



## Investigate the socio-economic status of growers and determinants of mango yield in Lucknow district of Uttar Pradesh

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### ABSTRACT

The present study was conducted in Lucknow district of Uttar Pradesh during 2016-17 to know the socio-economic status of mango growers in investigate the determinants influencing the mango yield. The study area was selected purposively in order to maximum production and area under mango orcharding. The primary information collected from 200 mango growers through simple random sampling technique. A pre-tested questionnaire, semi-structured interview schedule and open discussion method were used for data collection. In order to achieve the objectives of study, descriptive analysis and multiple regression function was used as analytical tools. The results of study revealed that about 90 per cent marginal and small farmers have been engaged in mango orcharding as source of income and food security. Most of the mango growing farmers were in the old age group (above 50 years) and studied up to intermediate level. The aggregate annual income earned by mango growing farmers was Rs. 1.55 lakhs, which ranged from Rs. 0.50 lakh in case of marginal farmers and Rs. 4.5 to 6.0 lakhs in case of medium category farmers. Most of the determinants studied were found positively contributing towards higher mango yield. However, effects of fertilizer and plant protection chemical, number of bearing trees, labour engagement, planting density and age of orchard were highly significant. Horticulture institutes and state agriculture department should emphasize to train farmers and disseminate improved production technologies and proper use of farm inputs towards the greater yield.

**Keywords:** Determinants, regression coefficient, yield, food security, income and employment, foreign exchange.

India is an ancient home of mango production because it is blessed with a wide variety of soil and climatic conditions, high nutritive value, richness in variety, delicious taste and excellent flavour. Traditionally, it has potentiality to earn foreign exchange, while at the same time acting as a source of food security and household income (Singh and Nandi, 2018). Farmers have used to get considerable income that plays an important role in poverty reduction by providing additional employment opportunity near about two million people annually (MOA, 2004-2014). Today, India has become the world's largest producer with an annual production of about 19.68 million tonnes which accounts for more than one-third of the total world production (FAOSTAT, 2016). The country is also prominent exporter of fresh mangoes to the world with exported 46,510,27 MT valued at Rs. 406.50 crores during 2018-19 (DGCI&S, 2018) and 49,658.68 MT of fresh mangoes to the world for the worth of Rs. 400.21 crores during the year 2019-20. (APEDA, 2019). Apart from food security, employment generation and income to the farmers, mangoes contributing significant role in Indian exchequer by earning foreign exchange.

### Area of mango cultivation and production

The cultivation of mango is low input intensive as compared to food grain that means fewer requirements of resources (Singh and Nandi, 2020) and it is more profitable venture for resource-poor farmers that used to get considerable income and create employments for both male and female especially in rural areas through cultivation, processing and marketing. Mango has cultivated in largest area *i.e.* 2263 thousand hectare which is 34.92 per cent of total area under the fruit crop production. The total production of mango in India was 19687 thousand MT (IHD 2016-17) which is 21.20 per cent of total fruit production with productivity 8.7 MT ha<sup>-1</sup>.

In India, Uttar Pradesh is the leading state in mango production having 250.73 thousand hectare (14.72 per cent) area under mango cultivation and 4347.50 thousand MT (23.06 per cent) of the total production of mango. The productivity of mango was also recorded highest in Uttar Pradesh (17.1MT ha<sup>-1</sup>) during 2016-17 which is also much higher than the national productivity (8.7MT ha<sup>-1</sup>). In Uttar Pradesh, The highest production of mango has been reported from Lucknow district followed by neighboring districts like Lucknow, Saharanpur, Unnao, Bulandshahr, Amroha, Sitapur,

Ayodhya, Sultanpur, Meerut, Bijnor, Muzaffarnagar, Hardoi etc.

### **Mangoes of Lucknow district**

The major mango producing areas in Lucknow are Malihabad, Mal, Kakori and Bakshi ka Talab. The varieties like Dashehari, Lucknow Safeda, Mallika, Amrapali, Fazli Chausa, Langra, Bombay Green and Ramkela have been commercially grown in Lucknow district. Mango season is started with local varieties from the last week of May and that continues up to the first week of August. The mango varieties like Totapari, Banganapalli, Alphonso and Suvarnrekha have been imported from other states and available in local markets of Lucknow. Dashehari, Langra, Lucknow Safeda, Chausa varieties are exported to other states from Lucknow. The major mango cultivation and marketing problems in the district are shattering of flowers and premature fruit dropping, severe infestation incidence of pest and diseases, alternate and irregular bearing and growers fetch low remunerative price. Major sources for planting materials of mango in Lucknow are ICAR-CISH Rehmankhara, Rajkiya Santati Udyan-Malihabad, local nurseries of Malihabad and Mall.

As per existing data from 2014 to 2015, Lucknow shows an increasing trend in mango production as 524.59 thousand tons in 2014 and 563.78 thousand tons in 2015. Therefore, considering the importance of mango crop in Lucknow district, Uttar Pradesh, it is worthwhile to investigate socio-economic status of growers and determinants of mango and to suggest measures for optimal returns of mango growers and recommