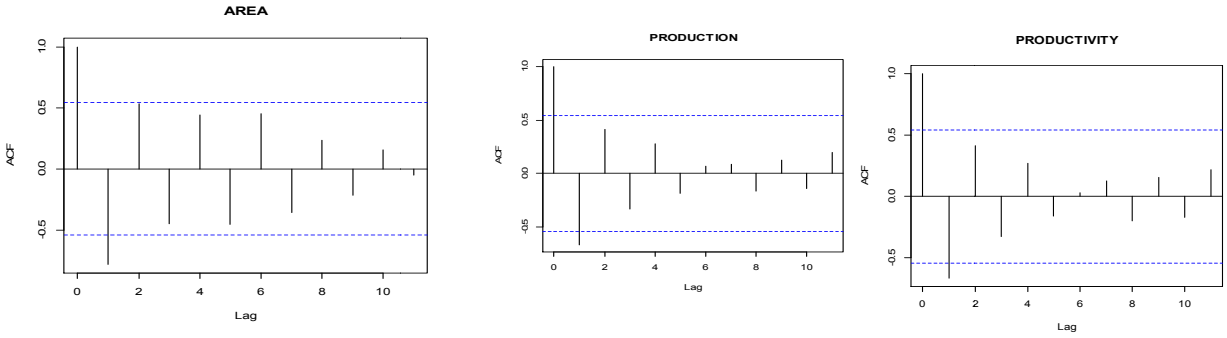
RESULTS AND DISCUSSION

Forecasting of area, production and productivity using ARIMA Model

The annual data on rice crop cultivated area, production and pro of Chhattisgarh plain zone for the period from 2002-03 to 2017-18 were used for forecasting the future values using ARIMA models. The ARIMA methodology is also called as Box-Jenkins methodology. The BoxJenkins procedure is

concerned with fitting a mixed Auto Regressive Integrated Moving Average (ARIMA) model to a given set of data. The main objective in fitting this ARIMA model is to identify the stochastic process of the time series and predict the future values accurately. These methods have also been useful in many types of situation which involve the building of models for discrete time series and dynamic systems. But, this method was not good for lead times or for seasonal series with a large random component (Granger and Newbold, 1970).

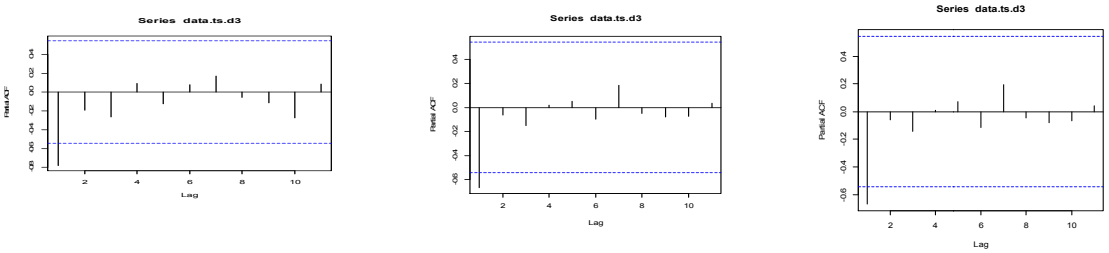
Forecasting for area, production and productivity of rice in Chhattisgarh plain zone was required four steps. In the first step includes the identification of model through coding under which indicates p, d, q. The steps second have estimated the parameters of model. When the step third made diagnostic checking with respect to reliability of model and in fourth steps made forecasting of area, production and productivity of rice.



The main stages in setting up a Box-Jenkins forecasting model are as follows.

Identification ,Estimating the parameters ,Diagnostic checking and Forecasting

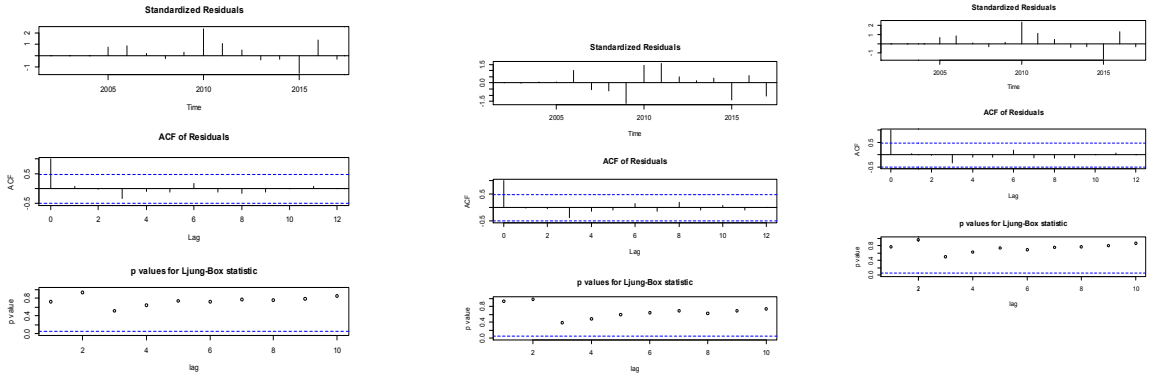
Identification of the model



ARIMA model was estimated after transforming the area, production and productivity data of rice into stationary series. The Auto Correlation Function (ACF) and Partial Auto Correlation Function (PACF) values are graphically presented in Figure 1. Based on p, d, q values many models were tested. A ARIMA (p,d,q) model were identified by finding the initial values for the orders of parameters p and q.

Fig. 1: Expressed Auto-Correlation Function (ACF) and Partial Auto-Correlation Function (PACF) plot of area, production and productivity data of rice in Chhattisgarh plain zone

Fig. 2: Diagnostic checking for area, production and productivity of rice in Chhattisgarh plain zone



They were obtained by looking for significant spikes in autocorrelation and partial autocorrelation functions. At the identification stage, one or more models were tentatively chosen which seem to provide statistically adequate representations of the available data. Finally, the ARIMA (1,3,2) (1,3,2) (1,3,2) were selected as the most suitable models to .

forecasts of rice area, production and productivity of Chhattisgarh plain zone of Chhattisgarh based on Least Mean Absolute Percentage Error (MAPE), Mean Absolute Square Error (MASE) value and highest Root Mean Squared Error (RMSE) value that are presented in Table 1

Table 1: Identification of models by selected parameters of area, production and productivity of rice in Chhattisgarh plain zone

Particulars	Type	Model	RMSE	MASE	MAPE
Chhattisgarh Plain Zone	Area	(1,3,2)	36994.04	0.66	0.99
	Production	(1,3,2)	856423.6	0.55	12.37
	Productivity	(1,3,2)	0.29	0.56	12.09

RMSE= Root Mean Squared Error, MASE= Mean Absolute Square Error, MAPE= Mean Absolute Percentage Error

Table 2: Estimation of parameters of identified model for area, production and productivity of rice in Chhattisgarh plain zone

Particulars	Type	Model	Coefficient			Standard Error		
			AR1	MA1	MA2	AR1	MA1	MA2
Chhattisgarh Plain Zone	Area	(1,3,2)	-0.65	-1.97	0.99	0.22	0.60	0.60
	Production	(1,3,2)	- 0.83	-1.98	0.99	0.18	0.71	0.71
	Productivity	(1,3,2)	-0.81	-1.98	0.99	0.19	0.72	0.72

Estimation of parameters

The parameters of best fitted model of area, production and productivity of Chhattisgarh plain zone were presented in Table 2. The specification of Autocorrelation (AR), differencing and Moving Average (MA) terms are obtained by help of the forecasting.

Diagnostic Checking

The time series plot of the standardized residuals mostly indicates that there was no trend in the residuals and in general, no changing variance across the time (Figure 2). The ACF of the residuals shows non significant autocorrelations that is a good result. The bottom plot gives p-values for the Ljung-Box-Pierce statistics for over the period. These statistics consider the accumulated residual autocorrelation from lag 1 up to and including the lag on the horizontal axis. The dashed blue line was at .05, largely p-values were above it. That was a good result. Diagnostic checking for area, production and productivity of Chhattisgarh plain zone are graphically presented in the Figure 2.

Forecasting

After identification of the model and it's adequate checking then model used to forecast the area, production and productivity of rice for the upcoming year of 2027-28. Hence, used the identified ARIMA model to forecast the area, production and productivity of rice in Chhattisgarh plain zone is presented in Table 3 and illustrated in Figure 3.

It revealed from the results that forecast the production of rice for Chhattisgarh plain zone will decrease to 5087281 tonnes for 2027 as against base year of 2018 production of rice 6687572 tonnes and the area of rice in Chhattisgarh plain zone will also decrease to 2883009 ha for 2027 as against base year 2018 area of rice 2992711 ha and the productivity of rice in Chhattisgarh plain zone will be decreased 1.65 tonnes/ha for 2027 as against base year 2018 productivity of rice 2.21 tonnes/ha. Based on the forecasting and validation of results, it may be concluded that ARIMA model could be successfully used for forecasting of rice area, production and

productivity of agro-climatic zones and Chhattisgarh State as a whole for the immediate subsequent years.

Table 3: Forecast of area, production and productivity of rice by Chhattisgarh plain zone

Particulars	Forecast					
	2018-19 (Base Year)			2027-28 (Upcoming Year)		
	Area (ha)	Production (tones)	Productivity (tones/ha)	Area (ha)	Production (tones)	Productivity (tones/ha)
Chhattisgarh Plain Zone	2992711	6687572	2.21	2883009	5087281	1.65

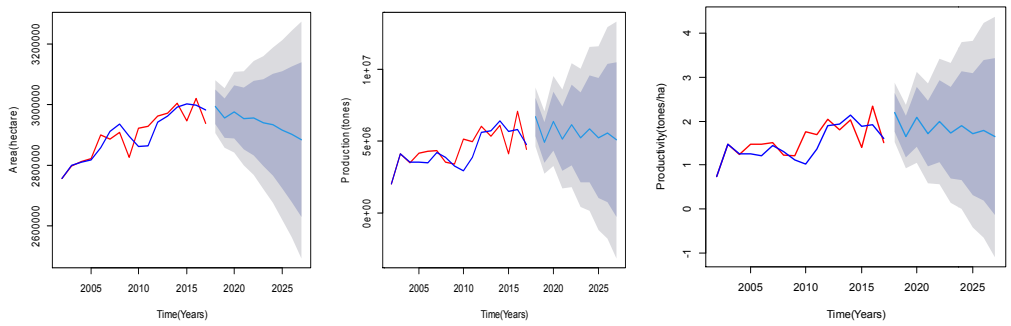


Fig. 3: Actual and predicted area, production and productivity of rice in Chhattisgarh plain zone

Suggestions

From the empirical findings of the study, it is being suggested that for declining the production was due to declining in area and productivity of rice in Chhattisgarh plain zone of Chhattisgarh might be due to cultivation land converted into urbanization and most of the land has gone to colonization and industrialization the causes of declining the productivity directly indicating that the adoption of packages of practices not up to the full packages for cultivation of rice.

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Price Analysis Coriander in Selected Markets of Rajasthan

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ABSTRACT

This study has been undertaken with the objectives of examining the trend, seasonality, variability pattern of market arrivals and prices of coriander in selected markets of Kota, Ramganjmandi and Baran and analysing the relationship between market arrivals and prices. The has shown that the positive trend in arrival was observed in Ramganjmandi whereas negative trend was observed in Kota and Baran market. All the selected markets showed positive trend in prices. Coriander prices have not shown definite seasonal pattern in Ramganj mandi as compared to Baran and Kota markets. In respect of price indices of coriander, lower values were observed in the month of February in Baran market (90.30 points), in the month of May in Kota market (92.8 points) and in month of February in Ramganj mandi (93.8 points).
Keyword: Arrivals, Coriander, Prices, Market

INTRODUCTION

Coriander seed (Dhania) is one of the most important spice for the flavouring of food. India is the largest-producer and exporter of coriander in the global market. The exports have increased significantly in the past few years due to strong demand from the overseas markets. The changing pattern of food consumption or consumption of more spicy foods, especially in developed countries. According to the Spice Board of India, Coriander production in 2021-22 was estimated to decline by 10.2 percent at 8.00 lakh tonnes as against 8.91 lakh tonnes in 2020-21 period. It is mainly grown in Madhya Pradesh (2.79 lakh ha), Rajasthan (0.98 lakh ha) and Gujarat (0.75 lakh ha) states. In Rajasthan, its cultivation mainly concentrated in Baran, Kota and Jhalawad districts, jointly contributing more than ninety percent to the states area and production both. Production estimation declined mainly due to 4 percent decline in overall acreage. Continuously declining acreage under this crop is point to ponder. Prices play a crucial role in area allocation to a crop (Burark et al., 2011; Sharma and Burark , 2015; Burarket al., 2015). Continuous decreasing prices since 2014 till 2018 may be a main reason for its shrinking area in the state as well as country. As per the Ministry of Commerce data, Coriander exports from India has registered a decline of 18 percent during Apr-Aug 2022-23 at 14,056.66 tonnes as compared to 17,116.99 tonnes exported last year same period. Exports from India had declined mainly due to higher rates of Indian coriander as compared to the Russian and Bulgarian coriander in international markets. As per trade sources, the Indian coriander was quoted around $1500-1600 per tonnes as compared to Russian $825-950 per tonnes and Bulgarian at $1000-1050 per tonnes. However, the coriander imports during (Apr-Aug 2022) have increased significantly by 291 percent at 15,044.15 tonnes as compared to 3,845.21 tonnes corresponding period last year. Higher imports have resulted in more than sufficient availability in domestic markets. The decomposition of time series data are helpful in various ways. An understanding of price fluctuations is a pre requisite for stabilization programme. It gives some idea to the government procurement agency regarding the suitable time for making purchases. To the farmers, it is helpful in providing guidance as to when and where it will be more profitable for them to dispose off their goods or products. The analysis of

prices and market arrivals over time is important for formulating a sound agricultural price policy. Fluctuations in market arrivals largely contribute to the price instability of coriander in the state. The transition in commodity exchanges also play important role on the spot price of coriander as it gives some indication of future price. In order to reduce the instability in price fluctuations of coriander, there is a need to have a thorough understanding of the price behaviour.

METHODOLOGY

Kota region was purposively selected for the price behaviour study as around 80 per cent of coriander of Rajasthan is produced in this region . Kota, Ramganj mandi and Baran markets had highest arrivals of coriander. The data on market arrivals and wholesale prices of coriander crop were collected from these three APMC i.e. Kota, Ramganjmandi and Baran markets of Rajasthan for the present study to study the price behaviour. The price behaviour of the coriander in selected markets over the period May, 2003 to April 2022 was analysed in terms of mean value for each month and the coefficient of variation. The Karl Pearson correlation coefficient was also computed to know the degree of relationship between three selected market arrivals and prices.

Trend analysis

Time series data consisted of a number of components like trend, cyclical, seasonal and irregular fluctuations. In the conventional method of time series analysis, the above four components are assumed to behave as under in additive or multiplicative scheme, respectively:

$Y = T + C + S + I$ or $Y = T \times C \times S \times I$

Where,

Y is the original time series data, T is the trend, C is the cyclical, S is the seasonality and I is the irregular component of the time series.

Trend component can be defined as the tendency of prices or arrivals to move up or down over a long period of time. It is not concerned with the movement in prices from one year to another but for large number of years. The important causes of long term trend in prices are the changes in demand and supply over a long span and the general price level in the country.

In order to decompose the trend effect, first of all, the original data were deseasonalised. After that, the trend was computed by least squares method and this method was used with the specification as given below:

$Y = f(T)$

Where,

Y = deseasonalised prices in (Rs/qtl.) or arrivals (qtl.)

T = time period in months

The mathematical form of the model was:

$$Y = a + bT + U$$

Using ordinary least square estimation model, the parameters were computed as:

$$\hat{a} = \bar{Y} - bT$$

$$\hat{b} = \frac{\sum y_1 t_1}{\sum t_1^2}$$

Where, $y_1 = Y_1 - \bar{Y}$

$t_1 = T_1 - \bar{T}$

The reliability of the estimates was tested using t statistics.

Seasonal Behaviour

(a) Computation of seasonal indices:

The seasonal price indices were computed by taking 12 months moving average of the original data with the following multiplicative model of time series analysis:

$P = T \times S \times C \times I$…….. (1)

Where,

P = Monthly price

T = Trend value

C = Cyclic component

S = Seasonal component

I = Irregular component

The ratio to moving average method was used for the construction of the seasonal price indices. The effect of trend and cyclical variations were eliminated by twelve months centered moving averages. Thereafter, the ratios of original price indices to centered twelve months moving averages were worked out. These ratios were averaged and the twelve months indices were equal to 1200.

(b) Extent of intra year price rise

The difference between the lowest and the highest price within the year is termed as intra year price rise. The prices of most commodities usually remain the lowest in the harvest season and rise thereafter till they reach the highest level in the next pre-harvest season. The intra year price variation or rise was computed by using the following formula.

$$ASPV = \frac{HSPI - LSPI}{\left(\frac{HSPI + LSPI}{2}\right)} X\,100$$

Where, ASPV = Average Seasonal Price Variation
HSPI = Highest Seasonal Price Variation
LSPI = Lowest Seasonal Price Variation

This coefficient has some advantages over IPR (Intra- Year Price Rise) and indicates the average variations in prices during the year.

RESULTS AND DISCUSSION

(a) Trends analysis

Trend represents the general direction of change in arrivals and prices over a period of time. Trend component is affected by changes in demand while price trend is affected by adjustment in supply arising out of development of cold storage and marketing facilities, production technology and market arrivals over long period. The estimated parameters for trend value for arrivals and prices of Coriander crop for selected markets are given in Table 1. A negative trend in arrivals of coriander was observed in both Kota and Baran markets whereas positive trend was observed in arrivals of coriander for Ramganjmandi market. This may be due to decrease in area under coriander in the catchment area of Ramganj mandi. All the markets *viz.,* Kota, Ramganj Mandi and Baran showed positive trend in prices of coriander.

Table 1.: Trend equations of coriander arrivals and prices during 2003-22

Particulars	Kota	Ramganj mandi	Baran
Arrivals	Yt = 125864 - 635.256*t	Yt = 8193.26 + 352.398*t	Yt = 19963.4 - 7.20628*t
Prices	Yt = 1789.67 + 21.3534*t	Yt = 1886.21 + 22.2176*t	Yt = 1715.31 + 22.0566*t

(b) Seasonal Indices of Arrivals and Prices

The seasonal component is defined as the intra-year pattern of variation that is repeated from year to year. Seasonal price variations resemble a cycle covering a period of 12 months or less (Dorosh and Shahabuddin, 2002).The estimated monthly seasonal price and arrivals indices of coriander crop at the selected markets of the state are presented in Table 2.

The higher indices of arrivals were observed during the months from March to June in both Kota (243.7-132.3) and Baran (228.3-136.5) markets. It is clear that the peak period of arrivals were during March to June. Similar results were found by Powar and Misal (2005).The decline in arrivals was more prominent from July to February in both Kota and Baran markets and reached to the lowest in November (35.7) in case of Kota market and in the month of February(51.3) in Baran market. The higher seasonal indices of arrivals were observed in February to May in Ramganjmandi . The lowest value of index was observed in the month of October (26.7).

Table 2: Seasonal Indices of Prices and Arrivals of Coriander.

	Kota		Ramganj Mandi		Baran	
Month	Price	Arrival	Price	Arrival	Price	Arrival
Jan	98.1	37.3	105.0	31.1	100.7	52.9
Feb	97.1	44.1	93.8	124.4	90.3	51.3
March	102.6	243.7	101.8	413.3	92.3	228.3
April	101.9	278.6	100.6	130.4	95.5	187.5
May	92.8	186.1	95.2	211.9	94.4	147.3
Jun	100.4	132.3	99.8	85.2	92.7	136.5
July	104.2	59.7	99.8	41.8	107.7	77.6
Aug	109.4	38.6	101.4	27.5	112.6	53.7
Sep	101.6	36.3	99.2	36.0	107.3	68.9
Oct	99.1	57.0	97.7	26.7	101.9	62.7
Nov	98.7	35.7	102.2	36.1	103.5	65.4
Dec	94.0	50.5	103.4	35.6	101.0	68.0
Total	1200.0	1200.0	1200.0	1200.0	1200.0	1200.0
IPR	**17.9**	**-**	**10.2**	**-**	**22.7**	**-**
ASPV	**16.4**	**-**	**9.7**	**-**	**22.0**	**-**

IPR = Intra-year Price Rise, **ASPV** = Average Seasonal Price Variation

Coriander prices have not shown definite seasonal pattern in Ramganj mandi as compared to Baran and Kota markets. In respect of price indices of coriander, lower values were observed in the month of February in Baran market (90.30 points), in the month of May in Kota market (92.8 points) and in month of February in Ramganj mandi (93.8 points). February-March are the post-harvest months of the coriander crop. The highest values of price indices were observed during lean arrivals months of June to January in selected markets. The maxima in the price were reached during August in Baran and Kota markets and during January in Ramganj mandi. Seasonal indices of prices of coriander reached to the lowest level in the months of Feb-March with the arrival of new crop and release of old stocks held by traders and big farmers. There was continuous price rise from post harvest season to next pre harvest season in Baran and Kota market. The difference between lowest and highest seasonal price indices ranged between 10.2 per cent (Ramganj mandi) to 22.7 per cent (Baran). The highest coefficient of average seasonal price variation was recorded in Baran Market (22 %) and lowest in Ramganj mandi (9.7%). All these parameters revealed that variation in prices of coriander in Baran market over the months were higher as compared to Kota and Ramganj Mandi.

(c) Market Arrivals and Prices variability of coriander

The extent of monthly price variability in selected markets for coriander has been brought out in Table 3. The price variability, measured in terms of coefficient of variation, in the Kota market was more pronounced during July to October with values of coefficient of variation was more than 50 percent which ranging from 51.51 per cent in August and 57.02 per cent in July and was lowest (34.88 %) in January. The Ramganjmandi experienced lower degree of price variability during January to June months. It remained generally high in the remaining months, the higher value was observed in September in (53.9%). On the other hand, it remained quite high more than 50 per cent during the period June to October in Baran market. The variability was lower (33 to 39%) during the months of December to February.

The Baran market, shown a relatively small range of coefficients of variation i.e. 18.70 per cent in June to 56.86 per cent in November. The CV of Ramgajn mandi was concerned, the variability in arrivals was more pronounced during the months of Jan. to May. The variability in average arrivals of coriander in Kota market was maximum (36.04 to 145.77%) during the months of April to June (which is peak season month). Burark *et al*. (2012) also obtained same results while studying the Market Integration and Price volatility in Domestic Market of Coriander in Rajasthan.

Table 3: Variability in the market arrivals of coriander during 2003-2022

	Kota		Ramganj Mandi		Baran	
Month	Price	Arrival	Price	Arrival	Price	Arrival
Jan	49.47	34.88	54.73	41.36	40.57	37.05
Feb	42.13	37.01	80.66	40.86	30.70	39.05
March	36.93	35.91	55.34	39.65	45.43	47.56
April	36.04	35.77	107.79	38.37	37.96	40.87
May	114.00	41.15	15.50	38.66	34.08	43.23
Jun	145.77	47.25	08.39	40.22	18.70	51.16
July	66.66	57.02	08.36	47.26	41.46	56.21
Aug	70.19	51.51	08.67	52.18	46.55	58.54
Sep	63.11	54.69	10.34	53.90	50.45	56.00
Oct	48.22	54.50	05.16	52.61	36.71	54.95
Nov	59.43	44.78	08.24	45.33	56.86	48.00
Dec	52.64	35.20	11.96	42.90	40.18	33.61

(d) **Relationship between Market Arrivals and Prices**

The degree of relationship between market arrivals and prices of coriander was studied for the years 2003 to 2012 by computing correlation coefficients. The relationship was also studied for different months. This was necessitated due to the seasonality in coriander production, the negative relationship may be more pronounced during the peak season . The relationship between market arrivals and prices in different months may be more fruitful to encourages farmers to adjust their cropping pattern and sell at a time when prices are reasonably high. The results of correlation analysis, given in Table 5, reveal that the negative relationship between market arrivals and prices was not universally true for all the markets.

Table 5: Relationship between market arrivals and wholesale prices

	Kota	Ranganj	Baran
Jan	-0.316	-0.722	-0.119
Feb	0.056	-0.483	-0.122
March	-0.262	-0.171	-0.376
April	-0.719	-0.370	-0.315
May	-0.182	-0.076	-0.048
June	-0.683	0.410	-0.683
July	-0.001	0.331	0.322
Aug.	0.050	0.393	-0.042
Sept.	-0.131	0.150	-0.022
Oct.	-0.624	-0.122	-0.739
Nov.	-0.611	0.238	-0.445
Dec.	-0.813	-0.032	-0.673

CONCLUSIONS

The study has concluded that in Coriander a positive trend in arrival was observed in Ramganjmandi whereas negative trend was observed in Kota and Baran market. All the selected markets showed positive trend in prices. Coriander prices have not shown definite seasonal pattern in Ramganj mandi as compared to Baran and Kota markets. The extent of variability in the arrivals of Coriander was lower in Baran and Ramganjmandi as compared to Kota market. It prices were relatively stable in Ramganjmandi but were more volatile in Baran market. The study has confirmed the negative relationship between market arrivals and prices over the years in the selected markets. However, across different months, there have been several instances of positive relationship between arrivals and prices in all the three markets.

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Growth, Instability and Impact of MSP on Area, Production and Productivity of Cotton in Vidarbha.

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ABSTRACT

The key concern of this research is to assess the growth, instability and impact of MSP over area, production and productivity of Cotton during last two decades in Vidarbha region of Maharashtra. The necessary time series data of cost of Cultivation of Cotton and area, production and yield were compiled from various official published sources for the period from 2000-01 to 2019-20. The growth analysis revealed that the growth in various cost of selected crops of Vidarbha region are found positively significant at 1 per cent level for overall period during 2000-01 to 2019-20. For Cotton highest growth rate found cost-c for main produce i.e. 16.39 percent, The Coefficient of variation for various cost and prices was found to be high in the period-I and low in the Period-II, on the whole, it was observed that the degree of stability is increasing for over the period. Cotton crop maximum instability found i.e. 77.87 per cent. There was an increase in trend in cost and price of selected crops during overall period was positive and among the competitive parametric models, almost all cases third degree polynomial model was found best fitted based on R^2 and significance. The index number shows the annual trend for the cost and price of selected crops which indicate that the index number for cost as well as price i.e. MSP were increasing trend in overall period on the initial tri-annum (2000-01 to 2002-03) average as a base value. Cotton crop shows the positive difference (gap) between MSP and cost of cultivation among the selected crop with 11 positive and 9 negative difference. The increase in MSP over the previous year brought additional area under selected crops, but the impact was nominal. From the results we conclude that impact of MSP on area is higher but there is lower impact of MSP on productivity of selected crops.

***Keyword**: MSP, Growth Rate, Coefficient of Variation*

INTRODUCTION

Cotton is the oldest of all fibers used by human beings and it forms one of the most important commercial crops playing a key role in the economy of the world. It is the leading textile fiber in the world accounting for 40 per cent of the world fiber use. Cotton was first cultivated about 7,000 years ago, by the inhabitants of the Indus Valley Civilization. Cotton often refers to as white gold or 'King' of fiber is an important commercial crop cultivated in India. Cotton, is one of the principal cash crops of India, contributes significantly to its economy and foreign exchange earnings. Approximately, 60 million people depend upon Cotton production and related industries for their livelihoods. In fact, India has the largest area, which is approximately 37 per cent of the global area under Cotton cultivation. However, in terms of productivity, sustainable production and consumption practices, the Indian Cotton sector is facing some major challenges. Water is extensively required for Cotton cultivation. Unfortunately, Cotton farmers in India rely heavily on rainfed cultivation and it accounts for almost 70 per cent of the total area of Cotton cultivation. Besides rainfall pattern, pest

infestation has a significant effect on Cotton cultivation in India. Bollworm and sucking pests have devastated Cotton crops for years. Cotton, mostly known for its direct commercial use, has other uses as well, including being a part of human and animal consumables. Cotton is used to make fibers, which in turn are used to make thread, which then is woven into clothing. In addition, Cotton seeds are crushed and squeezed for oil, which is found in a variety of processed foods consumed by human bodies

METHODOLOGY

The study was undertaken to examine the growth and extent of deviation in Cotton and district wise impact of MSP on area, production and productivity. The study further attempts to assess the direction of trends.

Selection of area

Cotton is grown entire vidarbha region of maharastra including eight potential district i.e. Akola, Amravati, Buldhana, Chandrapur, Nagpur, Wardha, Washim and Yawatmal.

Collection of data

The study was based on secondary data of cost of cultivation of Cotton collected from Agricultural Prices Costs Scheme under the Department of Agricultural Economics and Statistics, Dr. P.D.K.V. Akola. The yearly data of cost of cultivation, Minimum Support Price were compiled for the period of 20 years (2000-01 to 2019-20). The period has been divided into three periods,

Period-I (2000-01 to 2009-10), Period-II (2010-11 to 2019-20) and Overall period (2000-01 to 2019-20).

Analytical tools and techniques

The data was collected from secondary sources subjected to appropriate analytical technique in order to arrive at a meaningful conclusion.

Growth rate analysis

The growth rates will be used to measure the past performance of the economic variable. The growth rates is used to examine cost and prices change over a period of time.

Growth rate was worked from using the following exponential function,

$$Y = ab^t$$

Where, Y= costs / prices

t = time in years

b = regression coefficient

a = intercept

The compound growth rates R will be calculated by using the following formula

$$CGR(R) = [Antilog (logb)-1]*100$$

Where, R =compound growth rates.

The t test was applied to test the significance of b.

Instability analysis

To calculate the instability in cost and prices of major crops in Vidarbha region an index of instability was used as measure of variability. The coefficient of variation (CV) was calculated by using following formula

Coefficient of variation (%) = $\left(\frac{\sigma}{\bar{x}}\right) * 100$

Where, σ = standard deviation,

$\bar{x}$ = mean

The simple coefficient of variation often contains trend component and thus over estimates the level of instability in time series data.

Index Number

An index number is a statistical measure design to show the changes in variables or group of related variables or group of related variables with respect to time.

The index number was calculated by choosing the triennium average for 2000-01 to 202-03 as a base year.

$$\text{Index Number} = \frac{\text{Current Year Value}}{\text{Base Year Value}} \times 100$$

Impact of Minimum Support Prices

Study the impact of lagged Minimum Support Prices on the cost and prices of Cotton Linear, logarithmic forms of equation has been fitted. The previous year Minimum Support Prices generally influence the producer farmer decision on a carrier location for the current year the linear equation has been used as linear regression equation.

1. Linear regression equation:

a. $A_t = a + b\ P_t\ -1$

b. $P_t = a + b\ P_t\ -1$

c. $Y_t = a + b\ P_t\ -1$

2. Logarithmic regression equation:

a. Log. A_t = log a + b P_t -1

b. Log. P_t = log a + b P_t -1

c. Log.Y_t = log a + b P_t -1

Where,

At = Area of major crops at (t^{th}) period,

P_t = Production of major crops at (t^{th}) period,

Y_t = Productivity of major crops at (t^{th}) period,

P_t -1 = Minimum Support Prices of major crops taken in per quintal.at $(t-1)^{th}$ period.

Linear type of function found a better fit than logarithmic function. Hence it is used.

RESULTS AND DISCUSSION

Compound growth rate and instability index of cost and prices were computed and presented in Table-1 and Table-2

Table 1: Compound growth rate of costs of Cotton

S.N.	Particular	Period-I	Period-II	Overall
		2000-01 to 2010-11	2011-12 to 2019-20	2000to 2020
1	Cost-A	9.08**	9.3**	12.54**
2	Cost-B	8.54**	9.85**	12.42**
3	Cost-C	8.18**	9.87**	12.33**
4	Cost-C for main produce/ha	23.75**	9.87**	16.39**
5	Cost of production	-0.02	6.01**	6.52**
6	Minimum Support Price	5.05**	6.04**	6.60**

Note: *=Significance At 5 Per cent Level
** = Significance At 1 Per cent Level

During the first period 2000-01 to 2010-11 (Period-I) the estimated compound growth rates were found to be significant for all the cost of Cotton except the Cost of production. It is found to be non-satisfactory. On the contrary, the Minimum Support Price was found to have positive and significant growth rate.

During the 2011-12 to 2019-20 (Period-II) all the costs of Cotton showed positive and significant growth rates at 1 per cent level. Cost of production shows the positive growth at 1 per cent level. Minimum Support Price also showed positive and significant growth rate during this period.

In the overall period, all the costs of Cotton showed positive and significant growth rates at 1 per cent level. The Minimum Support Price showed positive and significant growth rate in this period with a growth of 6.6 per cent. In general, it can be concluded that there was significant growth with respect of Minimum Support Prices.

Instability in cost and prices of Cotton

As seen from Table 2, that coefficient of variation of Cost-C for main produ/ha for Cotton was highest during overall period by 77.87 per cent. For period-I and period-II The coefficient of variation is highest for Cost-C for main produ/ha i.e. 47.31 per cent and 27.44 per cent respectively.

The coefficient of variation for minimum support prices is highest during overall period i.e. 61.91 per cent. There was variation in the MSP during Period-I compared to Period-II as indicated by lower coefficient of variation in Period-I. It is revealed that the MSP exhibited more variability with coefficient of variation at 18.61 per cent and 26.90 per cent in Period-I and period-II.

Table 2: Instability for cost and prices of Cotton

S.N.	Particular	Coefficient of variation (CV) (%)		
		Period-I	Period-II	Overall
1	Cost-A	34.00	26.29	74.67
2	Cost-B	33.11	27.41	74.88
3	Cost-C	31.42	27.42	74.90
4	Cost-C For Main Produ/Ha	47.31	27.44	77.87
5	Cost of production	12.59	19.35	53.18
6	MSP	18.61	26.90	61.91

Trends in cost of Cotton

For trend analysis of Cost-A of Cotton (Table 3), maximum value of R^2 is 0.97 third degree polynomial trend is best suited. In trend analysis of Cost-B, maximum value of R^2 i.e. 0.97 is best fitted for third degree polynomial trend. In trend analysis of Cost-C, maximum value of R^2 i.e. 0.97 is best suited for third degree polynomial trend.

For trend analysis of Cost-C for main produ/ha, maximum value of R^2 i.e. 0.44 is for third degree polynomial trend which is best suited. In trend analysis of Cost of production, maximum value of R^2 i.e. 0.69 is best fitted for third degree polynomial trend. For trend analysis of Minimum Support Prices of Cotton, maximum value of R^2 is 0.95 is best fitted for third degree polynomial trend.

Table 3: Trends in cost of Cotton

S.N.	Particulars	Models	R^2	Coefficients		
				b^1	b^2	b^3
1	Cost A	Third Degree Polynomial	0.97	-4775.77	746.50	-20.56
2	Cost B	Third Degree Polynomial	0.97	-6027.62	927.88	-24.70
3	Cost C	Third Degree Polynomial	0.97	-6867.66	1048.18	-28.10
4	Cost-C For Main Produ/Ha	Third Degree Polynomial	0.44	11634.16	-877.08	26.92
5	Cost of production	Third Degree Polynomial	0.69	-1204.70	163.61	-5.36
6	MSP	Third Degree Polynomial	0.95	-70.46	20.67	-0.42

Index number for costs of Cotton

It is seen from the Table 4 that the index numbers for Cost-A has recorded the highest rise in index number of from 2003-04 (86.20) to 2015-16 (629.26).Also index number for Cost-B was (619.46) the highest value in 2019-20 and with lowest (87.37) in the year 2002-03. For Cost-C index number was (603.86) the highest value in 2019-20 and with lowest (94.04) in the year 2002-03. Cost-C for main produce per ha has recorded the highest index number of from 2019-20 (956.85) and lowest (116.16) in 2000-01.

Table 4 Index number for costs of Cotton

YEAR	Cost 'A'	Cost 'B'	Cost-C	Cost-C For Main Produce/Ha	Cost of production
2000-01	104.10	109.00	105.40	116.16	88.97
2001-02	109.10	103.63	100.57	134.83	100.27
2002-03	86.80	87.37	94.04	149.01	110.77
2003-04	128.92	135.15	135.52	214.73	84.66
2004-05	134.14	132.59	128.23	203.18	86.67
2005-06	119.16	111.63	112.93	178.94	83.17
2006-07	110.05	108.60	106.20	168.22	76.44
2007-08	177.34	171.27	166.47	263.78	86.29
2008-09	189.67	187.25	182.96	289.91	94.75
2009-10	239.65	233.22	224.21	355.28	110.52
2010-11	296.21	328.39	312.33	488.91	111.06
2011-12	370.04	349.65	342.54	542.77	170.02
2012-13	446.70	438.74	435.52	690.10	187.39
2013-14	449.03	438.74	435.52	690.10	187.39
2014-15	442.13	410.95	407.61	645.88	221.31
2015-16	629.26	584.06	580.12	919.23	226.30
2016-17	599.93	609.71	596.13	944.61	182.82
2017-18	574.94	587.29	580.34	919.58	221.26
2018-19	623.02	611.65	597.79	947.24	227.31
2019-20	619.57	619.46	603.86	956.85	234.61

Also index number for Cost of production was (234.61) the highest value in 2019-20 and with lowest (83.17) in the year 2005-06. This recorded lowest cost amongst all the costs of Cotton.

Index number for Minimum support price of selected crops

It is seen from the Table 5 that the Index numbers for minimum support price of Cotton, has shown gradual increase. It shown the highest increase of index number in the year 2019-20 i.e. (298.71) and lowest (98.22) in the year 2000-01.

Table 5 Index number for Minimum Support Price of selected crops

YEAR	COTTON	YEAR	COTTON
2000-01	98.22	2010-11	161.46
2001-02	100.91	2011-12	177.61
2002-03	100.91	2012-13	209.90
2003-04	103.61	2013-14	215.29
2004-05	105.49	2014-15	217.98
2005-06	106.57	2015-16	220.67
2006-07	102.26	2016-17	223.90
2007-08	109.26	2017-18	232.51
2008-09	161.46	2018-19	293.33
2009-10	161.46	2019-20	298.71

4.4.2 Gap between Minimum Support Price and cost of cultivation of Cotton

The gap between Minimum Support Prices and cost of production of Cotton of Vidarbha region are presented in the Table 6.

The gap is calculated for the study period i.e. 2000-01 to 2019-20.The results revealed that the gap between MSP and cost of cultivation of Cotton in Vidarbha region recorded which ranged from -1010.3 to 860.26 (Rs/Qtl).

Table 6. Gap between Minimum Support Price and Cost of Production of Cotton

YEAR	MSP	Cost of Production	Gap
2000-01	1825	2009.1	-184.07
2001-02	1875	2264.3	-389.33
2002-03	1875	2501.3	-626.34
2003-04	1925	1911.9	13.14
2004-05	1960	1957.2	2.82
2005-06	1980	1878.3	101.75
2006-07	1900	1726.3	173.73
2007-08	2030	1948.6	81.4
2008-09	3000	2139.7	860.26
2009-10	3000	2495.7	504.28
2010-11	3000	2507.9	492.1
2011-12	3300	3839.3	-539.3
2012-13	3900	4231.7	-331.65
2013-14	4000	4231.7	-231.65
2014-15	4050	4997.7	-947.65
2015-16	4100	5110.3	-1010.3
2016-17	4160	4128.5	31.48
2017-18	4320	4996.5	-676.47
2018-19	5450	5133.1	316.91
2019-20	5550	5331.2	218.81

The highest gap was registered in year 2008-09 (860.26 (Rs./Qtl)) followed by 2009-10 (504.28 (Rs./Qtl)), 2010-11 (492.1 (Rs./Qtl)), 2018-19 (316.91 (Rs./Qtl)), 2019-20 (218.81 (Rs./Qtl)), 2006-07 (173.7 (Rs./Qtl)). 2005-06 (101.75 (Rs./Qtl)), 2007-08 (81.4 (Rs./Qtl)), 2016-17 (31.48 (Rs./Qtl)), 2003-04 (13.14 (Rs./Qtl)), 2004-05 (2.82 (Rs./Qtl)).There were 11 positive difference (gap) and 9 negative difference (gap) which shows that minimum support price was ruled higher than cost of cultivation.

Impact of MSP on area of Cotton in Vidarbha region

The numerical values of the linear function for Cotton indicates that R^2 is significant at 1 per cent level and supports the results that variation in areas of Cotton is explained by the explanatory variable, i.e., previous year's Minimum Support Prices of the Cotton.

Table 7. Impact of MSP on area of Cotton in Vidarbha region

S. N.	Districts	R^2	S.E.	Linear Regression Equation
1	Akola	0.67	169.83	y = 2445.6 - 0.21x
2	Amravati	0.07	510.37	y = 2615.7 - 0.12x
3	Buldhana	0.11	317.67	y = 2394.5 - 0.09x
4	Chandrapur	0.85	177.34	y = -190.4 + 0.37x
5	Nagpur	0.78	151.48	y = 188.9 + 0.25x
6	Wardha	0.8	282.34	y = 163.8 + 0.48x
7	Washim	0.75	139.23	y = 1155.3 - 0.21x
8	Yawatmal	0.29	392.09	y = 3574 + 0.21x

y = area, x =MSP

Table 7 revealed that 67 per cent variation in area of Akola district, 7 per cent variation in area of Amravati district, 11 per cent variation in area of Buldhana district, 85 per cent variation in area of Chandrapur district, 78 per cent variation in area of Nagpur district, 80 per cent variation in area of Wardha district, 75 per cent variation in area of Washim district. 29 per cent variation in area of Yawatmal district is explained by independent variable i.e. lagged MSP. The elasticity for these variables is significant at 1 per cent level in case of area of Cotton. The value of elasticity has found as -0.21, -0.12, 0.09, 0.37, 0.25, 0.48, -0.21, 0.21 per cent indicating thereby that previous year price influences current year's areas major districts of Cotton (like Akola, Amravati, Buldhana, Chandrapur, Nagpur, Wardha, Washim, Yawatmal).

Impact of MSP on production of Cotton in Vidarbha region

The numerical values of the linear lag function for Cotton indicates that R^2 is significant at 1 per cent level and supports the results that variation in production of Cotton is explained by the explanatory variable, i.e., previous year's minimum support prices of the Cotton.

Table 8. Impact of MSP on production of Cotton in Vidarbha region

S. N.	Districts	R^2	S.E.	Linear Regression Equation
1	Akola	0.13	980.44	y = 1711.6 + 0.33x
2	Amravati	0.44	1401.60	y = 372.1 + 1.07x
3	Buldhana	0.00007	1680.43	y = 2937 + 0.01x
4	Chandrapur	0.67	814.76	y = -1342 + 1.008x
5	Nagpur	0.59	862.36	y = -990.8 + 0.90x
6	Wardha	0.7	1195.38	y = -1847.3 + 1.5x
7	Washim	0.25	316.41	y = 1095.6 - 0.1x
8	Yawatmal	0.11	2592.73	y = 3328.7 + 0.80x

y = Production, x =MSP

Table 8 revealed that 13 per cent variation in production of Akola district, 44 per cent variation in production of Amravati district, 0.00007 per cent variation in production of Buldhana district ,67 per cent variation in production of Chandrapur district, 59 per cent variation in production of Nagpur district, 7 per cent variation in production of Wardha district, 25 per cent variation in production of Washim district, 11 per cent variation in production of Yawatmal district is explained by independent variable i.e. lagged MSP. The elasticity for these

variables is significant at 1 per cent level in case of production of Cotton. The value of elasticity has found as 0.33, 1.07, 0.01, 1.008, 0.90, 1.5, -0.1, 0.80 per cent indicating thereby that previous year price influences current year's production of major Cotton growing districts (like Akola, Amravati, Buldhana, Chandrapur, Nagpur, Wardha, Washim, Yawatmal).

Impact of MSP on productivity of Cotton in Vidarbha region

The numerical values of the linear lag function for Cotton indicates that R^2 is significant at 1 per cent level and supports the results that variation in productivity of Cotton is explained by the explanatory variable, i.e. previous year's MSPs of the Cotton. Table 9 revealed that 34 per cent variation in productivity of Akola district, 36 per cent variation in productivity of Amravati district, 2 per cent variation in productivity of Buldhana district, 35 per cent variation in productivity of Chandrapur district,

Table 9. Impact of MSP on productivity of Cotton in Vidarbha region

S. N.	Districts	R^2	S.E.	Linear Regression Equation
1	Akola	0.34	95.91	y = 85.6 + 0.06x
2	Amravati	0.36	138.51	y = 23.7 + 0.08x
3	Buldhana	0.02	116.01	y = 186.2 + 0.01x
4	Chandrapur	0.35	96.53	y = 87.33 + 0.06x
5	Nagpur	0.41	97.11	y = 74.89 + 0.07x
6	Wardha	0.46	82.75	y = 75.99 + 0.06x
7	Washim	0.11	87.95	y = 132.58 + 0.02x
8	Yawatmal	0.05	100.50	y =163.5+0.021x

y = productivity, x =MSP

41 per cent variation in productivity of Nagpur district, 46 per cent variation in productivity of Wardha district , 11 per cent variation in productivity of Washim district, 5 per cent variation in productivity of Yawatmal district is explained by independent variable, i.e. lagged MSP. The elasticity for these variables is significant at 1 per cent level in case of productivity of Cotton. The value of elasticity has found as 0.6, 0.08, 0.01, 0.06, 0.07, 0.06, 0.02, 0.02 per cent indicating thereby that previous year price influences current year's productivity of major Cotton growing districts (like Akola, Amravati, Buldhana, Chandrapur, Nagpur, Wardha, Washim, Yawatmal).

CONCLUSIONS

- The growth analysis revealed that the growth in various cost of selected crops of Vidarbha region are found positively significant at 1 per cent level for overall period during 2000-01 to 2019-20. For Cotton highest growth rate found cost-c for main produce i.e. 16.39 percent,
- The Coefficient of variation for various cost and prices was found to be high in the period-I and low in the Period-II, on the whole, it was observed that the degree of stability is increasing for over the period.
- For Cotton, crop maximum instability found i.e 77.87 per cent. There was an increase in trend in cost and price of selected crops during overall period was positive and among the competitive parametric models, almost all cases third degree polynomial model was found best fitted based on R^2 and significance.
- The index number shows the annual trend for the cost and price of selected crops which indicate that the index number for cost as well as price i.e. FHP and MSP were increasing trend in overall period on the initial tri-annum (2000-01 to 2002-03) average as a base value.
- Cotton crop shows the positive difference (gap) between MSP and cost of cultivation

among the selected crop with 11 positive and 9 negative difference.

- The increase in MSP over the previous year brought additional area under selected crops, but the impact was nominal.
- From the results we conclude that impact of MSP on area is higher but there is lower impact of MSP on productivity of selected crops.

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Present status of Agriclinics and Agribusiness Centers Scheme in India with special reference to Gujarat State

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ABSTRACT

AC & ABC Scheme was launched by Government of India, April 2002 with the objective to supplement the public extension system through committed private extension services at free or nominal cost to educated and trained candidates in a self employment mode. The present study was conducted to study the present status and progress of AC & ABC scheme in India with a special focus on Gujarat state. The secondary data were collected for the period of year 2002 to 2019. In India, among the various agencies, highest training network of AC & ABC scheme provided by NGOs followed by agribusiness companies. States such as Maharashtra, Uttar Pradesh and Tamil Nadu states have the leading and have remarkable achievement. Other state like Karnataka, Bihar and Rajasthan have also exhibited fair degree of progress. Gujarat holds the Eighth rank in India in terms of number of candidates trained and agri-venture established. Dairy/Poultry/Piggary/Goatary followed by ACABC and Agriclinics are the major ventures established under this scheme. In Gujarat state, total nine Nodal Training Institutes provide training to agripreneurs for establishing the various agri-ventures and out of these agencies, International School for Public Leadership (ISPL), Ahmedabad and Shashwat Sheti Vikas Pratishthan (SSVP), Amreli have trained highest number of candidates. Junagadh, Amreli and Rajkot districts were leading in training and establishment of major agri-ventures like Agriclinics and Agribusiness Centres, Dairy/Poultry/Piggary/Goatary and Agri-Clinics.

Key words: *Agriclinics, Agribusiness centers, agri-ventures, agripreneurs*

INTRODUCTION

Agriculture and allied sectors are considered to be mainstay of the Indian economy because these are important sources of raw materials for industries and they demand for many industrial products particularly fertilizers, pesticides, agriculture implements and a variety of consumer goods. Due to the changing socio, economic, political, environmental and cultural dimensions over the world, farmers' and nations' options for survival and for sustainably ensuring success in changing their respective economic environments has become increasingly critical. It is also worth noting that the emergence of the free market economies globally has resulted in the development of a new spirit of enterprise "Agripreneurship" and the increased individual need for responsibility for running their own businesses.

Agriclinics and Agribusiness Centres Scheme (AC & ABC Scheme) was launched in April 2002 by Government of India with the objective to supplement the public extension system through committed private extension services at free or nominal cost by educated and trained candidates in a self employment mode, by Extension Division, Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW), Ministry of Agriculture & Farmers Welfare, Government of India. There are two main components for the scheme: Training and Subsidy. National Institute of Agricultural Extension Management (MANAGE), Hyderabad, provides training to agricultural graduates through Nodal

Training Institutes (NTIs) under Agriclinics and Agribusiness Centres Scheme for performing extension services. The trained candidates establish business units under agricultural allied activities. Subsidy component is implemented through National Bank for Agricultural and Rural Development (NABARD), Mumbai. Trained candidates establishing agriventures availing credit facilities are extended with subsidy depending on their project, gender, social category and regional preferences.

This programme aims to tap the expertise available in the large pool of agriculture graduates. Committed to this programme, the Government is now also providing start-up training to graduates in agriculture, or any subject allied to Agriculture like Horticulture, Sericulture, Veterinary Sciences, Forestry, Dairy, Poultry Farming and Fisheries etc. Those completing the training can apply for special start-up loans for venture. The present paper aims to

a. To study the present status of AC & ABC scheme in India and also

b. To study the present status of AC & ABC scheme in Gujarat.

METHODOLOGY

The secondary data related to present status and progress of AC & ABC scheme in Gujarat and other States of the India like trainees trained, number of established agriventures (state wise, district wise and activity wise) were compiled from official website of MANAGE. The secondary data were collected for the period of year 2002 to 2019. Tabular analysis was carried out to find out the present status and progress of AC & ABC scheme.

RESULTS AND DISCUSSIONS

Table 1: Training network of AC & ABC scheme in India

Sl. No.	Particulars	No. of NTI's	Percentage (%)
1.	State Agricultural Universities	16	10.13
2.	State Government Institutes	18	11.39
3.	NGOs	54	34.17
4.	Agribusiness Companies	34	21.52
5.	Institutes of Co-operative Management	16	10.13
6.	Krishi Vigyan Kendras	20	12.66
	Total	**158**	**100.00**

From table 1, it can be concluded that amongst 158 NTI network for training of AC & ABC scheme in India, agencies having highest network was found to be of NGOs i.e 54 NTI's (34.17%) followed by agribusiness companies (21.52%), KVKs (12.66), State government institutes (11.39%), State Agricultural Universities (10.13%) and Institutes of co-operative management (10.13%).

Table 2: State wise distribution of AC & ABC Scheme in India

Sr. No.	Name of the State	No. of Candidates Trained	No. of Agri-ventures established	Success Rate (%)
1.	Maharashtra	17129	8062	47.07
2.	Uttar Pradesh	15077	7152	47.44
3.	Tamil Nadu	7445	3689	49.55
4.	Karnataka	4046	1618	39.99
5.	Bihar	4031	1392	34.53
6.	Rajasthan	3717	1387	37.32
7.	Madhya Pradesh	3680	1329	36.11
8.	Gujarat	1997	767	38.41
9.	Telangana	1738	417	23.99
10.	Jammu & Kashmir	1491	191	12.81
11.	Andhra Pradesh	1243	321	25.82
12.	West Bengal	1187	296	24.94
13.	Chattisgarh	808	335	41.46
14.	Jharkhand	771	186	24.12
15.	Assam	754	227	30.11
16.	Odisha	623	114	18.30
17.	Uttrakhand	471	161	34.18
18.	Manipur	439	128	29.16
19.	Himachal Pradesh	421	108	25.65
20.	Kerala	239	51	21.34
21.	Nagaland	184	21	11.41
22.	Puducherry	136	84	61.76
23.	Arunachal Pradesh	35	03	08.57
24.	Meghalaya	35	03	08.57
25.	Mizoram	35	00	00.00
26.	Delhi	34	06	17.65
27.	Goa	13	07	53.85
28.	Sikkim	09	01	11.11
29.	Tripura	05	01	20.00
30.	Chandigarh	03	01	33.33
Total (India)		**69169**	**28510**	**41.22**

From the table 2, it was found that in India, total 69169 candidates were trained and out of these 28510 candidates established their agri-ventures. So in India, the overall success

rate was observed to be 41.22 percent. Maharashtra, Uttar Pradesh and Tamil Nadu had the leading share and remarkable achievement while other state such as Karnataka, Bihar and Rajasthan also exhibited fair degree of progress. Gujarat holds the eighth rank. The state wise analysis shows that the maximum candidates trained and established agriventures were in the state of Maharastra followed by Uttar Pradesh, Tamil Nadu, Kartanaka, Bihar, Rajasthan, Madhya Pradesh and Gujarat and so on. In states such as Maharastra, Uttar Pradesh, Tamil Nadu, Chattisgarh and Goa, the number of ventures established was more than 40 per cent of the candidates (Success rate %) trained. In Gujarat, total 1997 candidates were trained and out of these 767 candidates established their agri-ventures. So in Gujarat, the success rate observed was 38.41 percent. So, the success rate in Gujarat for AC & ABC scheme is little lower than the average of India (41.22%).

Table 3: Activity-wise distribution of agri-ventures under AC & ABC Scheme in India

Name of Agri-venture	No. of Agri-ventures established	Percentage (%) of total Agri-ventures established
Dairy/Poultry/Piggery/Goatary	9405	32.99
Agri-Clinic & Agribusiness Centre	7962	27.93
Agri-Clinics	4567	16.02
Veterinary Clinics	940	03.30
Farm Machinery Unit	815	02.86
Nursery	589	02.07
Vermicomposting/Organic manure	536	01.88
Value addition	422	01.48
Vegetable production & Marketing	405	01.42
Fisheries Development	397	01.39
Seed Processing & Marketing	380	01.33
Crop Production	318	01.12
Horti.Clinic	178	00.62
Direct Marketing	171	00.60
Bio-fertilizer Production & Marketing	166	00.58
Mushroom Cultivation	131	00.46
Organic Production/food chain	117	00.41
Landscaping + Nursery	114	00.40
Cultivation of Medicinal Plants	114	00.40
Contract Farming	111	00.39
Floriculture	111	00.39
Soil Testing Laboratory	110	00.38
Apiary	104	00.36
Sericulture	63	00.22
Animal Feed Unit	59	00.21

Rural Godown	58	00.20
Pesticides Production & Marketing	57	00.20
Production & Marketing of Bio-control agents	30	00.11
Tissue Culture Unit	28	00.10
Agriculture Journalism	18	00.06
Agri-Eco Tourism	17	00.06
Fishery Clinic	17	00.06
Total	**28510**	**100.00**

From table 3, it was found that there were 32 agri-ventures established by the trained agripreneurs under AC&ABC Scheme. Out of the total 28510 candidates who established their agri-ventures, highest number (total 9405) of the agri-ventures were established in Dairy/Poultry/Piggery/Goatary sector (32.99%) followed by Agri-Clinic & Agribusiness Centre (total 7962 & 27.93%), Agri-Clinics (total 4567 & 16.02%) and Veterinary Clinics (total 940 & 03.30%). From table 4, it was also found the the agriventures like Tissue culture unit, Agriculture journalism and Fishery clinic were least in number established by the trained agripreneurs.

Table 4: NTI's wise distribution of trained candidates and agri-ventures established under AC & ABC Scheme in Gujarat

Sl. No.	Name of the Nodal Training Institute (NTI)	No. of Candidates Trained	No. of candidates established Agri-ventures	Success Rate (%)
1.	International School for Public Leadership , Ahmedabad	566	251	44.35
2.	Shashwat Sheti Vikas Pratishthan, Amreli	517	216	41.78
3.	Indian Society of Agribusiness Professionals (ISAP), Vadodara	225	114	50.67
4.	Vivekananda Research and Training Institute , Kutch	168	64	38.10
5.	Jai Research Foundation , Vapi	153	62	40.52
6.	Ganpat University, Meshana	115	NA	NA
7.	Mitcon Consultancy Services Ltd.(MCSL), Amreli	102	13	12.75
8.	Anand Agricultural University, Anand	80	15	18.75
9.	Entrepreneurship Development Institute of India, Ahmedabad	71	32	45.07
	Total	**1997**	**767**	**38.41**

From table 4, it was found that in Gujarat total nine NTI's provided training to agripreneurs for establishing the various agri-ventures. Total 1997 candidates were trained by these NTI's and out of that 767 candidates established their agri-venture and got benefitted under this scheme. So 38.41 percentage of candidates established the agri-ventures. Out of 9 nodal agencies International School for Public Leadership (ISPL), Ahmedabad and Shashwat Sheti Vikas Pratishthan (SSVP), Amreli were the leading agency which trained highest number of candidates i.e. 566 & 517 respectively and also in terms of number of agri-venture established i.e. 251 & 216 respectively. Further, in case of Success rate (%), the highest rate was found for the Indian Society of Agribusiness Professionals (ISAP), Vadodara i.e. 50.67 percent followed by Entrepreneurship Development Institute of India (EDII), Ahmedabad (45.07%), ISPL, Ahmedabad (44.35%), SSVP, Amreli (41.78%), Jai Research Foundation , Vapi (40.52%)

followed by Mitcon Consultancy Services Ltd.(MCSL), Amreli (12.75%) and Anand Agricultural University, Anand (18.75%) respectively.

Table 5: District-wise candidates trained and established ventures of AC & ABC scheme in Gujarat

Sl. No.	Name of the District	No. of Candidates Trained	No. of Agri-ventures established	Success Rate (%)
1.	Junagadh	283	101	35.69
2.	Amreli	232	105	45.26
3.	Rajkot	212	95	44.81
4.	Ahmedabad	122	34	27.87
5.	Sabarkantha	102	40	39.22
6.	Banaskantha	95	18	18.95
7.	Mahesana	92	28	30.43
8.	Bhavnagar	85	29	34.12
9.	Anand	82	30	36.58
10.	Vadodara	73	33	45.21
11.	Surendranagar	66	28	42.42
12.	Gandhinagar	65	22	33.85
13.	Surat	50	26	52.00
14.	Kheda	47	19	40.43
15.	Valsad	39	13	33.33
16.	Aravalli	38	15	39.47
17.	Navsari	37	15	40.54
18.	Jamnagar	35	15	42.86
19.	Panch Mahals	35	15	42.86
20.	Patan	31	09	29.03
21.	Gir Somnath	31	13	41.93
22.	Dohad	29	14	48.28
23.	Kachchh	27	14	51.85
24.	Bharuch	19	09	47.37
25.	Morbi	15	04	26.67
26.	Chhota Udaipur	14	06	42.86
27.	Botad	09	06	66.67
28.	Mahisagar	08	02	25.00
29.	Devbhoomi Dwarka	08	00	00.00
30.	Narmada	07	05	71.43
31.	Porbandar	04	02	50.00
32.	Tapi	03	02	66.67
33.	Dang	02	00	00.00
Total (Gujarat)		**1997**	**767**	**38.41**

In Gujarat, out of total 33 districts, Junagadh, Amreli and Rajkot districts having highest positions in terms of training & establishment of major agri-ventures like ACABC, Dairy/Poultry/Piggary/Goatary & agriclinics etc. In Junagadh district, success rate (35.69%) was found with a total 283 candidates trained and out of these total 101 candidates established the various agri-ventures. Similarly, in Amreli district, success rate (45.26%) was found with a total 232 candidates trained and out of these total 105 candidates established the various agri-ventures while in Rajkot district, total 212 candidates trained and out of these total 95 candidates established the various agri-ventures with a success rate of 44.81. In the districts of South Gujarat like Narmada, Tapi and Dang, less number of candidates trained and established their agriventures. (Table 5).

Table 6: Activity-wise distribution of agri-ventures under AC & ABC scheme in Gujarat

Sl. No.	Name of Agri-venture	No. of Agri-ventures established	Percentage (%) of the total Agri-ventures established
1.	Agri-Clinic & Agribusiness Centre	311	40.55
2.	Dairy/Poultry/Piggery/Goatary	198	25.81
3.	Agri-Clinics	107	13.95
4.	Farm Machinery Unit	32	04.17
5.	Seed Processing & Marketing	22	02.87
6.	Veterinary Clinics	17	02.22
7.	Nursery	14	01.83
8.	Direct Marketing	08	01.04
9.	Crop Production	08	01.04
10.	Value addition	07	00.91
11.	Vermicomposting/Organic manure	06	00.78
12.	Soil Testing Laboratory	06	00.78
13.	Bio-fertilizer Production & Marketing	04	00.52
14.	Organic Production/food chain	04	00.52
15.	Pesticides Production & Marketing	04	00.52
16.	Vegetable production & Marketing	04	00.52
17.	Floriculture	03	00.39
18.	Animal Feed Unit	02	00.26
19.	Agriculture Journalism	02	00.26
20.	Mushroom Cultivation	02	00.26
21.	Cultivation of Medicinal Plants	01	00.13
22.	Contract Farming	01	00.13
23.	Landscaping + Nursery	01	00.13
24.	Apiary	01	00.13
25.	Production & Marketing of Bio-control agents	01	00.13
26.	Agri-Eco Tourism	01	00.13
	Total	**767**	**100.00**

The statistics about activity wise performance of agri-clinic and agri business centre scheme in Gujarat is given in table 6. It was observed that Agri-Clinics and Agribusiness Centres was the major activity with 40.55 percent share of total activity followed by Dairy/Poultry/Piggary/Goatary (25.81%) and Agri-Clinics (13.95%) having major position of agri-ventures established under this scheme in Gujarat. Further, agri-ventures such as cultivation of medicinal plants, contract farming, landscaping with nursery, Apiary, Production & Marketing of Bio-control agents and Agri-Eco Tourism with a each one candidate and 00.13 percent were the least among all activities.

CONCLUSION

Under the AC & ABC Scheme, Among the various agencies, highest network of training institutes was found to be of NGOs followed by agribusiness companies in India. Maharashtra, Uttar Pradesh and Tamil Nadu are the leading and have remarkable achievement which other state like Karnataka, Bihar and Rajasthan also exhibited fair degree of progress. Gujarat holds the Eighth rank in terms of number of candidate trained and venture established. Dairy/Poultry/Piggary/Goatary was found the major activity followed by ACABC and Agri-Clinics having major position of venture established under this scheme in India. In Gujarat state, total nine NTI's which provide training to agripreneurs for establishing the various agri-ventures amongst which, International School for Public Leadership (ISPL), Ahmedabad and Shashwat Sheti Vikas Pratishthan (SSVP), Amreli trained highest number of candidates. Junagadh, Amreli and Rajkot districts have maximum performance in terms of training & establishment of major agri-ventures like Agri-Clinics and Agribusiness Centres, Dairy/Poultry/Piggary/Goatary and Agri-Clinics in Gujarat state.

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Mango Export and Trade Directions: India's Perspectives

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ABSTRACT

Mango account for approximately half of all tropical fruits produced worldwide. Mango is commercially grown in more than 80 countries. Major Mango producing countries are India, China, Thailand, Indonesia, Mexico, Pakistan, Philippines, Nigeria, Egypt and Brazil. India's contribution to the world's mango production is the highest. The major mango producing states in India are Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat and Telangana although many other Indian states also cultivate mango. Hence this study was conducted to assess the trends in mango export and its trade direction: India's perspective with objective of estimation of growth and export performance of Mango from India. India is the one of the largest producer and exporter of mango in the world.The export data from 2004-05 to 2022-23 was collected from secondary sources. The results revealed that production of mango in India witnessed positive and significant growth of 4.11 per cent per annum, while area grew by 1.85 per cent per annum. The India's export to major countries indicated that UAE is a major importer for Indian Mango followed by UK, USA, Kuwait and Canada. The Country has exported 22963.76 MT of Fresh Mangoes to the World for the worth of Rs 378.49 crore 48.53 USD Million during the year 2022-23. The present study concludes that mango has great export potential in future and strategic efforts must be taken up to increase the production and productivity of mango.

Key Word: Mango, Export, Growth Rate, Markow Chain Analysis.

INTRODUCTION

India is recognized as the fruits and vegetables basket of the world. India holds second position for fruit production in the world after China. Major fruits produced in India are banana, grapes, mango and cashew among these fruits mango is recognized as king of fruits. Major mango producing countries in the world are China, Thailand, Indonesia, Mexico, Pakistan, Philippines, Nigeria, Egypt and Brazil. In the year 2022-23, India produced 21.82 million. Mango is cultivated 1.23 million hectors with an annual production of almost 10.99 million tons, in India which account for more than 55 per cent of world's total production. Major Mango producing states are Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat and Telangana. India is the Second largest Mango-producing country in the world and a largest exporter with more than 11.33 per cent of the world's export share.Indian mangoes are emerging fast as an important foreign exchange earning fruit crop. 'Alphonso' is the leading export cultivar of India, followed by Totapuri, Banganapalli and Kesar.. The worth of exported mango in the year 2022-23 was Rs.378.49 crores. The present, study focuses to estimate Mango Export and Trade Directions: India's Perspectives. The specific objectives of the present study were as under.

Objectives:

1. To work out growth trends in area, production and productivity of Mango in India
2. To examine the export of mango as well as their trade directions

METHODOLOGY

Estimation of Growth Rates

The growth rates in area, production, yield; export of Mango in India was studied by using compound growth rates.

The growth rate was estimated using following model

$Y = a.b^t$ ..... (1)

Where,
Y = Dependent variable for which growth rate is to be estimated
(Quantity exported / export value / unit value)
a = Intercept
b = Regression Coefficient
t = Time Variable
This equation was estimated after transforming (1) as follows,

Log y = log a + t Log b ..... (2)

Then the percent compound growth rate (g) was computed using the relationship.

CGR (g) = (antilog b – 1) X 100 ..... (3)

The significance of the regression coefficient was tested using the student 't' test.

Markov chain analysis

The trade directions of Mango export were analyzed by using the first order Markov chain approach. Central to Markov chain analysis is the estimation of transitional probability matrix P. The elements P_{ij} of the matrix P indicates the probability that export was switch from country i to country j with the passage of time. The diagonal elements of the matrix measure the probability that the export share of a country was retained. Hence, an examination of the diagonal elements indicates the loyalty of an importing country to a particular country's export.

In the context of the current application major Mango importing countries were considered. The average exports to a particular country was considered to be a random variable which depends only on the past export to that country which can be denoted algebraically as

$$E_{jt} = \sum_{i=1}^{r} \left(E_{it-1} * P_{ij} + e_{jt} \right)$$

Where,
E_{jt}= Exports from India to j^{th} country during the year t
E_{it-1} = Exports to i^{th} country during the period t-1
P_{ij}= Probability that the exports will shift from i^{th} country to j^{th}country
e_{jt} = The error term which is statistically independent of E_{it-1}
t = Number of years considered for the analysis
r = Number of importing countries

The transitional probabilities P_{ij} which can be arranged in a (c * r) matrix have the following properties

$$0 \leq P_{ij} \leq 1$$

$$\sum_{i=1}^{n} Pij = 1 \text{ for all}$$

Thus, the expected export shares of each country during period 't' was obtained by multiplying the export to these countries in the previous period (t-1) with transitional probability matrix.

RESULT AND DISCUSSION

Growth in area, production and productivity of Mango in India

The trends in area, production and productivity of Mango in India are presented in table no 1.
The production of Mango in India witnessed positive growth at the rateof3.94percentperannum, while growth in productivity2.16percentperannum .However area witnessed a growth rate of 1.72 per cent perannumindicating a good sign as far as Mango production is concerned.

Table No 1: Compound growth rate of area, production, productivity of Mango.

Particulars	Area (ha)	Production (MT)	Productivity (kg/ha)
India	1.72***	3.94***	2.16***

(***denotessignificance at1%, level,respectively)

Mango export from India

The India's export to major countries indicated that UAE is a major importer for mango followed by UK, USA, Kuwait and Canada. The growth rate of export of Mango from India were worked out and presented in table no 2. The Mango export to UAE, UK, USA, Kuwait and Canada were to majority countries is increasing. The export performance of mango was analyzed found to be increasing by 6.29per cent,50.2 per cent, 40.52per cent, 27.61percent, 8.81 per cent and 15.2 per cent per year, respectively.From table no.2 It was revealed that the highest growth rate of quantity of mango exportedto USA from India was 40.52 per cent per year which is significant at 1 per cent level where at lowest was found inSingapore 0.42 per cent which is non- significant. The highest growth rate in case of total value of Mango exported was found in UK

i.e.77.87 per cent & lowest was found in Singapore i.e. 6.99 per cent which is significant at 5 per cent level. It was concluded that the quantity as well as value of export earnings from India is increasing.

Table 2: Country wise compound growth rate of Mango export from India.

Sr. No	Country	Quantity (MT)	Value (Rs. Lakh)
1.	UAE	6.29**	16.95***
2.	UK	50.2^{NS}	**77.87*** **
3.	**USA**	**40.52*** **	**49.24*** **
4.	Kuwait	27.61***	26.13***
5.	Canada	8.81^{NS}	21.58*
6.	Qatar	15.2***	21.78***
7.	Oman	0.82 ^{NS}	11.42**
8.	Singapore	-0.42^{NS}	6.99**
9.	Saudi Arab	12.84**	19.92***
10.	Beharain	30.41***	23.37**
11.	Total	-2.92^{NS}	11.79***

(***,**and*denotessignificance at 1%, 5 %and10%level, respectively)

Transitional probability of Mango export from India

The structural change in export of Indian mango was examined by estimating the transitional probability matrix using Markov chain model. Markov chain analyzes the structural change in any system whose progress through time can be measured in terms of single outcome variable. The transitional probability matrix was obtainedby using the actual proportion of exports to different importing countries. The year wise export quantity of top 10 country viz., UAE, UK, USA, Kuwait, and pooling all other countries export as other countries. The matrix gives a broad indication of direction of trade of Indian mango export. The raw elements in the transitional probability matrix provide the information of the extent of loss in trade, on account of competing countries the column elements indicates the probability of gains in volume of trade from other competing countries and diagonal elements indicates probability of retention of previous year's trade volume by the respective country. The information regarding transitional probability of export of Mango to major countries is presented in table no 3. It was revealed that the UAE, UK, USA found to be most loyal importers of Mango. UAE has lost 78 per cent and 0.07 per cent of its previous share to UK and Kuwait. However UAE has gained 50 per cent and 78 per cent share of USA and other country. However UAE has gained 13 per cent and 82 per cent share of UK and Kuwait.It revealed that 13 per cent and 82 per cent of previous share of UK and other Kuwaitis shifted to UAE. It is concluded that UAE and UK should be considered most potential importers.

Table 3: Transitional probability of Mango Export from India.

Country	UAE	UK	USA	Kuwait	Others	Total
UAE	**0.78**	0.07	0	0.05	0.07	0.082
UK	0.13	**0.39**	0.31	0.12	0.034	0
USA	0	0.78	**0.21**	0	0	0
Kuwait	0.82	0	0	**0.0**	0.17	0
Others	0.17	0	0.82	0	**0**	0
Totals	0.03	0.18	0	0.009	0	**0.77**

CONCLUSIONS

- Area and production of Mango in India is increasing at 2.29 per cent and 3.94per cent per year
- Export of Mango is increasing in case of major importers for Mango.
- The UAE, Qatar and Oman are the consistent importers for Mango.
- Mango has as established export market and it has better opportunities for export in the international market in future too.considering the production of mango in the country should be strategically planned and promoted for all varieties in general Alphanso, Totapuri, Banganapalli and kesar.

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Production and marketing of roasted *Rabi* Sorghum (*Hurda*) in Solapur District

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ABSTRACT

Sorghum, like pearl millet, is a low-cost source of energy, protein, iron, and zinc among all grains and pulses. In southern Indian states namely Maharashtra, Karnataka, Andhra Pradesh, Tamilnadu and Telangana, sorghum is a staple food where it is consumed in a variety of ways. Ambil, Bhakari, Chaklya, Dried Dhapate, Kanya, Lahya and Thalipit are some of the local preparations. In recent years, there has been a greater focus on value-added products, indicating a shift toward commercial agriculture that is more market-driven. In most of the sorghum growing parts of the India there is a practice of roasting sorghum heads at the dough stage and eating the threshed grain as a delicacy. The panicles were buried in hot coals and ashes for several minutes to be cooked, following which the light green seeds were lightly beaten off the heads and hand winnowed. In Maharashtra this very popular snack is called Hurda. After Makar Sankrant (14th January) the demand for roasted sorghum increases. This paper is a modest attempt to investigate the economics of production and marketing of sorghum value added product with the specific objectives as to ascertain the input use and estimate the costs and returns; to access the marketing structure; to estimate the costs and margins in marketing and to ascertain the constraints in marketing of roasted rabi sorghum (Hurda).

Primary data for the year 2020-21 of 10 hurda vendors from outskirt of Solpaur city on required parameters were collected through personal interviews. Simple tabular analysis involving sums, averages, ratios and percentages were employed to estimate the cost of cultivation of sorghum for roasted sorghum (hurda). The cost of production of roasted sorghum (hurda) was evaluated by using fixed and variable costs involved.

The study was concluded as the family of hurda growers was comprises of 40.68, 35.59 and 23.73 per cent per cent of male, female and children, respectively having higher share of persons with upto primary level education (32.20%). Total holding and gross cropped area of hurda grower was estimated to be 4.63 ha and 5.27 ha, respectively with a cropping intensity of 126.08 per cent.

Local varieties of roasted sorghum viz. Surti, Gulbhendi, Kuchkuchi, Dudhmogra and some improved varieties namely, Phule Madhur, Phule Uttara were mostly preferred by the farmers. The cost of cultivation of sorghum for hurda was Rs. 26132.66/-, wherein the expenditure on hired human labour (16.97 %) and seed (13.52 %) were the major cost items of working capital. The total fixed costs involved in the preparation of hurda were estimated to be Rs. 30164.48, while total variable costs were Rs. 148764.22, Total cost of hurda production was Rs.178928.70 with net income from hurda party were Rs. 260034.58 and B:C ratio was 2.45.

Introduction

Sorghum is a staple food for many people all over the world. Sorghum, like pearl millet, is a low-cost source of energy, protein, iron, and zinc among all grains and pulses. Many people are switching to a gluten-free diet these days because of the numerous established health benefits it can provide. When you add sorghum to your diet, you'll be able to eat just as delectable baked products without the bloating, soreness, and cramping that come with gluten intake.

In southern Indian states namely Maharashtra, Karnataka, Andhra Pradesh, Tamilnadu and Telangana, sorghum is a staple food where it is consumed in a variety of ways. *Ambil*, *Bhakari*, *Chaklya*, Dried *Dhapate*, *Kanya*, *Lahya* and *Thalipit* are some of the local preparations. Sorghum can also be used for a variety of other purposes including starch, glucose, syrup, oil gluten and feeds.

Traditionally, agriculture in India has concentrated on the cultivation of food crops in order to meet the country's food security needs. However, in recent years, there has been a greater focus on value-added products, indicating a shift toward commercial agriculture that is more market-driven. This paper is a modest attempt to investigate the economics of production and marketing of sorghum value added products.

Roasted Sorghum (*Hurda*)

In most of the sorghum growing parts of the India there is a practice of roasting sorghum heads at the dough stage and eating the threshed grain as a delicacy. The cultivars most suitable for roasting have a sweet endosperm that is dimpled at maturity. ***Vani*** sorghums (*durra* group) of India are especially popular in this respect. The panicles were buried in hot coals and ashes for several minutes to be cooked, following which the light green seeds were lightly beaten off the heads and hand winnowed. In Maharashtra this very popular snack is called *Hurda*. Recently in Maharashtra, it has been reported that there is increasing demand for roasted sorghum (*hurda*) not only from urban but also from rural areas. Generally, after *Makar Sankrant* (14th January) the demand for roasted sorghum has increases.

2. Objectives

1. To ascertain the input use and estimate the costs and returns of roasted *rabi* sorghum (*Hurda*).
2. To access the marketing structure of roasted *rabi* sorghum (*Hurda*).
3. To estimate the costs and margins in marketing of roasted *rabi* sorghum (*Hurda*).
4. To ascertain the constraints in marketing of roasted *rabi* sorghum (*Hurda*).

Methodology

Method of data collection

Primary data on physical input, cost expended on various items of expenditure, return gained and marketing constraints were collected through personal interviews with *Hurda* vendors using specifically designed questionnaires. For the analysis, data for the year 2020-21 was collected.

Selection of area

The Solapur district was chosen on purpose since it has the maximum area under sorghum. The majority of *Hurda* parties are held on the outskirts of the Solapur city.

Sampling

The economics of marketing of value-added sorghum products i.e. roasted sorghum (*Hurda)* on a big scale were chosen. Purposively, 10 *hurda* vendors were chosen from outskirt of Solpaur city.

Cost Concepts and Evaluation of Items of Cost

Simple tabular analysis involving sums, averages, ratios and percentages were employed to estimate the cost of cultivation of sorghum for roasted sorghum (*hurda*). The cost of production of roasted sorghum (*hurda*) was evaluated by using fixed and variable costs involved.

Cost of Cultivation of Sorghum for roasted sorghum (*hurda*)

The cost cultivation of sorghum estimated by using the standard cost concepts *viz.,* cost 'A', cost 'B' and cost 'C'. The details are as follows,

Cost 'A'

It includes the actual expenses incurred on account of human labour, bullock labour, total machinery labour, planting material, manures and fertilizers, plant protection, irrigation, etc. Also, the depreciation on implements, machinery and farm buildings, land revenues, cess and other taxes as well as interest on working capital, incidental charges, etc. were also considered during the estimates.

Cost 'B'

Comprises of cost 'A' plus imputed costs as rental value of owned land and interest on fixed capital.

Cost 'C'

Comprises of cost 'B' plus imputed value of family labour considered on the basis of rates prevailed in the villages.

Marketing of Sorghum Grain, *Roti*, *Hurda* and Chaff Fodder

Simple statistical methods such as sums, averages, ratios and frequency were used to estimate marketing expenses, margins of Sorghum *hurda* marketing.

Analysis of Problems Faced by Vendors

Percentages according to number of respondents were estimated to identify the problems of *hurda* vendors.

Results and Discussion

Family Size and its Composition

Ascertaining the details of family type, composition and educational status allows the researcher to understand the social, economic and intellectual position of the sample under study. The details of families of different samples have been depicted in Table 1.

Table 1. Primary information of roasted sorghum *(hurda)* vendors (Per farm)

Sr. No.	Particulars	No. of person (n= 10)	Per cent
A)	**Composition of family**		
1	Male	2.40	40.68
2	Female	2.10	35.59
3	Children	1.40	23.73
	Total	**5.90**	**100.00**
B)	**Education**		
I	Literates		
	1. Primary (I to VII)	1.90	32.20
	2. Secondary (VIII to X)	1.30	22.03
	3. Higher secondary	1.20	20.34
	4. Graduate	1.20	20.34
II	Illiterate	0.30	5.09
	Total	**5.90**	**100.00**

There were 5.90 members per sorghum *hurda* grower's family. The proportion of male and female members was 40.68 and 35.59 per cent, respectively. The members completed education up to primary level was 32.20 per cent and about 5.09 per cent were illiterate.

Land use pattern

Land is a resource that is scanty in supply and in a populous country like India; it is a major factor limiting the agricultural growth. Land use is a synthesis of physical, chemical and biological systems and possesses on the one hand human/societal processes and behaviour on the other. The monitoring of such systems includes the diagnosis and prognosis in a holistic manner at various levels i.e. losses of productive land through various factors; conversion of wetlands to agriculture and urban use; and conversion of other types of land to various uses. Table 2 displays the details of selected farmers' land use patterns.

Table 2 Land use pattern of roasted sorghum *(hurda)* vendors (Per farm)

Sr. No.	Particulars	Area (ha)	Per cent
1	**Total holding**	**4.63**	**100.00**
2	Permanent fallow	0.25	5.39
3	Operational holding	4.38	94.61
4	Current Fallow	0.20	4.33
5	Net cultivated area	4.18	90.28
	a. Irrigated	1.08	23.33
	b. Un-irrigated	3.10	66.95
6	**Gross Cropped Area(GCA)**	**5.27**	
7	**Cropping intensity**		**126.08**

In case of sorghum *hurda* growers, the total land holding was higher (4.63 ha) as compared to grain growers. The proportion of operational holding and net cultivated area was 94.61 and 90.28 per cent,

respectively. The gross cropped area was 5.27 ha with 126.08 per cent of cropping intensity. The varying cropping intensity in both types of growers was may be due to difference between the areas under irrigation at both the farms.

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Asset position

Table 3 displays information about farmers' asset positions. The asset is classified as land, residential housing, irrigation structure, machinery, implements and other

Table 3 Capital assets of roasted sorghum *(hurda)* vendors (Per farm)

Sr. No.	Particulars	Value (`)	Per cent
A)	**Farm Assets**		
1	Land	10391570.00	
2	Residential house	357760.00	58.56
3	Irrigation structure	54500.00	8.92
4	Livestock	38400.00	6.29
5	Machinery	1330.00	0.22
6	Implements	1415.00	0.23
B)	**Assets for *Hurda* parties**		
1	Shed	71500.00	11.70
2	Kitchen utensils	76000.00	12.44
3	Furniture	8110.00	1.33
4	Toys	820.00	0.13
5	Other	1081.99	0.18
	Total assets (excluding land)	**610916.99**	**100.00**

In case of sorghum *hurda* growers own land worth an average of Rs. 1,03,91,570/-. The largest investment was in residential housing, which costs about Rs. 3,57,760/- and contributed share of 58.56 per cent, followed by in investment irrigation structure Rs. 54,500/- (08.92%) and livestock Rs. 38,400/- (6.29%).

Kitchen utensils received the highest investment of Rs. 76,000/- (12.44%), followed by a shed of Rs. 71,500/- (11.70%), furniture of Rs. 8,110/- (1.33%) and toys of Rs. 820/- (0.13 %) among the assets for *hurda* parties. while other assets were valued at Rs. 1081.99/-. Thus the total assets owned by the roasted sorghum vendors was worth of Rs. 6,10,916.99/- excluding value of land

Cropping pattern of *rabi* sorghum growers

Individual crops in the cropping pattern were classified as *kharif, rabi*, summer and annual and their areas are shown in Table 4.

Table 4 Cropping pattern of *rabi* sorghum growers (Per farm)

Sr. No.	Crop	Area (ha)	Per cent
A)	**Kharif**		
1	Soybean	0.40	7.58
2	Red gram	0.70	13.28
	Sub total	**1.10**	**20.86**
B)	**Rabi**		
3	Sorghum	2.40	45.54
4	Wheat	0.20	3.80
5	Chickpea	0.32	6.07
6	Red gram	0.20	3.80
9	Onion	0.04	0.76
	Sub total	**3.16**	**59.97**
C)	**Annual andperennial**		
10	Sugarcane	0.50	9.49
11	Mango	0.31	5.88
12	Custard apple	0.20	3.80
	Sub total	**1.01**	**19.17**
	GCA	**5.27**	**100.00**

Sorghum was the most important *rabi* crop, accounting for 42.19 percent of the total area under cultivation, followed by chickpea, red gram and wheat, which accounted for 13.62 percent, 3.99 percent and 3.32 percent, respectively.In the summer, fodder crops occupied 0.66 percent of the land, while in case ofsugarcane 9.97 per cent of the area under cultivation. Similar dominance of *rabi* crops was also observed in case of roasted sorghum (*hurda*) growers farm with contribution of 59.97 per cent of gross cropped area. The per cent contribution of *kharif*, annual and perennial crops was 20.86 and 19.17 per cent, respectively. Rabi sorghum shared maximum (2.40 ha) area, followed by red gram (0.70 ha) in *kharif* and sugarcane (0.50 ha).

Per hectare resource use for *rabi* sorghum

The amount of resource used per hectare by sorghum grain and hurda growers is depicted in Table 5.The table shows that the use of male human labour was 24.76 mandays per hectare, with females contributing 21.42 mandays. The total utilization of bullock labour and machine power was observed to be 1.35 pair days and 6.72 hrs, respectively.

Table 5 Resource use level for *rabi* sorghum **(Per ha)**

Sr. No.	Particulars	Unit	Quantity
1	Total human labour	Mandays	
	a. Male		4.63
	b. Female		6.66
2	Bullock power	Pairdays	0.70
3	Machine power	Hrs	5.00
4	Seed	Kg	11.60
5	Fertilizers	Kg	
	N		18.90
	P		32.91
	K		2.97
6	Irrigation charges	Rs	1275.38
7	Plant protection	Rs	--
8	Output		
	a. Main Produce	Qt	4.11
	b. By-product	Qt	36.40

The average per hectare use of seed was noticed to be 13.51 kg, In case of fertilizer dose, it was noticed that the application of Nitrogenous fertilizers was far low (23.61 kg/ha) than recommended dose of 40 kg/ha, but in case Phosphorous, the rate of application was more (22.70 kg/ha) than the recommended dose of 20 kg/ha. While, though there was no recommendation for potash fertilizer ingredient, still growers applied 9.03 kg/ha of the same. All these fertilizer application below or above the recommendations made by growers were may be due to use of complex fertilizers instead of straight ones and also applications as per availability.

Resource use by roasted sorghum (*hurda*) vendors

Hurda was served with a variety of chutnies, including groundnut, coconut, and jaggery. The inputs used by hurda vendors are depicted in Table 6.

Table 6 displays data on average input utilization per season. The average quantity of groundnut chutney, coconut chutney and jaggery used were 31.7 kg, 20.2 kg and 26.8 kg, respectively. The cost of the raw materials needed for lunch was Rs. 60,215.80/-. The total male and female labour required were 236 man days and 176.6 man days, respectively. The average expenses for fuel, electricity, transportation, and advertising were Rs. 8,275.15/-, Rs.2,290.02/-, `2,680.98/-, and Rs. 6,250.43/-, respectively.

Table 6 Input used by *Hurda* Vendors **(Per unit)**

Sr. No.	Particulars	Units	Quantity	Value(`)
1	Groundnut chutney	kg	31.7	4738.52
2	Coconut chutney	kg	20.2	3780.87
3	Jaggery	kg	26.8	1183.72
4	Labour	Days		
5	Male		236.00	49530.20
6	Female		176.60	23735.56
7	Fuel			8275.15
8	Electricity charges			2290.02
9	Transport charges			2680.98
10	Advertisement cost			6250.43

Varieties of roasted sorghum

There are many more varieties of roasted sorghum, including Phule Madhur, Phule Uttara, and local varieties such as Surati, Gulbhendi, Kuchkuci, and Dudhmogra, but the cultivators' preferred varieties were found to be PhuleMadhur, Surati, and Gulbhendi.

Table 7 Variety wise area under cultivation for roasted sorghum

Sr. No.	Variety	Area (ha)	Per cent
1	PhuleMadhur	0.56	53.33
2	Surti	0.45	42.86
3	Gulbhendi	0.04	3.81
	Total	**1.05**	**100**

Table 7 shows the average area for each variety. The majority of the areai.e. 0.56 ha (53.33%) was under the PhuleMadhur, followed by 0.45 ha (42.86%) under Surti and 0.04 ha (3.81%) under Gulbhendi.

4Cost of cultivation of *rabi* sorghum for roasted sorghum

The per hectare cost of cultivating *rabi* sorghum cultivated for grain and hurda was calculated using standard cost concepts and depicted in Table 8.

The cost of cultivation of cultivating *rabi* sorghum for roasted sorghum is shown in Table 8 According to the table, Cost ‘C' was accounted for Rs. 26,132.66/-. Because no family labors were employed in the cultivation process, therefore Cost B and Cost C were equal. Among the various cost items, total hired human labour charges (male and female) accounted for Rs. 4,435.17/- (16.97%), followed by rental value of land Rs. 3,977.95/- (15.22%), incidental charges Rs. 3,786.33/- (14.89%), cost of seed Rs. 3,532.50/- (13.52%), machine power Rs.2510.85/- (9.61%), expenses on fertilizers Rs. 1989.09/- (7.62%)and bullock labour Rs.1,155.00/- (4.42%). Out of the total cost of cultivation, the Cost A was Rs. 20,423.20/- (78.15%).

Table 8 Per hectare cost of cultivation of *rabi* sorghum grain and roasted sorghum

Sr. No.	Particulars	Value (Rs.)	Per cent
1	Hired human labour		
	a. Male	1982.55	7.59
	b. Female	2452.62	9.39
	Total	4435.17	16.97
2	Bullock power	1155.00	4.42
3	Machine power	2510.85	9.61
4	Seed	3532.50	13.52
5	Fertilizers	1989.09	7.62
6	Irrigation charges	1275.38	4.88
7	Plant protection charges	--	--

8	Incidental charges	3786.33	14.89
9	Repairs	85.97	0.33
10	**Working capital**	**18770.28**	**71.83**
11	Interest on working capital@ 6%annum	1126.22	4.31
12	Depreciation	495.52	1.89
13	Land revenue	31.18	0.12
	Cost A	**20423.20**	**78.15**
14	Rental value of land	3977.95	15.22
15	Interest on fixed capital @ 10%	1731.51	6.63
	Cost B	**26132.66**	100
16	Family Labour		
	a. Male	--	--
	b. Female	--	--
	Total	--	--
	Cost C	**26132.66**	**100**
II	Output		
a.	Main produce	35088.12	
b.	Bye produce	11350.61	
III	Cost net of by produce	14782.05	
IV	Per quintal cost	1220.64	
V	Per Kg. cost	12.20	

As the seed for roasted sorghum (*hurda*) varieties were expensive that other varieties, the expenditure on seed material mentioned in the table was quite higher.

Cost incurred for production of roasted sorghum (*hurda*) by vendors

The sorghum growers themselves were the roasted sorghum (*hurda*) vendors in Solapur district. The cost of cultivation of *rabi* sorghum has already been discussed in previous section. The cost of production of hurda is depicted in Table 9.

The total fixed costs contributed 16.86 percent (Rs. 30,164.48/-) of total costs in the production of *hurda*. Among the variable costs, the largest expenditure was on hired human labour of Rs. 1,38,550.97/- (40.95%), as the *hurda* unit required a large number of workers. The raw material cost of Rs. 35835.77/- was the next major variable influencing the variable cost (20.03%) which includes different *chatanies*, spices, etc. The cost of fuel was estimated to be Rs. 8275.15/-. Expenditure on electricity, transport and miscellaneous items were observed to be Rs. 2,290.02/-, Rs 2,680.98/- and Rs. 3,170.18/-, respectively. The *hurda* vendors also made expenses on advertisements, which accounted for 1.89 per cent of the total costs.

Thus the total cost of *hurda* production was Rs. 178928.70/-, whereas the gross income received by vendors including *hurda* and by-product of rabi sorghum was estimated to Rs.438963.28/-. Excluding the loss the net income and B:C ratio was Rs.260034.58/- and 2.45, respectively. Which means, production of *hurda* was a profitable venture.

Table 9 Cost of production of roasted sorghum (*hurda*) (Per vendor)

Sr. No.	Particulars	Unit	Qty.	Value	Per cent
A)	**Fixed cost**				
	Interest on fixed capital @10 %			14750.00	4.46
	Depreciation on shed, kitchen utensils and other			15414.48	4.66
	Total Fixed Cost			**30164.48**	**16.86**
B)	**Variable cost**				
1	Raw material including CoC of sorghum	`		35835.77	20.03
2	Labour	Days			
	a. Male		236	49530.20	27.68
	b. Female		176.6	23735.56	13.27

3	Fuel	`		8275.15	4.62
4	Electricity charges	`		2290.02	1.28
5	Transport charges	`		2680.98	1.50
6	Advertisement cost	`		6250.43	3.49
7	Miscellaneous expenditure	`		3170.18	1.77
8	Interest on variable cost @ 6%	`		16995.93	9.50
	Total Variable Cost	`		**148764.22**	**83.14**
	Total Cost	`		**178928.70**	**100.00**
	Per kg cost of production			**147.75**	
	Gross income from *hurda* and by-produce	`		438963.28	
	Loss	q	0.08	240.47	
	Net income	`		**260034.58**	
	B:C Ratio			2.45	

Constraints faced by vendors in marketing of roasted sorghum (*Hurda*)

Table 10 Constraints in marketing of Roasted sorghum (*Hurda*) (N=10)

Sr. No.	Particulars	Per cent
1	Uncertain demand	80.00
2	Expectations of customers	60.00
3	Fluctuation in input prices	50.00
4	Losses during processing	50.00

According to Table 10, the vendors experienced problems with uncertain demand and losses during processing (80 %). Customers' irrational expectations were the source of the problem for 60 per cent of the vendors. Input price fluctuations affected half of the vendors.

Conclusions

- Family of *hurda* growers was comprises of 40.68, 35.59 and 23.73 per cent per cent of male, female and children, respectively.
- Total holding of *hurda* grower was higher than sorghum grower (4.63 ha).
- In the study area, GCA of *hurda* growers was 5.27 ha.
- Local varieties of roasted sorghum viz. Surti, Gulbhendi, Kuchkuchi, Dudhmogra and some improved varieties namely, Phule Madhur, Phule Uttara were mostly preferred by the farmers.
- The cost of cultivation of sorghum for *hurda* was ` 26132.66/-.
- The total cost and net income from *hurda*party were ` 330425.87 and ` 936710.61, respectively. B:C ratio was 2.83.

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Production and marketing of Sorghum bread (*Roti*) in Solapur District

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ABSTRACT

Purpose of this research was to investigate the selective sorghum value added products, as they are produced on large scale and has market value. In light of these considerations, the current study on the marketing of value-added products of sorghum was carried out with the specific objectives as to ascertain the input use and estimate the costs and returns of sorghum roti; to access the marketing structure; to estimate the channel wise costs, margins and price spread and to ascertain the constraints in marketing. Primary data on physical input, cost incurred, returns gained and marketing constraints were collected through personal interviews with 15 roti vendors purposively selected from Solapur city. For the analysis, data for the years 2020-21 were collected. The cost of production of sorghum bread (roti) was evaluated by using fixed and variable costs involved.

The annual sorghum requirement was 3847.98 kg, rice and salt requirements of 769.59 kg and 76.96 kg, respectively. The labour charges for 100 roties ranged between ` 85 and ` 100, thus annual labour charges were calculated to be `90,357.80/- and annual fuel costs were calculated to be ` 51,480.42/-. Grinding costs `21,182.58/- at a rate of `4.60/kg.

The main factor influencing the total cost of production was sorghum, which contributed 35.36 percent (`24.6) to the total cost. Labour charges were the next major factor, accounting for 34.16 percent (`23.76/-), followed by fuel expenditure (19.49 %), grinding charges (6.61 %) and rice (3.18 %). The total cost of production per kg was calculated to be `69.56. The cost of production per roti was Rs. 2.64. Annualy, 100692.67 roties were produced and approximately, 78.36 and 20.18 per cent were disposed of in Channel-I (Roti vendor – Hotel owner – Consumer) and Channel-II (Roti vendor – Consumer), respectively.

The total marketing cost in Channel-I was `7.86, which included packaging charges of `2.70 and transport charges of ` 5.16. The cost of marketing in Channel II was `2.70 only. The producer received a gross price of ` 108.60 and a ` 112.53 per kg of flour (i.e. 26.47 number of roties) from Channel-I and Channel-II, respectively. The per roti price paid by the consumer in Channel-I was `8.50, while ` 4.25 in Channel-II.

Unpredictability in demand was the major problem faced by cent per cent vendors in marketing of roties, followed by higher fluctuations in prices of inputs (73.33%) and low margin (46.67%).

INTRODUCTION

Sorghum *Roti*

Of late, sorghum has garnered a great deal of acceptance in the form of unleavened bread (*roti, bhakri*) - a nutritious ready-to-eat food amongst all classes of the society. In fact, it is slightly tricky to master the preparation of *jowar roti* than the *rotis* prepared with wheat and *maida*flour.

The preparation of sorghum roti is laborious and time-consuming activity. Many hotels and dhabas are serving sorghum *roties* to its customers but due to laborious work the have some limitations. Sorghum dry *roties* is remedy on it, as it will retain its property of palatability for very long time. Individual household can record the demand for dry sorghum *roti* from different hotels can start their own business. This business needs few things like room, gas cylinder and raw material (flour) so it requires less investment. The women self help group can also start this type of business.

Purpose of this research was to investigate the selective sorghum value added products, as they

are produced on large scale and has market value. In light of these considerations, the current study on the marketing of value-added products of sorghum was carried out with the following objectives in mind:

Objectives

1. To ascertain the input use and estimate the costs and returns of sorghum value addition
2. To access the marketing structure of *rabi* sorghum value-added products.
3. To estimate the channel wise costs, margins and price spread.
4. To ascertain the constraints in marketing.

METHODOLOGY

Method of data collection

Primary data on physical input, cost expended on various items of expenditure, return gained and marketing constraints were collected through personal interviews with sorghum *Roti* vendors using specifically designed questionnaires. For the analysis, data for the years 2020-21 were collected.

Sampling

Purposively, 15 *roti* vendors from Solapur city were selected.

Cost Concepts and Evaluation of Items of Cost

The cost of production of sorghum bread (*roti*) was evaluated by using fixed and variable costs involved.

Marketing of Sorghum *Roti*

Simple statistical methods such as sums, averages, ratios and frequency were used to identify the main marketing channels and estimate marketing expenses of Sorghum *roti* marketing. The specifics are as follows:

Analysis of Problems Faced by Farmers/Vendors

Percentages according to number of respondents were estimated to identify the problems of *roti* vendors.

RESULTS AND DISCUSSION

Capital assets of Sorghum *Roti* vendors

Roti and chaff fodder vendors do not necessitate a large initial investment and it is depicted in Table 1.1. They used a portion of their home to prepare, dry and store their ordered *roties*.

T

able 1.1 Asset position of *roti* vendors **(Per Unit)**

Sr. No.	Particulars	Value (₹)	Per cent
1	House	57113.33	96.10
2	Kitchen utensils	2313.33	3.90
	Total	**59426.66**	**100.00**

The asset position of *roti* vendors is shown in Table 4.6. They owned a house worth ₹57,113.33/- (96.10%) and kitchen utensils worth ₹2,313.33/- (3.90%), which included pans, plates and other items.

Resource use by Sorghum *Roti* vendors

The input utilized for preparation of bread (roti) and fodder by vendors is presented in Table 1.2.

The average annual *roti* production was 100693, with a sorghum requirement of 3847.98 kg, rice and salt requirements of 769.59 kg and 76.96 kg, respectively. The labour charges for 100 *roties* ranged between Rs.85 and Rs.100, thus annual labour charges were calculated to be Rs. 90,357.80/- and annual fuel costs were calculated to be Rs.51,480.42/- . Grinding costs Rs.21,182.58/- at a rate of Rs.4.60/kg.

Table 1.2 Annual input used for *roti* and chaff fodder vendors **(Per unit)**

Sr. No.	Particular	Quantity
1	Sorghum (kg)	3847.98
2	Rice (kg)	769.59
3	Salt (kg)	76.96
4	Fuel (Rs.)	51480.42
5	Labour (Rs.)	90357.80
6	Grinding charges (Rs.)	21182.58
7	*Roties* produced (No.)	1,00,693

Cost incurred for production of Sorghum *Roti*

The cost of production per kg unit was calculated and shown in Table 1.3. The costs estimated below were based on 15 *roti* vendors data. as the number of *roties* prepared and sold was varying vendor to vendor and per *roti* costs were too low, so per kg of sorghum flour was considered as unit for costs estimation. The average number of *roties* made from one kg of flour was 26.47.

Table 1.3 Cost of production of sorghum bread (*roti*) (Per kg of sorghum flour)

Sr. No.	Particulars	Value (Rs.)	Per cent
A)	**Fixed costs**		
1	Interest on fixed capital @ 10%	0.31	0.45
2	Depreciation of kitchen utensils	0.12	0.17
	Subtotal	**0.43**	**0.62**
B)	**Variable cost**		
1	Sorghum (1Kg.)	24.60	35.36
2	Rice (200g.)	2.21	3.18
3	Salt (20g.)	0.40	0.57
4	Grinding charges (for 1 kg.)	4.60	6.61
5	Fuel	13.56	19.49
6	Labour charges	23.76	34.16
	Subtotal	**69.13**	**99.38**
	Total cost of production	**69.56**	**100**
	No. of *roties* produced from 1 kg flour	26.47	
	Per *roti* cost of production	2.64	

According to the table, the main factor influencing the total cost of production was sorghum, which contributed 35.36 percent (₹24.6) to the total cost. Labour charges were the next major factor, accounting for 34.16 percent (₹23.76/-), followed by fuel expenditure 19.49 percent (₹13.56/-), grinding charges 6.61 per cent (₹ 4.60/-) and rice 3.18 percent (₹2.21/-). The total cost of production per kg was calculated to be ₹69.56. The cost of production per *roti* was Rs. 2.64.

Disposal pattern of rabi sorghum *roties*

The disposal pattern is depicted in Table 1.4.

Table 1.4Disposal pattern of *rabi* sorghum grain and *roties*

Sr. No.	Particulars	No. of Rotis/ Vendor	Per cent
1	Total no. of *rotis* produced	100692.67	100
2	Home consumption	1229.67	1.22
3	Gratis to relatives and new customers	242.00	0.24
4	Channel – I	78905.33	78.36
5	Channel – II	20315.67	20.18

In case of *roties*, 100692.67 *roties* were produced each year. The vendor's family consumed 1129.67 *roties* (1.22%), while, *roties* given on gratis to relatives and new customers were 242 *roties* (0.24%). Approximately 78.36 per cent (78905.33 *roties*) and 20.18 per cent (20315.67 *roties*) were disposed of in Channel-I and Channel-II, respectively.

Marketing channel

Two marketing channels were discovered for *roti*,

Channel – I = *Roti* vendor – Hotel owner – Consumer

Channel – II = *Roti* vendor – Consumer

Channel wise marketing cost of sorghum bread (*Roti*)

The data in Table 1.5 depicts the cost of marketing of *roties*. The total marketing cost in Channel-I was Rs.7.86, which included packaging charges of Rs.2.70 and transport charges of Rs. 5.16.

Table 1.5 Channelwise marketing cost of sorghum bread (*Roti*)

(Per kg of sorghum flour)

Sr.No.	Particulars	Channel – I	Channel – II
1	Packing charges	2.70	2.70
2	Transport charges	5.16	--
3	**Total marketing cost**	**7.86**	**2.70**

The transport charges were added because the *roti* vendors supply the produce to the hotels. As the customers pick the *roties* as per their requirement from the vendors, no other expenses were involved and therefore, cost of marketing in Channel II was Rs.2.70 only.

Price spread in marketing of *rabi* sorghum bread (*roti*)

The price spread in the marketing of sorghum bread was calculated and shown in Table 1.6. According to the table, the producer received a gross price of ₹ 108.60 and a ₹ 112.53 per kg of flour (i.e. 26.47 numbers of *roties*) from Channel-I and Channel-II, respectively.

Table 1.6 Price spread of sorghum bread (*Roti*) **(₹/kg of sorghum flour)**

Sr. No.	Particulars	Channel – I		Channel – II	
		Amount	Per cent	Amount	Per cent
1	Gross price received by producer	108.60	48.25	112.53	100.00
2	Costs incurred by producer	5.16	2.29	--	--
3	Net price received by producer	103.44	45.96	112.53	100.00
4	Cost incurred by hotel owners	3.32	1.48	--	--
5	Margin of hotel owners	113.15	50.27	--	--
6	Price paid by consumer	225.07	100.00	112.53	100.00
8	Per *roti* price paid by consumer	8.50		4.25	

The costs incurred by producer in Channel-I (Rs. 5.16/-) were inclusive of packaging as well as transport charges. The hotel owner receives a margin of Rs.113.25, which was 50.27 percent of the price paid by the consumer. The per *roti*price paid by the consumer in Channel-I was Rs.8.50, while Rs. 4.25 in Channel-II.

Constraints faced by vendors in the marketing of sorghum bread (*roti*)

Table 1.7 shows the issues that the vendors encountered. Unpredictability in demand was the major problem faced by cent per cent vendors in marketing of *roties*, followed by higher fluctuations in prices of inputs (73.33%) and low margin (46.67%).

Table 1.7 Constraints in marketing sorghum bread (*Roti*) **(N=15)**

Sr. No.	Particulars	Per cent
1	Seasonal and uncertain demand	100.00
2	Higher fluctuation in input prices	73.33
3	Low margin	46.67

Throughout the year, there was greater volatility in input prices. This issue was encountered by 73.33 percent of vendors. According to 46.67 per cent of vendors, they have a low margin when compared to hotel vendors.

CONCLUSIONS

- Per kg cost of production of *roti* was Rs. 69.54.
- Average 26.47 *roties* were produced from one kg. of sorghum flour. Per *roti* cost of production was Rs. 2.64.
- No marketing structure was found for *roti*. This product was produced and marketed under private ownership.
- Two marketing channels were found for *roti*i.e. Producer- Hotel vendor-Consumer and Producer- Consumer. In the Channel II, producer got more margins as compared to Channel I and consumer had to pay less as well.
- Hotel vendor got more margins as compared to *roti* vendor.

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Economics of Manufacturing Indegenous Dairy Product at Producer Level in Yavatmal District

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ABSTRACT

Dahi,Paneer and Pedhaaresome of the most important traditional products widely consumed in India. Economic analysis of this product is necessary to optimize the cost of each component used to manufacture the indigenous dairy product. It helps the product to keep its presence in the competitive market. As a result the consumer will benefit of this optimum price. Therefore, cost of the product was calculated at the milk producer's level. The production cost of Dahi, Paneer and Pedhais Rs.52.69, Rs.283.27and Rs. 264.59 per Kg. respectively.

Keywords: *Dahi, Paneer, Pedha, Cost*

INTRODUCTION

Today India is the largest producer of milk, with a share of 23% of the total milk production worldwide. Milk production has been growing at an average rate of 5.68 percent per annum. The per capita availability has increased considerably from 289 gm. in 2011-12 to406 gm. in 2019-20. There is rising consumption of milk and milk products in urban and rural India. The rapid change in lifestyle vis-a-vis food habits and their moresignificant influence will divert of more expenditure towards milk and milk products. Dahi, Paneer and Pedha are the well-known traditional product being used by all classes of society. Therefore, it is necessary to calculate the cost of Dahi, Paneer and Pedhato fix the prices of the product that will help to maintain the equilibrium between producer and consumer interest.

METHODOLOGY

The present study was conducted in the Yavatmal district of Maharashtra. The primary data was collected by actual observation and interviewing milk producers and processors of Pusad and Darwhataluka for the year 2020-21.The total 80 samples were selected by purposive sampling. Data on milk inflow, its utilization pattern and output of product was taken. The expenditure incurred on quantity of raw material, labour required, expenses on refrigeration, packaging, energy and depreciation on equipment's and building. Actual observations were taken on quantity of different ingredients required and their price of the item's used for processing of dairy product. To work out the cost of production of Dahi, Paneer and Pedha, the tabular analysis technique were used to worked out different cost component of Dahi, Paneer and Pedha.

RESULTS AND DISCUSSION

Table: 1 Component wise Cost of Dahi

Sr. No.	Cost component	Total Cost (Rs.)	Fixed Cost (Rs.)	Variable Cost (Rs.)	Total Cost per unit (Rs./kg)	% Cost
1	Raw material	1260000	0	1260000	42	79.71
2	Labor	123667	48667	75000	4.12	7.82
3	Refrigeration & Electricity	32285	14285	18000	1.08	2.04
4	Water	4316	0	4316	0.14	0.27
5	Steam	72209	11905	60304	2.41	4.57
6	Packaging	45000	0	45000	1.50	2.85
7	Depreciation on building	1200	1200	0	0.04	0.08

8	Miscellanies	42038	0	42038	1.40	2.66
9	Total Cost	1580715	76057	1504658	52.69	100.00
10	Per unit cost (Rs./liter)	52.69		Total production in a year = 30000 kg		

Table: 2 Componentwise Cost of Paneer

Sr. No.	Cost component	Total Cost (Rs.)	Fixed Cost (Rs.)	Variable Cost (Rs.)	Total Cost per unit (Rs./kg)	% Cost
1	Raw material	1792944	0	1792944	249.02	87.91
2	Labour	95328	14866	80462	13.24	4.68
3	Refrigeration & Electricity	12672	5285	7387	1.76	0.62
4	Water	2088	0	2088	0.29	0.10
5	Steam	86256	32057	54199	11.98	4.23
6	Packaging	28800	0	28800	4.00	1.41
7	Depreciation on building	720	720	0	0.10	0.04
8	Miscellanies	20276	0	20736	2.88	1.02
9	Total Cost	2039544	52928	1986616	283.27	100.00
10	Per unit cost (Rs./Kg)	283.27		Total production in a year = 7200kg		

Table: 3 Componentwise Cost of Pedha

Sr. No.	Cost component	Total Cost (Rs.)	Fixed Cost (Rs.)	Variable Cost (Rs.)	Total Cost per unit (Rs./kg)	% Cost
1	Raw material	2860200	0	2860200	190.68	72.07
2	Labour	198667	48667	150000	13.24	5.01
3	Refrigeration & Electricity	26428	14285	14400	1.76	0.67
4	Water	4316	0	4316	0.29	0.11
5	Steam	666057	42057	624000	44.40	16.78
6	Packaging	150000	0	150000	10.00	3.78
7	Depreciation on building	15000	15000	0	1.00	0.38
8	Miscellanies	48178	0	48178	3.21	1.21
9	Total Cost	3968846	120009	3851094	264.59	100.00
	Per unit cost (Rs./Kg)	264.59		Total production in a year = 15000 kg		

From the Table 1 it was found that the cost of Dahi was Rs.52.69 per kg. It was further found that the cost raw material contributes highest (79.71 %), followed by labour (7.82), Steam (4.57%), Packaging (2.85%) respectively.

Table 2 showed that the cost of Paneer was Rs.283.27/kg. It was further found that the cost raw material contributes highest (87.91 %), followed by labour (4.68), Steam (4.23%), Packaging (1.41%) respectively.

From the Table 1 it was revealed that the cost of pedhawas Rs.264.59 per lit. It was further found that the cost raw material contributes highest (72.07 %), followed by Steam (16.78%), labour (5.01), Packaging (3.78%) respectively.

Table: 4 Economics of Dahi, Paneer, Pedha

Sr. No.	Product	Selling Price (Rs./kg)	Cost (Rs./kg)	Profit (Rs./kg)	Percent of per kg profit to per kg cost
1	Dahi	60	52.69	7.31	14
2	Paneer	360	283.27	76.73	27
3	Pedha	350	264.59	85.41	32

CONCLUSIONS

Manufacturing of traditional Indian dairy products like Dahi, Paneer and Pedha is a profit making business and can generates lot of employment opportunities in rural India. The cost of milk product manufacturing can be reduced by increasing the quantity of production. The manufacturing of pedha is most profitable product followed by dahi and paneer respectively.

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AAPLA GAON : A Case Study of Shri. Vanlaxmi Agro-Tourism

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ABSTRACT

The present exercise was carried out to identify the facilities, packages, activities and SWOT analysis of Shri. Vanlaxmi Agro-Tourism Center (Aapala gaon) , Beldare Tal. Karad Dist. Satara which was established in the year 2013. The data pertaining to the current year 2021-22 was grabbed by paying personal visits to the selected ATC and also by desk approach. This agro-tourism centre is located 310 Kilometers away from Mumbai, the capital city of Maharashtra. Its road distance from Pune and Satara is 180 and 65 Kilometers. It is 17 and 90 Kms away from Karad and Chiplun railway stations, respectively. While, its distance from Pune and Kolhapur airports is 170 and 90 Kilometers, respectively. This agro-tourism centre is situated aside of the Karad-Chiplun road.

The results indicated that this is an ideal ATC wherein different rural and agricultural amenities have been erected for the enjoyment of urban tourists. This ATC is offering packages for one day, overnight and double overnight picnics providing indigenous food/cousins and residence. The facilities established are Vitthal Temple, Cottage, Bamboo House, Conference Hall, Indoor Games, Swing, Nakshatra Garden, Zodiac Garden, Spider Net, Delicious Banquet, Kutirs, etc. The agricultural activities available in this Agro-Tourism Centre are Poultry, Vermi Compost, Dairy, Goatary, Open Byre, Jaggery Unit, Hydroponic, Jute Bag Jumping, Rain Dance, Tractor Safari, Bullock Cart Safari, Horse Riding, Camp Fire, Spider Net, Laughing & Joy, Local Songs, Recreation, etc. Covid-19 had adversely affected on the activities of Agro- Tourism. However, the situation presently is gearing up with liberilisation of the Covid restriction. Nowadays, 100 tourists arrive on Saturday/ Sunday/ Public Holiday and 25-30 on other days.

The selected ATC is a recipient of two Memorial Awards during 2016-17 and 2019-20 for effectively running the Agro-Tourism in rural area. It has the strengths of strong supplementary source of income for farmers, employment generation and rural development and weakness of comparatively low growth, less educated farmers, so need varied trainings and lack of government support. Whereas, its opportunities cover the immense scope of growth, more farmers can be beneficiaries, government support can increase the outreach and government lands can be converted as ATCs. The threats of said ATC were noticed that the climatic conditions and rampant migration from farming to other sectors.

The study suggested that there should be awareness for implementation of perfect models, effective training programmes, more consultancy services, government support with agro-tourism policies, supportive agro-tourism financing, product and service quality control, strategic partnership development and marketing programmes.

Keywords : Aapala Gaon, Agro-Tourism, ATC, SWOT analysis, Memorial Awards

INTRODUCTION

The Maharashtra state is a bio-diverse state with nine Agro-Climatic Zones and varying soil types suitable for agricultural development. Though Maharashtra is a highly industrialized state of India, the agriculture and allied activities contribute nearly 12 per cent to the state's income, although 55 per cent of the population is dependent on agriculture. This state is among the leading producers of variety of agricultural products enjoyed by its residents and beyond. The rural families are mainly engaged in farming and to some extent in agri-related businesses. The farmers' income is not consistent because of many factors such as unpredictable environment and more unpredictable crop yield, fluctuating market prices for agricultural products, unawareness of technology, unexpected and huge expenses, government policies, etc.

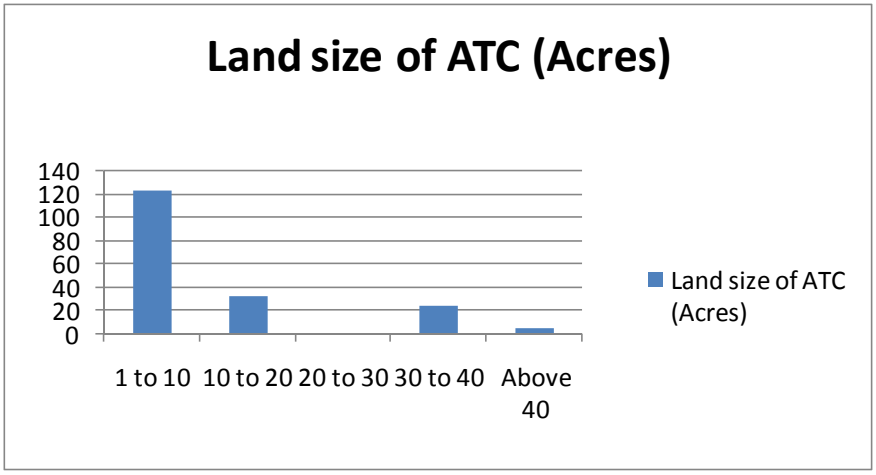
In India and Maharashtra, the urbanization is increasing day by day. Maharashtra is the third most urbanized state in the country. The state has 45.23 per cent urban population, which is much higher than the national average of 31.16 per cent. The pace of innovations and technology advances is getting faster and is forcing everybody to complete severely to survive and grow in the city area. People from city areas are unhappy to face traffic chaos and pollution but are helpless. They are far away from nature and natural beauty. Their routine life is revolving around jobs place to home and free time is restricted to manmade entertainment places such as theatres, hotels and clubhouses. The one and only available nature they can enjoy are in the form of small gardens. Most of the city people like to visit and experience villages for excursion. If these people get proper facilities of accommodation, bed and breakfast, they can satisfy their desire to learn about agriculture, taste the bucolic cuisine and enjoy rural life at economic prices. No doubt, it naturally tends to give opportunity to the farmers and villagers to start and develop Agro-Tourism Centers so as to add one sure source of income.

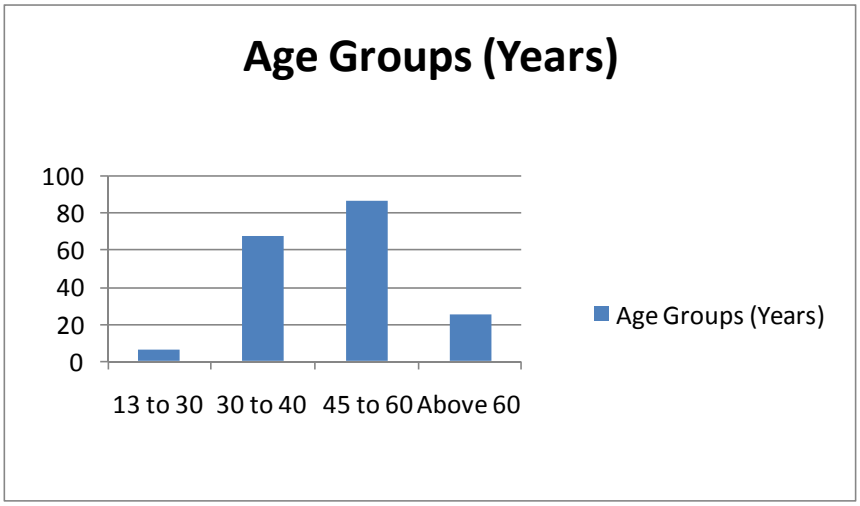
Now days, the major development in Agro-Tourism is taking place all around the world in its different forms. It gives people the chance to breathe fresh air, learn about rural environment, ride horses, pick fruits, feed animals, milk cows and participate in actual work of farm and buy produce directly from a farm. Agro-Tourism is a form of niche tourism in which farms are used as tour destinations for educational and recreational purposes. Agro-Tourism Center is the location where tourist from urban areas can come and spend their weekends and holidays in a village with agricultural atmosphere at a very economic cost. It is the home away from home giving a personal feel of harmony with rural culture. Agro-Tourism integrates agriculture with pleasure and gives the benefit of agriculture and tourism activities to the tourists that deliver economic benefits to concerned farmer and villagers.

Agro-Tourism includes opening up farms to visitors from urban areas and letting them to take experience of rural life. Apart from telling them about the various crops and how they are sown and harvested, the Agro-Tourism exposes tourists to traditional food, handicrafts, culture, music and language. Tourist can get an experience of rural activities viz., bullock cart rides, milking cows and goats and picking farm fresh fruits and vegetables, etc. The Agro-Tourism Development Corporation (ATDC) was established on 16th May, 2004 in Maharashtra. Its aim is to promote Agro-Tourism to help rural youth to earn good respectable living in the village and on the farm itself. First ever International Agro-Tourism day was celebrated on 16th May, 2008 in Pune.

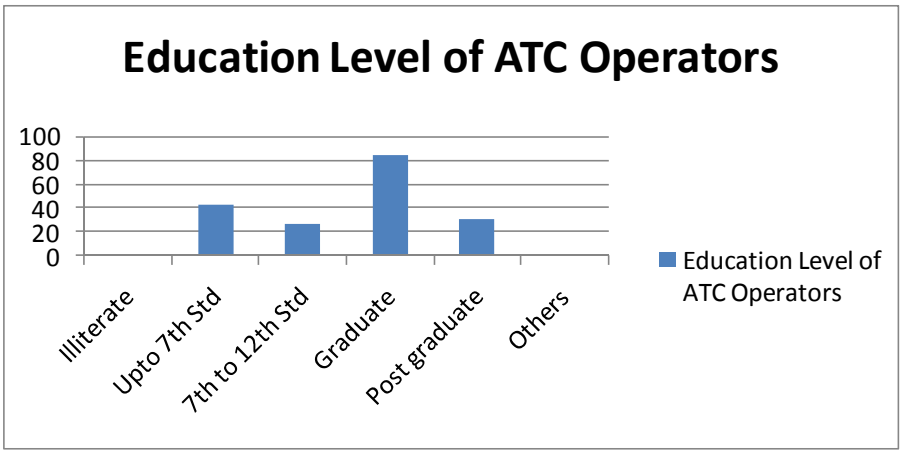
Facts of Agro-Tourism in Maharashtra

The Agro-Tourism in Maharashtra has helped to generate additional income to the farmers. It has created a vast impact on the lives of farmers as well as rural community.





Agro-Tourism does not require large area of land. It can be started and operated in the land of minimum 5 acres. The land holding size of the maximum number of agro-tourism centers is between 1-10 acres. The maximum numbers of agro-tourism centers are operated by farmers of age group between 30-60 years, who has got experience in farming.



The maximum numbers of agro-tourism centers are operated by educated farmers. This gives the scope to develop through trainings and capacity building.

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ATCs in Maharashtra

The Table 1 represents divisionwise number of agro-tourism centers (ATCs) in Maharashtra

Table 1: Divisionwise agro-tourism centers in Maharashtra (April, 2021).

Sr. No.	District/Region	Number of ATCs
1	Pune	226
2	Aurangabad	07
3	Konkan	61
4	Amravati	07
5	Nagpur	12
6	Nashik	15
TOTAL		3285

A Case Study of Shri. Vanlaxmi Agro-Tourism Centre (Aapla Gaon), Beldare Tal: Karad, Dist: Satara

Location

This agro-tourism centre is located 310 Kilometers away from Mumbai, the capital city of Maharashtra. Its road distance from Pune and Satara is 180 and 65 Kilometers. It is 17 and 90 Kms away from Karad and Chiplun railway stations, respectively. While, its distance from Pune and Kolhapur airports is 170 and 90 Kilometers, respectively. This agro-tourism centre is situated aside of the Karad-Chiplun road.It is spread over 5 acres of land. This has generated the employment to 30 labours.

Map

Objectives

This study is undertaken with the following specific objectives.

(1) To indentify the facilities and packages available in selected agro-tourism Centre.

(2) To study the activities carried out by such ATC.

(3) To conduct the SWOT analysis of this ATC.

(4) To suggest the measures to achieve development and growth of such ATCs.

METHODOLOGY

This research is mainly carried out through desk approach i.e. secondary sources viz., maps, photographs, leaf lets, pamphlets, books, internet websites, dissertations, doctoral level research work, journals, news paper clippings, conference materials,etc. Personal interviews with officials of selected ATC by using questionnaire

Facilities and activities established

The Covid-19 had adversely affected on the activities of Agro- Tourism. However, the situation is presently gearing up with liberilisation of the Covid-19 restrictions. Nowadays, 100 tourists arrive on

Saturday/ Sunday/ Public Holiday and 25-30 on other days.

The following types of facilities and activities are established and implemented .

- Vitthal Temple
- Cottage
- Bamboo House
- Conference Hall
- Swing
- Nakshatra Garden
- Zodiac Garden
- Spider Net
- Delicious Banquet
- Kutirs
- Water Fall
- Basket Ball
- Indoor Games
- Punchkarm Ayurvedik center/ Acupuncture Way
- Music Chair
- Swimming Pool
- Rain Dance
- Camp Fire
- Bullock Cart/ Horse Riding
- 'Gondhal'- Custom
- Bee Keeping
- Selfi Point
- Rabbit /Bird Rearing
- Vermi Compost
- Vanlaxmi 'Goshala'- Indigenous Cow Rearing
- Milk & Milk Products
- Sheep & Goat rearing
- Poultry
- Jaggery Unit
- Hydroponic
- Jute Bag Jumping
- Tractor Safari
- Bullock Cart Safari
- Laughing & Joy
- Local Songs
- Recreation

Packages

The visitors can enjoy their village experience by staying either at dormitories or cottages or Kutirs. People may secure an experience of eating of tasty delectable food from home-grown vegetables and fruits. The visitors families indulge in various activities live in the lap of nature and take home wonderful memories.

Picnic

(I) One Day Picnic

- Adults : Rs. 400/- (Rs. 475 for Public Holidays)
- Children : Rs. 300/- (3 to 12 years)
- **Timing :** Morning : 10 to 15 hours
  Afternoon : 13 to 18 hours
  Evening : 17 to 22 hours

One day picnic includes : Tea, Breakfast, Snacks, Lunch/Dinner with Dessert, Rain Dance, Indoor and Outdoor Games, Tour Orientation on agro-tourism.

(II) Overnight Picnic

- Dormitory : Rs. 6000/- per person.
- Kutir : Rs. 700/- per person.
- Bamboo House : Rs. 750/- per person.
- Cottage : Rs. 8000/- per person.
- Cottage AC : Rs. 1100/- per person.

Overnight picnic includes : Lunch/Dinner and 1 Breakfast/Snacks.

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(III) Two Overnights Picnic

- Students of schools and colleges : Rs. 1950/- per head.

Two Overnights picnic includes : 4 Breakfasts, 2 Lunches, 2 Dinners, Camp Fires,
D. J., Rain Dance, Bullock Cart Safari, Tractor Safari with tourism tour.

The other tours includes Family Tours, Educational Tours, Industrial Visits
Conferences, Birth Day Celebrations, etc. The charges as per negotiations held from time to time.

Awards

- Received Yashwantrao Chavan Agro-Tourism Memorial Award by Agriculture Department, Zilla Parishad, Satara during 2016-17.
- Agro-Tourism Memorial Award by Maharshtra State Agri and Rural Tourism Co-operative Federation Limited (Mart), Baramati on 02 .07.2019.

SWOT Analysis

Strengths

- Strong supplementary source of income for farmers.
- Employment generation.
- Rural development.

Weaknesses

- Comparatively low growth.
- Less educated farmers, so need varied trainings.
- Lack of government support.

Opportunities

- Immense scope of growth.
- More farmers can be beneficiaries.
- Government support can increase the outreach.
- Government lands can be converted as ATCs.

Threats

- Climatic conditions.
- Less competition, so no threats.
- Rampant migration from farming to other sectors.

Suggestions

- Awareness
- Implementation of perfect models.
- Effective training programmes for capacity building.
- More consultancy services.
- Government support with agro-tourism policies/regulations.
- Supportive agro-tourism financing.
- Product and service quality control.
- Strategic partnership development.
- Marketing programmes.

CONCLUSIONS

The study suggested that there should be awareness for implementation of perfect models, effective training programmes, more consultancy services, government support with agro-tourism policies, supportive agro-tourism financing, product and service quality control, strategic partnership development and marketing programmes.

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Economic Analysis of Farming Systems in Jalna District

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ABSTRACT

In the study on attempt has been made to study the "Economic Analysis of Farming Systems in Jalna District". For this study the, Primary data collected from 60 farmers consisting 30 farmers of each farming system (i.e. Crop + Livestock farming system and Crop + Livestock + Horticulture farming system). The per hectare use of resources was highest in Crop + Livestock + Horticulture farming system as compared to Crop + Livestock farming system. The per hectare used of human labour was highest i.e. 214.49 man-days in Crop + Livestock + Horticulture farming system as followed by Crop + Livestock farming system i.e 157.12 man-days. Per hectare used of seed was highest i.e. 2055.52 kg in Crop + Livestock + Horticulture farming system as compared to Crop + Livestock farming system i.e. 49.31 kg. The per hectare total cost of cultivation was highest in Crop + Livestock + Horticulture farming system i.e. Cost C_3 was Rs. 465686.78 and gross income was Rs. 802510.58 followed by Crop + Livestock farming system i.e. Cost C_3 was Rs. 318580.76 and gross income was Rs. 475720.26. The per hectare net profit was maximum in Crop + Livestock + Horticulture farming system (i.e. Rs. 336823.80) followed by Crop + Livestock farming system (i.e. Rs. 157139.50). The study revealed that, the among the two farming system Crop + Livestock + Horticulture farming system was found to be highly profitable farming system than Crop + Livestock farming system.

Keywords - *Crop + Livestock, Crop + Livestock + Horticulture, Farming system, Resource, Gross income, Profit*

INTRODUCTION

Farming system is an integrated set of activities that farmers perform in their farms under their resources and circumstances to maximize the productivity and net farm income on a sustainable basis. The farming system represents an appropriate combination of different farm enterprises viz., cropping systems, livestock, horticulture, forestry, poultry, piggery, fisheries and goat rearing etc., and were the means available to the farmer to raise their profitability. All components of farming systems are interrelated to each other.

Crop production is subject to a high degree of risk and uncertainty and provides only seasonal, irregular and uncertain income and employment to the farmers. In order to minimize the risk and uncertainties, the farmers are practicing integrated farming system. Farming systems refers to the organization of enterprises on the farm to achieve the maximum income.

Livestock sector plays pivotal role in providing nutritive food rich, in animal protein and also helps in supplementing family incomes and generating gainful employment in the rural sector. The total Livestock population is 536.76 million in the country showing an increase of 4.8% over Livestock Census-2012. Total Bovine population (Cattle, Buffalo, Mithun and Yak) is 303.76 million in 2019 which shows an increase of 1.3% over the previous census. The total number of Cattle in the country is 193.46 million in 2019 showing an increase of 1.3 % over previous Census. The total Buffalo in the country is 109.85 million showing an increase of about 1.1% over previous Census. The total Milch Animals (in-milk and dry) in Cows and Buffalo is 125.75 million, an increase of 6.0 % over the previous census. The total Sheep in the country is 74.26 million in 2019, increased by 14.1% over previous Census. The Goat population in the country in 2019 is 148.89 million showing an increase of 10.1% over the previous census. (Source: 20th livestock census 2019).

Horticulture in India plays vital role in our daily life. In India next to mango and banana, citrus represents third largest grown fruit crop. Total Horticulture production in 2021-22 is estimated to be 341.63 Million Tonne, an increase of about 7.03 Million Tonne (increase of 2.10%) over 2020-21 (Final). Increase in production of Fruits, Vegetables and Honey while decrease in production of Spices, Flowers, Aromatics & Medicinal Plants and Plantation Crops over previous year, is envisaged. The Fruits production is estimated to be 107.10 Million Tonne compared to 102.48 Million Tonne in 2020-21. The production of Vegetables is estimated to be 204.61 Million Tonne, compared to. 200.45 Million Tonne in 2020-21. Onion production is estimated to be 31.70 Million Tonne against 26.64 Million Tonne in 2020-21. Potato production is expected to be 53.58 Million Tonne, compared to 56.17 Million Tonne in 2020-21. (Source: Ministry of Agriculture & Farmers Welfare).

METHODOLOGY

The present study on Economic Analysis of Farming Systems in Jalna District. Two tehsils viz. Jafrabad and Bhokardan was selected on the basis of availability of potential farming system. In all, six villages i.e. Three villages each from Jafrabad and Bhokardan tehsils, were selected randomly. 10 farmers from each village consisting of 5 Crop + Livestock and 5 Crop + Livestock + Horticulture farming system were selected. Thus, 60 farmers from 6 villages comprising of 30 Crop + Livestock farming system and 30 Crop + Livestock + Horticulture farming systems were selected for study.

For the present study, the primary data was collected by survey method from the selected farmers with the help of specially designed schedule for the year 2021-2022. The data was collected on different aspects such as the family size, land utilization, cropping pattern, capital assets, livestock position, cost and returns from Crop and Crop + Livestock farming system.

Economics of farming systems

Cost and returns of farming system were calculated as per the standardized cost concept.

COST A_1

It is the actual paid out cost incurred by the farmers. This cost comprise of the expenditure incurred by the farmers in cash as well as kind for the cultivation of crops in respect of following items.

1. Hired human labour (Days)
2. Bullock labour (Days)
3. Machinery charges (Hr)
4. Seed or Planting material (Kg)
5. Manure (Tonnes)
6. Fertilizers (Kg)
7. Plant Protection (Lit)
8. Irrigation charges (Rs)
9. Land revenue and other taxes
10. Interest on working capital
11. Depreciation on implements and farm building

COST A_2

Cost A_1+ Rent paid for leased inland.

COST B_1

Cost A_1+ interest value of owned fixed capital assets (excluding land)

COST B_2

Cost B_1 + Rental value of land

COST C_1

Cost B_1 + imputed value of family labour

COST C_2

Cost B_2 + Imputed value of family labour

COST C_3

Cost C_2 + 10 % of Cost C_2

Gross and Net Income

Gross Income

Gross income= Value of main produce + Value of by produce

Net income

It is difference between the gross income and the cost of cultivation at different cost concepts.

Input-output Ratio

It is the ratio of gross income and total expenditure incurred.

RESULTS AND DISCUSSION

Resource use pattern

The resource use pattern of any production activity indicates composition of the expenditures incurred on various inputs. It is useful to locate the strength and weaknesses in the production system so as to increase the efficiency.

Table.1 Per hectare resource use pattern

Sr. No	Particulars	Unit	Farming systems			
			C + L		C + L + H	
			Qts	Rs/ha	Qts	Rs/ha
1	Hired labour	Days	26.14	5946.11	75.06	17719.54
2	Family labour	Days	130.98	36215.00	139.44	37052.00
3	Total labour	Days	157.12	42161.11	214.50	54771.54
4	Bullock labour	Days	6.74	4718.00	10.50	7349.41
5	Machinery	Hrs	10.74	8595.00	18.73	14986.99
6	Seed	Kg	49.31	4908.42	2055.52	44961.95
7	Manure	Tonnes	2.65	2650.00	23.20	23198.71
8	Fertilizers					
	N	Kg	144.33	865.98	394.47	2366.81
	P	Kg	385.07	4235.77	846.68	9313.46
	K	Kg	80.15	1522.80	206.57	4028.19
	Micronutrients	Kg	4.68	4680.00	28.83	6055.66
	Total		614.23	11304.55	1476.55	21764.12
9	Plant protection	Litre	4.91	8396.85	19.30	14098.04
10	Livestock fodder	Kg	12634.28	100536.11	8085.85	60482.28

The average per hectare resources utilization is given in table.1. It is seen from table.1 that the per hectare used of human labour was highest i.e. 214.50 man-days in Crop + Livestock + Horticulture farming system followed by Crop + Livestock farming system i.e. 157.12 man-days. Per hectare used of machinery was highest i.e. 18.73 hours in Crop + Livestock + Horticulture farming system as compared to Crop + Livestock farming system i.e. 10.74 hours. Per hectare used of seed was highest i.e. 2055.52 kg in Crop + Livestock + Horticulture farming system followed by Crop + Livestock farming system i.e. 49.31 kg. Per hectare used of manure was highest i.e. 23.20 tonne in Crop + Livestock + Horticulture farming system followed by Crop + Livestock farming farming system i.e. 2.65 tonne. Per hectare used of fertilizers was highest i.e. 1476.55 kg in Crop + Livestock + Horticulture farming system followed by Crop + Livestock farming system i.e. 614.23 kg. The resources use i.e. seeds, fertilizers, machinery, etc. in proposed farming system are in varied proportion.

Expenditure pattern of different farming systems

Table.2 Expenditure pattern of different farming systems (Rs/ha)

Sr. No	Particulars	Farming systems			
		C + L	% of Cost C_3	C + L + H	% of Cost C_3
1	Hired human labour Male	2156.98	0.68	8125.15	1.74
	Female	3789.13	1.19	9594.39	2.06
2	Bullock labour	4718.00	1.48	7349.41	1.58
3	Machine charges	8595.00	2.70	14986.99	3.22
4	Seed	4908.42	1.54	44961.95	9.65
5	Manures	2650.00	0.83	23198.71	4.98
6	Fertilizer N	865.98	0.27	2366.81	0.51
	P	4235.77	1.33	9313.46	2.00
	K	1522.80	0.48	4028.19	0.87
	Micronutrients	4680.00	1.47	6055.66	1.30
7	Irrigation charges	3231.59	1.01	11290.95	2.42
8	Plant protection	8396.85	2.64	14098.04	3.03
9	Incidental charges	367.22	0.12	367.22	748.91
10	Repairing charges	408.67	0.13	976.49	0.21
11	Livestock maintenance	100536.11	31.56	60482.28	12.99
12	Working capital (1 to 11)	151062.52	47.42	217577.39	46.72
13	Interest on working capital @ 6%	9063.75	2.85	13054.64	2.80
14	Depreciation	5935.81	1.86	8408.58	1.81
15	Land Revenue	154.79	0.05	161.72	0.03
16	**COST A_1**	**166216.87**	**52.17**	**239202.33**	**51.37**
17	Rental value of leased land	-	-	-	-
18	**COST A_2**	**166216.87**	**52.17**	**239202.33**	**51.37**
19	Interest on fixed Capital @ 10% per annum	7926.09	2.49	13372.48	2.87
20	**COST B_1**	**174142.96**	**54.66**	**252574.81**	**54.24**
21	Rental value of land	79260.91	24.88	133724.81	28.72
22	**COST B_2**	**253403.87**	**79.54**	**386299.62**	**82.95**
23	Family human labour Male	30075.00	9.44	27492.00	5.90
	Female	6140.00	1.93	9560.00	2.05
24	**COST C_1**	**210357.96**	**66.03**	**289626.81**	**62.19**
25	**COST C_2**	**289618.87**	**90.91**	**423351.62**	**90.91**
26	**10% OF COST C_2**	**28961.89**	**9.09**	**42335.16**	**9.09**
27	**COST C_3**	**318580.76**	**100.00**	**465686.78**	**100.00**
28	Main Produce	142201.46	-	137296.20	-
29	By Produce	1613.14	-	1263.54	-
30	Livestock (Dairy) Produce	331905.66	-	229617.51	-
31	Horticulture	-	-	434333.33	-
31	**Total value of Produce**	**475720.26**	**-**	**802510.58**	**-**

(Figures in the parentheses indicates the percentages to cost C_3)

It is revealed from the table.2 that the, in case of Crop + Livestock farming system, cost A_1, cost A_2, cost B_1, cost B_2, cost C_1, cost C_2 and cost C_3 was Rs. 166216.87, Rs. 166216.87, Rs. 174142.96, Rs. 253403.87, Rs. 210357.96, Rs. 289618.87 and Rs. 318580.76. The Gross return was Rs. 475720.26. The per centage of livestock maintenance was 31.56% in Crop + Livestock farming system. The percentage shared of hired human labour, seed and manure was 1.87%, 1.54% and 0.83% in Crop + Livestock farming system.

In case of Crop + Livestock + Horticulture farming system cost A_1, cost A_2, cost B_1, cost B_2, cost C_1, cost C_2 and cost C_3 was Rs. 239202.33, Rs. 239202.33, Rs. 252574.81, Rs. 386299.62, Rs. 289626.81, Rs. 423351.62, and Rs. 465686.78. The gross return was Rs. 802510.58. The percentage of livestock maintenance was 12.99% in Crop + Livestock + Horticulture farming system. The percentage shared of seed, manure and hired human labour was 9.65%, 4.98% and 3.80% respectively.

Profitability of different farming systems

Profitability of farming systems is important to examine the best farming system in the study area. The information on profitability of different farming system is presented in table.3.

Table.3 Profitability of different farming systems (Rs/ha)

Sr. No	Particulars	Farming systems	
		C + L	C + L + H
1	Income (Rs)	475720.26	802510.58
2	Expenditure (Rs)	318580.76	465686.78
3	Profit (Rs)	157139.50	336823.80
4	B:C Ratio	1.49	1.72

It can be seen from the table.3 that, In Crop + Livestock + Horticulture farming system i.e. Rs. 336823.80 per hectare profit was high as compared to Crop + Livestock farming system i.e. Rs. 157139.50. The per hectare income of Crop + Livestock + Horticulture farming system i.e. Rs. 802510.58 over Crop + Livestock i.e. Rs. 475720.26 was more. B:C ratio of Crop + Livestock + Horticulture farming system was 1.72 followed by Crop + Livestock farming system i.e. 1.49.

To sum up, it can be noted that as farmers shifts from Crop + Livestock farming system to Crop + Livestock + Horticulture farming system the income, expenditure and profit goes on increases. It indicates that the Crop + Livestock + Horticulture farming system was economically most viable in Jalna district as compared to other farming systems.

CONCLUSIONS

It is concluded from the study that, the per hectare used of human labour was highest in Crop + Livestock + Horticulture farming system (214.50 man-days) followed by Crop + Livestock farming system (157.12 man-days). Employment pattern indicates share of wags days in gross farm employment increase as farmer shifts from Crop + Livestock farming system to Crop + Livestock + Horticulture farming system. The per hectare total cost of cultivation was highest in Crop + Livestock + Horticulture farming system i.e. Cost C_3 was Rs. 465686.78 and gross income was Rs. 802510.58 as compared to Crop + Livestock farming system i.e. Cost C_3 was Rs. 318580.76 and gross income was Rs. 475720.26. B:C ratio of Crop + Livestock + Horticulture farming system was 1.72 followed Crop + Livestock farming system was 1.49. Crop + Livestock + Horticulture farming system over Crop + Livestock farming system was more profitable. The profitability of farmers, indicates that the Crop + Livestock + Horticulture farming system was economically most viable in Jalna district as compared to Crop + Livestock farming system.

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Income Generated Through minor Forest Products of Tribal Farmers in Gadchiroli District

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ABSTRACT

The present study was conducted in Gadchiroli district of Maharashtra state. In India, Minor Forest Products are an important livelihood source for several communities, particularly those living in forest fringe village. According to census 2011, the tribal population in India was 104 million people which accounts for 8.6 per cent of the total population of the country. It is estimated that, there is one tribal man for every fourteen Indians. In India, nearly 31.00 per cent of them are directly dependent on MFPs for their livelihood. In the present study entitled assess marketing of selected minor forest products in Gadchiroli district", was undertaken with a view to study the various channels of marketing of MFPs and to analyse the problems faced by the tribal farmers in transacting MFPs. Dhanoratahsil is a tribal dominated tahsil which was selected purposively on the basis of maximum area under forest. Random sampling techniques was fallowed regarding selection of the villages and tribal farmers. In present study represents marketed and marketable surplus of selected MFPs, in case of charoli and gum, marketed surplus is 100.00 per cent means whatever products were collected, the whole quantity was sold to the market. But in case of mohaflower only 7919 kg quantity which was account to 78.26 per cent sold by collector and 2200 kg quantity which account 21.74 per cent kept for family consumption, for making liquor to family consumption Minor Forest Products (MFPs) are seen as crucial in improving the livelihood of tribal poor and to promote sustainability as there is immense potential of these product in value added in national and international market.Tribals farmers obtained employment and additional income trough out the year from the collection of MFPs.

Keywords:Income generated, Minor Forest, Products.

INTRODUCTION

In India, Minor Forest Products are an important livelihood source for several communities, particularly those living in forest fringe village. About 400 million people in India depend on Minor Forest Products (MFPs). According to census, the tribal population in India was 104 million people which accounts for 8.6 per cent of the total population of the country. It is estimated that, there is one tribal man for every fourteen Indians. In India, about 53 per cent of total tribal population lives in rural areas and nearly 31 per cent of them are directly dependent on MFPs for their livelihood**.** Minor Forest Products (MFPs) technically defined as all vegetables and animals products other than firewood and timber obtained from the forest. Forest produce mainly divided into two categories i.e major and minor product. Major forest products are timber, small wood and fire wood. Minor forest products(MFPs) is defined as non wood forest produce, which can be exploited without harming the forest and will not included minerals as well as forest animals or animals part.Schedule Tribes (STs) are indigenous, have their own distinctive culture, are geographically isolated and are low in socio economic conditions. For centuries, the tribal groups have remained outside the realm of the general development process due to their habitation in forest and hilly tracts.The word 'Minor' applied to these types of products is, however is misnomer, because over the years such products are contributing in much significant way to the national economy. So that, in some of the state as much as 50 per cent of the forest revenue is derived from MFPs. It is also reported that MFPs contributed 30-50 per cent of the total forest revenue of the country.Minor Forest Products (MFPs) are seen as crucial in improving the livelihood of tribal poor and to promote sustainability as there is immense potential

of these product in value added in national and international market.The Gadchiroli district of Maharashtra constitutes of 11299 km of the forest lands making a home for a variety Non Timber Forest Produce (NTFPs) including gum plants, oil seeds. In the Gadchiroli, 13 crucialNTFPs were found among 10 were dominated. The major species are Bamboo, Tendu, Mahua, Charodi, Triphala (Amla, Hirda, Behda), Karanj, Palas,Gum,etc.

METHODOLOGY

Sampling Frame work for Collection and Marketing of MFPs

Table 1. The details of selected sample from Dhanora Tahasil

Sr.No.	Name of Village	No of sample
1	Kanartola	10
2	Menda	10
3	Lekha	10
4	Girola	10
5	Horekasa	10
6	Hulondi	10
Total no. of Tribal farmer Selected for the study		60

In order to fulfill the objectives of study, necessary primary data were collected from the tribal farmers by the personal interview. For this purpose a pre tested questionnaire, specially designed for the present study was used. Three important MFPs i.eCharoli, Gum, and Moha flower were considered for the study. In addition to this information on marketing cost and marketing margin of wholesalers, retailers were collected from 10 market functionaries by the personal interview method using a structured schedule. The data collected pertains to the agricultural year 2020 and the survey was conducted in the month of January 2021.

In the **p**resent study entitled "Marketing analysis of minor forest product in Gadchiroli district",was undertaken with a view to study the various channels of marketing of MFPs and to analyse the problems faced by the tribal farmers in transacting MFPs. Dhanora tahsil is a tribal dominated tahsil which was selected purposively on the basis of maximum area under forest. Random sampling techniques was fallowed regarding selection of the villages and tribal farmers.The details of selected sample are given below.

Information regarding organizations involved in marketing and processing of MFPs in Gadchiroli district were collected from the office of Mavim (Mahila Arthik Vikas Mahamandal, Gadchiroli), Maharashtra State Rural Livelihood Mission (MSRLM), Godwana Harbs, Science and Technology Research Centre(STRC). VandhanVikas Gat, Dhanora etc.

RESULT AND DISCUSSION

Socioeconomics characteristics of tribal farmers

The distribution of tribals according to size of land holding was workout and presented in Table 2. The distribution of tribals in three categories i.e small, medium and large, according to their size of land holding.Out of 60 selected tribalfarmers 71.33 per cent belong to small holding groups, 25.00 per cent tribals belonged to medium group and only 3.33 percent tribals belonged to large group of land holdings.

Tables 2. Distribution of Tribal's according to land holding

Sr.no	Size of holding	Size limit (ha)	Tribals selected	Average size of holding (ha)
1	Small	Upto 2.00	43(71.66)	1.28
2	Medium	2.01 to 4.00	15(25.00)	2.21
3	Large	Above 4.01	02(3.33)	4.16
4	Total		60(100.00)	2.55

(Figure in parenthesis indicate the per cent to total)

Average size of land holding in case of small, medium and large group were 1.28 hectares, 2.21 hectares and 4.16 hectares respectively. Overall land holding was 2.55 hectares.

Table 3. Average size family of selected Tribal farmer

Sr.no	Small	Medium	Large	Overall
Male	1.88 (36.36)	1.86 (39.57)	1.81 (40.04)	1.85 (38.54)
Female	1.27 (24.56)	1.58 (33.62)	1.56 (34.51)	1.47 (30.63)
Children	2.02 (39.07)	1.26 (26.81)	1.15 (25.44)	1.48 (30.83)
Total	**5.17 (100.00)**	**4.7 (100.00)**	**4.52 (100.00)**	**4.80 (100.00)**

(Figure in parenthesis indicate the per cent to total)

The detailed of average size of family of sample tribal's is presented in table 3. Overall average number of family members were 4.80 which comprised of 1.85 males 1.47 female and 1.48 children.

It is essential to study the average size of family to get an idea about per person income obtained from MFPs collection. The tribals were divided according to size of land holdings. In general, the size of family for small,medium and large was 5.17,4.7 and 4.52 members respectively.

Education is the important factor affecting the standard of living of tribals. Table 4.Indicates the distribution of tribals according to education.

Table 4. Distribution of selected tribal according to education level

Particulars	Land holding size			
	Small	**Medium**	**Large**	**Overall**
Illiterate	1.09 (21.08)	0.67 (14.26)	0.22 (4.87)	0.66 (13.75)
Primary	2.09 (40.43)	1.49 (31.70)	0.60 (13.27)	1.39 (28.96)
Secondary	1.12 (21.66)	1.25 (26.60)	1.03 (22.79)	1.13 (23.54)
Junior college	0.81 (15.66)	1.04 (22.13)	1.51 (33.41)	1.12 (23.33)
UG college	0.06 (1.16)	0.25 (5.32)	1.16 (25.66)	0.69 (14.38)
Total	5.17 (100.00)	4.7 (100.00)	4.52 (100.00)	4.80 (100.00)

(Figure in parenthesis indicate the per cent to total)

It was observed from table 4 that, overall average proportion of illiterate members was highest in small group of tribalsi.e 21.08 per cent fallowed by medium group which accounts 14.26 per cent while it was lowest in large group i.e 4.87 per cent. Highest per cent of education level was observed in primary group i.e 40.23 per cent in small group, 31.70 per cent in medium group and 13.27 per cent in large group. Per cent of overall total education wasobserved high in primary group i.e 28.96 per to total education level

Per cent level of education in junior college and UG college was found more in large group than small and medium group and per cent of illetracy was found more in small group of tribals.

Land utilization pattern

The information about land utilization indicated the area of land actually utilize in different purpose like crop production, irrigation etc. It can be seen from Table 5 that, the overall

Table 5.Land Utilization pattern (ha)

Sr.No	Particulars	Land holding size			
		Small	**Medium**	**Large**	**Overall**
1.	Total land holding	1.28 (100.00)	2.21 (100.00)	4.16 (100.00)	2.55 (100.00)
2	Fallow land	0.16 (12.5)	0.3 (13.57)	0.22 (5.29)	0.23 (9.01)
3	Net cultivated land	1.12 (87.5)	1.91 (86.43)	3.94 (94.71)	2.35 (92.17)
4	Area under irrigation	0.62 (48.44)	1.03 (46.60)	2.10 (50.48)	1.25 (49.02)
5	Gross cropped area	1.74 (135.94)	2.94 (133.03)	6.04 (145.19)	3.57 (140.00)
6	Cropping intensity	155.36	153.93	153.30	154.20

Land holding of selected tribal farmers was found to be 2.55 hectares. The overall fallow land was 9.01 per cent of total land holding, whereas net cultivated land was 92.17 per cent,.

It can be revealed from above table that, the average net cultivated land was highest in large group 3.94 hectare which account 94.71 per cent of total land holding area of large farmer, followed by medium group 86.43 per cent and small group 87.5 per cent. The gross cropped area was highest in large group.

Table 6 Cropping pattern of selected tribals

Sr. No	Particular	Land size holding			
		Small	**Medium**	**Large**	**Overall**
1.	**Kharif crops**				
a.	Paddy	0.95 (54.60)	1.58 (53.74)	3.55 (58.77)	2.02 (56.58)
b.	Soybean	0.12 (6.89)	0.16 (5.44)	0.20 (3.31)	0.16 (4.48)
c.	Tur	0.03 (1.72)	0.08 (2.72)	0.11 (1.82)	0.07 (1.96)
d.	Mung	0.02 (1.15)	0.09 (3.06)	0.08 (1.32)	0.06 (1.68)
	Total	**1.12** (64.36)	**1.91** (64.97)	**3.94** (65.23)	**2.35 65.82)**
2.	**Rabi crop**				
a.	Gram	0.28 (16.09)	0.46 (15.65)	0.66 (10.93)	0.46 (12.88)
b.	Linseed	0.29 (16.67)	0.41 (13.95)	0.67 (11.09)	0.45 (12.61)
b.	Wheat	0.04 (2.30)	0.06 (2.04)	0.42 (6.95)	0.17 (4.76)
	Total	0.61 (35.06)	0.93 (31.63)	1.75 (28.97)	0.71 (19.89)
3.	**Summer crop**				
a.	vegetables	0.01 (0.57)	0.10 (3.40)	0.35 (5.79)	0.15 (4.20)
4.	**Gross cropped area**	1.74 (100.00)	2.94 (100.00)	6.04 (100.00)	3.57 (100.00)

(Figure in parenthesis indicate the per cent to total)

Table 6 described the cropping pattern of selected tribal farmers and it was found that paddy was dominating crop in kharif season whereas gram and linseed were major crop in rabi season.

In kharif season, the overall area allocated under paddy crop was 2.35 hectares which accounts 65.82 per cent, area under soybean was 0.16 hectares which accounts 4.48 per cent and area under tur and mung were 0.07 hectares and 0.06 hectares respectively. The area under paddy were 0.95 ha, 1.58ha, 3.55 ha in small, medium and large group of tribals respectively which accounts 54.60 per cent, 53.74 per cent, 58.77 per cent

In rabi season,gram and linseed were important crops grown by selected tribals farmers. It was observed that at overall level the area under gram and linseed were 0.46 ha and 0.45 ha respectively which was 12.88 per cent and 12.61 percent. Area under wheat crop was very less as compare to gram and linseed crop, the overall area under wheat was 0.17 ha which account 4.17 per cent to total gross cropped area.

Employment and income generated through collection and marketing of MFPs

Table7. Employment (days/year) through MFPs

Sr.No	Particular	Small	Medium	Large	Overall
1	Charoli	42.56 (25.50)	44.25 (27.33)	36.45 (27.90)	41.09 (26.83)
2	Gum	56.10 (33.61)	45.26 (27.96)	25.27 (19.35)	42.21 (27.56)
3	Mohaflower	68.26 (40.89)	72.36 (44.70)	68.89 (52.74)	68.84 (44.96)
	Total	**166.92** **(100.00)**	**161.87** **(100.00)**	**130.61** **(100.00)**	**153.13** **(100.00)**

(Figure in parenthesis indicate the per cent to total)

It is observed from Table 7 that the overall employment was available from MFPs collection was 153.13 days of which employment from charoli was 41.09 days which accounts 26.83 per cent , employment from collection of mohaflower was 68.94 days i.e 44.96 per cent and from gum, 42.21 days which accounts 27.56 per cent to total. Annual employment generated from MFPs was highest in small group i.e 166.92 days followed by medium group 161.87 per cent, and lowest for the large group 130.61 days

It is seen that highest employment available from mohaflower i.e 68.84 days followed by gum and charoli and in small group i.e 166.92 days followed by medium and large group. It means in study area maximum employment available from collection of Mohaflower and small group tribals and medium group of tribals were received maximum employment through collection of MFPs.

Table8. Income generated through MFPs

Sr.No	Particular	Small	Medium	Large	Overall
1	Charoli	2187.5 (22.99)	1875 (23.11)	1750 (26.19)	1937.5 (23.91)
2	Gum	2062.5 (21.67)	1540 (18.99)	1182.5 (17.70)	1595.00 (19.68)
3	Mohaflower	5266.8 (55.34)	4695 (57.89)	3750 (56.11)	4570.6 (56.41)
	Total	9516.8 (100.00)	8110.00 (100.00)	6682.5 (100.00)	8103.1 (100.00)

(Figure in parenthesis indicate the per cent to total)

It was observed that, an average overall annual income per household obtained from charodi, gum and mohaflower were 8103.1 rupees. Overall annual income from collection of mohaflower was 4570.6 rupees i.e 56.41 per cent which was highest as compared with charoli 1937.5 rupees i.e 23.91 per cent and gum 1595 rupees which account 19.68 per cent.

The total income obtained from collection of charoli, gum and mohaflower were found to be highest in small group tribalsi.e 9516.8 rupees followed by medium group and large group which contributes 8110 rupees and 6682.5 rupees respectively.

CONCLUSIONS

Tribals farmers obtained employment and additional income trough out the year from the collection of MFPs. Therefore Govt should provide them storage and transportation facilities so that the tribalsfarmers efforts can be minimize at some extend.

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Resource Use Efficiency in Dairy Entrepreneurship

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ABSTRACT

The study was undertaken in four tahsils of Amravati district in Maharashtra to examine the input- output relationship and assess the resource use efficiency in milk production . The study covered 120 milk producers . The results of Cobb-Douglas production revealed that ,the partial regression coefficient valueswere positive in the variables viz; medicines, vaccination, concentrate feed, breeding charges and in family labour where as partial regression coefficient valuesvalues were shown negative in variables hired human labour ,dry fodder and in green fodder etc. The results of resource use efficiency and marginal value productivity of inputs indicated that, medicines, vaccination, concentrate feed , breeding charges and family labour were positive and had significant effect. Whereas, hired human labour shown negative though not significant. This may due to over employment of family labour in dairy business.It is suggested that, the milk production in improved buffalo can be increased by increasing the farmer's technical efficiency with the same resource base and technologies. There is a need for technical guidance to farmers particularly regarding scientific feeds and fodder management practices.

Key words – fodder, concentrates, labour, resource use efficiency

INTRODUCTION

In India, agriculture and allied sectors provide livelihood to about 70 percent of the population and contribute nearly fifteen percent of national income. The per capita available land is 0.30 hectare (ICAR Booklet 2011). The pressure exerted by over increasing occupancy on the land by increasing strength of population has been further reducing the per capita available land. It is insufficient for maintaining minimum standard of living hence, it is utmost necessary that, subsidiary agro-based industries or occupation must be tried by rural people to seek over the means for their survival.

As a subsidiary agro-based industry, dairy provide drought power and manures which augment the crop production, Milch animals are one of the solutions to solve the problem of uncertainty associated in family business. Dairy enterprise is marginally profitable and farmers have ample opportunities to increase output by using more feed and hired labour inputs. The family members (men, women and children) and paid labours share each other in most of the related in dairy entrepreneurship. Therefore, to bring improvement in dairy enterprise and rural life, self employment of rural family members could contribute in the improvement of dairy farming activities as well as rural life.

There is great variation in the productivity and resource use efficiency of different breeds of milch buffalo reared in different resource situation due to variation in genetic characteristics feeding and management practices. Ultimately, these resourcesaffect milk production. These resources have to be optimally utilized in order to get maximum income from dairy enterprise. Thus, present research study was under taken to provide guidelines for recognition of dairying by the improvement of dairy productivity in Amravati district in Maharashtra to cope with the object ofto study on resource use efficiency in thebuffalo milk production.

METHODOLOGY

The primary data was collected from 120 milk producers randomly in four tahasils in Amravati

district through questionnaire during the year 2018-2019. Out of which, 32 improved buffalo milk producers were selected for the present study.Resource use efficiency was calculated by using cobb-Douglus production function with the fallowing formula.

$Y= a\ X_1^{b1} \times X_2^{b2} \times X_3^{b3} \times X_4^{b4} \times X_5^{b5} \times X_6^{b6} \times X_7^{b7}$

The Function was fitted in logarithms. The transformed function is -----

$LogY = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7$

$+b_8 \log X_8 + b_9 \log X_9 + b_{10} \log X_{10} + b_{11} \log X_{11} + + b_{12} \log X_{12} + b_{13} \log X_{13}$

Where,

Y= Total receipt in rupees .

X_1-hired human labour(Rs)X_2-dry fodder (Rs)

X_3- green fodder (Rs) X_4-medicines & vaccination (Rs)

X_5- concentrate feed (Rs) X_6- grazing charges(Rs)

X_7- watering (Rs),

X_8-breeding (Rs)

X_9- transportation of inputs (Rs)

X_{10}- cleaning expenses(Rs)

X_{11}- calcium dose (Rs)

X_{12}- interest on working capital (Rs)

X_{13}-family labour charges (Rs)

a = Constant intercept which indicate the level of output when zero inputs are use.

$b_1$to b_7 = Production elasticity's partial regression coefficient of respective variables.

Above Cobb-Douglas production function is used for different variables and its results shown as resource use efficiency in the results and discussions.

RESULTS AND DISCUSSION

The collected was tabulated by using Cobb-Douglas production functionfor different variables and its results shown as resource use efficiency in the buffalo milk production presented in table-1

Table1 Resource use efficiency in the buffalo milk production

Sr.No.	Variables	be-coefficient	SE- Standard	T (stat) Value
	Intercept (a)	1.6925	1.9143	0.8841
1	X_1-hired human labour	-0.0420	0.0328	-1.27
2	X_2-dry fodder	-0.3281	0.0400	-0.81927
3	X_3- green fodder	-0.01175	0.1543	0.0761
4	X_4 –medicines and vaccination	0.4414	0.2976	1.4831
5	X_5- concentrate feed	0.1509	0.3735	0.4040
6	X_6- grazing charges	-0.15159	0.25369	-0.59755
7	X_7- watering	0.00824	0.0401	0.02051
8	X_8-breeding charges	0.0203	0.0406	0.5012
9	X_9- transportation of inputs	0.07553	0.19011	0.3972
10	X_{10}- cleaning expenses	-0.0047	0.2083	-0.02286
11	X_{11}- calcium dose	0.0095	0.1053	0.090753
12	X_{12}- interest on working capital	0.3122	0.151288	2.0640
13	X_{13}-family labour charges	0.2671	0.23094	1.5696
14	R^2 (R- square)	0.4505		
15	Number of observations	32		

The table 1 shows that , value of partial regression coefficient were found positive in variables viz; medicines and vaccination (X_4), concentrate feed (X_5), breeding charges (X_8) , inputs transportation cost (X_9) , interest on working capital(X_{12}), and family labour charges(X_{13}) were respectively as0.4414, 0.1509,0.0203, 0.07553 , 0.3122 & 0.2671. On the contrary, value of partial regression coefficient were found negative in variables viz; hired human labour (X_1), dry fodder(X_2),green fodder(X_3),grazing charges(X_6),& in cleaning expenses(X_{10}) were respectively as -0.0420,-0.3281,-0.01175,-0.15159, and -0.0047. The maximum partial regression coefficient was observed in variable(X_4)medicines and vaccination where asthe minimum value of partial regression was found in X_7- watering

Regression coefficient in production function in respect of various resources used in improved buffalo milk production reflected in table 1 that , medicines ,vaccination feed ,and labour explain 45% of variation in milk yield. (as shown in the table) The regression of coefficient of vaccination,concentrate feed, breeding and family labour charges were found positive and significant. However the milk yield elasticity withrespect to watering was very low. In this statistical analysis, it is cleared that, the responsiveness of milk output to proper medicines, vaccination, concentrate feed, family labour and breeding charges was high. The hired human labour shown negative though not significant this may due to over employment of family labour in dairy business.

CONCLUSIONS

The statistical analysis of resources used in the improved buffalo milk production shown that, the partial regression coefficient value were positive in the variables viz; medicines, vaccination, concentrate feed, breeding charges and in family labour where as values were shown negative in variables hired human labour ,dry fodder and in green fodder etc. It is concluded that medicines, vaccination, concentrate feed , breeding charges and family labour were positive and had significant effect. Whereas, hired human labour shown negative though not significant. This may due to over employment of family labour in dairy business.

Recommendations

The forgoing analysis that, the responsiveness of milk output to proper vaccination, breeding and concentrate feed was high. The hired human labour showed negative though not significant this may due to over employment of family labour in dairy enterprise. So it is suggested that, the milk production in improved buffalo can be increased by increasing the farmer's technical efficiency with the same resource base and technologies. There is a need for technical guidance to farmers particularly regarding scientific feeds and fodder management practices.

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Export Performance of Chilli in India

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ABSTRACT

This study was aimed at investigating the "Export Performance of Chilli in India". The nature of data for study is mainly based on secondary sources. The time series data of chilli export were obtained for 22 years from the year 1996-97 to 2017-18. the period of study was divided into different periods, i.e. Period I (1996-97 to 2006-07), Period II (2007-08to 2017-18) and Overall period (1996-97 to 2017-18). The data on export quantity and value were collected from Directorate General of Commercial Intelligence and Statistics (DGCIS), Government of India, National horticulture board. The export data of chilli was collected for HS code of 0904. To examine the growth in export of chilli from India compound growth rate (CGR) was computed based on its fit using non-linear models, especially the exponential model. Coefficient of variation and Cuddy-Della Valle Instability Index will be used to estimate the instability in export of chilli data. The study revealed that, the growth in chilli export was high in quantity during period-I than period-II, value in rupee and value in dollar was increased in period-II as compared to period-I.Instability in chilli export measured in quantity was high during period-I compared to period-II.Instability in chilli export was serious concerns which affect the prices of chilli in domestic market and reduce foreign earning. So export of chilli may stabilize by proving appropriate support. Hence, there is need to evolve policies directing higher production of chilli and formulate alternative management strategies and policies to boost chilli export in India.

Keywords: *Chilli, export, instability. Cuddy della index*

INTRODUCTION

Chilli (*Capsicum annuum* L.) is an important vegetable cum spice crop valued for its aroma, taste, flavor and pungency grown in all parts of world. It belongs to the family Solanaceae with the chromosome number 2n=24 and centre of origin of hot chilli is Mexico. Chilli is cultivated from 3500 BC and it is brought to Asia by Portuguese navigators during the 16th century. Chilli became intensely popular in India after it was first brought to India by Vasco-Da-Gama. Chilli found its way in Ayurveda, the traditional Indian medicinal system.

India has become world's largest producer and exporter of chilli, exporting to USA, UK, Saudi Arabia, Bangladesh, Pakistan, Sri Lanka, UAE, Singapore, Malaysia, Indonesia, Canada, Vietnam, Germany and many countries across the world. The Global area under chilli cultivation is 1.776 million hectare with a production of 7.182 million tonnes. The India's area under chilli cultivation is 316.47 thousand hectare and total chilli production is 3633.99 thousand MT. India, the world's biggest producer and the consumer of red spice, exported 44.90 Thousand MT. chilli, which worth of 22,074.05 lakhs during the year 2017-18 (Source- Horticulture statistics -2018). India and china are the largest exporter of chilli in the world with 25 per cent and 24 per cent share of total global exports, respectively. The demands for Indian chilli in the market of Malaysia, Bangladesh, Sri Lanka, UK and USA have been growing on an average between 20 to 25 per cent because of its quality and price competitiveness.

Major importers of chilli include the USA followed by Malaysia and Sri Lanka in the world. Interestingly, Spain is not only fourth largest exporter but also the fourth largest importer of chilli. India, as

observed in the earlier section, it is the largest producer, consumer and exporter of chillies in the world. India produces on average 1.3 to 1.5 million tonnes of red chillies annually. India is the largest consumer of chilli in the world. Nearly 80% of India's production is consumed within the country and only about 15-20% of domestic production is exported. Exports of chillies from India have increased during past 10 years and on average they stood at about 2.2 lakh tones per year.

Chilli has great nutritional value and medicinal properties particularly the high content of moisture (85.7%), protein (2.9%), fat (0.6%), mineral matter (1.0%), fiber (6.8%), carbohydrates (3.0%), Kcal (29.0g), vitamin C (111.0 mg/100g), niacin (0.9/100g), mineral phosphors (80mg/100g), carotene (175 mg/100g), calcium (30g/100g), iron (4.4mg/100g).Chillies are cholesterol free, low sodium, low calorie, rich in vitamins i.e. Vitamin A and C and a good source of folic acid, potassium and vitamin E. Dehydrated green chilli is a good source of vitamin 'C.The objectives of the study are: 1) To study the growth in export of chilli. 2) To estimate the instability in export of chilli.

METHODOLOGY

The study area pertains to the country as a whole in general. Growth rate and instability in export were studied for the country as a whole.Chilli was purposively selected for the present study in view of its importance among spices and performance in international market. The nature of data for study is mainly based on secondary sources. The time series data of chilli export were obtained for 22 years from the year 1996-97 to 2017-18. the period of study was divided into different periods, i.e. Period I (1996-97 to 2006-07), Period II (2007-08to 2017-18) and Overall period (1996-97 to 2017-18). The data on export quantity and value were collected from Directorate General of Commercial Intelligence and Statistics (DGCIS), Government of India, National horticulture board. The export data of chilli was collected for HS code of 0904. The different techniques used for the study were- Growth rate analysis and Instability analysis.

Growth analysis

To examine the growth in export of chilli from India compound growth rate (CGR) was computed based on its fit using non-linear models, especially the exponential model. Conventionally, the compound growth rate were estimated after the converting the growth model to semi-log form and estimated through Ordinary Least Square (OLS) technique assuming multiplicative errors term. However, there are several problems associated with this technique including the difficulty in estimating standard error of estimates of original parameters. Hence, a non-linear estimation technique for solving exponential model assuming additive error terms was used to estimate compound growth rate

by using exponential growth function as given below:

$$Y^t = \text{constant} * (1+CGR) + E_t \quad (1)$$

Where,

Y^t= time series data for export quantity / export value for year t

t = Time trends for years of interest

E_t = error terms

CGR is compound growth rate for the period under consideration.

The Marquardt algorithm was used to parameters of equation. The significance of regression coefficient will be tested by applying standard 't' test procedure.

Instability

Cuddy-Della Valle Instability Index will be used to estimate the instability in export of chilli data. This index is modification of coefficient of variation (CV) to accommodate for trend which is commonly present in time series economic data. It is superior over other scale dependent measure such as Standard Deviation or Root mean Square of the residuals (RMSE) obtained from the fitted trend lines of raw data and hence suitable for cross comparison. The Cuddy-Della Instability Index calculated as follows:

$$I_x = CV \sqrt{1 - \bar{R}^2}$$

Where,

CV= coefficient of variation (σ/x)

$\bar{R}^2$ = adjusted coefficient of multiple determination

Where, ever trend in time series data is non-significant, instability of that particular was analyzed with the help of conventional statistical tool of instability i.e. coefficient of variation. The coefficient of variation was calculated by using formula,

$$CV\ (\%) = \frac{\text{Standard deviation (a)}}{\text{Mean (x)}} \times 100$$

RESULTS AND DISCUSSION

Considering the objectives of the study, the required data collected was analysed and interpreted. The results obtained are presented and discussed below.

Growth rates of chilli export from India

The results obtained by using the exponential growth function used for the estimation of export of chilli are presented in the table 1.The results revealed that, during period-I, the average quantity of chilli exported to all countries was 109326.97 thousand MT. The value realized from chilli export to in all countries rupees and dollars term was 64202.68 lacks and 149.15 million dollars, respectively. During period-II, export of chilli to all countries was increased. In quantity term, average export of chilli was 335161.10 thousand MT, whereas in value in rupees and dollars, it was 363315.73 lacks and 635.02 million dollars, respectively. In overall period of the study, export of chilli to all countries measured in quantity was 222244.04 Thousands MT. Value realized from the export in rupees and dollar was 213759.21 lacks and 392.08 million dollars, respectively.

Table 1: Compound growth rate in export of chilli from India

Particulars		Period-I			Period-II			Overall		
		Qty	Rs.	US $	Qty	Rs.	US $	Qty	Rs.	US $
Growth	Mean	109326.97	64202.68	149.15	335161.1	363315.73	635.02	222244.04	213759.21	392.08
	CGR	7.97*	-4.12^{NS}	-6.84**	6.64*	14.37*	10.08*	8.96*	15.45*	11.90*
	SE	2.15	2.75	2.71	0.93	2.17	1.76	0.67	1.46	1.27
	"t" Value	3.7	-1.5	-2.52	7.11	6.61	5.7	13.25	10.56	9.31

Note: *** significant at 1%, ** significant at 5 %, * significant at 10%.

The result of compound growth rate (CGR) revealed that, the growth in chilli export high in quantity in period-I than period-II, value in rupee and value in dollar was increased in period-II as compared to period-I. The compound growth rate of chilli export measured in quantity, value in rupee and value in dollar was 7.97, -4.12 and -6.84 per cent per annum respectively in period-I. During period-II, CGR of chilli export measured in quantity was 6.64 per annum. It was 14.37 and 10.08 per cent per annum for value in rupees and value in dollar. All the growth rates were significant, except value of rupee in period-I. During overall period, compound growth rate of chilli export was 8.96, 15.45 and 11.90 per cent per annum for quantity, value in rupee and value in dollar, respectively. Quantity in period-I revealed 5 per cent significant and dollar 1 per cent significant at level of significance. Also in period-II and overall period revealed significant at 5 per cent level of significance.

3.2Instabilityin export of chilli from India

The instability in export of chilli was estimated with the help of coefficient of variation and Cuddy-Della Valle instability index and result were presented in the table 2. The instability in export of chilli was measured on important parameters *viz*; export of chilli measured in quantity, value in rupee and value in dollar.

The result revealed that, instability in chilli export measured in quantity was high during period-I compared to period-II. The coefficient of variation and CDI value of quantity was 0.27 and 0.19 in period-I and 0.25 and 0.09 in period-II, respectively. The CV and CDI estimate of Chilli export measured in value in rupees in period-I was 0.27 and 0.25, and in period-II, it was 0.53 and 0.17, respectively. The CV and CDI estimate of chilli export measured in value in dollar in period-I was 0.32 and 0.26, respectively. Whereas it was 0.39 and 0.15 for value measured in dollar in period-II, respectively. In overall period, instability of C.V and CDI in chilli export measured in quantity was 0.58 and 0.16, respectively. It was 0.92 and 0.43 for value measured in rupees and 0.75 and 0.37 for value measured in dollars, respectively.

Table 2: Instability in export of chilli from India

Particulars		Period-I			Period-II			Overall		
		Qty	Rs.	US $	Qty	Rs.	US $	Qty	Rs.	US $
Instability	CV	0.27	0.27	0.32	0.25	0.53	0.39	0.58	0.92	0.75
	CDI	0.19	0.25	0.26	0.09	0.17	0.15	0.16	0.43	0.34

CONCLUSION

The present study was undertaken to analyse growth rates and instability in export of chilli. The study revealed that, the growth in chilli export was high in quantity during period-I than period-II, value in rupee and value in dollar was increased in period-II as compared to period-I.Instability in chilli export measured in quantity was high during period-I compared to period-II.Instability in chilli export was serious concerns which affect the prices of chilli in domestic market and reduce foreign earning. So export of chilli may stabilize by proving appropriate support. Hence, there is need to evolve policies directing higher production of chilli and formulate alternative management strategies and policies to boost chilli export in India.

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Economics of Production and Marketing of Paddy in Chandrapur District

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ABSTRACT

The present study entitled "Economics of Production and Marketing of Paddy in Chandrapur District" was undertaken to study the growth rates and instability of area, production and productivity of paddy in chandrapur district. The time series data on area, production and productivity were obtained for 30 years from the 1989-99 to 2018-19. The data was collected from krishi.mahagov.in website. Compound growth rate (CGR) was computed based on its fit using non-linear model, and Coppocks Instability Index were used to estimate the instability in area, production and productivity of paddy. Result shows that, area, production and productivity of paddy in chandrapur district were continuously increased.

Keywords: *Paddy, Growth, Instability, Coppocks Instability Index*

INTRODUCTION

Rice (*Oryza sativa*) belongs to family *Gramineae*. Rice is one of the major food crop grown on the earth. Two third of the world population eat rice as their staple food. About 80% of world rice production comes from the cultivation of *Oryza sativa*. Rice is mainly grown in rainfed areas that receive heavy annual rainfall. That is why it is fundamentally a kharif crop in India. It demands temperature of around 25^0C and rainfall of more than 100 cm. Rice is also grown through irrigation in those areas that receive comparatively less rainfall. Rice is the staple food of eastern and southern parts of India. In 2016-2017, total rice production in India amounted to 110.15 million tonnes, which was much less than production of previous year, 106.29 million tonnes. These are happen due to low rainfall and effect of cyclonic storm at major rice growing region. **(Source: USDA).**

In 2017-2018 area, production of paddy in Maharashtra 1446.6 (MH), 2660.5(MT) and productivity is 1839 (T/ha). In 2017-2018 area and production of paddy in World 165 (MH), 495.9 (MT), and productivity is 210 (T/ha). In 2017-2018 area, production and productivity of paddy in India 42949.80 (Ha), 112905.50 (MT) and 2585 (Kg/ha). **(Source: India.agri.stat. and FAO).** In 2016-2017 area, production and productivity of paddy in Chandrapur is 1773 (ha), 2935 (MT) and 1656 (Kg/ha). **(Source: USDA).** The Agricultural Universities in the state has released total 54 high yielding varieties and scented rice varieties such as SKL 7, PKV Khamang, PKV Makarand, Pusa Basmati, Indrayani etc.

OBJECTIVES

To study growth and instability in area, productionand productivity of Paddy in Chandrapur district.

METHODOLOGY

Study area: The study area pertains to Chandrapur district of Maharashtra State.

Selection of period: Based on the objective of the study, for the analysis of the growth rate and instability in area, production and productivity were studied for the chandrapur district. The time series data on area, production and productivity were obtained for 30 years from the year 1989-90 to 2018-19.

Nature and source of data: Data used for the present study was collected from various Government published sources. Time series secondary data on the area, production and productivity and farm harvest price of paddy, rainfall and other data were obtained from various published sources.

Analytical techniques employed for analyzing the data:

The present study was based on time series secondary data of Paddy in Chandrapur district. The study was conducted on the following aspects.

1. Growthrate analysis:

The compound growth rate of area, production and productivity for paddy was estimated for three sub periods and overall period. It was estimated with the following exponential model.

$Y = a.b^t$

$\log Y = \log a + t \log b$

$CGR (r) = [\text{Antilog} (\log b) - 1] \times 100$

Where,

CGR = Compound growth rate

Y = Area/ production/ productivity

a = intercept

b = regression coefficient

t = time variable

2. Instability Analysis:

To measure the instability in area, production and productivity, an index of instability was used as a measure of variability. The coefficient of variation (CV) was calculated by the formula,

$$CV (\%) = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

The simple coefficient of variation (CV) often contains the trend component and thus overestimated the level of instability in time series data. To overcome this problems, we used the instability index (II) given by Coppock's instability index of variation. The algebraic form of equation is

$$V \log = \sum \frac{\left(\log \frac{X_{t+1}}{X_t} - m\right)^2}{N - 1}$$

$$CII = [\ (\text{Antilog}\sqrt{V \log} - 1) \times 100\ ]$$

Where,

X_t = Area/ production/ productivity of crop in year t

N = Number of years – 1

m = Arithmatic mean of the difference between the $\log X_1$ and X_{t-1}

RESULTS AND DISCUSSION

1. Growth performance of Paddy

The growth performance of Paddy pertaining to three periods and overall was presented in the Table 1, from the above table it was shown that in period I the area, production and productivity is increase by 2.10, 1.99 and 1.10 percent per annum. In period II the production and yield of paddy is increase by 3.44 and 7.37 percent per annum while the area shows stagnant growth (i.e. 1.96 percent per annum).In period III the area, production and yield of paddy is increase by 2.73, 3.33 and 6.82 percent per annum. At overall basis the productivity and yield of paddy increase by 1.89 and 5.89 percent per annum while the area shows growth (i.e.3.62 percent per annum). At over all level, it is also seen that the area, production and productivity under Paddy in this district was significantly increased over the period of time.

Table 1. Compound growth rate for paddy in chandrapur district

Particulars		Chandrapur
Period I	Area	2.10***
	Production	1.99***
	Yield	1.10***
Period II	Area	1.96
	Production	3.44***
	Yield	7.37***
Period III	Area	2.73***
	Production	3.33***
	Yield	6.82***
Overall Period	Area	3.62
	Production	1.89***
	Yield	5.95***

(Note: ***, ** and * denotes significances at 1%, 5% and 10% level of significance)

2. Instability in Paddy

The Table 2 reveals that during period I, coefficient of variation for the area was less when compared to production and yield. The

highest coefficient of variation for area, production and productivity was found in period III i.e. 12.29 per cent per annum, 39.96 percent per annum and 36.09 per cent per annum respectively.

In the same way CII was found highest for area, production and productivity i.e.12.23 per cent per annum, 39.42 per cent per annum and 35.63 per cent per annum respectively. The instability in area, production and productivity was found to be increased in II period as compared to I period in the district. The highest CV and CII in area, production and productivity were noticed in period III i.e. (CV) 12.29, 39.96 and 36.09 per cent per annum and (CII) 12.2, 39.42 and 35.63 per cent per annum respectively.

Table 2. Instability for paddy in chandrapur district

Particulars		Area	Production	Productivity
Period I	CV	4.47	18.50	14.58
	CII	0.90	4.26	4.77
Period II	CV	5.71	33.63	32.59
	CII	5.50	30.53	30.15
Period III	CV	12.29	39.96	36.09
	CII	12.23	39.42	35.63
Overall	CV	8.54	42.34	39.35
	CII	8.49	34.56	31.17

CONCLUSION

Compound growth rate for area, production and productivity under paddy was recorded high during period III in Chandrapur district. The instability in the area, production and productivity of paddy was observed in Chandrapur district. It may be because the crop largely depends on vagaries of nature which causes heavy losses.

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Economics of vegetable nurseries in Solapur district of Maharashtra

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ABSTRACT

In recent years, vegetable nurseries have one of the complementary business to agriculture. The present study on economic of vegetable nurseries in Solapur district was ensure in order to study the socio-economic characteristics of nursery owners, estimate the cost incurred and returns and employment generated through the nursery activity. The financial feasibility also estimated by the way of B:C ratio, internal rate of returns of nursery enterprise along with the problems of nursery owners. The study was based on primary data obtained from 15 nursery owners, selected 5 nurseries from each group. Groups were classified based on the turnover of nursery i.e. group I (1 to 3 lakh), group II (3.1 to 5 lakh) and group III (Above 5.1 lakh). The 15 nurseries were selected by sample random sampling method for present study.

The data concerning the costs and returns from nursery activity, employment pattern,problem faced by nursery owners were collected by survey method with the help of pre- tested schedules for the period of 2019-20. From the study, it was observed that about 10 nursery owners were managing nursery as main occupation, while at overall level, the survival percentage in case of chilli, tomato and brinjal seedling was Rs. 82.95, 82.02 and 96.23per cent respectively and the total cost required for preparation of chilli, tomato and brinjal seedling was Rs.2,78,637.10, Rs. 4,68,492.81 and Rs.3,43,549.93, respectively. However, the overall total returns generated from sale of chilli, tomato and brinjal seedlings were 6,39,414.80,9,58,410.80 and Rs. 6,97,887.89,respectively. Therefore, at overall level, the chilli, tomato and brinjal seedlings were observed to be economically feasible and it have B:C ratio 2.29, 2.04 and 2.03, respectively and the chilli seedlings more observed to be more profitable than tomato and brinjal. As most of the operations in the nursery business were carried out by manually, thenursery business become labour expensive. Therefore, nursery business provide more employment to the labours. At overall level, employment generated through nursery activitywas about 78.15 days for males and 40.56 days for females.The price fluctuation, less germination percentage and high labours charges were the major problems faced by nursery owners. Other important problems i.e. lack of credit facility, lack of quality seeds etc., were faced by nursery owners.

The capital investment on vegetable nursery was found to be economically profitablein terms of positive net present worth, benefit cost ratio of nursery more than unity and internal rate of return of group I (29.81 %), group II (31.97 %) and group III (37.27 %). Therefore, from the study it is observed that nursery business provided additional income and opportunities to farmers throughout the year.

Keywords: *Capital investment, Financial feasibility, B:C ratio, internal rate of returns*

INTRODUCTION

Horticulture is an aesthetic science that deals with important crops which grow in the gardens *e.g.* vegetables crops in the vegetable garden, fruit crop in

the fruit orchard. Horticulture is the art of cultivating plants in gardens to produce food and medicinal ingredients or for comfort and ornamental purpose.

The second largest producer of vegetables is India after China. India is the largest producer of ginger and okra amongst vegetables and rank second in the production of brinjal, cauliflower, cabbage, potato, and onion. In 2020-21 vegetable production increase about 193.61 million tonnes as compared to 188.91 million tonnes in 2019-20.There are two types of nurseries, *i.e.* Temporary and Permanent nurseries and . according to type of plants grown nurseries are classified as: (i) Fruit Plant Nurseries (ii) Vegetable Nurseries: (iii) Ornamental Plant Nurseries (iv) Medicinal and Aromatic Plant Nurseries (v) Forest Plant Nursery (vi) Hi-Tech Nurseries. Generally, farmers and nursery manager are raising seedling in plug tray or portray to produce healthy seedlings. Soil less media with cockpit is usually used to sow the seedsand the rooting media. Sowing is done manually. According to the survey by state of Indian Agriculture at present there are about 10,000 to 13,000 registered nurseries which are registered under public and private sectors. At present, in Maharashtra total 159 registered nurseries of government and private sector are operating. Out of that in Solapur district 41 private registered nurseries are present during 2019-20.(Source: Sub Divisional Agricultural Office, Solapur.)

Recent years, nurseries have emerged as one of the complementary business to agriculture. Therefore, it is necessary to evaluate nursery business from economic point of view. In view of this, the present investigation *viz*., "Economics of Vegetable Nurseries in Solapur District of Maharashtra" has been attempted in this direction. The studyhas been undertaken in the Solapur district of Maharashtra during 2019-20.

Objective

1) To estimate the costs and returns of nursery from selected vegetable.

2) To evaluate the financial feasibility of selected vegetable nursery

3) To study the employment generated by selected vegetable nursery

METHODOLOGY

Solapur district is selected purposively for the present study as representative of Western Maharashtra. There are 41 registered nurseries in Solapur district. Out of eleven tahsil in the district three tahsil was selected on the basis of highest nurseries. In three tahsil 15 nurseries were selected on the basis of turnover (Rs. 1 to 3, Rs 3.1 to 5 and above 5 lakh) for present study.

The primary information relating to aspects like capital investment, costs and return,employment pattern, seedling produced, sale of seedling was collected by survey method through specially designed questionnaire by taking personnel interview of selected nursery owner for the year *i.e*. 2019-20. To calculate NPV and IRR previous five-year data from2014-15 to 2019-20 were used with the help of specially designed schedules. The collected data was further analysed for presenting the results.

RESULTS AND DISCUSSIONS

1) Capital investment of nursery

The capital investment plays important role in building infrastructure facilities for efficient running of nursery business. The information about capital investment for creating infrastructure such as land, shed, hand tools, implements and machinery and irrigation structure are given in Table1.1

Table 1.1 Average investment in capital assets for nursery(per/nursery)

Sr. No.	Particulars	Group I (n=5)	Group II (n=5)	Group III (n=5)	Overall average (n=15)
1.	Land	170000.00 (23.20)	232000.00 (24.90)	1130000.0 (56.54)	510666.67 (23.41)
2.	Shed	464000.00 (63.31)	580000.00 (62.25)	740000.00 (37.02)	594666.00 (27.26)
3.	Hand tools and machinery for nursery	4221.42 (0.58)	4598.60 (0.49)	4719.69 (0.24)	4513.24 (0.21)
4.	Implements and machinery for agriculture operation	19680.00 (2.69)	20140.00 (2.16)	22040.00 (1.10)	61860.00 (2.84)
5.	Irrigation structure	75000.00 (10.23)	95000.00 (10.20)	102000.00 (5.10)	1010000.00 (46.29)
	Total	732901.42 (100.00)	931738.60 (100.00)	1998759.69 (100.00)	2181705.91 (100.00)

(Figures in the parentheses are percentage to the total investment)

From the Table 1.1, it is observed that, average capital investment per nursery in Group I was Rs. 7,32,901.42, Group II was Rs.9,31,738.60 and Group III was Rs. 19,98,759.69. Out of it is concluded that average capital investment of Group III was more than Group I and Group II. At overall level, average capital investment was Rs. 21,81,705.91 out of which 23.41 per cent was shared by land followed by shed 27.26 per cent, hand tools and machinery for nursery 0.21 per cent, and irrigation structure 46.29 per cent.

2) Cost and Profitability from nurseries

The profitability from nurseries plays important role for efficient running of nursery business. The information about profitability from nurseries are given in Table 2.1.

Table 2.1Profitability from nurseries

Sr. No.	Particulars	Overall		
		Chilli	Tomato	Brinjal
1.	Total cost (Rs.)	278637.10	468492.81	343549.93
2.	Total returns (Rs.)	639414.80	958410.80	697887.89
3.	Net return (Rs.)	360777.69	489917.98	354337.96
4.	B:C ratio	2.29	2.04	2.03

At overall level, total cost, total returns, and B:C ratio was estimated are given above Table 2.1. Total cost required for preparation of all three seedlings *i.e.* chilli, tomato and brinjal were Rs. 2,78,637.10, Rs.4,68,492.81 and Rs. 3,43,549.93, respectively. At overall level, total returns from chilli, tomato and brinjal seedlings were Rs. 6,39,414.80, Rs. 9,58,410.80 and Rs.6,97,887.89 respectively. Then, at overall level net return from chilli, tomato and brinjal seedlings were Rs. 3,60,777.69, Rs. 4,89,917.98 and Rs. 3,54,337.96, respectively. Finally, it was found that B:C ratio of chilli, tomato and brinjal were 2.29, 2.04and 2.03 respectively. From that estimation it was found that the B:C of chilli seedlings was highest as compared to tomato and brinjal seedlings.

Table 3. 1 Average number of seedlings raised and sold over different size group of nurseries (Number/ Nursery)

Sr. No.	Particulars	Group			
		I (n=5)	II (n=5)	III (n=5)	Overall(n=15)
1	Chilli seedlings				
	Prepared	310210.10	711450.20	782516.30	642355.20
	Sold	294510.00	621665.80	682360.40	532845.60
	Survival percentage	94.93	87.38	87.20	82.95
2	Tomato Seedlings				
	Prepared	725652.50	985375.10	2012335.00	1168484.84
	Sold	569250.00	784499.40	1521483.00	958410.80
	Survival percentage	78.44	79.61	75.60	82.02
3	Brinjal seedlings				
	Prepared	645102.30	845320.40	1525782.60	2310132.20
	Sold	590905.20	786491.50	1239682.80	2223142.80
	Survival percentage	91.59	93.04	81.24	96.23
5	Total				
	Prepared	1680964.90	2542145.70	4320633.90	4120972.24
	Sold	1454665.20	2192656.70	3443526.20	3714399.20
	Survival percentage	86.53	86.25	79.69	90.13

Groups I, II and III prepared chilli seedlings of 310210.10, 711450.20 and 782516.30, respectively. Only 294510.00, 621665.80 and 682360.40 seedlings survived to be sold by the respective groups. Chilli seedling survival percentage for Groups I, II and III were 94.93, 87.38 and 87.20, per cent respectively.

In the case of tomato seedlings, groups I, II and III prepared 725652.50, 985375.10 and 2012335.00 seedlings, respectively. Only 569250.00, 784499.40 and 1521483.00 seedlings survived to be sold by the respective groups. In the case of tomato seedlings, the survival percentages were 78.44, 79.61 and 75.60 per cent for groups I, II, and III,respectively. Groups I, II and III each prepared 645102.30, 845320.40 and 1525782.60 brinjal seedlings. The sample of nursery owners were finally sold 590905.20, 786491.50 and 1239682.80 seedlings from respective groups. In the case of brinjal, the survival percentage for groups I, II and III were 91.59, 93.04 and 81.24, per cent respectively.

Total numbers of seedlings prepared by group I was 1680964.90, out of these, average number of sold seedlings were 1454665.20, and survival percentage was 86.53 per cent. Then, total numbers of seedlings prepared by group II was 2542145.70, from that prepared seedlings about 2192656.70 numbers of seedlings were sold and survival percentage was 86.25 per cent. Finally, in group total numbers of seedlings prepared were 4320633.90, out of these, 3443526.20 numbers of seedlings wee sold and their survival percentage was 79.69 per cent. At overall level, total number of seedlings prepared 4120972.24, from that average 3714399.20 seedlings were sold and their survival percentage was 90.13 per cent.

1. Employment generation

Human labour is one of the important inputs in the production activity. The human labour used in the present study were of two type's *viz.,* male and female labour. The estimate of employment generated through the nursery activity is given in Table 4.1

It is observed from the Table 4.1, that the total employment generated in the case of groupI was 61.60 male and 28.00 female days, out of these male days, 17.00, 17.40, 15.60and 11.60 days were in form of chilli, tomato, brinjal and other seedlings. And for chilli, tomato, brinjal and other seedlings the female employment generated were 8.00, 8.00, 7.80,and 4.20 days respectively.

Similarly, in Group II, 85.90 male days and 43.40 female days employment was generated. Out of these male days, 17.60, 20.80, 19.60 and 27.90 days were in form of chilli,tomato, brinjal and another seedling and for chilli, tomato, brinjal and other seedlings the female employment generated were 11.00, 10.40, 13.80 and 8.20 days respectively.

Table 4.1. Employment generation through nursery activity (Standard day)

Sr. No.	Crop	Group I		Group II		Group III		Overall	
		M	F	M	F	M	F	M	F
1.	Chilli	17.00 (27.59)	8.00 (28.57)	17.60 (20.48)	11.00 (25.34)	23.20 (22.52)	13.20 (20.62)	19.26 (24.64)	10.73 (26.45)
2.	Tomato	17.40 (28.24)	8.00 (28.57)	20.80 (24.21)	10.40 (23.96)	33.00 (32.03)	16.60 (25.93)	23.73 (30.36)	11.66 (28.75)
3.	Brinjal	15.60 (25.32)	7.80 (27.85)	19.60 (22.81)	13.80 (31.79)	22.40 (21.74)	15.20 (23.75)	17.73 (22.68)	12.26 (30.23)
4.	Other	11.60 (18.83)	4.20 (15)	27.90 (32.47)	8.20 (18.89)	24.40 (23.68)	19.00 (29.68)	17.43 (22.30)	5.90 (14.54)
	Total	61.60 (100.00)	28.00 (100.00)	85.90 (100.00)	43.40 (100.00)	103.00 (100.00)	64.00 (100.00)	78.15 (100.00)	40.56 (100.00)

In case of Group III, total employment of 103.00 male and 64.00 female days were generated. Out of these male days 23.20, 33.00, 22.40 and 24.40 days were in form of chilli, tomato, brinjal and other seedlings and for chilli, tomato, brinjal and other seedlings the female employment generated were 13.20, 16.60, 15.20 and 19.00, respectively.

2. Internal Rate Return and Payback period

Table 5.1 The internal rate of return and payback period

Particulars	Group I	Group II	Group III
IRR (%)	29.81	31.97	37.27
Payback period (year)	3.1	2.2	1.5

The estimated payback period for group I was 3.1 years, it means the owners of the nursery will recover all his initial investment which he has done during its establishment year within 3 years and 1 month. For group II, estimated payback period was 2.2 years, it means the owners of the nursery will recover all his initial investment which he has done during its establishment year within 2 years and 2 months. Similarly, estimated payback period for group III was 1.5 years, which indicates that the owners of the nursery will recoverall his initial investment which he has done during its establishment year within 1 year and 5 months.

3. Break-even point

The break-even analysis is the level at which total revenue equals to total cost. A break-even analysis is a financial apparatus which helps to determine at what stage the project or business will be profitable. In other words, it is a financial calculation for determining the number of seedlings a nursery should sell to cover its costs. The information about BEQ of seedlings is presented in the Table 6.1 .

Table 6.1 Average break-even quantity of seedlings produced by the nursery owners

Sr. No.	Particulars	Chilli	Tomato	Brinjal
1.	Break even quantity	75816.80	92469.10	87579.40

The estimated break-even quantity of seedlings of chilli, tomato and brinjal was 75816.80, 92469.10 and 87579.40, respectively. Number of actual seedlings produced was much more than estimated break-even quantity. This indicated that all the nurseries were running in profit.

CONCLUSIONS

The most successful propagation method for chilli, tomato, and brinjal are preparation of seedlings. The survival percentage in the case of chilli, tomato and brinjal seedlings were 82.95, 82.02 and 96.23 per cent, respectively. At overall level, total cost required for preparation of a chilli, tomato and brinjal seedling was Rs. 2,78,637.10, Rs. 4,68,492.81 and Rs. 3,43,549.93, respectively. The total returns realised from a sale of chilli, tomato and brinjal and seedling were Rs. 6,39,414.80, Rs.9,58,410.80 and Rs. 6,97,887.89, respectively.Among the different seedlings prepared chilli, tomato and brinjal seedlings were cost: benefit ratio was 2.29, 2.04, and 2.03 respectively. The B:C ratio of chilli seedlings was highest than tomato and brinjal.The nursery activity provides more employment to labours throughout the year. At overall level, employment to males were 78.15 days and females were 40.56 days.

Payback period of group I, group II, and group III was 3.1, 2.2 and 1.5 respectively.

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An Economic Analysis of Cashew Nut Production in Konkan Region of Maharashtra

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A B S T R A C T

Cashew is one of the most valuable processed nuts on global commodity markets and has the potential to generate employment and revenue for developing countries. India is the second largest exporter of cashew kernels in the world. The study was conducted in Konkan region of Maharashtra and is based on both primary and secondary data collected from120 respondents and data were analyzed by using standard statistical tools (i) compound annual growth rates (CAGR) (ii) budgeting technique (iii) financial feasibility tests. The study revealed that both area and production of cashew has been increasing in the country as well as in Maharashtra over the past years. The establishment cost (initial investment cost and maintenance cost during gestation period) accounted to Rs. 1,30,255 per ha. Cost of cultivation during bearing period was Rs. 61,773 /ha, while the average total yield obtained by the farmer was 2114 kg of raw Cashew nut per ha. Average price realized was Rs. 153.40/ kg of raw nuts. Farmers realized higher gross return of Rs. 3,18,631/ ha and net return of Rs. 2,57,877/ha. It is observed that April month was the highest harvest month. Feasibility analysis revealed that, the NPV @ 12 percent discount rate, BCR, IRR and payback period were Rs. 10,78,155, 3.98, 68.73% and 5.7 and 5.6 years respectively. Study revealed that establishment cost of plantation is highly expensive. Hence farmers should be provided with required credit at reasonable rate of interest. Since there is high labour requirement and higher wage rate, there is a scope to evolve labour saving technologies. Study also revealed that cashew cultivation is highly profitable venture and is also financially feasible to establish new plantations in the konkan region of Maharashtra.

Keywords : *CAGR, financial feasibility tests and Cost of cultivation*

INTRODUCTION

The cashew tree (*Anacardiumoccidentale* L.), native of Brazil, was introduced to Mozambique and then to India in the sixteenth century by the Portuguese as a means of controlling coastal erosion. It was not until the nineteenth century that plantations were developed and the tree then spread to a number of other countries in Africa, Asia and Latin America (Harish, 2009). Subsequently,the tree spread to a number of countries in Africa, Asia, Latin America and West Indies. Cashew is now widely cultivated for its kernel, fruit, cashew nut
shell liquid and other products. However, it is mostly found in the coastal regions of South Africa, Madagascar, Tanzania, and South Asia, from Sri Lanka to the Philippines.

India is the largest producer, processer, consumer and exporter of cashew in the world. The current Cashewnut production in India accounts for 45 per cent of the global production. India being the leader in the world in raw Cashew nut production and is also the largest supplier of cashew kernels to the major world markets. It is grown in Kerala, Karnataka, Goa, and Maharashtra along the West coast and Tamil Nadu, Andhra Pradesh, Odissa and West Bengal along the East-coast, occupies an area of 10.30 lakh hectares in the country with a production of 9.98 lakh metric tons.Even though strong competition from other countries has reduced India's share in the global

cashew exports, India's advantage in terms of less percentage of broken kernels has brought European and US buyers to its proximity. To strengthen cashew exports, there is scope for increasing production by developing cashew as plantation crop on commercial basis, exploring new markets and strengthening non-traditional markets, adding value to the product by introducing innovations in processing and branding them.

Among the major states in the country, Maharashtra tops with respect to area, production and productivity of cashew nut. During 2018-19, area under Cashewnut in Maharashtra was 191.45 thousand hectares producing 269.44 thousand tonnes with yield of 1407 kg per hectares.

Keeping in view the importance of cashew in the Indian economy in general and its major growing states in particular, the present study made an attempt to analyze the cost and returns structure involved in production and processing of Cashewnut in Konkan region of Maharashtra.

METHODOLOGY

The study is based on both primary and secondary data. Primary data was collected from farmer-respondents of konkan region of Maharashtra and secondary data collected from different source like www.indiastat.com and district agriculture office, Ratnagiri and Sindhudurga.

Sampling Design

Multistage sampling technique was adopted in the selection of the districts, taluks, villages and cashew growers. Two districts viz., Sindhudurga and Ratnagiri districts were selected as these two districts were the major districts of cashew plantation in Maharashtra state. From each selected district two taluks, from each taluk two villages and from each village 12 farmers were selected. Thus, in all 96 cashew growers were selected to collect the required information. Vengurla and Sawanthwadi tahsils in Sindhudurga district and from Ratnagiri district, Rajapur and Lanja tahsils were selected for the study.

Analytical tools

For the purpose of evaluating the objectives of the study, based on the nature and extent of data availability, the following analytical tools will be used for analyzing the data to draw meaningful results and conclusions.

Descriptive analysis

To workout the averages and percentages Compound annual growth rate analysis.,To study the annual growth rate in quantity and value of export of coir products, the compound growth rate was computed using semi-log or exponential model (Kulkarni*et. al.* 2012).

$$\ln Y_t = \alpha + \beta t + u_t$$

Where,

Yt = Quantity (tonnes) of coir products exported in year t.

t = Time element which takes the value 1, 2 ..... n for various years.

α= Intercept

ßt= Regression co-efficient

Annual compound growth rate (r) = [(Antilog t)-1) x100]

Budgeting technique

To workout the cost and returns involved in Cashewnut production Estimation of Financial feasibility . For estimation of financial feasibility, Net Present Value (NPV), internal rate of return (IRR) and benefit-cost ratio (BCR) were assessed using the technique given by Gittinger (1974).

RESULTS AND DISCUSSION

Decade-wise growth in area, production and yield of Cashew in India

In India, cashew cultivation is largely found in Kerala, Karnataka, Goa and Maharashtra along the west coast and Tamil Nadu, Andhra Pradesh, Orissa and West Bengal along the east coast. The decade-wise growth in the area, production and productivity are presented in Table 1.

Table 1.Decade-wise growth in the area, production and productivity are presented in India

CAGR (%)	Area	Production	Productivity
1980-81 to 1989-90	1.74	8.80	6.93
1990-91 to 1999-00	3.65	3.14	- 0.49
2000-01 to 2009-10	2.55	4.55	1.95
2010-11 to 2017-18	1.53	1.89	0.45

It is seen from the table that the compound annual growth rate (CAGR) for area was found to be highest during 1990-91 to 1999-00 (3.65% per year). This might be due to economic liberalization which affected indirectly the cultivation of cashew, followed by 2.55 per cent per annum during 2000-01 to 2009-10, 1.74 per cent per year during 1980-81 to 1989-90 and 1.53 per cent per annum during 2010-11 to 2017-

18. The growth in production was found to be highest during pre-economic liberalization period *i.e.,* during 1980-81 to 1989-90 (8.80% per year)followed by 4.55 per cent per year during 2000-01 to 2009-10, 3.14 per cent per annum during 1990-91 to 1999-00 and 1.89 per cent during 2010-11 to 2017-18. While the average annual growth in yield of cashew was found to be highest during 1980-81 to 1989-90 (6.93 % per year) followed by 1.95 per cent per year during 200-01 to 2009-10, 0.45 per cent during 2010-11 to 2017-18 and there was a negative growth during 1990-91 to 1999-00. We can see a decreasing growth rate in yield over decades. The major reasons attributing to low productivity in the country might be due to: Use of low yielding local varieties , Planting of cashew in marginal and poor fertile land .Non-adoption of recommended package of practices, Pest infestation (tea mosquito bug and cashew stem and root borer) leading to yield reduction up to 30 to 40 percent (Kulkarni*et al*., 2012).

Growth in area, production and productivity of Cashewnut in Maharashtra

Year-wise area, production and productivity are presented in Table 2.

It seen that during 2000-01, the area under Cashewnut in Maharashtra was 121 thousand hectares and has increased more than one and half folds (186.20 thousand hectares) with an average annual growth of 4.76 per cent. With respect to cashew production, during 2000-01 in Maharashtra 98 thousand tonnes of cashew has been produced which has increased more than

Table 2.Year-wise area, production and productivity in Maharashtra

Years	Area (000 ha)	Production (000 MT)	Productivity (kg/ha)
2000-01	121	98	1050
2001-02	143	103	880
2002-03	148	110	1000
2003-04	148	120	1100
2004-05	160	174	1200
2005-06	160	183	1300
2006-07	164	197	1500
2007-08	167	210	1500
2008-09	170	225	1323
2009-10	175	198	1186
2010-11	181	208	1231
2011-12	183	223	1282
2012-13	184	225	1282
2013-14	184	236	1317
2014-15	186	235	1262
2015-16	186.2	220	1200
2016-17	186.2	257	1378
CAGR (%)	**4.76**	**7.82**	**-0.03**

two and half folds to reach 257 thousand tonnes during 2016-17 with an annual growth rate of 7.82 per cent. While yield was found to be only 1050 kg/ha during 2000-01 and has increased gradually with some fluctuations over the years to 1378 kg/ha with a declining growth rate of -0.03 per cent per year. This might be due to the universal law of diminishing marginal returns.

Establishment Cost of Cashewnut plantation

Establishment of cashew plantation includes investment cost and maintenance cost and is presented in Table 3.

Initial investment cost (First year)

In cashewnut production in Konkan region of Maharashtra, total investment cost was found to be Rs. 56,010 (43 % of the total establishment cost).Among investment components

Table.3 Establishment cost of cashew plantation (Per ha)

Sr.No.	Particulars	Cost	Percent
A	**Investment cost**		
1	Rental value	10840	8.32
2	Borewell	12630	9.70
3	Pump set	15820	12.15
4	Planting materials	8490	6.52
5	Drip pipes	5860	4.50
6	Stakings	980	0.75
7	Digging of pit & planting	1390	1.07
	Sub total	56010	43.00
B	**Maintenance cost**		
	Year-II	22694	17.42
	Year-III	24416	18.74
	Years-IV	27135	20.83
	Sub Total (II+III+IV)	74245	57.00
	Total Establishment cost (A+B)	130255	100.00

cost of pump set was found to be Rs. 15820, cost on digging bore well was Rs. 12,630, rental value was found to be Rs. 10840, cost of planting materials was Rs. 8490, cost on drip pipes was Rs. 5860 and cost of digging pits and for planting was Rs. 1390.

Maintenance cost during gestation period (from second year to fourth year)

The maintenance cost incurred by the Cashewnut growers in during the gestation period is presented in the Table 3. The results revealed that total maintenance cost during gestation period (up to fourth year) accounted to Rs. 74,245 of which cost of Rs. 22,694, Rs. 24416, andRs.27,135 occurred during second, third and fourth years respectively. Hence the total establishment cost was summed to Rs. 1, 30,255.

Cost of cultivation of cashewnut plantation (5th year onwards)

The cost of cultivation of Cashewnut isdepicted in Table 4.

Table.4 Cost of cultivation of cashewnut during bearing period

Sr.No.	Particulars	Cost	Percent
I	**Variable cost**		
A	**Labour cost**		
1	Ploughing/ harrowing	1744	2.82
2	Pruning	1572	2.55
3	Application of FYM & Fertilizers	1695	2.74
4	Application of PPC	1599	2.59
5	Weeding	3641	5.89
6	Irrigation	1022	1.65
7	Harvesting	12997	21.04
Total labour cost		24271	39.29
B	Material cost		
	FYM	4060	6.57
	Fertilizers	6161	9.97
	PPC	6783	10.98
	Total material cost (b)	17003	27.53
	Subtotal (a+b)	41274	66.82
	Managerial cost @ 10% of (a+b)	4127	6.68
II	Fixed cost		
	Rental value	14036.6	22.72
	Depreciation	2334.74	3.78
	Total fixed cost	16371.34	26.50
	Total cost (I+II)	61773	100.00

The total cost incurred in cultivation of cashew plantation was found to be Rs. 61,773 of which variable cost accounts Rs.41,274 (66.82% of the total cost)and fixed cost accounts Rs. 16371 (26.50% of the total cost). Variable cost includes labour cost (Rs. 24271), material cost (Rs. 17003) and managerial cost @ 10% on variable cost (Rs. 4127). Among labour cost, harvesting costwas found to be highest accounting Rs. 12997 followed by cost of weeding accounting to Rs. 3641. Fixed cost constitutes rental value (Rs. 14,036) and depreciation of fixed capital (Rs. 2334).

Yield and returns realized in cashewnut during bearing period (5th year onwards)

The Cashew nut growers harvested cashew fruits/nuts for a period of four months (February, March, April and May) in a year. The yields obtained and returns realized from the sale of Cashew nut are presented in the Table 5.

Table.5 Yields obtained and returns realized in cashew nut (5th year onwards)

Sr.No.	Particulars	Yield (Kg)	Percent
1	**Yield obtained in nuts**		
	a) February	329	15.54
	b) March	547	25.87
	c) April	646	30.55
	d) May	592	28.00
	Total yield (Kg/ ha)	2114	100.00
2	**Average price/kg of nuts**	153.4	
3	Gross returns (Rs.)	318631.5	
4	Cost of cultivation (Rs.)	60754.4	
5	**Net returns (**Rs.**)**	257877.1	

It could be seen from the table that average yield obtained by the farmers was 329 kg/ha in February (15.54 % of the total yield), 547 kg/ha in March (25.87 % of the total yield), 646 kg/ha in April (33.55% of the total yield) and 592 kg/ha in May (28% of the total yield) and total of 2114 kg of raw Cashew nut per ha. Average price obtained was Rs. 153.40/ kg of raw nuts. Farmers realized higher gross return of Rs. 3,18,631/ ha and net return of Rs. 2,57,877/ha.

It is observed that April month was the highest harvest month.

Financial feasibility of investment in cashew nut production in Maharashtra

Table.6 Financial feasibility of investment in cashew nut production in Maharashtra

Sr.No.	Particulars	Results
1	NPV (Rs./ha)	1078155
2	B:C ratio	3.98
3	IRR (%)	68.58
4	PBP (Years)	5.6

The foregoing results presented in the Table 6 revealed that the Net Present Values at 12 per cent discount rate for the entire life period of the cashew (20 years) were positive and the NPV was Rs. 10,78,155. The Benefit cost ratio was 3.98. However, the ratios were greater than unity indicating remunerative returns per rupee of investment in cashew. The internal rate of returns was found to be 68.58 percent. The internal rate of return was observed to be above the current bank rate. Thus, the results of this study justified farmers' investment in cashew cultivation. The Pay Back Period was5.6 years. Therefore investment on cashew would be recovered before 5.7 years at 12 percent rate of interest. The financial feasibility results of the present study are in line with the cultivation of cashew in Ratnagiri and Sindhudurga district of Maharashtra.

In conclusion, cashew cultivation provides excellent opportunities in raising the income of the farmers even in the dry tracts and thereby at national level by the way of export. Even though Maharashtra state has more area under cashew still there is more scope to increase the cashew area. With this intension in mind, an attempt was made to assess the economics of cashew cultivation in Maharashtra

state. The study implied that in Maharashtra both area and production showed positive trends over the years but there is a slight declining trend in yield over the years.

Therefore a prompt attempt should be made by the research and extension personnel in this regard. Study revealed that establishment cost of plantation is highly expensive. Hence farmers should be provided with required credit at reasonable rate of interest. Since there is high labour requirement and higher wage rate, there is a scope to evolve labour saving technologies. Study also revealed that cashew cultivation is highly profitable venture and is also financially feasible to establish new plantations in the konkan region of Maharashtra.

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Role of Public Policy NREGA in Employment Generation in Maharashtra

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ABSTRACT

The National Rural Employment Guarantee Scheme (NREGA) came into existence after the enactment 'National Rural Employment Guarantee Act (2005) in September 2005. The scheme initiated in 200 districts was subsequently enlarged twice to to cover all the 593 rural districts of the country. The goals of scheme are strong social safety net for the vulnerable groups by providing employment source, empowerment of rural poor. The significance of NREGA lies in the fact that it creates a right based framework for wage employment programme.

The present study attempts to examine the role of National Rural Employment Guarantee Scheme (NREGA) in the state of Maharashtra with focus on employment guaranteed, works undertaken, strengths, bottlenecks and strategies for strengthening the programme. The study is undertaken in Western Maharashtra, at micro level based on the data available and reports from beneficiaries of the scheme and government officials. It was observed that only 34 per cent households registered under NREGA received job cards in Western Maharashtra. This proportion was highest in the Kolhapur district (51 to 55 per cent). Only 10-15 per cent of households belonging to SC and ST category received job cards against 75 per cent for other categories. The Nandurbar district showed significantly high proportion of job cards issued to ST category. While Sangli district has highest proportion of SC population in the Western Maharashtra. The Scheme Act aims at creating durable assets and strengthening the livelihood resource base of rural poor people. The actual employment generation is much below than 100 days in a year in most of the districts of Western Maharashtra expect Nandurbar district.

The works under taken through NREGA were rural irrigation, water conservation and harvesting, drought proofing and land development. The number of water conservation activities accounted the maximum share in total works carried out under NREGA, followed by rural irrigation and drought proofing. Thus, the works under NREGA in western Maharashtra mainly related to irrigation and water conservation activities.

The wages offered under NREGA are low, which could be due to improper measurement of productivity and lack of information to workers regarding wage rates. However, the NREGA is the much better scheme than other employment related programmes.

Keywords: *NREGA, Employment , Job cards*

INTRODUCTION

The National Rural Employment Guarantee Scheme (NREGA) came into existence after the enactment 'National Rural Employment Guarantee Act (2005) in September 2005. The scheme initiated in 200 districts was subsequently enlarged twice to to cover all the 593 rural districts of the country. The goals of scheme are strong social safety net for the vulnerable groups by providing employment source, empowerment of rural poor. The significance of

NREGA lies in the fact that it creates a right based framework for wage employment programme.

The primary objective of the scheme is to provide 100 days of guaranteed wage employment in a year to every household who is able to do unskilled manual work. The scheme has approach regarding identification of works, issue of job cards to the eligible, provision for social audit and transparency in payments. The scheme has brought a noticeable change in rural areas with regard to employment opportunities, nature of work, system and procedure in work opportunities. This sector makes employment a right for people and in the case of failure to provide employment, the state government is liable to pay an unemployment allowance, equivalent to half of minimum wage. the experience of Employment Guarantee Scheme (EGS) in Maharashtra, which came in existence in 1965 as a pilot project in Sangli district reveals that though poverty rate has not fallen, the scheme does provide some security to poorer. This study attempts to study the role of NREGA in the state of Maharashtra with focus on employment guaranteed, works undertaken, strengths, bottlenecks and strategies for strengthening the programme..

METHODOLOGY

The study is conducted in the region of Western Maharashtra, as in the region two mandals were selected randomly. Furtherer two villages were selected from each mandal. At the village level, employment beneficiaries, non beneficiaries and work sites were selected and studied with help of schedules. Secondary data was collected from websites and department implementing the scheme. The data was analysed by using growth rates, averages and percentages during the NREGS situation.

RESULTS AND DISCUSSSION

Implementation of NGERA

Though the Act came into force in February 2006 in 200 most backward districts of the country, it was extended to all the 615 districts of India. In the Maharashtra state, various districts came under the purview of NREGA in three different phases.

Job Card Issued

The job card is issued free of cost by the Gram Panchayat within 15 days after receiving an application and employment is given within 15 days of issuance of job cards if failed, unemployment allowance has to be paid as per the rules in NREGA. The job cards insurance that labour are in possession of record of the number of days they have worked, wages paid and unemployment allowance received. The information regarding percentage of job cards are issued to the total number of persons registered under NREGA in western Maharashtra is presented in Table 1.

Table 1. reveals that there have been wide variations in the proportion of job cards issued to the number o households registered under NREGA across various districts of western Maharashtra. It was observed that only 34 per cent households registered under NREGA received job cards in Western Maharashtra, which is quite low. Only in Kolhapur district this proportion was 51 to 55 per cent during the period of 2016-17 to 2019-20. The districts Pune and Sangli showed very low proportion in respect to job cards issued. The reasons for the low percentage of issue of job cards would be lack of awareness among household's scheme and registration process, lack of maintenance of records of migrated people, job cards are not issued due to non attachment of photograph. Other problems in the issue of cards, wrong entries in job cards, changes in number of working days, illiteracy, etc., which results in defects in implementation of NREGA in the right way.

Table 1. Job card issued to the persons in Western Maharashtra

District	2016-17	2017-18	2018-19	2019-20
Pune	3.85	3.99	4.00	4.00
Satara	48.00	47.30	47.30	47.30
Sangli	8.66	8.25	8.25	8.25
Solapur	16.10	45.20	45.20	45.20
Kolhapur	55.30	51.49	51.40	51.40
Dhule	36.44	36.40	36.45	36.45
Nandurbar	37.80	37.88	37.85	37.85
Jalgaon	50.25	40.85	40.85	40.86
W.Maharashtra	32.05	33.92	33.94	33.95

Distribution of job cards

It was observed that most of the SC and ST category families willing to give preference to do unskilled manual work. However, it was also observed that only 10-15 per cent of households belonging to SC and ST category received job cards against 75 per cent for other categories (Table 2).

Table 2. Share of SC, ST and other categories in job card issued during 2019-20 in Western Maharashtra

District	SC	ST	Others
Pune	6.45	5.12	88.50
Satara	8.90	1.07	90.03
Sangli	21.25	0.18	78.57
Solapur	12.77	2.39	84.84
Kolhapur	9.76	0.15	90.09
Dhule	2.88	10.29	86.83
Nandurbar	4.50	82.30	13.20
Jalgaon	16.81	19.00	64.19
W.Maharashtra	10.50	15.07	74.43

The Nandurbar district showed significantly high proportion of job cards issued to ST category. While Sangli district has highest proportion of SC population in the Western Maharashtra. The proportion of SC workers being issued job cards therefore stands higher than ST category in the Sangli district.

Employment Generation

The objective of the NREGA is to enhance the livelihood security of the people in rural areas by guaranteeing 100 days of wage employment in a year for unskilled manual work.

Table 3. Employment generation under NREGA in Western Maharashtra

Districts	Total mandays generated (lakhs)		Average mandays per households per year	
	2018-19	2019-20	2018-19	2019-20
Pune	0.04	--	12.66	--
Satara	0.06	--	23.56	--
Sangli	0.28	0.02	16.50	30.95
Solapur	0.29	0.11	15.35	25.89
Kolhapur	0.03	--	--	--
Dhule	7.38	3.03	50.15	60.74
Nandurbar	57.75	17.06	104.45	46.26
Jalgaon	0.85	0.32	21.60	14.30
W.Maharashtra	67.80	21.54	30.53	25.57

The Scheme Act aims at creating durable assets and strengthening the livelihood resource base of rural poor people. The choice of work suggested in Act the causes of chronic poverty like drought, deforestation, soil erosion etc., which leads the process of employment generations on sustainable basis. However, making a provision of 100 days of employment in a year, there has been variation in actual employment generation. The actual employment generation is much below than 100 days in a year in most of the districts of Western Maharashtra expect Nandurbar district.

The works under taken through NREGA were rural irrigation, water conservation and harvesting, drought proofing and land development. The different works undertaken under NREGA among various district of western Maharashtra for the year 2018-19 are presented in Table 4.

Table 4. Works undertaken by NREGA in Western Maharashtra (2018-19)

District	Total work	Share (Per cent)					
		Rural irrigation	Water conservation	Drought proofing	Irri .facility to land develop	Land develop ment	Others
Pune	55	7.94	67.15	-	-	24.91	-
Satara	265	-	78.75	-	-	21.25	-
Sangli	1095	48.60	39.33	8.60	-	1.65	1.82
Solapur	1975	20.88	67.07	1.05	0.05	4.10	6.85
Kolhapur	190	21.91	-	73.60	-	0.56	3.93
Nashik	110	0.88	92.90	0.96	0.88	2.60	1.82
Dhule	1330	22.10	58.85	1.90	-	-	17.05
Nandurbar	3530	25.15	20.85	7.80	3.95	5.65	36.60
Jalgaon	2075	23.90	34.45	32.10	-	0.35	8.20
W.Mah.	10625	19.04	51.04	14.00	0.54	6.79	8.59

The number of water conservation activities accounted the maximum share in total works carried out under NREGA, followed by rural irrigation and drought proofing in Western Maharashtra. The water conservation was carried out highest in Nashik followed by Satara and lowest in Nandurbar district. The works relating to rural irrigation was highest in Sangli district. Thus, the works under NREGA mainly related to irrigation and water conservation activities. The growth in agricultural production mainly depends on irrigation facilities therefore; it was given most priority under NREGA in Western Maharashtra.

CONCLUSIONS

The Scheme is successful in terms of asset creation water conservation, watershed development and prevention of drought. The major problem relates to the employment generation as the mandays generated and number household provided100 days of employment are quite low in all areas of the region. The wages offered under NREGA are low in several districts, which could be due to improper measurement of productivity and lack of information to workers regarding wage rates for different kind of works. However, the NREGA is the much better scheme than other employment related programmes.

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Input Out Put Prices, their Pariety and Income from Gram

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ABSTRACT

In this study an attempt has been made to study the input-output prices, their parity and income received from gram in Vidarbha region of Maharashtra State. For the present study data on input use, their prices, cost of cultivation, output, output prices and Gross returns from gram was obtained for last 10 years i.e. from 2010-11 to 2019-20. Every year, numbers of the farmers were obtained as per the availability of farmers in APC cluster. The study revealed that, the output-input price parity indices for gram were decreased during year 2010-11 and increased in the subsequent years, indicated thereby in the year 2010-11 the output price was lower than input price and term of trade was unfavourable for gram growers. However, the term of trade was favourable for the gram growers in the remaining years. The total cost of cultivation for gram has gone up from Rs 23691.14 per hectare in 2010-11 to Rs 47907.08 per hectare in 2019-20 depicting an increase by 2.02 times during a period of study. The gross return for gram has recorded an increase of 38.60 per cent during the period study. This is atributable to the increase in the prices of main product.

Keywords: Cost of cultivation Input-output, gross return and price parity indices

INTRODUCTION

Agriculture is a most important sector of Indian Economy. It, being the largest economic activity, serves as an index of country's economic development. In spite of the fact that agriculture was given the top most priority in almost every 'Five year Plan', the first two decades after independence witnessed a slow pace in the growth of agricultural production. For a base of 50 million tones, the food grain production has risen only 75 million tons by mid sixties and the per capita net availability of food remained almost unchanged. Gram commonly known as 'chick pea' or Bengal gram is the most important pulse crop in India. Chick pea occupies about 38 per cent of area under pulses and contributes about 50 per cent of the total pulse production of India. It is used for human consumption as well as for feeding to animals. It is eaten both whole fried or boiled and salted or more generally in the form of split pulse which is cooked and eaten. Both husks and bits of the 'dal' are valuable cattle feed. Fresh green leaves are used as vegetable (sag). Straw of chick pea is an excellent fodder for cattle. The grains are also used as vegetable (chhole). Chick pea flour (besan) is used in the preparation of various types of sweets. Chick pea is considered to have medicinal effects and it is used for blood purification. Chick pea contains 21.1 per cent protein, 61.5 per cent carbohydrates, 4.5 per cent fat. It is rich in calcium, iron and niacin.

Gram is the most important pulse crop of India. In India area was 9.44 million hactor, production 10.13 million tones, productivity 1073 (kg/ha) (DES-2019-20). In Maharashtra area production and productivity is 2043.2 (000 hector), 2240.1(000 tonnes) and 1096.4 (kg/ha) respectively in the year 2019-20.(krishi.maharashtra.gov.in). In Vidarbha it is grown in an area of 6917.89 (00, ha) with production of 8040.32 (00, t) of an average production and productivity is 2136.82 kg/ha.

METHODOLOGY

For the present study major pulse crop of Vidarbha region i.e. Gram, was selected and Data use for the present study was collected from

Agricultural Price and Costs (APCs) scheme, Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV) Akola. Data on input use, their prices, cost of cultivation, output, output prices and Gross return was obtained for last 10 years i.e. from 2010-11 to 2019-20. Every year, number of the farmers was obtained as per the availability of farmers in APC cluster. The data for maximum 50 farmers for each crop was obtained from APC cluster.

Index of Input Prices:

The input price indices 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 labour, fertilizer, farm yard manure, capital, pesticide, depreciation on implements and rental value of land was constructed. (Thakare and Shende (2012), Shende and Shinde (2010) also used this methodology for calculating indices of input prices).

The composite indices of input prices was 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 ith input in total input cost. Pit/Pio is the price index of ith input in the tth 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.

After computing Input price indices and output price indices was calculated and after deflating output price indices by input price indices, we get parity indices.

$$\text{Parity index} = \frac{\text{Output price indices}}{\text{Input Price indices}} \times 100$$

Temporal changes in input and output prices and cost of cultivation:

The data is subjected to tabular analysis to study the changes in input and product prices, cost and returns for Gram. Simple tabular analysis was used to analyze the temporal changes in the cost of cultivation of Gram. Cost structure of each crop was 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 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 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

$$Y = abt$$

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 –

$$CGR\ (r) = [\text{Antilog } (\log b) - 1] \times 100$$

Where,

r = Compound growth rate

RESULTS AND DISCUSSION

Changes in input and output prices:

As stated above the study of input use and the changes there in over period of time is important it indicates the extent to which the farmers have adopted the new production technology. An attempt was therefore made in the present study to estimate the per hectare use of the key inputs for two points of time, namely, 2010-11 and 2019-20 and estimate the changes in the level of inputs used for these periods. Results obtained in this behalf are presented and discussed crop-wise in the following section.

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. The changes in input and output prices was analysed both at current as well as constant prices. To nullify the effect of inflation, the current prices were converted into constant prices.

Compound growth rates of input and output prices of gram at current and constant prices: The rate of growth of average input prices and output prices for gram at current prices are presented in Table 1

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

	Gram		Tur		Black gram	
Items	Current Prices	Constant Prices	Current Prices	Constant Prices	Current Prices	Constant Prices
Input Prices						
i) Wages rate (Rs /ha)	4.97***	1.34	6.89***	6.50**	5.99**	9.63*
ii) Bullock labour price(Rs /ha)	2.51	-1.02	-3.65	-4.84	-2.06	-1.05
iii)FYM price (Rs /ha)	-26.74	-24.85	-6.7	-7.85	-14.30	-12.77
iv)Fertilizer price (Rs/ha)	9.64***	5.85*	8.61***	7.25*	7.48**	8.59*
v)Seed price (Rs /ha)	9.73*	5.94*	10.67**	9.31**	7.73**	7.73**
2)Output Price (RS /ha)	5.57*	1.92*	8.14*	6.81*	5.58	6.67*

(***, **, *denotes significant at 1%, 5% and 10% level of significance)

Table 1 reveals that, at current prices the prices of all inputs showed an increasing trend during the period 2010-11 to 2019-20 except Bullock labour prices and FYM price. Table 5.1 also reveals that the price of seed, fertilizer and wages was increased by 9.73, 9.64 and 4.97 percent per annum respectively. While the output price for gram was increased by 5.57 percent per annum. (Hence the hypothesis is accepted). At the constant prices, the prices of seed and fertilizer was increased by 5.94 and 5.85 per cent per annum respectively and other input prices showed stagnant growth while the output price of gram at constant price was increased by 1.92 per cent per annum.

Parity between output price index and input price index for gram:

The input-output price indices for gram are presented in Table 2. It is evident from the table that in 2010-11 the parity index was decreased and 2010-11 onwards parity indices are increased by 9.14 per cent.

Table 2: Parity between output price index and input price index for gram

(Base year- Average of triennium Ending -2010-2011 to 2012-2013)

Years	Input price index	Output price index	Parity index
2010-11	94.47	78.40	82.99
2011-12	101.19	110.72	109.41
2012-13	100.92	110.87	109.85
2013-14	83.06	93.80	112.93
2014-15	97.10	116.44	119.91
2015-16	95.18	118.37	124.36
2016-17	108.81	169.67	155.93
2017-18	96.88	125.31	129.34
2018-19	109.14	149.76	137.22
2019-20	102.92	133.02	129.24

While the output price indices are also increased throughout the year. In year 2011-12, 2012-13 and 2014-15 and onwards the output price indices are more than input price indices that means during this particular year the output price was more than input prices.

Changes in cost of cultivation of gram: The result in Table 3 shows the changes in the cost of cultivation of gram in Vidarbha. The total cost of gram has gone up from Rs 23691.14 per hectare in 2010-11 to Rs 47907.08 per hectare in 2019-20 depicting an increase by 2.02 times during a period of study. The increase in costs 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, costs of interest on fixed capital and depreciation cost .The cost of human labour, machine labour, seeds and fertilizer has increased at a faster rate. Among operational cost items, family labour (13.04) recorded the maximum share followed hired human labour (3.34) and bullock labour (2.05) in the increase in cost of cultivation over time.

Out of the total increase of Rs 24215.94 in the total cost of cultivation per hectare, the operational cost items contributed about 58.77 per cent and the remaining 41.23 per cent by fixed cost items. The increased in fertilizer and insecticide has been to the tune of 7.34 per cent and 3.34 per cent respectively of the total increase in cost of cultivation. (Hence the hypothesis is accepted). The relative shares of different inputs in the cost of cultivation of gram at two points of time are also given in Table 3. The share of operational cost has remained around 63.86 per cent in 2019-20, which was lower than that in 2010-11. But within operational cost, the share of machine labour in the total cost decreased from 12.90 per cent in 2010-11 to 10.54 per cent in 2019-20 and the share of bullock labour in the total cost decreased from 7.93 in 2010-11 to 5.04 in 2019-20. 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 4.63 per cent in 2010-11 to 6.01 per cent in 2019-20, for gram. (Gurjar and Varghese (2005) also also found similar results).

The extent of change in physical inputs and their prices along with changes in physical output and their prices and gross return for gram over period of time is given in Table 5.4.1. The extent of changes in physical input over period of time for gram is compared with its costs, it could be concluded that ,the use of fertilizer has also decreases i.e. from 66.23 kg/ha in 2010-11 to 64.85 kg/ha in 2019-20 due to slight change in the prices of fertilizers. The positive change in cost of seed is attributable to marginal increase in physical seed rate and large increase in the prices of seed over time. Similarly, the change in cost human labour for gram is due to physical quantity of human labour used for gram as well as its prices over the years. The use of human labour is increase and the price of human labour is also increased due to less use of quantity of bullock labour.

The gross return for gram has recorded an increase of 38.60 per cent during the period study. The increase in gross return from gram is attributable to the increase in the main and by- product of gram as well as increase in their prices over the years. It worth mentioning that the rate of increase in the prices of main product and by- product of gram has much higher compared to the increase in the physical yield of main product and by-product. The cost of production of gram has increased from Rs 1669.32 per quintal in 2010-11 to Rs 4237.92 per quintal in 2019-20. While the cost of production has recorded an increase of 153.83 per cent during the period being study.

Table 3: Changes in cost of cultivation of gram

Sr. No	Particulars	Cost of cultivation				Change in 2019-2020 Over 2010-2011		Share in Total Change (%)
		2010-2011		2019-2020				
		Rs /ha	Per cent	Rs /ha	Per cent	Rs /ha	Per cent	
A)	**Operational costs**							
	Hired human labour	3988.74	16.59	4797.61	9.92	808.86	20.27	3.34
	Family labour	1750.57	7.38	4908.49	10.14	3157.92	180.39	13.04
	Bullock labour	1885.31	7.93	2383.87	5.04	498.55	26.44	2.05
	Machine labour	3091.20	12.90	5104.50	10.54	2013.29	65.12	8.31
	Seed	1768.56	7.45	4271.57	8.86	2503.00	141.52	10.33
	Fertilizer	1083.91	4.63	2861.76	6.01	1777.85	164.02	7.34
	Insecticides	1114.44	4.76	1923.53	4.11	809.09	72.60	3.34
	Incidental charges	348.71	1.61	2412.36	5.10	2063.65	591.79	8.52
	Repairs	292.37	1.37	281.17	0.79	-11.20	-3.83	-0.04
	Interest on working capital	923.53	3.97	1535.31	3.32	611.77	66.24	2.52
	Sub-total(A)	16247.39	68.82	30480.21	63.86	14232.82	1324.60	58.77
B)	**Fixed Cost**							
	Land revenue and taxes	30.32	0.12	14.73	0.25	-15.59	-51.41	-0.06
	Depreciation	431.09	1.95	2726.38	5.73	2295.28	532.42	9.47
	Rental value of Land	5309.6	22.03	7376.93	15.13	2067.33	38.93	8.53
	Interest on fixed capital	1672.72	7.06	7308.81	15.00	5636.09	336.94	23.27
	Sub-total(B)	7443.75	31.17	17426.87	36.14	9983.11	856.88	41.23
C)	**Cost C (A+B)**	23691.14	100	47907.08	100	24215.94	2181.48	100

Table 4: The extent of changes in physical inputs, input prices, physical output, output prices and gross return for gram

Sr. No	Particular	2010-2011 (base year)	2019-2020 (current year)	Percent change in 2019-2020 over base	Growth rate per annum (%)
A)	**Quantity of inputs**				
1	Seed (Kg/ha)	72.00	78.14	8.53	1.27
2	Fertilizer (Kg/ha)	66.23	64.85	-2.08	1.51
3	Human labour (hrs/ha)	417.15	423.90	1.61	-0.77
4	Bullock labour (hrs/ha)	65.48	25.08	-61.69	-10.00
B	**Prices of inputs**				
1	Seed (Rs /kg)	24.56	54.66	122.54	8.35*
2	Fertilizer (Rs /kg)	16.36	44.12	169.68	8.01**
3	Human labour (Rs /hrs)	13.75	22.89	66.42	5.79***
4	Bullock labour (Rs /hrs)	28.79	95.03	230.09	13.9***
C	**Yield (qtl/ha)**				
1	Main product	13.69	11.35	-17.10	-0.05
2	By-product	7.37	6.74	-8.53	1.17
D	**Price of output (Rs /qtl)**				
1	Main product	2232.54	3787.85	69.66	5.78***
2	By-product	192.81	200.00	3.72	0.64
E	**Value of output (Rs /ha)**				
1	Main product	30575.55	43000.16	40.63	5.72*
2	By-product	1422.85	1349.86	-5.12	1.82
3	Gross return	31998.4	44350.02	38.60	4.91
F	**Cost of production (Rs /qtl)**	1669.32	4237.92	153.83	8.33***
G	**Minimum Support Price**	2100	4875	132.14	8.76***

(***, **, *denotes significant at 1%, 5% and 10% level of significance)

CONCLUSIONS

It is concluded from the study that, the output-input price parity indices for gram were decreased during year 2010-11 and increased in the subsequent years, indicated thereby in the year 2010-11 the output price was lower than input price and term of trade was unfavourable for gram growers. However, the term of trade was favourable for the gram growers in the remaining years. The total cost of cultivation for gram has gone up from Rs 23691.14 per hectare in 2010-11 to Rs 47907.08 per hectare in 2019-20 depicting an increase by 2.02 times during a period of study. The gross return for gram has recorded an increase of 38.60 per cent during the period study. This is attributable to the increase in the prices of main product.

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Production and marketing of Cauliflower in Nagpur District

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ABSTRACT

The present study entitled "Production and marketing of Cauliflower in Nagpur district" was undertaken in four tehsils of Nagpur district i.e. Nagpur rural, Kamptee, Kalmeshwar and Katol. The primary data were collected from selected farmers by personal interview method by preparation of schedule and it was tested by asking the information from some selected farmers. The collected information regarding cost and returns of cauliflower cultivation, marketing related information from the intermediaries. The data were collected from the year 2018-19.

The per hectare cost of cultivation of Cauliflower at 80 farmers at cost 'A_2' was Rs 70350.07, cost 'B_2' was Rs. 104037.27 and cost 'C_2' was Rs. 109077.87 Whereas, cost C_3 was 119985.65 Rs. /ha. The major share cost of cultivation goes towards plants protection chemical i.e. 14.65 per cent. Average gross return and net return was Rs. 189453.24 and Rs. 69467.59. The benefit-cost ratio on overall basis was 1: 1.57.

With regard the marketing of Cauliflower, following three marketing channels were studied.

Channel I:– Producer→Consumer.

Channel II:– Producer→Commission agent cum wholesaler → Retailer → Consumer.

Channel III:– Producer→Retailer→ Consumer.

The total marketing cost was workedout to Rs. 102.35 Rs. 697.49 and 482.85 in channel I, II and III. Whereas, the total market margin accrued by middleman was Rs. 2020.26 and Rs. 2450.27 in channel II and III. The producers' share in consumer's rupee was 93.01 per cent in channel I, 34.03 per cent in channel II and 31.94 per cent in channel III.

Keywords:*Cauliflower, cost &, returns, marketing cost, margin, pricespread,*

INTRODUCTION

India has been the second largest producer of vegetables in the world accounting for 14 per cent of the world production of vegetables. Vegetable cultivation now-a-days is increasing fastest, which has become an important constituent in daily diet of human being. Without vegetable, there is no means of that essential diet. Due to this, farmers now have become more conscious about achieving knowledge of different cultivation practices, its importance in daily life, costs, returns and marketing about the vegetables. Nagpur district, because of certain features of favourable climatic condition, becomes one of the important vegetables growing areas in Vidarbha region. Cauliflower is cultivated on a large scale in this region and its economic cultivation have an influence on the prosperity of the cultivators. The success of the cauliflower production mostly depends upon the environmental conditions and personal care taken by cultivators. The present study was undertaken to estimate the costs and returns and profitability marketing cost, margin and price spread of cauliflower in Nagpur district of Maharashtra.

Total area under Cauliflower in India was 4.53 lakh ha, with production 86.68 lakh MT and productivity of Cauliflower was 19.13 MT/ha. Total area of Cauliflower in Maharashtra was 12,500 ha, with production 2.30 lakh MT and productivity of Cauliflower was 18.44 MT/ha. (Horticulture Area Production Information System, 2018). Total area of Cauliflower in Nagpur district was 371 ha, with production 8380.90 MT and productivity of Cauliflower was 22.59 MT/ha. (Joint Director of Agriculture, Nagpur 2018).

Cauliflower (Brassicaoleracea*)* is member of the genus Brassicaand family Cruciferae, one of the most important vegetable crops of India. The edible part of cauliflower is known as curd, which consists of a shoot system with short internodes, branches apices and bracts.

The harvesting is done as soon as the curd attains right maturity and they are compact, with white colour of the curds is maintained. For

harvesting curds cut off stalk well below the curd with a sharp cutting knife or sickle. Early maturing cultivar have an average yield of 80-120 q/ha. The main season Cauliflower produces 150-200 q/ha.

OBJECTIVES

1. To estimate the cost and returns of Cauliflower.
2. To study the marketing of Cauliflower.

METHODOLOGY

The present study had been undertaken with aim to study production and marketing of cauliflower in Nagpur district. It deals with methodology adopted for study viz. Selection of sample, collection of data, analysis and interpretation of data.

a. Selection of Area

The present study had been undertaken in Nagpur district of Vidarbha region. The district was selected purposely, wherein production of Cauliflower was concentrated. The data was pertained to the year 2018-19 for kharif season only.

b. Selection of Sample

From Nagpur district, four Tehsils were selected where the production of Cauliflower raised. From each Tehsil, four villages were selected randomly, hence total sixteen villages were selected. The five farmers from each village were selected randomly, producing cauliflower. Therefore, total 80 farmers from 16 villages were selected for present study. The five commission agents, five wholesalers from APMC Nagpur as well as five retailers who marketed the cauliflower in different markets were selected, to assess the marketing cost and margin during marketing of the cauliflower.

c. Source of data

i. Primary data

The primary data were collected from selected farmers by personal interview method by preparation of schedule and it was tested by asking the information from some selected farmers.

The collected information regarding cost and returns of cauliflower cultivation, marketing related information from the intermediaries.The data were collected from the year 2018-19.

ii. Selection of market intermediaries

All the major agencies involved in marketing of Cauliflower i.e. 5 commission agents, 5 wholesalers and 5 retailers were selected to study the marketing of Cauliflower.

Analysis of data

The collected data were tabulated, interpreted for the necessary results. The data were summarized with aid of statistical tools like average, percentage etc. to obtain meaningful results.

The collected data were analyzed, interpreted by simple tabular method using average, mean etc. on the following sub heads.

1. Standard cost

The standard cost concept will be used for estimating the cost of cultivation of Cauliflower. This includes cost A_1, A_2, B_1, B_2, C_1 C_2 and C_3.

2. Marketing cost

Marketing cost are the actual expenses incurred in marketing process.

Cost of marketing comprises loading, unloading, transportation, weighing charges, commission charges, labour packaging, market fees etc.

Marketing cost (MC) is expressed as follows:

$MC = C_F + C_W + C_R$

where C_F is the cost of the farmer in marketing

C_W is the cost of the wholesaler in marketing

C_R is the cost of the retailer in marketing

3. Marketing margins

It is the difference between price paid by the two agencies in marketing channels where produce is transferred from one agency to another.

Marketing margin (MM) is expressed as follows:

$$MM = Sp - (Pp + Mc)$$

Where,

MM - Marketing margin

Sp - Selling price

Pp - Purchase price

Mc - Marketing cost

4. Price spread

It refers to the difference between price paid by the consumer and price received by the producer for an equivalent quantity of the farm product.

Price spread (Ps) is expressed as follows:

$$PS = PC - PR$$

Where,

PS - Price spread

PC - Price paid by final consumer

PR - Price received by ultimate producer

i) Net price of producer

It is equal to gross price of Cauliflower received by producer minus all expenses incurred by him on marketing of the produce.

Net Price of producer (NNP) is expressed as follows:

$NPP = GPP - \{CP + (MLP \times GPP)\}$

Where,

NPP - Net price received by the producers

GPP - Gross price received by producers

CP - Marketing cost incurred by the producers

MLP - Marketing Losses

ii) Producers' share in consumer's rupee

It is the ratio net price received by producer expressed as percentage of the price paid by the ultimate consumer.

Producers' share in consumer's rupee (Ps) is expressed as follows:

$$Ps = \frac{Pf}{Pc} \times 100$$

Where,

Pf = price received by the producer

Pc = price paid by the consumer

RESULTS AND DISCUSSIONS

Keeping in view the objectives of the study, the necessary data collected from different sources were analysed and interpreted. The results obtained are presented and discussed below.

1.Cost and returns of Cauliflower at farm level

Table 1: Per hectare cost of cultivation of Cauliflower farmer

Particulars		Unit/ha	Input	Cost per input (Rs.)	Total cost (Rs.)	Percentage To total cost
Hired Human Labour	Male	DAYS	20.05	274.04	5494.50	4.57
	Female	DAYS	75.23	131.52	9894.26	8.24
	Total	DAYS	95.28	405.56	**15388.76**	12.82
Bullock Labour	Hired	DAYS	0.84	664.67	558.32	0.46
	Owned	DAYS	7.53	675.56	5086.96	4.23
	Total	DAYS	8.37	1340.23	**5645.28**	4.70
Machine Charges	Hired	HOURS	3.90	852.41	3224.39	2.68
Manure		TONS.	2.71	1055.88	2861.43	2.38
Fertilizer	N	Kg.	162.59	19.35	3146.11	2.62
	P	Kg.	128.53	34.10	4386.28	3.65
	K	Kg.	128.62	34.45	4430.95	3.69
	Total				**11963.34**	9.97
Seed	Cost	Kg/Rs.	0.667	11206.40	7474.66	6.22
Irrigation charges	Cost	RS.			555.83	0.46
Insecticide (Plant Protection)	Cost	RS.			17587.59	14.65
Incidental charges	Cost	RS.			130.06	0.10
Repairing charges	Cost	RS.			174.68	0.14
Working capital	Cost	RS.			65006.02	54.17
Int. on working capital @ 6%	Cost	RS.			3900.36	3.25
Depreciation		RS.			1322.16	1.10
Land Rev. cess& other taxes		RS.			121.53	0.10
COST A1		**RS.**			**70350.07**	58.63
Rent paid for leased land		RS.			0	0
COST A2		**RS.**			**70350.07**	58.63
Int. on Fix. Cap. @ 10 %/annum		RS.			2233.19	1.86
COST B1		**RS.**			**72583.26**	60.49
Rental value of land		RS.			31454.01	26.21
COST B2		**RS.**			**104037.27**	86.70

Family Human Labour	Male	DAYS	5.97	273.71	1634.04	1.36
	Female	DAYS	26.15	130.27	3406.56	2.83
	Total	DAYS	32.12	403.98	**5040.60**	4.20
COST C2					**109077.87**	90.90
10 % of Cost C2					**10907.78**	9.09
COST C3					**119985.65**	100.00
Yield Per hectare	Main	QTLS.	143.03	1324.57	189453.24	
Per qtl. Cost of main produce at Cost C3					**838.88**	

It is revealed from the Table 1. that, the per hectare cost of cultivation at cost 'A_2' was Rs 70350.07, cost 'B_1' was Rs. 72583.26 Whereas cost 'B_2' was Rs. 104037.27 and cost 'C_2' was Rs. 109077.87 whereas cost 'C_3' was Rs 119985.65 which indicate the 10 per cent as a managerial cost.

The major share of cost of cultivation goes towards cost 'A_2' (58.63 per cent). In cost 'A' share of fertilizer was 9.97 per cent, plant protection chemicals 14.65 per cent, hired human labour 12.82 per cent, manure 2.38 per cent, bullock labour 4.70 per cent and seed 6.22 per cent, machine hours 2.68 per cent, cost 'B_1' contributes to 60.49 per cent, cost 'B_2' contribute 86.70 per cent to the total cost i.e. cost 'C_3'.

The share of family labour was 4.20 per cent. Per hectare yield obtained by overall farmers was 143.03 quintal with gross returns of Rs. 189453.24. In case of overall size group, per quintal cost of production was Rs. 838.

2. Marketing of Cauliflower

Marketing cost of Cauliflower

The per quintal cost incurred by the producer, commission agent cum wholesaler and retailer was analysed in all the three channels and the results are presented in the Table 2.

Table 2:Marketing cost incurred in Cauliflower marketing

Sr. No.	Particulars	TotalPrice(Rs./ quintals)		
		Channel I	Channel II	Chanel III
	Marketing cost incurred by producer			
1	Loading	12.55 (0.85)	13.66 (0.33)	13.81 (0.32)
2	Transportation charges	65.69 (4.48)	77.85 (1.88)	67.97 (1.57)
3	Unloading	12.50 (0.85)	12.94 (0.31)	13.09 (0.30)
4	Weighing charges	6.22 (0.42)	6.44 (0.15)	6.61 (0.15)
5	Market entry fee	5.39 (0.36)	5.44 (0.13)	5.59 (0.12)
	Total marketing cost	102.35 (6.93)	116.33 (2.82)	107.07 (2.48)
	Selling price of producer	1464.33 (100.00)	1518.81 (36.86)	1483.95 (34.43)
	Marketing cost incurred by Commission Agent Cum Wholesaler			
1	Transportation charges	-	12.78 (0.31)	-
2	Storing	-	17.28 (0.41)	-
3	Loading & Unloading	-	19.88 (0.48)	-

4	Gunny bag charges	-	15.33 (0.37)	-
5	Cess	-	22.16 (0.53)	-
6	Weighing charges	-	5.46 (0.13)	-
7	Commission charges	-	126.65 (3.07)	-
	Total marketing cost	-	219.54 (5.32)	-
	Selling price of wholesaler	-	2110.89 (51.23)	-
	Marketing cost incurred by retailer			
1	Transportation charges	-	13.42 (0.32)	13.60 (0.31)
2	Storing	-	17.59 (0.42)	17.80 (0.41)
3	Loading & Unloading	-	19.84 (0.48)	19.77 (0.45)
4	Gunny bag charges	-	15.23 (0.36)	15.38 (0.35)
5	Cess	-	43.26 (1.04)	45.22 (1.04)
6	Weighing charges	-	5.07 (0.12)	5.41 (0.12)
7	Commission charges	-	247.21 (5.99)	258.60 (6.00)
	Total marketing cost	-	361.62 (8.77)	375.78 (8.71)
	Selling price of retailer/ Purchase price of consumer	1464.33 (100.00)	4120.23 (100.00)	4310.00 (100.00)

(Figure in parenthesis indicate the percentage to total)

It is inferred from Table 2 that, in case of Cauliflower farmers, there was Rs.102.35 marketing cost incurred by Cauliflower cultivator in channel I where producer sold his produce to consumer. In channel II producer sold his produce to commission agent cum wholesaler incurred the marketing cost of Rs.116.33. In channel III producer sold his produce to retailer incurred the marketing cost of Rs. 107.07. The cost of loading accounted 0.85 per cent, 0.33 per cent, and 0.32 per cent transportation cost was 4.48 per cent , 1.88 per cent and 1.57 per cent unloading cost was 0.85 per cent , 0.31 per cent and 0.30 per cent in channel I, channel II, and channel III respectively.

The total marketing cost incurred by commission agent cum wholesaler for channel II was Rs.219.54, with contribute share of commission charges which was 3.07 per cent. Charges of transportation was 0.31 per cent. Charges of storing 0.41 per cent. Charges of loading and unloading 0.48 per cent. Charges of gunny bag 0.37 per cent. Charges of weighing 0.13 per cent. The market cess fund was 0.53 per cent for channel II.

The table revealed that, in channel II cost of marketing incurred by retailer was Rs.361.62 and Rs.375.78 in channel III which contribute share of commission charges which was 5.99 per cent in channel II and 6.00 per cent in channel III, followed by market cess fund which was 1.04 per cent in channel II and 1.04 per cent in channel III, loading and unloading charges which was 0.48 per cent in channel II and 0.45 per cent in channel III, storing

charges which was 0.42 per cent in channel II and 0.41 per cent in channel III, gunny bag charges which was 0.36 per cent in channel II and 0.35 per cent in channel III and weighing charges in channel II and III were 0.12 and 0.12 per cent, respectively.

Market margin accrued by intermediaries during marketing

Marketing margin in marketing of Cauliflower was worked out and presented in Table3.

The table revealed that, in channel I, channel II and channel III per quintal, price received by producer was Rs. 1464.33, Rs. 1518.81 and Rs. 1483.95, respectively. In case of Cauliflower there were marketing costs incurred by producer was Rs.102.35, Rs. 116.33 and Rs. 107.07 in channel I, channel II and channel III respectively. The commission agent cum wholesaler incurred marketing cost for channel II Rs. 219.54 and accrued market margin of Rs. 372.54 per quintal.

Table 3:Market margin accrued by intermediaries during marketing

(Rs./Qt.)

Sr. No.	Particulars	Channel I	Channel II	Channel III
	Producer			
1	Price received by producer	1464.33	1518.81	1483.95
2	Marketing cost incurred by producer	102.35	116.33	107.07
	Commission agent cum wholesaler			
1	Purchase price	-	1518.81	-
2	Marketing cost incurred	-	219.54	-
3	Market margin	-	**372.54**	-
4	Selling price	-	2110.89	-
	Retailer			
1	Purchase price	-	2110.89	1483.95
2	Marketing cost incurred	-	361.62	375.78
3	Market margin	-	**1647.72**	**2450.27**
4	Price paid by consumer	1464.33	4120.23	4310.00

The marketing cost incurred by retailer for channel II Rs. 361.62 and earned margin of Rs.1647.72 and in channel III incurred to Rs.375.78 and earned margin of Rs. 2450.27and sold produce to the consumers to Rs. 4120.23 and 4310.00 per quintal in channel II and channel III, respectively.

Price spread in marketing of Cauliflower

The detail of price spread for average in marketing of Cauliflower are given in Table 4.

Table 4: Price spread in marketing of Cauliflower

(Rs./Qt.)

Sr. No.	Particulars	Channel I	Per cent of consumers price	Channel II	Per cent of consumers price	Channel III	Per cent of consumers price
1	Net price received by producer	1361.98	93.01	1402.48	34.03	376.88	31.94
2	Total marketing cost	102.35	6.98	697.49	16.92	482.85	11.20
3	Total market margin	-	-	2020.26	49.03	2450.27	56.85
4	Consumer's price	1464.33	100.00	4120.23	100.00	4310.00	100.00
5	Producers' share in consumer's rupee (%)	93.01		34.03		31.94	

The table depicted that the net price received by the producer was higher in channel II Rs. 1402.48 followed by channel III Rs. 1376.88 and channel I Rs. 1361.98. The total marketing cost incurred in channel

II was Rs. 697.49 (16.92 per cent) which was more than in channel I Rs. 102.35 (6.98 per cent) and in channel II Rs. 482.85 (11.20) in marketing of Cauliflower in Nagpur.

The highest total market margin accrued by the intermediaries in channel III as compared to channel II was Rs. 2450.27 (56.85 per cent) and Rs. 2020.20 (49.03 per cent), respectively in marketing of Cauliflower.

The producers' share in consumer's rupee was higher in channel I (93.01 per cent) means the selling of Cauliflower in market by cultivator to direct consumer is found to more profitable as compared to channel II (34.03 per cent) and channel III (31.94 per cent).

CONCLUSIONS

The present study was undertaken to Production and marketing of cauliflower in Nagpur district, to estimate the cost and returns, marketing of cauliflower.

The per hectare cost of cultivation of Cauliflower at overall 80 farmers at cost 'A_2' was Rs 70350.07, cost 'B_1' was Rs. 72583.26 Whereas cost 'B_2' was Rs. 104037.27 and cost 'C_2' was Rs. 109077.87 whereas cost 'C_3' was Rs 119985.65. Major share of cost of cultivation goes towards plant protection chemicals 14.65 per cent and hired human labour 12.82 per cent.

At overall level average gross returns obtained Rs. 189453.24 and net returns at overall basis obtain at cost C_3 was Rs. 69467.59.The benefit-cost ratio at overall level 1:1.57. It was highest in large farmers i.e. 1:1.66.

The producers' share in consumer's rupee was higher in channel I (93.01 per cent) means the selling of Cauliflower in market by cultivator to direct consumer is found to more profitable as compared to channel II (34.03 per cent) and channel III (31.94 per cent).

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Vegetables' Export from Nagpur : A Successful Agribusiness Venture

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ABSTRACT

Agri-Business is now emerging sector with the development. To promote the income of farmers and to increase processing of agricultural produce, the agribusiness model is needed to be evaluated. As initiatives, a successful agribusiness model 'Mitraya Farmer Producer Company Ltd' is identified. The data is collected for the financial year 2021-22. The costs and returns, break-even analysis, channel are analyzed.

From the results, it is found that the net return of the company is Rs 2.27 crores in year 2021-22. The return per rupee invested is Rs 1.33. The Break Even Point for the company is 239.54 tons. The main constraint for company is lack of technical knowhow for export oriented production.

***Keywords** : Break Even Point, Vegetable Export, Agribusiness*

INTRODUCTION

Agri-Business is now emerging sector with the development. To promote the income of farmers and to increase processing of agricultural produce, the agribusiness model is to be evaluated. The results of the paper evaluation will give insight to develop other agri-business models.

The food chain in India from the farmer to the consumer involves several intermediaries leading to handling at multiple points and longer transit time. Only 25% of the consumer's rupees reaches the farmer as compared to 50% in developed countries. It is estimated that 20% of the food produced in India is wasted. This is valued more than Rs 50,000 crores approximately. This wastage is equal to the amount that the government spends on food subsidy by more than 3 to 4 times.

India produces a wide range of fruits and vegetables of both the topical and temperate varieties because of the varied climatic conditions in our country. India having around 4000 fruit processing units with an aggregate capacity of more than 12 lakh MT (less than 4% of total fruits produced). Unfortunately, around 2.20% of fruits & Vegetables are processed as against 30% in Thailand, 70% in Brazil, 78% in Philippines and 80% in Malaysia. The wastage is estimated as high as over 25% of the total production of fruits and vegetables. To avoid such losses, the present paper is taken.

Objectives:

1. To study the Fixed Capital Investment of selected company;
2. To estimate Fixed and Variable costs of selected company;
3. To estimate Break-even Analysis of selected company;
4. To evaluate Procurement and Export channel of selected company; and
5. To analyze Constraints faced by selected company.

METHODOLOGY

The certified successful agribusiness 'Mitraya Farmer Producer Company Ltd' is identified. The data is collected from the selected agri-business. The data is collected for the financial year 2021-22.

A) Estimation of the Fixed Capital Investment

The data on the buildings and infrastructure is collected and it is presented in results and discussion. The Fixed Capital on Buildings, Pack House (cold storage), vehicles, tools and implements is collected and simple tabular analysis is presented in results.

B) Fixed Costs and Variable Costs of the Mitraya Farmer Producer Company Ltd.

The fixed costs are estimated on the basis of depreciation of fixed capital,

principal and interest on fixed capital. While the variable cost involves the cost purchasing of vegetables, labour cost, transport, quality control etc.

C) The profit and break-even analysis of Mitraya Farmer Producer Company Ltd

Total Cost per annum = Fixed Cost + Variable Cost per annum

Net Profit = Gross Return – Total Cost

Benefit Cost Ratio = Gross Return / Total Cost

Break Even Analysis = Fixed Cost/ (Price per unit – Variable Cost per unit)

D) The procurement and export channel of Mitraya Farmer Producer Company Ltd

Collection of vegetables, their sorting, grading, packing and export process in mentioned in the form of flow chart.

E) The constraints faced by Mitraya Farmer Producer Company Ltd.

The constraints faced by company owner in running business is discussed and presented in result.

RESULTS AND DISCUSSION

The analysis is made on the line of the objectives and results obtained from the analysis are presented and discussed in following sections.

The Registration Details of the Mitraya Company are given in table number 1. The company is registered in 2018.

Table 1 : Registration Details of the Mitraya company

Sr.No.	Particulars	Remarks
1	Name of the Company	Mitraya Farmers Producer Co. Ltd
2	Corporate Identity Number	U01403MH2010PTC211392
3	Registration Date	13th July 2018
4	Category/Sub-Category of the Company	Company Limited by Shares Indian Non-Government Company
5	Whether listed Company	No
6	Address of company	53, Shrikrishna Nagar, Near Shrikrishna Temple, Wathoda, Nagpur 440009

The Fixed Capital Investment of Mitraya Farmers' Producer Company is presented in table : 2. As per the results, the Pack House Capital at Bhandara shared highest in total Fixed Capital Investment i.e. 48.81 percent, it is followed by Cold storage at Bhandara 20.92 percent.

Table 2 : Fixed Capital Investment of Mitraya Farmers' Producer Company

Per Annum

S.N.	Item	Value in (Rs. lakhs)	Percentage Share
1	Pack House building at Bhandara	350	48.81
2	Pack House at Nagpur	100	13.95
3	Cold storage 150 metric ton at Bhandara	150	20.92
4	Cold storage 100 metric ton	100	13.95
5	Tools and Implements	1	0.14
6	Vehicles	16	2.23
	Total	**7,17,00,000**	**100.00**

The table 3 depicted Estimation of the Fixed cost from depreciation, principle amount and interest on fixed capital. Depreciation is estimated on the basis of asset life. The interest on fixed capital is estimated at 11 percent per annum. The principle estimated on life of asset.

Table 3 : Fixed Cost of Mitraya Farmers' Producer Company

Per Annum (Rs.)

S.N.	Item	Depreciation	Interest of Fixed Capital	Principle Amt	Fixed Cost	Percent share
1	Pack house building at Bhandara	420000	3850000	466666	47,36,667	43.97
2	Pack House at Nagpur	120000	1100000	133333	13,53,333	12.56
3	Cold storage 150 metric ton at Bhandara	450000	1650000	500000	26,00,000	24.14
4	Cold storage 100 metric ton	300000	1100000	333333	17,33,333	16.09
5	Tools and Implements	4500	11000	5000.00	20,500	0.19
6	Vehicles	72000	176000	80000.00	3,28,000	3.04
7	Total Fixed Cost	1366500	7887000	1518333	1,07,71,833	**100.00**
8	Land Appreciation value					
9	Pack house Bhandara				35,00,000	32.49
10	Pack house Nagpur				10,00,000	9.28
11	**Total Fixed Cost with Appreciation**				**62,71,833**	58.22

The Pack house at Bhandara (43.97 percent) and cold storages at Bhandara (24.14 percent) contributed higher in Fixed cost sequentially. The land of pack house will appreciate over the time. The appreciation rate is assumed at 10 percent per annum. The appreciation value is seen higher at 32.49 percent.

Table 4 : Variable Cost of Mitraya Farmers' Producer Company **Per Annum**

S.N.	Variable Items	Unit	Quantity	Value (Rs.)	% share
1	Labour	days	(24000	41,40,000	6.58
	50/day for 30 days + 50 Extra shift for 10 days at Bhandara		+3600)		
	10/day at Nagpur				
2	Supervisor	days	2	1,92,000	0.31
3	Quality control	days	1	1,44,000	0.23
4	Driver		2	1,92,000	0.31
5	Purchase vegetables				
a	Chilli @22	tons	600	1,32,00,000	20.99
b	Lady's Finger @ 17	tons	360	61,20,000	9.73
c	Lemon @ 20	tons	15	2,25,000	0.36
d	Other seasonal vegetables like	tons	10	2,00,000	0.32
	Drumstick, Elephant foot Yam, Bottle guard etc				
e	Total			1,97,45,000	31.39
6	Packing cost @20		214130	42,82,600	6.81
7	Transport cost			1,44,00,000	22.89
	Weekly container cost 1.50 lakhs				
	Weekly transport cost from Bhandara to JNPT 1.50 lakhs				
8	Custom clearance			60,000	0.10
9	**Total Variable Cost**			**6,29,00,600**	100.00

The table 4 shows the Variable Cost of Mitraya Farmers' Producer Company. The results indicated that the purchased of raw material contributed 31.39 percent in total variable cost. Amongst the total purchase of Vegetables, the Chili is major vegetable purchased throughout the year and it contributed 20.99 percent in total cost, followed by Lady's Finger (9.73 percent). The cost of transportation is 22.89 percent in variable cost. The labour payment is also significantly higher i.e. 6.58 percent.

The gross return from export of the vegetables is presented in table number 5. The return from the Chilli was highest i.e. 52.24 percent. The Lady's Finger return was 35.26 percent in year 2020-21. Lemon and other seasonal Vegetables were also exported by company.

Table 5 : Gross Return from Export of Mitraya Farmers' Producer Company

Per Annum

S. N.	Vegetables/Fruits	Unit	Quantity	Value (Rs.)	% share
a	Chilli @80	tons	600	4,80,00,000	52.24
b	Lady's Finger @ 90	tons	360	3,24,00,000	35.26
c	Lemon @ 70	tons	15	10,50,000	1.14
d	Other seasonal vegetables like Drumstick, Elephant foot Yam, Bottle guard etc	tons	10	8,00,000	0.87
e	Tomatoes/ Capsicum to Jubilant Food Pvt Ltd	tons	120	96,00,000	10.45
f	Import of Apple	tons	2	35000	0.04
	Total		**1107**	**9,18,85,000**	**100.00**

The Break-Even Analysis and B:C ratio of the company is given in table 6. It is found that the net return of the company is Rs 2.27 crores in year 2021-22. The return per rupee invested is Rs 1.33. The Break-Even Point for the company is 239.54 tons indicates that the 239.54 tons quantity of Vegetables is required to be exported to cover cost.

Table 6 : Break-Even Analysis of Mitraya Farmers' Producer Company

Sr. N.	Particulars	Values (Rs.)	% share
a	Fixed Cost	62,71,833	9.07
b	Variable Cost	6,29,00,600	90.93
c	Total Cost	6,91,72,433	100.00
d	Gross Return	9,18,85,000	132.83
e	Net Return (PBT)	**2,27,12,567**	32.83
f	Average Price per ton	83,003	
g	Average Variable cost per ton	56,821	
h	Break Even Point	**239.54**	
i	B:C ratio	**1.33**	

The table 7 shows the Procurement and Export channel of Mitraya Farmers' Producer Company. The company primarily select the Vegetables in growing condition at field itself. It provides technical knowhow to farmer as per the export requirement. After the first selection, it finalize the Vegetables' selection at harvesting level. Company grades Vegetables at first level in field itself

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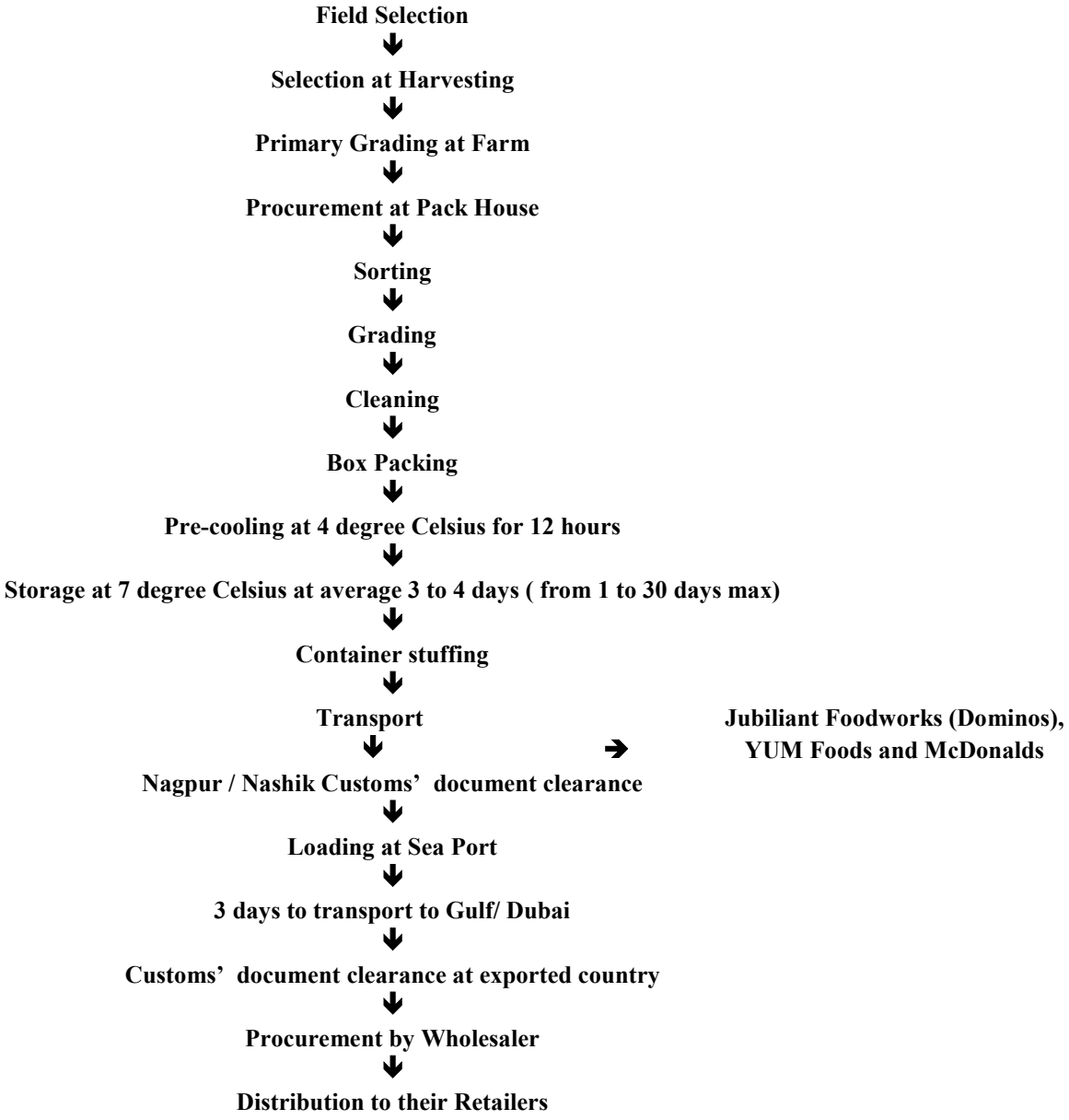
Table 7: Procurement and Export Channel of Mitraya Farmers' Producer Company



Next, it procures the Vegetables in Pack House. In Pack House, the Vegetables are processed by sorting, grading, cleaning and box packing. It, further stored in pre-cooling centre for 12 hours at 4 degree Celsius. Then, finally it is stored at cooling centre at 7 degree Celsius. The cooling centre can preserve the Vegetables around 30 days. But, the company, almost in 3 to 4 days exports the stored Vegetables to Gulf Countries. It also sell the Vegetables to Jubilant Foods, YUM Foods and McDonalds.

The Vegetables are load in containers and passed from Custom duties/ Formalities at Nagpur and Nashik. Further Export Packages are loaded at Mumbai Seaport in containers. The wholesalers at exported countries collect the containers.

Constraints

Lack of technical knowledge to Farmers regarding production of export oriented Vegetables is major constraint in running the Agribusiness.

CONCLUSIONS

The result of paper evaluation revealed that the net return of the company is Rs 2.27 crores in year 2021-22. The return per rupee invested is Rs 1.33. The Break Even Point for the company is

239.54 tons. The main constraint for company is lack of technical knowhow for export oriented production.

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Constraints Perceived by milk producer in milk production in Vidarbha Region of Maharashtra

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ABSTRACT

A study was conducted in the Vidarbha region of Maharashtra State to examine the constraints that farmers experience in the operation and management of dairy activities in milk production. It was chosen because its milk production and productivity are relatively low compared to those of other parts of the state. 210 milk farmers in the districts of Bhandara and Yavatmal in the Vidarbha region of Maharashtra State were surveyed to provide the data. There were 52.38 percent small herd milk producers, 32.38 percent medium herd milk producers, and 17.62 percent large herd milk producers. The constraints were prioritised using a Garrett ranking system. The lack of access to high-quality feed and fodder, the high cost of concentrates, a lack of veterinary facilities, a shortage of available labour, an absence of familiarity with improved management practices, an absence of green fodder throughout the year, an unstable pricing policy, inadequate credit facilities, a lack of information about a government scheme, and a lack of knowledge about marketing milk and milk products were all cited as major obstacles by milk producers.
Key words - Constraints, milk producer's, dairy farmers, milk production

INTRODUCTION

India's dairy industry has grown substantially after the beginning of Operation Flood in the 1970. In 2018–19, India produced 387 grammes of milk per person, per day, a rate of rise that well outpaced the country's average recommended dietary allowance for milk. Milk production in India is increasing at a growth of over 5 percent annually and has the potential to increase at an even higher rate for a long time because the productivity of India's milch animals is notably low in most of the country's states. Enhancing productivity and moving towards a food system approach should be the future focus of milk production expansion efforts. Improvements in cattle breeds, feeding materials and practices, upkeep, and animal health are all necessary to reach this objective. An increase in productivity has positive effects on both output and competitiveness. Improvements in animal nutrition, breeding techniques (including artificial insemination), animal husbandry, and veterinary care are required to increase livestock output. The fat content of milk is currently the only factor in determining its price. Developing metrics and standards for other attributes like SNF, like was done with fat, will be helpful.

Dairy industry growth has surpassed crop sector growth since the green revolution (Ramesh Chand,2023),. The Indian white revolution may have been more effective than the green revolution. In Vidarbha, Maharashtra, many resource-poor farmers rely on rain-fed cultivation. Recent droughts and irregular rains have hurt agricultural output, farm income and employment. Sixty-eight percent of the country is at risk of drought, with roughly a third at chronic risk (rainfall less than 650 mm) every year. Drought-prone districts have 29 percent irrigation, compared to 41 percent nationally (Bhawar, 2020).Despite low production in dry farming, dairy animals contribute significantly to the milk pool. In the dry zone, dairy farming could assist resource-starved farmers avoid city life. This industry can also promote income redistribution for marginalised groups. Understanding dairy farmers' constraints is

essential to provide economic data for dairy development forecasts.

With these considerations in mind, the current study set out to determine the primary problems encountered by dairy farmers so that the results might be used to the improvement of the milk sector in the especially in Vidarbha region of Maharashtra State.

MATERIALS AND METHODS

The Vidarbha region of Maharashtra State was selected on purpose because to its low milk output and productivity. Bhandara and Yavatmal, both districts in the Vidarbha region of the Maharashtra State, were chosen at random to collect data from the state's milk producers. Approximately 52.38 percent of milk producers are classified as having a small herd, 32.38 percent as medium, and 17.62percent as a large herd. Each district had two of its talukas chosen at random. And next, a random selection of three villages was made from each taluka. A total of 210 people were examined for the study. Prior to creating the structured interview schedule, we defined ten constraints and asked respondents to order on their experience in dairy farming. Farmers' perceptions of the many challenges facing the dairy industry were analysed using the Garrett ranking technique (Garrett and Woodworth, 1969). To calculate the percentage distribution across ranks, we used the following equation.

$$\text{Percent position} = \frac{100\ (\text{Rij} - 0.05)}{\text{Nij}}$$

Where,

Ri j - Rank gave for the i th factor by the j th individual.

Ni j - Number of factor ranked by the j th individual.

The data were collected using rank-wise constraint, and Garret's value was then multiplied by the table value. Multiplying the value of the Garret by the respondents' ranking yielded the total score. In addition, Garret's score was determined by dividing the total score by the number of respondents, and his position was based on the highest score.

Result and Discussion

Milk producer challenges in the study area were identified through observation and discussion. Farmers have difficulties with dairy farming and operations. The dairy farming in the region had a lot of challenges. The Garret rating system was used to prioritize the constraints in order to determine their relative importance.

Availability of quality feed and fodder round the year

Milk producers in the study area ranked a lack of access to high-quality fodder as their primary challenge (mean score: 75.57). Feed for livestock can be either green, dry, or concentrated. Small and fragmented land holdings, a lack of irrigation, poor quality fodder seeds, a lack of storage space, etc., are all contributing factors to the feed and fodder scarcity that milk producers are experiencing. Since fodder crops demand increased watering, the lack of irrigation infrastructure in the region was a major contributor to the problem.

Expensive concentrates

Most respondents ranked concentrate expenses as the second-most-important limitation (mean score: 70.24). Due to the non-availability of green and dry fodder, milk producers may opt to acquire concentrated to cover the nutritional needs of milch cows (Babita Adhikari et al., 2020). This could be the result of input sources deliberately creating a supply shortfall, a lack of reliable local suppliers, or local merchants manipulating the company's price tag. DK Meena et al. (2017) came to a similar conclusion, and they attributed it to the business objectives of local suppliers, their aim to create a market shortage, the company's manipulation of price tags, and the lack of government-approved shops.

Availability of veterinary facilities

The majority of respondents were of the opinion that disease transmission was more likely in crossbred animals. The third most important reason was the lack of veterinary facilities near the village (mean score: 63.41), which was exacerbated by the high expense of obtaining veterinary services at the doorstep and the lack of awareness of appropriate management practices. The most significant limitation was the lack of available AI resources. The lack of a veterinarian in the area was cited as a problem by RS Bhawar et al. (2020). Farmers had to travel between 10 and 15 kilometres to reach the nearest veterinary clinic for their animals. Consistent with the findings of Sharma et al. (2018), who cited a shortage of veterinary doctors or attendants as a major barrier to dairy production in India, we found that this was also an issue.

Identification of the constraints faced by different herd size categories of dairy farmers

Sr. No	Particulars of Constraints	Mean Score			Overall	
		Small	Medium	Large	Mean Score	Rank
1	Availability of quality feed and fodder round the year	74.55	75.85	78.08	75.57	1
2	Expensive concentrates	70.54	69.79	70.19	70.24	2
3	Availability of veterinary facilities	63.62	63.24	63.14	63.41	3
4	Availability of labour	59.21	60.41	58.41	59.45	4
5	Knowledge of improved management practices	52.00	51.62	53.57	52.15	5
6	Availability of green fodder round the year	46.90	46.94	45.65	46.70	6
7	Pricing policy	41.51	41.12	41.95	41.46	7
8	Credit facilities	36.08	35.74	35.70	35.91	8
9	Information of Government Scheme	29.83	29.82	29.95	29.85	9
10	Marketing of milk and milk products	22.69	22.85	22.05	22.63	10

Availability of labour

The average score for labour shortage in the table showing dairy farming restrictions is 59.45, placing it in fourth place. Grazing, stall feeding, shade cleaning, watering, animal bathing, milking and selling milk are just some of the many labor-intensive tasks associated with dairy production. Many people from rural areas relocated to urban areas in search of better lifestyles and education after realising that working in agriculture was associated with low self-esteem. The improved pay offered by MNREGA (Mahatma Gandhi National Rural Jobs Guarantee Scheme) has been documented by P Vaishnavi and G Manisankar (2022), who found that it encourages people to leave agriculture for social assistance due to its better compensation.

Knowledge of improved management practices

The milk yield, efficiency of production, and profitability of a dairy farm all rise with increased knowledge of dairy farming practices. Respondents as a whole scored 52.15 when asked how well they understood best practices for dairy production. Most respondents lacked even scientific knowledge regarding improved management practices like calf care and management, concentrate feeding rates, preparing concentrate feed with locally sourced ingredients, dry and green animal requirements, and artificial insemination timing, etc. These findings were consistent with those of Pooja Karki and MA Ansari (2023).

Availability of green fodder round the year

With a mean grade of 46.70, feed and fodder come in at number six. The need for green feed was higher than the available supply. According to RS Bhawar et al. (2020), the price of a litre of milk rises as a result of milk producers feeding concentrate to their milch animals. The lack of proper irrigation, low-quality fodder seeds, and inadequate fodder farming techniques all contributed to a decline in production of green fodder. According to this research, the main barriers to cultivating fodder crops are limited and fragmented land holdings and a lack of knowledge about fodder development programmes implemented by government agecies.

Pricing policy unstable pricing policy

Milk procurement pricing uncertainty ranked as the eighth limitation with a mean score of 41.46. Private dairy farmers in the Dairy Co-operative Society set milk procurement prices twice a year, during harvest and famine. Due to market rivalry, milk procurement agencies raise or lower prices, shocking milk producers. The milk producer didn't comprehend the Fat and SNF quantities that determined the purchase price per litre.

Adequate credit facilities

With a total score of 35.91, insufficient financial resources ranked as the eighth-most severe limitation in the probe. Possible causes include a lack of rural banking services and/or a lack of awareness of existing facilities among milk farmers. Milk

farmers are struggling to secure loans for capital expenditures including the purchase of cows, milking machines, barn construction (term loans), and hay and forage storage.

Information of Government Scheme

The lack of knowledge of Government Schemes is the ninth most restrictive factor, with an average score of 29.85. The government has a number of programmes designed to boost milk output and productivity, such as subsidies for the purchase of animals, fodder seeds, sheds, machinery, bulk milk coolers (BMCs), etc. However, the milk producers were not aware of these programmes.

Marketing of milk and milk products

The study also indicated that selling milk and dairy products was the eighth most difficult limitation to overcome. According to the survey participants, the milk producer faced challenges due to the far location of the milk procurement centre, the price fluctuations, the delay in payment, and the milk spoiling.

CONCLUSIONS

The study found that in the Vidarbha region of Maharashtra State, the lack of veterinary facilities was the biggest issue followed by the high cost of concentrates, and then the non-availability of quality feed and fodder throughout the year. According to these findings, feed is an important influence in milk production in the studied region. Therefore, the growth of fodder crops under the various government initiatives may improve the supply of dry and green fodder. One of the research area's biggest problems, however, was the steep price of concentrates. The procurement centre at the dairy cooperative organization may be a good place for milk producers to get affordable concentrates. Efforts should also be taken to ensure that all procurement centers have access to timely and sufficient veterinary facilities if they are to succeed in raising milk output in the area under study.

Despite these challenges, dairy farming in Maharashtra State's Vidarbha region has to be strengthened immediately by expanding veterinary facility, training facilities at the number of procurement centers and guaranteeing that farmers receive a fair price for their products on a consistent basis.

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Efficient Marketing of Bio fungicide and Value Chain Analysis

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ABSTRACT

Bio fungicide is one of the most important input for the farming. Bio Fungicide is nothing but a any substance which is organic and natural supplier for one or more of the elements required for plant Protection. In India Bio fungicides are not use on the large scale bio fungicide has residue effect. The concept of bio fungicide is based on observation the natural processes where a beneficial micro] organisms usually isolated from soil activity of plant pathogens. The study was taken with the Objectives to study the sample farmers behavior towards use of Trishul plus bio fungicide, to identify the competitors of Trishul plus bio fungicide, to study the promotional activities of Pravara Agro Biotech and its Competitors, to study the market share of Trishul plus bio fungicide and its competitors and to study the feedback of the sample farmers. 54 sample farmers (i.e. Pomegranate and Tomato growers) were selected purposively from Ahmednagar district on the basis of their land holding Dealers and retailers were selected purposively due to their limited numbers. Brand name was the most dominant factor while purchasing the product which consists of 95.12 percent followed by quality which was situated on second rank (86.99 percent) and result was the less effective parameter contributes only 66.66 percent. Price of Trycopower was high in all competitors fallowed by Trishul plus and Ketostar where the price of Amrutout was low among all competitors. Posters were mostly used by Patil biotech followed by Ajay Agro. News paper advertisement was mostly used by Pravara followed by Patil biotech. Pravara attend most number of exhibitions while Ideal Agro and Patil biotech doing most no of wall printing. Market share of Pravara Agro Biotech was high i.e. 17.22 percent than the competitors in the study area followed by Patil Biotech which contribute 17.05 percent. Market share of Invent agro was comparatively low among all competitors in selected area. The 20.33 per cent of farmers were saying that unavailability of small size packaging while 15.25 per cent farmers were give their feedback as a High price followed by delay in result and unavailability of product (11.86).

Keywords : . *Bio Fungicide, Market share and Value Chain Analysis*

INTRODUCTION

Bio fungicide is one of the most important input for the farming. Bio Fungicide is nothing but a any substance which is organic and natural supplier for one or more of the elements required for plant Protection. In India Bio fungicide are not use on the large scale bio fungicide have residue effect. The concept of bio fungicide is based on observation the natural processes where a beneficial micro] organisms usually isolated from soil activity of plant pathogens. Bio control microorganisms are free living fungi, bacteria, or antimycets that are active in root soil and foliar environment. This microorganism provides a wide range of antibiotic substances parasitize other fungi, compete with other fungi and induced localized or systemic resistance to a variety of plant pathogen.

The use of composts and supportive growing medium which both contain leaving microorganism to ameliorate disease are another example of this disease management option.

Global Bio fungicide scenario

Presently bio fungicides only 2% of the plant protection used globally however its growth rate shows an increasing trend in past 2 decades. Global production of bio fungicides has been estimated to be over 3000 tonnes per year which is increasing rapidly Increasing demand of residue free agricultural produce growing organic food market and easier registration than chemical fungicide are some of the key drivers in the bio fungicide.Globally the use of bio fungicide is increasing steadily by 10% every year. More than 200 products are being sold in US market, compared to only 60 comparable product sold in EU. More than 225 microbial bio fungicides are manufactured in 30 OECO countries. The NAFTA countries (USA, Canada and Mexico) use 45 % of the Bio fungicide while Asia lacks behind use only 5% of Bio fungicide sold world over. Most of the countries have amended their policies to minimize their use of chemical pesticide and promote bio pesticide and bio fungicide. However they are still largely regulated by the system originally designed for chemical pesticide. This has created market in barriers by imposing burden most cost on the bio fungicide industries. Although the effective bio fungicide several technological and policy gaps have been identified, they need to be strengthen in order to reduce excessive use of chemical pesticide and to promote use of bio pesticide.

OBJECTIVES

1. To study the sample farmers behavior towards use of Trishul plus bio fungicide.
2. To identify the competitors of Trishul plus bio fungicide
3. To study the promotional activities of Pravara Agro Biotech and its Competitors
4. To study the market share of Trishul plus bio fungicide and its competitors.
5. To study the feedback of the sample farmers.

METHODOLOGY

The study was purposively conducted in Sangamner tahasil of Ahmednagar district of Maharashtra. 54 sample farmers (i.e Pomegranate and Tomato grower) were selected purposively on the basis of their land holding and was categorized into small (2.00 ha), medium (2.01 to 4.00 ha), and large (4.01 and above). 9 farmers were selected from each village for the study. Dealers and retailers were selected purposively due to their limited numbers i.e. 12 retailers and 5 dealers.

RESULTS AND DISCUSSION

Information about Trishul Plus : Trishul plus is the trichoderma viride product which consist fungus around the root part of the plant. This fungus controls the disease causing fungus like Pythium, rhizoctonia, fusarium, collar rot etc.

Sample farmer's behavior towards use of Trishul plus bio fungicide

Table 1 Parameter considered while purchasing Trishul plus by farmers

Parameters	Scale (3)	Scale (2)	Scale (1)	Total	%	Rank
Price	Affordable 9(27)	Fair 32(64)	Non affordable 0	91	73.78	3
Quality	Better 25(75)	Good 16(32)	Average 0	107	86.99	2
Brand name	High 12(36)	Average 26(52)	Low 3	117	95.12	1
Service	Good 9(27)	Average 28(56)	Poor 4	87	70.73	5
Availability	Highly 12(36)	Rarely 19(38)	Unavailable 9	84	68.29	7
Packaging	Good 13(39)	Average 19(38)	Poor 9	86	69.91	6
Past experience	Good 9(27)	Average 21(42)	Poor 11	88	71.54	4

Max Rating:- 3(Max Scale) * 41 (No of farmers) = 123 (Max)

It is observed that brand name was the most dominant factor while purchasing the product which consist of 95.12 percent followed by quality which was situated on second rank(86.99 percent) and result was the less effective parameter contribute only 66.66 percent.

Identify the competitors of Trishul Plus Bio fungicide

Table 2 Competitors of Trishul Plus Bio fungicide

Sr. No	Name of company	Product
1	Ajay biotech	Ketostar
2	Patil biotech	Trycopower
3	Krushna Vally	Amrut out
4	Ideal Agro	Iozone
5	Panchshil Agro	Fungiclean
6	Arig agro	Saaf
7	Ranade biotech	Bhumi

From the table 2, it is observed that there were 7 major competitors to the Trishul Plus Bio fungicide in the study area.

Price as per packaging size of Trishul Plus and Its Competitors:

Table 3 Price as per packaging size of Trishul Plus and Its Competitors:

Sr. No	Name of company	Product	Rs/1 lit	Rs/5 lit
1	Pravara Agro biotech	Trishul Plus	330	1550
2	Ajay biotech	Ketostar	330	1490
3	Patil biotech	Trycopower	340	-
4	Krushna Vally	Amrutout	290	1290
5	Ideal Agro	Iozone	305	1400
6	Panchshil Agro	Fungiclean	335	-
7	Arig agro	Saaf	310	-
8	Randey Biotech	Bhumi	318	1420

It is observed that the price of Trycopower was high in all competitors fallowed by Trishul plus and Ketostar where the price of Amrutout was low among all competitors.

Promotional activities conducted by Pravara Agro Biotech and its competitors.

Table 4 Number of Promotional Activities by Pravara Agro Biotech and Its Competitor

Promotional Strategies	Newspaper	Posters	Exhibition	Wall Painting	Demonstration	Company Representative
Pravara	14	1500	3		2	12
Ajay	-	9000	2	40	2	31
Ranade agro	9	5400	2	200	3	26
Panchshil	3	3200	1	-	2	37
Ideal Agro	5	5000	2	500	2	9
Arig Agro	8	2600	2	-	1	21
Krishna vally	3	1200	2	-	2	17
Patil biotech	11	32000	3	500	3	45

It is observed that posters were mostly used by Patil biotech followed by Ajay. News paper advertisement was mostly used by Pravara followed by Patil biotech. Pravara attend most no of exhibition while Ideal Agro and Patil biotech doing most no of wall printing.

Promotional strategy of Pravara Agro Biotech and its competitors for retailers.

Table 5 Promotional strategy of Pravara Agro Biotech and its competitors for retailers.

Company Name	Sr. No	Festival Gift	Other gifts	Credit Facility	Other Benefits	Discount
Pravara	1	Greeting Card	Company kitchens on purchase of product	Upto 3 month	Siver Coin	8 to 10 per cent for dealers
	2	Celebration Pack	Calendars		Glass/ Fibre Statue	
	3	Sweets	Watches for dealers and Retailers			
Ajay Biotech	1	Greetings	Pens	Upto 3 month		10 per cent discount
	2	Sweets	Kitchens			
	3		Calendar's			
Ideal Agro	1	Greetings	Watches	2 month		5 to 10 per cent
	2	Sweets	-			
	3		-			
Panchshil Agro	1	Greeting	Calendars	2 month		6 per cent
	2	Photo frames	Pens			
	3	Sweets				
Patil biotech		greetings	-	2 months		6 per cent
Krishna valley		Photo frames	-	1 months		6 per cent
Arig Agro		Sweets	-	2 months		5 per cent
Ranadey Bioptech		Greetings	Calendar	2 months		8 per cent

On the basis of table 3.17 it is observed that greetings, celebration packs and sweets were most commonly used by all companies. Credit facility also given by all the companies. Pravara gives high discount (8 to 10 percent) followed by Ajay biotech.

Market share of Pravara agro biotech and its competitors

Table 6 Market share of the Pravara Agro biotech and its competitors in the year 2019-20

Sr.no	Company name	Sale in Rs.	Sale in lit.	Market share
1	Pravara Agro biotech	1000000	3030	17.22
2	Patil Biotech	990000	2911	17.05
3	Krishna Valley Agro	760000	2620	13.09
4	Ideal agro Biotech	620000	2332	10.68
5	Ajay Biotech	610000	1848	10.50
6	Arig agro	550000	1774	09.47
7	Panchshil	630000	1880	10.85
8	Ranade biotech	645000	2028	11.11
	Total	**5805000**	**18428**	**100**

It is observed that Market share of Pravara Agro Biotech was high i.e 17.22 percent than the competitors in the study area followed by Patil Biotech which contribute17.05 percent. Market share of Invent agro was comparatively low among all competitors in selected area.

Feedback of the sample farmers:

The feedback of the farmers which is users of Trishul plus bio fungicide are mainly categorized in 6 parameters.

Table 7 Feedback of sample farmers

Particulars	No. of Farmers	Percentage
Delay in result	9	15.25
High price	11	18.64
Unavailability of product	8	11.86
Insufficient after sale services	7	11.86
Unavailability of small size packaging (500 ml)	13	20.33
Total	**48**	**100**

It is observed that 20.33 per cent of farmers were saying that unavailability of small size packaging while 15.25 per cent farmers were give their feedback as a High price followed by delay in result and unavailability of product. (11.86).

CONCLUSIONS

- All 100 percent sample farmers were aware about Bio fungicides.
- All the farmers were aware about the company Pravara Agro Biotech all 54 farmers were aware hence 100 percent respondent were aware towards company.
- 90.74 percent of the total farmers were aware about Trishul Plus Bio fungicide product.
- 83.67 percent of the farmers were users of Trishul plus bio fungicides while 16.32 percent farmers are nonusers
- 37.5 farmers each for high price and delay for result were the reasons for non-using while unavailability is the reason for 25 percent farmers.
- 65.85 per cent farmers were using Trishul plus bio fungicide for the Pomegranate while 34.14 percent farmers were using Trishul

Plus bio fungicide for the Tomato crop.

- brand name was the most dominant factor while purchasing the product which consist of
- 95.12 percent followed by quality which was situated on second rank(86.99 percent) Result was the less effective parameter contribute only 66.66 percent
- Price of Trycopower was high in all competitors fallowed by Trishul plus and Ketostar where the price of Amrutout was low among all competitors.
- It is observed that posters were mostly used by Ranade followed by Ideal agro news pepper advertisement were mostly used by Pravara followed by Patil and Pravara and Patil biotech attend most no of exhibition while Ideal doing most no of wall printing Patil biotech attended most no of company field visit.
- Greetings, celebration packs and sweets were most commonly used by all companies. Credit facility also given by all the companies. Pravara gives high discount (8 to 10 percent) followed by Ajay biotech.
- Market share of Pravara Agro Biotech was high i.e 17.22 percent than the competitors in the study area followed by Patil Biotech which contribute17.05 percent. Market share of Invent agro was comparatively low among all competitors in selected area
- 20.33 per cent of farmers were saying that unavailability of small size packaging while
- 15.25 per cent farmers were give their feedback as a High price followed by delay in result and unavailability of product. (11.86)

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Economic Analysis of Jaggery Production in Kolhapur District

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ABSTRACT

The present study was undertaken during the year 2021-22 in Karveer and Panhala tehsils of Kolhapur district. For this study 30 jaggery processing units were selected randomly from Karveer and Panhala tehsil. The study revealed that the investment cost of establishment of jaggery processing unit was Rs. 814924.50. The total cost of jaggery production per processing unit was Rs. 2856227.72. while the returns from jaggery production per processing unit was Rs. 3448400.00 with a net return of Rs. 592172.28. The benefit-cost ratio was found to be more than one. The break-even point in physical terms was 242.47 Qtl. and in monitory terms it was Rs. 924921.05. It is observed that the regression coefficient of raw material was statistically significant at 10 per cent level of significance. Also, the regression coefficient of raw material, labour required and chemicals required were positive. Major constraints faced by jaggery producers were unavailability of skilled labour, unavailability of storage facility and problems in power supply. The some of jaggery producers also faced constraints like high cost of chemicals, unavailability of finance at low interest rate, unavailability of purifying agent, lack of infrastructure facility, lack of facility to repair equipments of jaggery production.

Keywords: *Jaggery, Cost and return, Breakeven analysis, B:C ratio, Constraints*

INTRODUCTION

Sugarcane (*Saccharum officinarum*) is one of the most important commercial crops and main raw material required for the sugar and jaggery industries. In India Sugarcane occupies around 48.57 lakh hectares of land with an annual cane production of around 399.25 million tonnes with an average yield of 82.20 tonnes/ha during the year 2020-21 (E&S, DAC, New Delhi, 2020-21). Sugarcane occupies a pivotal position in agricultural economy of our country. The industry sustains second largest agro-industry of India, coming next to the textiles.

India is the largest producer of the sweeteners in the world including sugar and jaggery. Out of total world jaggery production, more than 70% is produced in India. It offers employment opportunity to millions of people. Jaggery is prepared in almost all parts of the country where sugarcane is grown extensively. In India, Maharashtra state is the largest producer and consumer of jaggery. Large numbers of jaggery production units are located in this state.

Kolhapur district located in the western part of Maharashtra is widely accepted as the sugar capital of Maharashtra and it produces jaggery that ranks first in quality and second after Muzaffarnagar in quantity in India. Kolhapur jaggery is deliciously sweet and has longer shelf life as compared to jaggery produced in other parts of the country. The attractive white and golden colour, distinctive sweetness and aroma are the characteristics of the famous Kolhapur jaggery which was granted the Geographical Indication Tag (GI) in 2014. Keeping this in view, the study was undertaken with the following objectives:

1) To estimate the cost and returns of jaggery production.

2) To workout breakeven point of selected jaggery units.

3) To workout the resource use efficiency.

4) To analyze the constraints in production of jaggery.

METHODOLOGY

The present study was conducted in Kolhapur district of Maharashtra state during the year 2021-22. The Kolhapur district was purposively selected for the present study as it is recognised as one of the major sugarcanes growing areas and it is also famous for producing high-quality jaggery. The colour, texture, strength, and flavour of the Kolhapur jaggery are popular among consumers as indicators of its high quality. Two tehsils namely Karveer and Panhala were selected randomly from Kolhapur district for the present study. From Karveer and Panhala tehsils each 15 jaggery units were selected using random sampling technique. Hence total sample size was 30 jaggery units located in these two tehsils. The primary data was obtained through personal interview from the sample jaggery units with the help of specifically designed pre-tested interview schedule.

For analysing cost and returns of jaggery production tabular analysis was adopted.

Break even analysis

The level at which neither profit nor loss occurs to the firm is called the breakeven point. A firm is said to be at breakeven point when its costs are equal to revenue. The appropriate formula to estimate the breakeven output is,

Breakeven quantity =

$$\frac{Total\ fixed\ costs}{Selling\ price\ per\ unit\ of\ output - Variable\ costs\ per\ unit}$$

Formula for monitory terms as follows,

Breakeven point =

$$\frac{Total\ fixed\ costs}{(1 - variable\ cost\ per\ unit/selling\ price\ per\ unit\ of\ output)}$$

Resource use efficiency

The Cobb-Douglas production function was applied to find out resource use efficiency.

$Y = aX_1^{b1}X_2^{b2}X_3^{b3}$

Where,

Y = Output of main produce (q/day)

X_1 = Raw material (tonne/day)

X_2 = Human labour (no. of labour/day)

X_3 = Chemicals (kg/day)

u = Error term

a = Intercept

bi's = Regression coefficient

Constraints analyzation

Garret's ranking technique was used to analyze the constraints in Jaggery production. Identification of constraints faced by the producer is one of the important aspects of research. The respondents were asked to rank (in the order) the constraints in production of Jaggery and these ranks were converted to scores by referring to Garrets table. The order given by the respondents was changed into ranks by using the formula:

$$\text{Per cent position} = 100\ X\ \frac{(R_{ij} - 0.5)}{N_{ij}}$$

Where,

R_{ij} = rank given for i^{th} item by j^{th} individual

N_j = number of items ranked by j^{th} individual

RESULTS AND DISCUSSION

Initial investment of jaggery processing unit

Initial investment pattern in jaggery processing unit was estimated and presented in the Table 1. It is seen from Table 1 that the initial investment on establishment of jaggery unit was Rs. 814924.50 and land was most important factor contributing Rs. 574733.33 with 70.53%. Initial investment on shed was higher after land as Rs. 86043.33 with 10.56% to total investment cost. The investment on cane crusher was found to maximum after land and shed with Rs. 51600.00 having 6.33% of share to total investment cost.

Table 1 Initial investment of jaggery processing unit

Sr. No.	Particulars	Numbers	Total cost (Rs.)	Percent to total cost
1	Land (m^2)	500	574733.33	70.53
2	Shed	1.00	86043.33	10.56
3	Furnace	1.00	35390.00	4.34
4	Cane crusher	1.00	51600.00	6.33
5	Pan	1.00	29060.00	3.57
6	Filter plates	1.97	904.33	0.11
7	Juice storage tank	1.00	5366.67	0.66
8	Wooden stick	3.30	300.67	0.04
9	Wooden Spade	2.73	361.17	0.04
10	Iron scrapper	2.83	1073.17	0.13
11	Zarya	2.33	963.67	0.12
12	Moulds	34.03	4748.83	0.58
13	Water tank	1.00	2832.67	0.35
14	Plastic pipes	1.00	1963.33	0.24
15	Electrical motor	1.10	19583.33	2.40
		(3 to 15) Total	**154147.83**	
		(1 to15) Total	**814924.50**	100.00

Cost and returns from jaggery processing unit

The costs incurred in jaggery production it could be seen from the Table 5.10. From table It was revealed that the total cost for jaggery processing was Rs. 2856227.72. The percentage of fixed cost to the total cost was 0.99 per cent. The main components of fixed cost were land rent, interest on fixed capital and depreciation on machinery and equipment. Whereas raw material (sugarcane) cost , labour cost, chemical cost, electricity was included in the variable cost. Variable cost in jaggery production worked out to be Rs. 2767783.95. In the total cost, the cost of Sugarcane was the prime cost contributing 81.43 per cent with Rs. 2325800.00. Variable cost also includes chemical cost and labour cost which were estimated Rs. 97543.95 and Rs. 149700.00 with 3.42 and 11.45 percent to total cost respectively. The result further indicated that, on an average, 904.00 quintals of jaggery was produced annually. The net return from jaggery processing was Rs. 592172.28.

Table 2 Cost and returns from jaggery processing unit (2021-22)

Sr. No.	Particular	Quantity	Amount (Rs)	Percent
Fixed Cost				
1	Land rent(ha)	0.05	19157.78	0.67
2	Depreciation on machinery and equipment	~	3853.70	0.13
3	Interest on fixed capital (14%)	~	5395.17	0.19
	Fixed cost	~	28406.65	**0.99**
Variable Cost				
4	Raw material cost-Sugarcane	802.00	2325800.00	**81.43**
5	Chemical and clarifying agent cost			
	a) Hydrose powder	391.50	64790.00	2.27
	b) Phosporic acid	119.33	18625.00	0.65
	c) Bhendi powder	12.18	4588.00	0.16
	d) Lime	111.00	3921.00	0.14
	e) Oil	79.15	5619.95	0.20
	Total chemical cost		97543.95	**3.42**
6	Labour cost			
	a) For cane crushing	~	75975.00	2.66
	b) For juice heating	~	43550.00	1.52
	c) Gulavi	~	28350.00	0.99
	d) Female labour	~	29575.00	1.04
	e) For transportation	~	149700.00	5.24
	Total labour cost	~	326650.00	**11.45**
7	Electricity charges	~	17790.00	**0.62**
	Total variable cost		2767783.95	**96.92**
8	Interest on working capital(6%) [4 to 7]	~	41516.76	**1.45**
9	Repairing charges	~	17803.33	**0.62**
10	Others(construction charges)	~	717.03	**0.03**
	TOTAL COST		2856227.72	**100.00**
11	Jaggery Produced(Qtl)	904.00	3448400.00	
12	**NET RETURNS**	~	592172.28	
13	B:C ratio	~	1.21	

Breakeven point of selected jaggery units

The breakeven point was worked out for the estimating the minimum quantity of jaggery that should be produced in order to have no profit no loss in the business. The Breakeven point for selected jaggery producers was calculated and presented in Table 3

Table 3 Break- even analysis

Sr. No.	Particulars	Values (Rs.)
1	Total fixed costs	182554.48
2	Variable costs(Rs/Qtl)	3061.71
3	Price(Rs/Qtl)	3814.60
4	Break even output(Qtl)	242.47
5	Break even in monetary term (RS)	924928.05

The breakeven point gives the size of business. It is observed from the table that total fixed costs was Rs. 182554.48 . And the variable cost per quintal was Rs. 3061.71. Table also revealed the per quintal price of jaggery which is Rs. 3814.60. It was observed from the table that the breakeven output for jaggery was 242.47 Qtls. in physical terms and Rs. 924928.05. It indicated that minimum quantity of jaggery, have to produce to equal costs and returns.

Resource use efficiency

It is observed from Table 4 that, the value of coefficient of multiple determinations i.e R^2 was found to be 0.36 that means 36 percent variation in output was jointly explained by the three independent resource variables under consideration. The value of regression coefficient and standard error for intercept was 0.409 and 0.214 respectively. The table also revealed that regression coefficient of raw material (X_1) was found to be 0.505 while for labour required (X_2) and chemicals required (X_3) it was 0.077 and 0.037 respectively. The values of standard error for raw material (X_1), labour required (X_2) and chemicals required (X_3) were found to be 0.339, 0.143 and 0.305 respectively. The regression coefficient of raw material (X_1), labour required (X_2) and chemicals required (X_3) were positive. The regression coefficient of raw material (X_1) was positive and significant at 10 percent level of significance which indicates there is scope to increase the use of this resource to increase the production.

Table 4 Regression coefficient of Cobb-Douglas production function analysis of jaggery processing

Sr. No.	Name of variable	Coefficient	Std. error
1	Intercept	0.409	0.214
2	Raw material(X_1)	0.505*	0.339
3	No. of Labours required (X_2)	0.077	0.143
4	Chemicals required (X_3)	0.037	0.305
5	R^2	0.360	

* Represents level of significance at 10 percent

Constraints in production of jaggery

From Table 5 it was revealed that unavailability of skilled labour was ranked as the most important constraint with mean score value of 71.80. The other important constraints in jaggery production were unavailability of storage facility and problems in power supply with mean score value 58.37 and 54.53 respectively. The respondents further ranked high cost of chemicals, unavailability of

finance at low interest rate, unavailability of purifying agent, lack of infrastructure facility, lack of facility to repair equipments of jaggery production, unavailability of equipments of jaggery production, unavailability of proper grade as the major constraints. Their mean score was 53.07, 52.80, 46.73, 45.93, 42.57, 39.73, 32.47 respectively.

Table 5 Average score and Rank of constraints faced by the

Sr. No.	Constraints	Average score	Rank
1	Unavailability of equipments of jaggery production	39.73	9
2	Lack of facility to repair equipments of jaggery production	42.57	8
3	Unavailability of skilled labour	71.80	1
4	High cost of chemicals	53.07	4
5	Problems in power supply	54.53	3
6	Unavailability of purifying agent	46.73	6
7	Unavailability of finance at low interest rate	52.80	5
8	Unavailability of storage facility	58.37	2
9	Lack of infrastructure facility	45.93	7
10	Unavailability of proper grade	32.47	10

CONCLUSIONS

- The investment cost of establishment of jaggery processing unit was Rs. 814924.50. The total cost of jaggery production per processing unit was Rs. 2856227.72. While the returns from jaggery production per processing unit was Rs. 3448400.00 with a net return of Rs. 592172.28.
- Benefit cost ratio was 1:21. It is greater than one which implies it is profitable to the investment in jaggery processing activities. The breakeven point in physical terms was 242.47 Qtl. and in monitory terms it was Rs. 924921.05.
- Regression coefficient of raw material was found to be statistically significant at 10 per cent level of significance. Value of coefficient of determination i.e., R^2 was 0.36.
- The major constraints faced by jaggery producers revealed that, there was unavailability of skilled labour, unavailability of storage facility and problems in power supply. The some of jaggery producers also faced constraints like high cost of chemicals, unavailability of finance at low interest rate, unavailability of purifying agent, lack of infrastructure facility, lack of facility to repair equipments of jaggery production.

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Emerging Issues of Climate vulnerability for Major cultivated crops in Mandla district of Madhya Pradesh

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ABSTRACT

India is one of the largest producers of cereals, pulses and oilseeds in the world simultaneously affected with several climatic and non climatic factors during increasing farm income. An attempt has been made in this paper to finding the production issues of major cultivated crops in Mandla district of Madhya Pradesh state with ninety farmers who were selected though multi stage stratified random sampling from six villages. Crops like paddy, maize, wheat, Peas, soybean, mustard and Gram (Red, Black and Green and Gram) cover more than 90 per cent area of the total gross cropped area in the study area. In collected information, about 75 and 81 per cent Farmers were facing issues due to agro biological factors and climatic factors respectively. An average of 73 (81 per cent) farmer experienced with climatic factor which being affected their crop production. about 87 per cent farmers are facing issues of late onset of monsoon .Farmers are advised to soil health test community approach and Custom Hiring Centre (CHCs) to overcome labour scarcity, timely beware with weather based crop advisories, Construction of dug well, Farm Pond or community irrigation.

Key word: *climate resilient agriculture, Crop Production, Livelihoods*

INTRODUCTION

Agriculture sector has been playing a vital role in reducing rural as well as aggregate poverty, socio-economic advancement and sustainable economic development through gradual improvement of the rural economy. Whenever agriculture and food grains are talked about, rice comes first in mind. Rice (*Oryza sativa*) is the most important food in many parts of the world including India. More than half of the Indian population depends on rice for food calories and protein. Wheat (*Triticum spp.)* is the second most important cereal in India after rice.Wheat crop contributes substantially to the national food security by providing more than 50 per cent of the calories to the people who consume wheat as their staple food. (Raghav and Sen, 2014). About 70% of the rural population living in Madhya Pradesh (MP) is engaged in agricultural and allied activities covering agriculture, horticulture, fisheries, animal husbandry and dairy development. The main cereal crops grown in MP are wheat, paddy, maize, jowar and various kinds of millets. The main pulses are red (tuar, masoor), black (urad), green (mung) and Bengal (chana) gram. The main oilseeds are sesamum, groundnut and soybean. Cereals cover 42%, pulses 21%, oil seeds 21% and commercial crops occupy 3% of the total gross cropped area and the rest of the gross cropped area is occupied by vegetables, fruits, fodder plants and medicinal plants. Madhya Pradesh is divided into eleven Agro Climatic Zones (ACZ) based on rainfall, existing cropping pattern and administrative units. The state is also grouped into five major cropping zones, based on the cultivation of major crops. (MPSAPCC,2013).

The district Mandla is situated in the east central part of Madhya Pradesh, III, Agro climatic Zone (Northern Hill of Chhatisgarh). The entire district catchments are the Narmada River and its tributaries. The world's famous Tiger sanctuary, Kanha National Park located in the district. The total

geographical area of the district is 4, 67,150 ha. Out of which only 2, 43,800 ha (52.8%) and the total population 894236out of which ST is 511798, i.e.57.23 % (Gond & Baiga . The district consists 9 blocks, 5 tehsils, 472 Panchyat and 1247 villages. Average Rainfall of the district is 1320 mm. 92% area of the district is rain fed cropping intensity 131%. The Major crop of the district are Paddy (111400 ha), Maize (19000 ha), Pigeon pea (3100 ha), Urid (2900 ha) in Kharif followed by Wheat (38800 ha), peas (15300 ha), Mustard (14300 ha), Lentil (11,500 ha) and Gram (6138 ha.) in Rabi. The Topography of the district is undulating and Soil type is Light soil (11,21,48 ha), Medium soil (78016 ha), Heavy soil (53636 ha).i.e.46,32 &22 % respectively.(Annual Report, KVK mandla 2011) Crops production in India is highly sensitive to climate changes such as variability in monsoon rainfall and temperature changes within a season. Farmers of mandla have good potential to access water resources and soil productivity but at the same time they are also prone to frost, high temperature, dry spell and soil erosion. Studies by many institutes like Indian Agricultural Research Institute (IARI) and others point out greater expected loss in the Rabi crops. Every 1°C rise in temperature reduces wheat production by 4-5 Million 11 Tonnes. Small changes in temperature and rainfall have significant effects on the quality of fruits, vegetables, tea, coffee, aromatic and medicinal plants, and basmati rice. Disease and insects are extremely associated with temperature and humidity, and changes in these parameters may change their population dynamics.

METHODOLOGY

Madhya Pradesh has fifty three districts; out of these, Mandla District is selected purposively for this study since this district has the one of highest area of major cereals, pulses oilseeds in the state. Keeping in mind the aim of the study, multi stage stratified random sampling technique is used under restricted random sampling. Firstly, a list of all the developmental blocks of the district is prepared. Mandla district has nine development blocks namely Mandla, Bichiya, Bijadandi, Ghughri, Mandla, Mawai, Mohgaon, Nainpur, Narayanganj, Niwas. Out of these nine development blocks, two blocks - Mandla and Bichiya are selected purposively as per more number of projects and tribal community population (*Baiga and Gond*). In second stage, three villages from each block are selected randomly for the study. There are total 338 villages in Bichiya and 176 villages in Mandla block of Mandla district. Out of these, mostly benefited by Govt. departments like agriculture, Panchayat and rural development 45 villages per block have selected for the study. 6 villages are selected randomly by using random number table. Thus, in this way, a cluster of fifteen villages are formed in each selected block. In third stage, farmers are categorized into 5 groups such as marginal (less than 1 hectare of land holding), small (1-2 hectares of land holding), semi-medium (2-4 hectares of land holding), medium (4-10 hectares of land holding) and large (more than 10 hectares of land holding). 3 famers from each category are selected in each village. Whereas 45 farmers from each block and 9 farmers from each farm size are selected for the survey.

This study is mainly based on primary data which was collected through personal interview method with the help of well prepare scheduled and questionnaire for the production and marketing year 2017-18. This method is demarcated as the most need based, appropriate and feasible for this study. Most of the required secondary data are obtained from the district mission management unit under National Rural Livelihoods Mission (NRLM) and also collected through district's official website and publications. To find out the emerging issues faced by the climate resilient farmers in cultivation of major crops of Mandla district, simple ranking technique is used to rank the emerging issues faced by the farmers. The sample farmers are asked to rank the problems faced by them in cultivation of major crops of the study area. The study areas were covered under sustainable livelihoods and adaptation to climate change and sustainable agriculture projects through NRLM supported by Ministry of Rural Development. Most of the activities are based on climate smart agriculture (CSA) therefore the beneficiaries of these projects called as climate resilient farmers. The questionnaire includes major problems related to production and marketing of major cultivated crops.

RESULTS AND DISCUSSION

Emerging Issues during Production of Major Cultivated Crops

As per the information furnished by the farmers of all categories in the study area, Emerging issues faced by them in cultivation of major crops are analyzed and ranked according to their importance. As paddy, maize, wheat, Peas, soybean, mustard and Gram (Red, Black and Green and Gram) crops cover more than 90 per cent area of the total gross cropped area in the study area, the issues are analyzed for these above mentioned crops only.

Table 1: Emerging issues faced by Climate resilient farmers during production of major cultivated crops.

SN	Emerging Issues	Marginal Farmers	Small Farmers	Medium farmers	Semi-Medium farmers	Large Farmers	Total	
							Farmers	Issues faced by farmers (in %)
A	**Agro-Biological Factors**							
i.	Severity of pest and diseases	12	17	14	15	16	74	82.222
ii.	Lack of knowledge for organic inputs.	11	14	10	11	8	54	60.000
iii.	Non-availability of irrigation source	16	15	17	11	12	71	78.889
iv.	Non-availability of equipments	16	9	14	14	8	61	67.778
v.	Non-availability of labour	16	15	17	14	16	78	86.667
Average Farmers							68	75.111
B	**Climatic Factors**							
i	Dry spell	18	14	15	15	17	79	87.777
iii.	Non availability of weather based Crop advisories	17	10	9	12	14	62	68.888
iv.	Erratic Rainfall distribution	17	14	15	14	17	77	85.555
v	drought/Flood like situation	16	15	16	15	15	77	85.555
vi	Frost	11	14	12	10	16	63	70.000
vii	late onset of monsoon	17	15	14	16	16	78	86.666
Average Farmers							73	80.740

In above table, about 75 and 81 per cent Farmers are facing issues due to agro biological factors and climatic factors respectively. Non availability of labour during production shares maximum issue in agro-biological factors which is about 87 per cent. There after about 82 per cent farmers faced issues due to occurrence of pest and diseases. Government extension departments and NGOs have been promoting the organic approaches in production system therefore 60 per cent farmers are facing issues in lack of knowledge of organic inputs, but about 40 per cent farmers having knowledge about chemical free farming, it might be due to consequences of significant knowledge of organic inputs and governmental schemes among farmers. 67 per cent farmers are facing issues with non availability of farming equipments during production of major cultivated crops. An average of 68 farmers, who are facing issues due to agro biological factors.

There is always uncertainty in agriculture due to climatic factors, the sample farmers are mostly affected and faced issue due to climatic factor rather than agro-biological factors. an average of 73 (81 per cent) farmer experienced with climatic factor which being affected their crop production. Dry spell situation is faced by 100 percent marginal farmer and 88 per cent of average farmers due to non availability of assured irrigation. Timely land preparation and

sowing is helpful in better crop production whereas about 87 per cent farmers are facing issues of late onset of monsoon therefore violating farmer's experience in field. Erratic rain fall and drought or flood like situation faced by 85 per cent farmers. Frost is one of the yield related climatic factor which reduces yield during grain feeling stage, 70 per cent farmers affected with frost mainly in field of pulses and vegetables. Weather forecasting and weather based agro advisory plays important role to combat weather variability in spite of that only 31 per cent farmers are using weather based agro advisory services and remaining 69 per cent farmers are still facing climatic uncertainty in field.

CONCLUSIONS

Issues faced during cultivation of major crops varied from individual to individual depending upon their socio-economic status and size of land holdings therefore every problem were asked to each categorized farmer group. The Farmers were encouraged by agricultural projects to cultivate crops with organic approach. In spite of these farmers face many emerging issue like agro-biological and climatic factors. Agro-biological factors are more or less physically and economically directly related to agricultural production. Farmers are advised to deep ploughing during summer, soil health test based fertilizer application, collective and community approach and mechanized cultivation though Custom Hiring Centre (CHCs) to overcome labour scarcity, timely beware with weather based crop advisories to immediate saving from weather phenomena, Construction of dug well, Farm Pond or community irrigation sources for assuring at least critical irrigation. Adoption and selection of crop variety based on monsoon, community nursery, less water demanding crops and drought and flood tolerant variety, good tillage practices, raised bed planting, mulching and application of organic manure and bio-pesticide, improved package of practices (POPs), soil moisture conservation practices, repair and maintenance of water bodies and livelihood diversification are useful practices to combat drought or flood like situation. Self help groups have potential to promote climate resilient technology with better mobilization and building capacities among farmers.

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A Critical Analysis on Existing Agriculture e-Learning Infrastructure and Prototyping an ICT Based Education Platform Among Indian Farmers for Training and Capacity Building

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ABSTRACT

It is estimated that total number of smartphone users increased by 32.5% from 2018 to succeed in 635 Mn users by 2019. Rural India witnessed an estimated growth of nearly 35% YoY within the year 2018. Rural India with only 18% mobile internet penetration is clearly the subsequent area of growth. Smartphone penetration in Rural India (Tier II /III) has risen from 9% in 2015 to 25% in 2018. This growth figure shows how rapidly mobile penetration is going on in rural India. This study incorporates critical research on existing agriculture e-learning infrastructure in India and identifies area of improvement in Agriculture Education and Training (AET) Platforms. It also discusses recent internet and content consumption trends in rural parts of India . It includes recommendations which are completely protected with technical analysis performed over the 310 relevant responses from different people and geographies across PAN India. Video streaming and content videos is highly consumed in rural parts and because of reduced internet rates the internet consumption is increasing. A common interpretation regarding poor performance of existing e-learning platforms is concluded post analysis. Absence of one stop solution with integrated government and personal resources is the primary reason behind lesser penetration of such initiatives. Absence of multilingual content, lack of awareness & dull content are some secondary reasons answerable for inefficient initiatives in ICT for agriculture. 'Gamification in agriculture E-learning ' is an emerging trend which is found to be adaptable and accepted amongst smartphone users in rural India. This research gives a grip for introducing a platform or application which will be one stop solution for agriculture e- learning. A prototype application platform with demanding features is been recommended at last with user journey, feasibility analysis and user interface.

Keywords: **ICT in Agriculture, Innovations, Agriculture Education & Training Platforms (AET), Rural India, Smartphones**

1. INTRODUCTION

In India, there have been multiple initiatives related to the e learning and ICT (Information Communication & Technology) in agriculture. There are 100s of mobile applications available on play store which have a very less number of downloads. This numbers gives the reality check of the e-learning penetration agricultural trainings. Following are some loopholes which can be addressed with the help of an innovative Agriculture Education & Training (AET) platform:

1. Poor engaging and non-responsive education & training platforms.
2. Poor penetration of training AET application.
3. Poor linkages between the AET providers and the agricultural industry.
4. Underutilized smartphone penetration in rural parts of India.
5. Absence of single window, multi lingual, extraordinary buzz (eg e-NAM)

Considering an excellent penetration of smartphones and internet in Rural India and the success stories of

few applications Eg. TikTok, Fampay & Payment Applications give a ray of hope while designing a better infrastructure for E-learning in agriculture.

1.1 ICT in Agriculture:

ICTs can help overcome the various barriers that exist in agriculture. First, there is a lack of additional properties are available. Second, the problem of illiteracy among farmers. Third, power for competing farmers and large farmers is limited. Fourth, the gap that exists between modern and traditional technology is on the rise. ICT services provide critical care access to information, knowledge and technology that farmers need to improve to produce and thus improve their quality of life and livelihoods. ICTs not only helps to spread the knowledge but also improves the farmer's knowledge, increase their participation and share information with farmers. Proper use of ICT is helpful overcoming time, space, language and illiteracy. Therefore, the current study is an attempt to understand the role that ICTs play in to improve the lives of farmers.

1.2 Gamification / Infotenment:

This is very popular trend which is being adopted by various sectors/businesses to engage their users. Sectors like BFSI and Insurance also seen adopting 'Gamification' as an option for retaining customers. Syiem and Raj (2015) reported cell phone as the most widely used ICT [1]. According to them, cell phones were widely used by farmers to communicate with the public, to communicate with the middle men to market the product and to communicate with experts in real time to get agricultural advice. The main problems with the use of ICTs by farmers are lack of confidence in ICT performance, poor power supply, poor network connectivity and ignorance of the benefits of ICTs

RESEARCH METHODOLOGY

The study used survey to collect primary data from the respondents. This study has been carry out in Indian scenario. Sample size of the study is 310. The questionnaire was extended to more than 310 respondents. In order to make research outcomes more relevant, respondents are chosen in such a way that one should have signed up on any mentioned AET platforms once at least. The method of sampling technique used in the study is convenience sampling. This is been carried out in the month of February 2021 across PAN India (mainly focusing on rural parts).

Delphi Method is used to ensure whether all the objectives of the research are covered in questionnaire or not. To do so, questionnaire is reviewed by subject experts from the concerned domain. In order to perform qualitative analysis of competitors of existing Agriculture Education & Training (AET) Platforms, Delphi method remained crucial to draw informed judgment on issues that are largely unexplored, difficult to identify and highly contextual outcomes with the help of specific expertise. The data collected is analysed through MS excel, TABLEU and SPSS SOFTWARE. Using factor analysis method, this research study has extracted 3 important consolidated factors out of 7 which are most influential for inefficient Agriculture Education & Training (AET) Platforms. In this paper , the data is collected by extensive secondary research of the reports and research papers related to the topic.

Step I: Collection of primary data (using questionnaire, personal visits & surveys) and secondary data (through library study publications, datasets, Journals etc.)

Step II: Tabulation of data collected and analysing on statistical tools

Step III: Designing a prototype and feasibility check with Porter's 5 forces

Step IV: Future implementation strategy and recommendations

2.1 Objectives

1. To analyze prominent platforms for training & capacity building for farmers.

2. To perform a gap analysis for identifying factors responsible for inefficient AET infrastructure.

3. To identify the appropriate methods for farmers to embark on new technology in Agriculture.

4.To study the ways to increase the user engagement on Agriculture Education and Training (AET) platform .

5. To design a sustainable prototype of a single window user engaging platform for skill development with a revenue options.

2.2 Research Hypothesis

While undergoing secondary research of current ICT initiatives in agriculture, it is been found that existing Agriculture Education & Training (AET) Platforms are unable to capture an attention of farmers. Subsequently reports which are quoted in the reference of this research study during secondary research supports above problem statement. Multilingual educational content, poor engaging content, lack of awareness and trainers are some primarily stated reasons responsible for it, while excessive penetration of internet in recent years drives scope for addressing above problem statement which might turn out to be an excellent opportunity for entrepreneurs. Internet consumption patterns of rural consumers also highlights about type of content which rural India is consuming extensively. Moreover 'Gamification' is an emerging term which is acting as a new fuel for user engagement which helps retaining users who are signing in. Scattered applications for different educational categories also confuses the farmers considering poor digital literacy.

2.3 Scope

This study is useful for investigating, review and analyse existing agriculture E-learning services and identifying various factors responsible for their inefficient operation. The objective is to measure and evaluate the relevant information containing the product/business portfolio of different ICT initiatives operating in the Rural India. After analysing multiple reports and research papers, used case studies points out towards major scope of building an infrastructure or a product which will not only make things easy for farmers but also generate revenue for the initiators. Used cases of Data Selling to the Agri-input / FMCG/ BFSI companies is mentioned GSMA report 2020 mention which could be an amazing revenue model with the help of this product.

2.4 Limitations of the Study

1. Primary research is not done on field because of pandemic
2. Recommended prototype is not tested
3. Considering last mile impact of the product, a detailed on ground research

can add more accuracy in designing a prototype of AET.

3. RESULT AND DISCUSSION

Table 1. Detail about Demographics

Sr No	Demographics		No. Of. Respondents	Percentage
1	Gender	Male	173	55.80%
		Female	137	44.20%
2	Age	20-25	201	64.8%
		25-30	49	15.8%
		30-35	25	8%
		35-40	6	1.9%
		40-45	4	1.5%
		45 above	25	8%
3	Knowledge level about agriculture	Extremely Poor	16	5.2%
		Slightly poor	101	32.6%
		Fair Enough to contribute	159	51.3%
		Professional	32	10.3%
4	Agriculture background	Yes	177	56.8%
		No	133	43.2%

In order to achieve relevant research outcomes, questionnaire is filled with relevant respondents. A relevant respondent is someone who has used (self/assisted someone) any AET Platform at least once in his/her life. This adds more relevance to the research objectives

3.1 Competitive Landscape Of Existing Agriculture E-Learning Platforms (Competitor Analysis)

Existing e-learning platform	Market Position	Innovation Ability	Business Strategy	Threat for the Learning Platform
mKRISHI	Weak	Weak	Weak	High
ICAR	Strong	Moderate	Moderate	Medium
AgMOOC	Moderate	Weak	Weak	High
Krishi Vidyan Kendra	Moderate	Weak	Moderate	High
Agriculture Skill Coucil Of India	Strong	Moderate	Moderate	Medium
Local Gov Body (BDO/AFO)	Moderate	Weak	Weak	Medium
PVT companies eg.ITC	Moderate	Strong	Strong	Low

This competitive landscape is being drawn with the help of feedbacks shared on questionnaire from expertise. The purpose of plotting competitive landscape was to analyse existing players, reflect their impact and implement recommendations in a prototype. To quote technically, Delphi method is being used for making it more appropriate so as to draw relevant outcomes with the help of it. To do so, a separate questionnaire was designed and was asked to fill it by expertise in concerned domain. A collective judgment is being made in above table from the same.

3.2 Applications Available on ICAR Platform

Source: www.icmr.in

These applications have very less number of downloads (max 10000) which uncovers the poor penetration of AET applications in rural parts of India. Also there must be a consolidated single window platform which will we be high user engaging, hassle free & one stop solution for every query raised by farmer.

Analysis on SPSS to Identify Factors Resulting For Ineffective AET Platforms

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.829**
Bartlett's Test of Sphericity	Approx. Chi-Square	615.850
	df	21
	Sig.	.000

Table 3. Communalities

Particulars	Initial	Extraction
Lack Of Awareness	1.000	**0.878**
Affordability	1.000	**0.811**
Poor Connectivity	1.000	**0.783**
Poor Engagement	1.000	0.552
Unintegrated Agriculture Education Institutions	1.000	0.676
Unavailability of Trainers Experts	1.000	0.675
Absence of multilingual content option	1.000	0.674

Table 2. Shows information about the sample adequacy, here the value is 0.829 which is greater than 0.5. This means that the samples are adequate.

Table 3. Shows important factors.

Table 4. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.286	46.949	46.949	3.286	46.949	46.949
2	.945	13.501	60.450	.945	13.501	60.450
3	.818	11.682	72.132	.818	11.682	**72.132**
4	.648	9.259	81.392			
5	.481	6.867	88.259			
6	.447	6.383	94.642			
7	.375	5.358	100.000			

Table 4. Indicates that we have covered 72% of the decision making factors i.e. 28% is to yet to be explained which has various factors like government policy, environmental changes, pandemics etc. which cannot be studied. It is also having the individual components explanation that is, component is explaining 18% of the decision.

Table 5. Rotated Component Matrix[a]

Particulars	Component		
	1	2	3
Lack Of Awareness	0.312	0.018	**0.883**
Affordability	0.084	**0.709**	0.549
Poor Connectivity	0.243	**0.848**	-0.075
Poor Engagement	**0.717**	0.012	0.194
Unintegrated Agri Edu Institution	**0.788**	0.162	0.169
Unavailability Of Trainers	**0.767**	0.242	0.169
Absence Of Multilingual Content	**0.674**	0.464	0.064

Table 5. The main factors coming out of the data are:

1. **Problematic Interface, Outdated features & Customer support:**

This factor is consolidated with the help of column 1 of table 5

- While implementing Information & Communication Technology in Agriculture major problem will be faced in terms of searching trainers and educators, and integrating the Agriculture Education Institutions.
- Other hurdles are Poor Engagement and Absence of Multilingual content.
- Initiatives and resources (Government / Private) not integrated on a single platform or no guidelines provided for the same.

2. **Technological Aspect:**

This factor is consolidated with the help of column 2 of table 5

- Low prices of internet data has contributed to digitization but with low prices telecomm infrastructure has to be improved to solve poor connectivity problems.

3. **Awareness:**

- Lack of awareness has emerged as one of the leading hurdle.

3.4 Observations and Findings

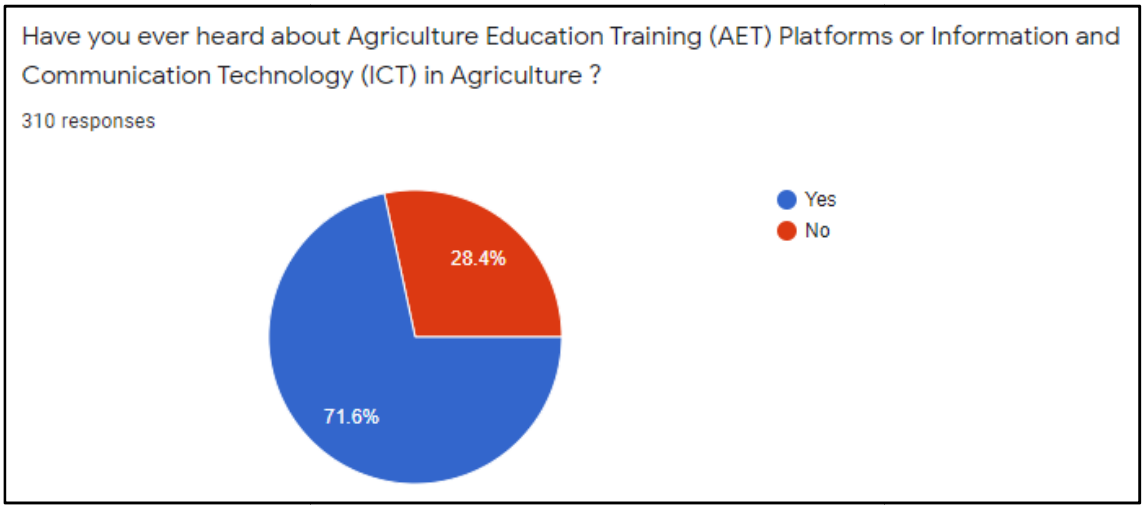


Fig 1. Out of 310 respondents, 71.6 % of the respondents are familiar with the AET platforms and ICT in Agriculture. Which will help to draw an accurate recommendations and help in designing a better AET Platform.

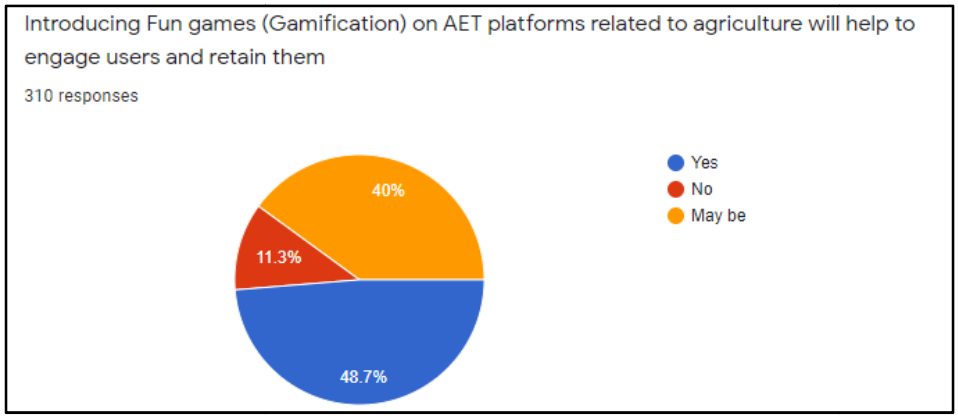


Fig 2. Out of 310 respondents, 60.6 % respondents strongly support the argument that we are still lagging in terms of agriculture education through E-Learning. While 33.9% of the respondents partially support the argument . Although we have better penetration of internet and smartphones in rural parts of India.

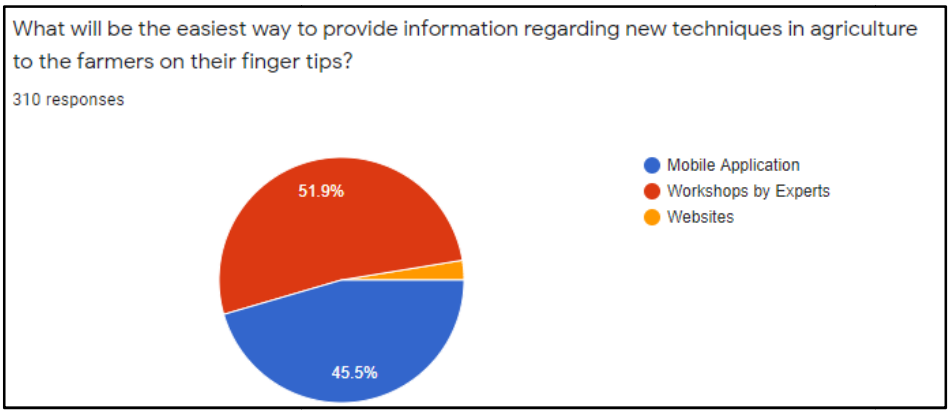


Fig 3. Out of 310 respondents, 51.9 % respondents believe that workshop by experts will be the easiest way to provide information regarding new techniques in agriculture. 45.5% selected Mobile application as an option for providing information regarding new techniques in agriculture. This reflection supports the literature review [2.1]. Websites option is certainly rejected by respondents as it has got very few supporting responses.

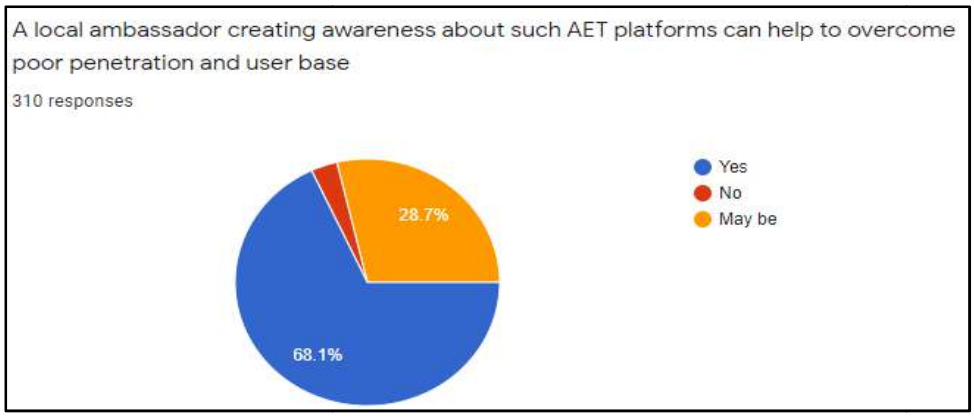


Fig 4. A followed question was being asked to know the views of respondents over the introduction of fun games to make AET platforms more engaging. 48.7 % of total respondents strongly support the argument that introducing fun games on AET platforms will help to engage and retain the users and 40 % of total respondents partially support this argument. While 11.3 % respondents rejects the statement. This

reflects that the taste of content consumption by a rural internet user has changed. Easy fun games on platform might help user to remain engaged and eventually retaining him/her. This conclusion supports the literature quoted in [2.5] which talks about content consumption and trends in rural parts of India.

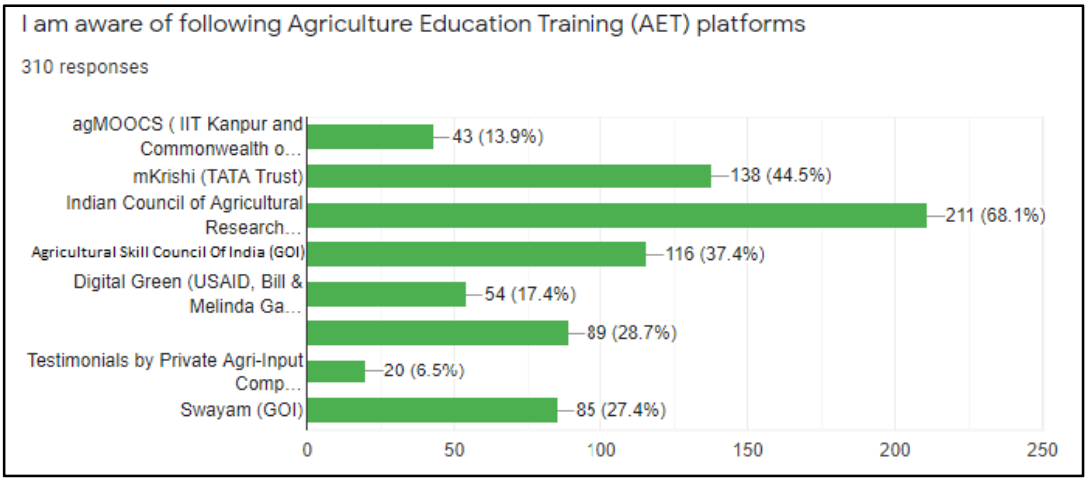


Fig 5. Respondents were asked to know about their views on appointing a local ambassador to create awareness about such AET platforms. Out of 310 respondents, 96.8 % respondents agreeing to the concept of hiring local ambassador to create awareness and excellent penetration of AET platforms. This shows high significance to an article quoted in literature review [2.6].

Total 310 respondents were asked to about the popularity of existing initiatives/platforms in Information Communication & Technology (ICT) in Agriculture. Respondents were asked to check boxes which they are familiar with. The most popular agriculture education training platform amongst all the respondents was Indian council for Agriculture Research (ICAR). 211 / 310 respondents selected for ICAR. While mKrishi (Tata Trust), Agricultural Skill Council of India, Famous youtube channels(Eg. Farming Leader, My Kisan Dost, Hello Kisaan) and Swayam stood 2nd , 3rd, 4th and 5th respectively.

Total 310 respondents were asked to select what all feature they need on an AET platform. Respondents were asked to check the features which they want us to be added in an AET platform. The most demanding feature was soil quality testing, 234 / 310 respondents selected for it. Expert's support, Soil testing and toll free number are some features which are in demand. Surprisingly 'Small games' and 'Rewards on Referrals' feature also got a good response.

3.5. Challenges Faced By Indian Farmers While Adapting Modern Technologies

Information plays an important role in empowering farmers to boost their livelihoods. Important info like sowing, improving soils, seeking the most effective worth for his or her turn out and ways to combat pests and diseases all empower the farmer and their higher cognitive process capabilities. Seasonal variability in weather patterns, deterioration in soil conditions and isolated climatic events like drought, floods, pest and disease outbreaks complicate the choice creating process of the farmers and influence their information necessities. Providing such knowledge may be difficult because the info must be tailored specifically to distinct conditions. Also in a country like India where geographical conditions varies very frequently, its difficult to predict rainfall and other environmental changes by which famer can react according to the need at particular instant. Given these challenges the arrival of knowledge and Communication Technology (ICT) is well timed. ICT is one of these solutions that have recently unleashed incredible potential to boost agriculture in developing countries. With the growing mobile, wireless, and net industries, ICT has found a position even in remote and less income areas.

Following are most common challenges faced by Indian farmers while adapting technological advancements in capacity building.

1. Poor technological knowledge of farmers and village level extension personnel

2. Economic problems of rural people
3. The top-down approach is adapted for extension activity. Which weakens linkages between research- extension and farmer remained weak etc.
4. Lack of Agricultural information literacy in India
5. Media, Information Management and ICT are not utilized efficiently
6. Poor internet connectivity in production and commercial areas
7. Poor outreach of awareness programs

Developing countries have to be compelled to adopt ICT's and associated business processes and management skills in order to stay competitive within the perpetually dynamic and progressively competitive international market. The positive result of ICT in an exceedingly developing country depends on a national sanctioning ICT setting that depends on multiple factors like accessibility, infrastructure, international and national governance issues, and human capability. One amongst the foremost necessary steps is to maximize accessibility of the ICT to all the levels of the society

3.6 Recommendation (Product Prototype)

3.6.1 About the Product

Krishi Saral is a single window, multi lingual gamified application platform which includes following features which are reflected in competitive landscape & factor analysis.

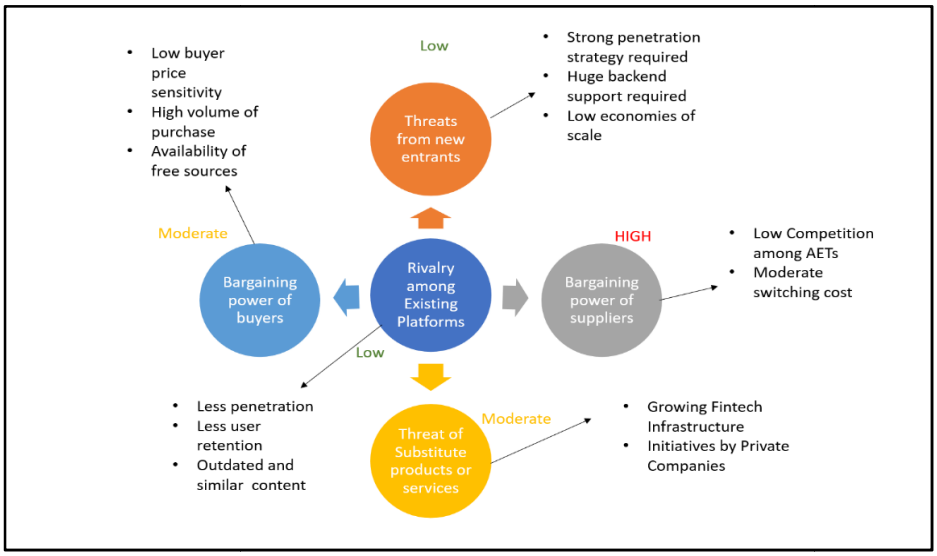
1. Avatar generation of the user by scanning user's face.
2. Krishi Saral has all the information related to farming and modern technology (eg Hydroponic, desert agriculture) enabled with the help of Geographic Information System (GIS).
3. Choice of selecting training for particular crops with the help of fun games.
4. Toll free helpline or miss-call for download link.
5. Referral discounts (lead magnet strategy) for user retention.
6. Voice assistance
7. Easy to discover nearby resources such as KVK, Krishi Kendra, APMC, Government bodies.
8. Animated Video testimonials
9. Enabling users to get advice one-on-one from experts
10. Weather forecast and soil quality testing

USP Of The Product

Using 'Gamification' apps increases use and discovery rate and often makes product more habit forming:

1. Gamification for marketing allows to attract and retain more customers.
2. The gamification of the results of business training results in a more efficient, satisfied and motivated person with increased productivity.
3. Using gamification for enterprise training results in a more engaged, satisfied and motivated workforce and as well as increased productivity.

Feasibility Analysis Using Porter's 5 Forces



U/I of the Prototype

User Journey

Raju is an an Indian farmer from Kerala state. He is 50 years old and a graduate. He is pursuing farming as his profession since 25 years and wants to grow Mushroom (special crop) first time at his farm. Local ambassador of guided & installed Krishi Saral in his smartphone. Lets see how 'Krishi Saral' assist him to learn.

Step 1: Raju scans his face and generate his animated Avatar.

Step 2: Raju wants to know about mushroom farming. Hence he follows following process

Click on Farming Techniques – Click on Rare Crops – Click on Grow Mushroom

Step 3: He has option of playing a small fun game which helps him to demonstrate farming virtually. He adjust all the features such as temperature, acreage and other agri inputs.

Step 4: He sees himself farming mushroom in video but he is couldn't understand it entirely.

Step 5: He clicks on Contact Expert / put a voice note asking his specific query and gets it resolved through expert with minimal charges.

CONCLUSIONS

Existing Agriculture Education & Training (AET) Platforms are out-dated, have less user engagement, low user retention and low penetration. Gamification is remedy for all these problems with developed content for engaging users. Multi lingual with innovative designs increase retention rate. AI based multilingual customer support can bridge the communication gap between agriculture E-learning resources and farmers. This research throws light on existing Agriculture E-learning infrastructure for Indian farmers and states important factors which are responsible for inefficient Agriculture Education & Training (AET) Platforms. These conclusions are backed up with a data/ responses we collected through questionnaire. Implementation of Krishi Saral in joint collaboration with private sectors, educational institutions and Government bodies (Gram panchayat, zilla parishad). This research study recommends a prototype of an application which addresses objectives identified with extensive primary and secondaryresearch. Designing a business model that would help generate revenue at the same time be pocket friendly as to motivate more and more

farmers to be interested for it. A local ambassador and referral strategy will be the best for excellent penetration, so does the better revenue through the Krishi Saral. A product like Krishi Saral which will be highly integrated can utilize all possible government resources and can be lucrative in terms of revenue.

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Post-harvest Losses of Cauliflower in Nagpur District

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ABSTRACT

The present study entitled "Post-harvest losses of cauliflower in Nagpur district" was undertaken in four tehsils of Nagpur district i.e. Nagpur rural, Kamptee, Kalmeshwar and Katol. The primary data were collected from selected farmers by personal interview method by preparation of schedule and it was tested by asking the information from some selected farmers. The collected information regarding, post-harvest losses faced by the farmers and constraints faced farmer, similarly the post-harvest losses occurred during the marketing of cauliflower. The data were collected from the year 2018-19.

The post-harvest losses at different stages of farm level was workout to be 11.09 kg/qt and per quintal corresponding monetary losses was Rs. 146.83/-. The total post-harvest losses cauliflower at market level was observed to be 12.15 kg/qt which causes per quintal economic loss of Rs. 500.58 /-.

The major constraints faced by farmers in post-harvest losses of cauliflower were burden of transportation cost was the major problem, daily fluctuation of crop prices, and irresponsibility during loading and unloading, existence of number of intermediaries in marketing process and losses during transportation and handling.

Keywords:*Post-harvest, losses, cauliflower, constraints*

INTRODUCTION

India has been the second largest producer of vegetables in the world accounting for 14 per cent of the world production of vegetables. Outputs of all agricultural commodities produced in the field have to undergo series of operations such as handling, transportation, processing, storage and exchange before they reach the consumer, and there are appreciable losses of outputs during these stages of their handling. The sum quantity of outputs lost in these operations at all these stages is referred to as "Post-harvest losses" of the crop.

In perishable crops like fruits and vegetables, proper and scientific storage, packaging, transport and handling technologies are the need of us to avoid the considerable amount of produce is wasted.

The post-harvest losses in vegetables during operations due to improper handling and storage are enormous. vegetables are important source of food and income.

Total area under Cauliflower in India was 4.53 lakh ha, with production 86.68 lakh MT and productivity of Cauliflower was 19.13 MT/ha. Total area of Cauliflower in Maharashtra was 12,500 ha, with production 2.30 lakh MT and productivity of Cauliflower was 18.44 MT/ha. (Horticulture Area Production Information System, 2018). Total area of Cauliflower in Nagpur district was 371 ha, with production 8380.90 MT and productivity of Cauliflower was 22.59 MT/ha. (Joint Director of Agriculture, Nagpur 2018).

Cauliflower (Brassicaoleracea*)* is member of the genus Brassicaand family Cruciferae, one of the most important vegetable crops of India. The edible part of cauliflower is known as curd, which consists of a shoot system with short internodes, branches apices and bracts.

The harvesting is done as soon as the curd attains right maturity and they are compact, with white colour of the curds is maintained. For harvesting curds cut off stalk well below the curd

with a sharp cutting knife or sickle. Early maturing cultivar have an average yield of 80-120 q/ha. The main season Cauliflower produces 150-200 q/ha.

The study on post-harvest losses in Cauliflower at various stages of marketing would help in assessing the extent and magnitude and losses in identifying the factor responsible for such losses. This in turn would help in developing proper measure to reduce post-harvest losses at different stages of production point to consumption point. Under these circumstances, the reduction in post-harvest losses can help in increasing the availability of vegetables to a great extent without increasing the production. In the absence of reliable and objective estimates of post-harvest losses at different stages, the way to evolve correct policies for minimizing such losses is more difficult.

OBJECTIVES

1. To workout post-harvest losses of Cauliflower at various stages.
2. To identify the constraints in post-harvest losses of Cauliflower.

METHODOLOGY

The present study had been undertaken with aim to study post-harvest losses of cauliflower in Nagpur district. It deals with methodology adopted for study viz. Selection of sample, collection of data, analysis and interpretation of data.

Selection of Area

The present study had been undertaken in Nagpur district of Vidarbha region. The district was selected purposely, wherein production of Cauliflower was concentrated. The data was pertained to the year 2018-19 for kharif season only.

Selection of Sample

From Nagpur district, four Tehsils were selected where the production of Cauliflower raised. From each Tehsil, four villages were selected randomly, hence total sixteen villages were selected. The five farmers from each village were selected randomly, producing cauliflower. Therefore, total 80 farmers from 16 villages were selected for present study. The five commission agents, five wholesalers from APMC Nagpur as well as five retailers who marketed the cauliflower in different markets were selected, to assess the marketing losses during marketing of the cauliflower.

Source of data

i. Primary data

The primary data were collected from selected farmers by personal interview method by preparation of schedule and it was tested by asking the information from some selected farmers.

The collected information regarding, post-harvest losses faced by the farmers, constraints faced by farmer similarly the post-harvest losses occurred during the marketing of cauliflower. The data were collected from the year 2018-19.

ii. Selection of market intermediaries

All the major agencies involved in marketing of Cauliflower i.e. 5 commission agents, 5 wholesalers and 5 retailers were selected to study the marketing of Cauliflower.

Analysis of data

The collected data were tabulated, interpreted for the necessary results. The data were summarized with aid of statistical tools like average, percentage etc. to obtain meaningful results.

The collected data were analyzed, interpreted by simple tabular method using average, mean etc. on the following sub heads.

Post-harvest losses

The post-harvest losses had been analysed in the form of physical loss as well as monitor loss at different stages of marketing was calculated.

Post-harvest losses (ML) is expressed as follows:

$ML = \{L_F \times GP_F\} + \{L_W \times GP_W\} + \{L_R \times GP_R\}$

Where,

L_F is the physical loss of produce at field level

GP_F is the gross price received by the farmer

L_W is the physical loss during wholesaling

L_R is the physical loss during retailing

GP_W is the gross wholesale price

GP_R is the gross retail price

RESULTS AND DISCUSSIONS

Keeping in view the objectives of the study, the necessary data collected from different sources were analysed and interpreted. The results obtained are presented and discussed below.

Per hectare cost of cultivation of Cauliflower (Overall)

It is revealed from the Table 1. that, the per hectare cost of cultivation at cost 'A_2' was Rs 70350.07, cost 'B_1' was Rs. 72583.26 Whereas cost 'B_2' was Rs. 104037.27 and cost 'C_2' was Rs. 109077.87 whereas cost 'C_3' was Rs 119985.65 which indicate the 10 per cent as a managerial cost.

Table 1: Per hectare cost of cultivation of Cauliflower farmer

Particulars		**Unit/ha**	**Input**	**Cost per input (Rs.)**	**Total cost (Rs.)**	**Percentage To total cost**
Hired Human Labour	Male	DAYS	20.05	274.04	5494.50	4.57
	Female	DAYS	75.23	131.52	9894.26	8.24
	Total	DAYS	95.28	405.56	**15388.76**	12.82
Bullock Labour	Hired	DAYS	0.84	664.67	558.32	0.46
	Owned	DAYS	7.53	675.56	5086.96	4.23
	Total	DAYS	8.37	1340.23	**5645.28**	4.70
Machine Charges	Hired	HOURS	3.90	852.41	3224.39	2.68
Manure		TONS.	2.71	1055.88	2861.43	2.38
Fertilizer	N	Kg.	162.59	19.35	3146.11	2.62
	P	Kg.	128.53	34.10	4386.28	3.65
	K	Kg.	128.62	34.45	4430.95	3.69
	Total				**11963.34**	9.97
Seed	Cost	Kg/Rs.	0.667	11206.40	7474.66	6.22
Irrigation charges	Cost	RS.			555.83	0.46
Insecticide (Plant Protection)	Cost	RS.			17587.59	14.65
Incidental charges	Cost	RS.			130.06	0.10
Repairing charges	Cost	RS.			174.68	0.14
Working capital	Cost	RS.			65006.02	54.17
Int. on working capital @ 6%	Cost	RS.			3900.36	3.25
Depreciation		RS.			1322.16	1.10
Land Rev. cess& other taxes		RS.			121.53	0.10
COST A1		**RS.**			**70350.07**	58.63
Rent paid for leased land		RS.			0	0
COST A2		**RS.**			**70350.07**	58.63
Int. on Fix. Cap. @ 10 %/annum		RS.			2233.19	1.86
COST B1		**RS.**			**72583.26**	60.49
Rental value of land		RS.			31454.01	26.21
COST B2		**RS.**			**104037.27**	86.70
Family Human Labour	Male	DAYS	5.97	273.71	1634.04	1.36
	Female	DAYS	26.15	130.27	3406.56	2.83
	Total	DAYS	32.12	403.98	**5040.60**	4.20
COST C2					**109077.87**	90.90
10 % of Cost C2					**10907.78**	9.09
COST C3					**119985.65**	100.00
Yield Per hectare	Main	QTLS.	143.03	1324.57	189453.24	
Per qtl. Cost of main produce at Cost C3					**838.88**	

The major share of cost of cultivation goes towards cost 'A_2' (58.63 per cent). In cost 'A' share of fertilizer was 9.97 per cent, plant protection chemicals 14.65 per cent, hired human labour 12.82 per cent, manure 2.38 per cent, bullock labour 4.70 per cent and seed 6.22 per cent, machine hours 2.68 per cent, cost 'B_1' contributes to 60.49 per cent, cost 'B_2' contribute 86.70 per cent to the total cost i.e. cost 'C_3'.

The share of family labour was 4.20 per cent. Per hectare yield obtained by overall farmers was 143.03 quintal with gross returns of Rs. 189453.24. In case of overall size group, per quintal cost of production was Rs. 838.

Post-harvest losses in Cauliflower

Post-harvest losses may occur at any point in marketing process, from the initial harvest through assembling and distribution to the final consumer. During the process of distribution and marketing, substantial losses occurred which range from slight loss of quality to total spoilage.

i) Post-harvest losses in Cauliflower at farm level

The post-harvest losses occurred for overall farmers to final retailer were estimated and presented in Table 2.

Table 2: Post-harvest losses in Cauliflower at farm level.

Stages	Losses (q/ha)	Per cent Loss	Economic Loss (Rs.)	Losses (Kg./qt)	Per cent Loss	Economic Loss (Rs.)
A. Harvesting						
Pest & disease	2.74	17.81	3629.32	1.98	17.85	26.21
Physiological disorder	1.77	11.50	2344.48	1.28	11.54	16.94
Injury	2.85	18.53	3775.02	2.06	18.57	27.27
Over ripe	1.71	11.11	2265.01	1.24	11.18	16.41
Sub total	9.07	58.97	12013.85	6.56	59.15	86.85
B. Grading & Packing						
Sorting	1.76	11.44	2331.24	1.28	11.54	16.94
Packing	0.82	5.33	1086.14	0.59	5.32	7.81
Sub total	2.59	16.84	3430.63	1.87	16.86	24.75
C. Transportation						
Handling	0.59	3.83	781.49	0.43	3.87	5.69
Poor packing	0.46	2.99	609.30	0.33	2.97	4.36
Loading & unloading	1.77	11.50	2344.48	1.28	11.54	16.94
Sub total	2.83	18.40	3748.53	2.04	18.39	27.00
D. Self Marketing						
Over ripening	0.50	3.25	662.28	0.36	3.24	4.76
Other	0.36	2.34	476.84	0.26	2.34	3.44
Sub total	0.87	5.65	1152.37	0.62	5.59	8.20
Total	15.38	100.00	20371.89	11.09	100.00	146.83

Table 2. presents that the overall scenario of post-harvest losses at different stages was workout to be 11.09 kg/qt and per quintal corresponding monetary losses was Rs. 146.83/-

The maximum losses registered at harvesting (6.56 kg/qt) followed by transportation (2.04 kg/qt) grading and packing (1.87 kg/qt) and marketing (0.62 kg/qt).

ii)Post-harvest losses of Cauliflower at commission agent cum wholesaler and retailer level

The post-harvest losses occurred at wholesaler and retailer level were estimated and presented in Table 3.

Table 3: Post-harvest losses in Cauliflower at market level (Kg/q)

Stages	Physical Losses	Per cent Loss	Economic Losses (Rs.)
A. Losses at commission agent cum Wholesaler level			
Loading & unloading	1.56	12.89	64.27
Sorting & Grading	0.90	7.40	37.08
Storage	0.96	7.90	39.55
Transportation	1.46	12.01	60.15
Sub total	4.88	40.16	201.05
B. Losses at Retailer level			
Loading & unloading	2.49	20.49	102.58
Sorting & Grading	1.85	15.22	76.22
Storage	1.62	13.33	66.74
Transportation	1.31	10.78	53.97
Sub total	7.27	59.83	299.52
Total	12.15	100.00	500.58

It is revealed from the table that the total post-harvest losses cauliflower at market level was observed to be 12.15 kg/qt which causes per quintal economic loss of Rs. 500.58 /-.

The maximum losses occurred commission agent cum wholesaler level during loading & unloading, transportation, storage and sorting & grading *i.e.* 1.56, 1.46, 0.96 and 0.90 kg/qt respectively corresponding economic losses were Rs. 64.27 /-, Rs. 60.15 /-, Rs. 39.55 /-, and Rs. 37.08 /-. The per quintal economic losses was Rs. 201.05 /-

The total post-harvest losses occurred retailer level was 7.27 kg/qt, in which losses incurred by loading & unloading was maximum 2.49 kg/qt followed by sorting & grading, storage and transportation *i.e.* 1.85, 1.62, and 1.31 kg/qt respectively.

The per quintal economic losses were estimated be Rs. 76.22 /-, Rs. 66.74 /- and Rs. 53.97 /-. The per quintal total economic losses was Rs. 299.52/-.

Constraints in post-harvest losses of Cauliflower

In post-harvest losses of Cauliflower, farmers faced number of constraints which were identified and given in table 4.

Table 4: Constraints in post-harvest losses of Cauliflower

Sr. No.	Constraints	No. of farmers (n=80)	Percentage of total farmers	Rank
1	Daily fluctuation of crop prices	75	93.75	II
2	Burden of transportation cost	78	97.50	I
3	Losses during transportation and handling	50	62.50	V
4	Intermediaries charges the very high commission	55	68.75	IV
6	Irresponsibility during loading and unloading	67	83.75	III

It was revealed that, burden of transportation cost was the major problem expressed by 78 farmers (97.50 per cent) followed by daily fluctuation of crop prices which was expressed by 75 farmers (93.75 per cent) and improper and irresponsibility during loading and unloading (83.75 per cent), existence of number of intermediaries in marketing process (68.75 per cent) and losses during transportation and handling (62.50 per cent).

CONCLUSIONS

The present study was undertaken to Post-harvest losses of cauliflower in Nagpur district, toworkout post-harvest losses of cauliflower and to identify constraints faced by post-harvest losses of cauliflower.

The overall scenario of post-harvest losses at different stages was workout to be 11.09 kg/qt and per quintal corresponding monetary losses was Rs. 146.83/-

The total post-harvest losses cauliflower at market level was observed to be 12.15 kg/qt which causes per quintal economic loss of Rs. 500.58 /-.

Most of the farmers burden of transportation cost was the major problem expressed by (97.50 per cent) followed by daily fluctuation of crop prices which was expressed by (93.75 per cent).

SUGGESTIONS

On the basis of present study, carefully handling during the transport of the cauliflower as well as loading and unloading during the marketing process by labour operated in the market has to be recommended daily fluctuation of cauliflower prices has to be reduced down by government intervention in the market. The selling of cauliflower in the market by the cultivator directly to the consumer is found more beneficial to the cultivators, similarly nonexistence of intermediaries during the marketing process will also be reduced the commission charges. By considering all these suggestions the losses will be supposed to reduced in the cauliflower so that the farmer will be encouraged to cultivate the cauliflower in their field and will earn maximum profit.

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Economics of Production and Marketing of Dragon Fruit in Western Maharashtra

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ABSTRACT

Dragon fruit is very strange looking fruit. The dragon fruit is also known as a pitahaya or pitaya in Mexico. In Central America and northern South America it popular as pitaya Roja. Dragon fruit plant sowing is excellent in the less expected rainfall areas. The tropical weather conditions are better for the dragon fruit cultivation. Cultivator can use the shading method for protecting the dragon fruit crop from the high sunlight. The dragon fruit plant gets the flowering in May to June month and fruits from Aug to Dec month. After one year of planting Dragon fruit plant start bearing the fruits. After one month of flowering stage, dragon fruits are ready for harvest. The immature dragon fruit has a bright green color skin. In this contest, the present research on "Economic of Production and Marketing of Dragon Fruit in Western Maharashtra" has been undertaken with objectives, to estimate the establishment cost in dragon fruit production, to study the costs and returns in dragon fruit production, to study the marketing of dragon fruit and to study the problems of dragon fruit production. Total 30 dragon fruit growers were selected form Pune and Solapur district. Data was pertaining to year the 2019-2020. Per hectare average costs of establishment of dragon fruit orchard was Rs.8,04,027. The major cost incurred on cement pole and cement plate used as supporting framework to dragon fruit plant, and it shared about 66 cent in the total cost. Per hectare resource use levels of total human labour was 197.53 man days comprising of 110.20 male labour and 87.33 female labour days. The per hectare bullock labour utilization was 0.60 pair days. In the case of machine power viz; tractor, spray pump and electric motor, it was observed to be 12.20 hrs, 17.67 hrs and 435 hrs, respectively. In the total cost of cultivation, the Cost A was Rs.78404.95 (24.71 per cent) and Cost B Rs.293917.45 (92.65 per cent). The per quintal cost of dragon fruit cultivation worked out to Rs.2639.96. B:C ratio in dragon fruit production was 3.13, which indicate that dragon fruit cultivation is highly profitable crop. Per quintal marketing cost incurred was Rs. 292.40. The major items in marketing cost were commission charges (48.15 %) followed by transportation charges (29.17 %), packaging charges (7.46%) and loading and unloading charges. The problems identified in production and marketing of dragon fruit are dragon fruit crop requires high initial investment cost for establishment of orchard, no any bank has started disbursement of loan for cultivation of dragon fruit crop as scale of finance for this crop is not done, government has not provided any subsidy for dragon fruit as like other fruit crops and technology was not developed for processing of dragon fruit.

Keywords: *Dragon fruit , cost of cultivation , production and marketing*

INTRODUCTION

Dragon fruit is very strange looking fruit. The dragon fruit is also known as a pitahaya or pitaya in Mexico. In Central America and northern South America it popular as pitaya Roja. Dragon fruit plant sowing is excellent in the less expected rainfall areas. The tropical weather conditions are better for the dragon fruit cultivation. Dragon fruit pant requires 50 cm annual rainfall and 20 °C to 30 °C temperature. The high sunlight is not convivial for the dragon fruit crop. Cultivator can use the shading method for protecting the dragon fruit crop from the high sunlight. The sandy soil is better for the dragon fruit cultivation. It requires pH of soil in between 5.5 to 7. Before plantation applies any organic compost on the soil in proportional ratio. There are many irrigation systems are available in latest technology like drip irrigation, sprinkler irrigation, micro jet, and basin irrigation but dragon fruit plant requires less water compared to other fruit farming. So, drip irrigation method is effective and better irrigation system for dragon fruit plants. The irrigation requires frequently in a different stage of dragon fruit farming like planting, flowering and fruit development stage. The dragon fruit plant gets the flowering in May to June month and fruits from Aug to Dec month. After one year of planting Dragon fruit plant start bearing the fruits. After one month of flowering stage, dragon fruits are ready for harvest. The immature dragon fruit has a bright green color skin. After some day fruit skin turns in red color from dark green. The better harvesting time for dragon fruit is 3 to 4 days after fruit change its skin color. In this contest, the present research on "Economic of Production and Marketing of Dragon Fruit in Western Maharashtra" has been undertaken with following specific objectives.

Objectives

To estimate the establishment cost in dragon fruit production

- To study the costs and returns in dragon fruit production
- To study the marketing of dragon fruit
- To study the problems of dragon fruit production
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METHODOLOGY

The list of dragon fruit growers was obtained from Department of Agriculture, Government of Maharashtra. Pune and Solapur districts were purposively selected as area under dragon fruit is more in these districts. Baramati and Indapur tahasils were selected from Pune district and Malshiras tahsil of Solapur district was selected. Total 30 dragon fruit growers were selected by using the probability proportion to sample size technique form Pune and Solapur district. Data was pertaining to year the 2019-2020. Standard cost concepts i. e. cost 'A', 'B', 'C' and tabular method was used for data analysis.

Table 1 Sample size of dragon fruit growers in Western Maharashtra

Sr.No.	District	Tahasil	Village	No.of farmers
1	Pune	Baramati	Malegaon Bk.	6
			Malegaon Kh.	6
2		Indapur	Pimple	4
			Madanwadi	4
			Lakadi	4
3	Solapur	Malshiras	Piliv	6
	Total			30

RESULTS AND DISCUSSION

Cropping pattern of sample farms

The cropping pattern of sample dragon fruit growers for the year 2019-20 is presented in Table 2.

Table 2 Cropping pattern of sample farms

Sr.No.	Particulars	Area (ha.)	Percentage
1	Average size of holding	2.32	
2	Net cultivable area	1.92	100.00
a)	Irrigated area	1.62	84.38
b)	Un-irrigated area	0.30	15.62
3	Area under crops		
A)	Cereals	0.45	15.73
B)	Pulses	0.15	5.24
C)	Other crops	0.20	6.99
D)	Sugarcane	1.12	39.16
E)	Dragon fruit	0.62	21.68
F)	Pomegranate	0.17	5.94
G)	Other fruit crops	0.15	5.24
4	Gross cropped area	2.87	100.00
5	Intensity of cropping	148.96	

The per farm average size of holding was 2.32. The area under irrigation was 1.62 ha. with an average of 84.38 per cent of the net cultivable area. It was observed that area under sugarcane crop was major share (39.16 per cent) followed by dragon fruit 21.68 per cent, cereals 15.73 per cent. Cropping intensity of was 148.96 per cent indicates the efficient utilization of net cultivable land.

Establishment cost of dragon fruit

The establishment cost of dragon fruit was estimated and depicted in Table 3.

Table 3 Establishment cost for dragon fruit **(Rs./ha)**

Sr. No.	Particulars	Unit	Quantity	Value (Rs.)	Per cent
1	Land preparation			12500	1.55
2	Manures	qtls	110	16500	2.05
3	Seedlings	No.	4760	95200	11.84
4	Cement pole and plate	No.	1190	535500	66.60
5	Fencing			52850	6.57
6	Fertilizers			17870	2.22
7	Drip Irrigation structure			48000	5.97
8	Irrigation charges			5287	0.66
9	Inter culture charges			17670	2.20
10	Other charges			2650	0.33
11	Total			804027	100.00

The per hectare average costs of establishment of dragon fruit orchard was Rs.8,04,027. The major cost incurred on cement pole and cement plate used as supporting framework to

dragon fruit plant, and it shared about 66 cent in the total cost. The other items of cost included cost towards seedlings, fencing, and drip irrigation structure, fertilizers, inter culture operations and other related costs.

Resource use levels of Dragon fruit

Per hectare resource use levels of total human labour was 197.53 man days comprising of 110.20 male labour and 87.33 female labour days. The per hectare bullock labour utilization was 0.60pair days. In the case of machine power viz; tractor, spray pump and electric motor, it was observed to be 12.20 hrs, 17.67 hrs and 435 hrs, respectively.

Table 4 Resource use levels of dragon fruit

Sr. No.	Particulars	Unit	Quantity
1	Total Human labour	Man days	197.53
	a. Male	Man days	110.20
	b. Female	Man days	87.33
2	Bullock pair	Pair days	0.60
3	Machine Powar		
	Tractor	Hrs	12.20
	Spray pumps	Hrs	17.67
	Electric motor	Hrs	435
4	Manures	Qtls	80.95
5	Chemical Fertilizers		
	N	Kg	188.33
	P	Kg	110.65
	K	Kg	85.95

Cost of cultivation of dragon fruit

Per hectare cost of cultivation of dragon fruit i.e. Cost C was worked out to Rs.317244.35. Among the different items of cost, maximum expenses were incurred on rental value of land Rs.165233.75 (52.08 per cent) followed by human labour Rs.53485.10 (16.87 per cent), amortization cost Rs.32161.08 (10.14 per cent). The other important cost were interest on fixed capital Rs.18117.67 (5.71 per cent), manures Rs.12142.50 (3.83 per cent) and irrigation charges Rs.7751.70 (2.44 per cent).The cost incurred in respect of land revenue, plant protection charges and micronutrients were negligible in cost of cultivation. In the total cost of cultivation, the Cost A was Rs.78404.95 (24.71 per cent) and Cost B Rs.293917.45 (92.65 per cent). The per quintal cost of dragon fruit cultivation worked out to Rs.2639.96

Table 5 Cost of cultivation of dragon fruit **(Rs./ha)**

Sr. No.	Particulars	Unit	Quantity	Value (Rs.)	Per cent
1	Total Human labour	Man days	197.53		
	a. Male	Man days	44.20	13039	4.11
	b. Female	Man days	71.33	17119.2	5.40
2	Bullock pair	Pair days	0.60	480	0.15
3	Machine Powar	Hrs	29.87	5988	1.89
4	Manures	Qtls	80.95	12142.5	3.83
5	Chemical Fertilizers				0.00
	N	Kg	188.33	4849	0.00
	P	Kg	110.65		1.53
	K	Kg	85.95		0.00
6	Micronutrients			1560	0.49
7	Biofertilizers			1795	0.57
8	Irrigation charges			7751.7	2.44

9	Plant Protection charges			952.5	0.30
10	Incidental Charges			1349.65	0.43
11	Repairs			792.85	0.25
	Working Capital			67819.4	21.38
12	Interest of working Capital			4069.16	1.28
13	Depreciation			6365.79	2.01
14	Land revenue and taxes			150.6	0.05
	Cost A			78404.95	24.71
15	Rental value of land			165233.75	52.08
16	Interest of fixed capital			18117.67	5.71
17	Amortization cost			32161.08	10.14
	Cost B			293917.45	92.65
18	family labour	Man days			0.00
	a. Male	Man days	66.00	19470.7	6.14
	b. Female	Man days	16.00	3856.2	1.22
	Cost C			317244.35	100.00
19	Yield	qtls	120.17	991402.50	991402.50
20	Per quintal cost			2639.96	
21	B: C ratio			3.12	

Costs, returns and profitability

The per hectare costs, returns and profitability of dragon fruit are presented in Table 6.

Table 6 Costs, returns and profitability of dragon fruit (Rs./ha)

Sr. No.	Particulars	Value (Rs.)
1	Cost Category	
	Cost 'A'	78404.95
	Cost ' B'	293917.45
	Cost 'C'	317244.35
2	Gross Income	991402.50
3	Profit at	
	Cost 'A'	912997.55
	Cost ' B'	697485.05
	Cost 'C'	674158.15
4	B:C ratio at	
	Cost 'A'	12.64
	Cost ' B'	3.37
	Cost 'C'	3.13

It is apparent from the Table 6 that per hectare gross income received from the production of dragon fruit was to Rs 991402.50. The per hectare net profit at Cost 'A' was Rs. 912997.55 in production of dragon fruit. Whereas, the profit at Cost 'B' was Rs. 697485.05. The per hectare total cost of cultivation of

dragon fruit i.e. Cost 'C' was to Rs.317244.35 and profit at Cost 'C' Rs.674158.15. B:C ratio in dragon fruit production was 3.13, which indicate that dragon fruit cultivation is highly profitable crop.

Disposal of Dragon fruit

Production and disposal of dragon fruit of sample cultivators has been worked out and presented in Table7

Table 7 Disposal pattern of dragon fruit on sample farms (Qtls/ha)

Sr. No.	Particulars	Quantity	Per cent
1	Total Production	120.17	100.00
2	Affected by pest, diseases and birds	0.57	0.47
3	Home consumption and gratis	0.62	0.52
4	Available for marketing	118.98	99.01

Total production of dragon fruit of sample farmers was 120.17 quintals, among that 0.47 per cent production was affected by pest, diseases and birds. Nearly 99 per cent of quantity of production is actually marketed. It as been observed that cent per cent sample farmers sold their produce to the traders in Pune and Mumbai market.

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Marketing cost of dragon fruit

It is revealed from table that the total marketing cost incurred was Rs. 292.40. The major items of cost were commission charges (48.15 %) followed by transportation charges (29.17 %), packaging charges (7.46%) and loading and unloading charges

Table 8 Per quintal marketing cost of dragon fruit (Rs.)

Sr. No.	Particulars	Amount	Per cent
1	Grading charges	8.20	2.80
2	Packaging charges	21.80	7.46
3	Commission	140.80	48.15
4	Transportation	85.30	29.17
5	Loading and unloading charges	18.80	6.43
6	Weighing	3.20	1.09
7	Market fee	14.30	4.89
8	Total	292.40	100.00

Problems in production and marketing of dragon fruits

The problems identified in production and marketing of dragon fruit of the sample farmers are as follows.

1. The dragon fruit crop requires high initial investment cost for establishment of orchard. No any bank or financial institute has started disbursement of loan for cultivation of dragon fruit crop as scale of finance for this crop is not done.
2. Government has not provided any subsidy for dragon fruit as like other fruit crops.
3. There were attack birds on mature dragon fruits.
4. It is need for development of technology for complete package of practices for cultivation of dragon fruit crop.
5. Market prices of dragon fruit were slashed down as import of this fruit from other countries viz; Vietnam, Mexico, etc.
6. Technology was not developed for processing of dragon fruit.

CONCLUSIONS

- The average costs of establishment of dragon fruit orchard was Rs.8,04,027 per hectare, which is higher side.

- The per hectare cost of cultivation of dragon fruit wasRs.317244.35.
- Per hectare gross income received from the production of dragon fruit was to Rs. 991402.50. and Net income was Rs. 674158.15
- The B:C ratio was 3.13, which indicate that dragon fruit cultivation is highly profitable crop.
- The 99 per cent of quantity of production is actually marketed as it is unawareness in local area and high price of fruit.
- The cent per cent sample farmers sold their produce to the traders in Pune and Mumbai market.

SUGGESTIONS

- It is necessary to involve dragon fruit for scale of finance.
- Government should provide subsidy for dragon fruit.
- Development of technology for complete package of practices

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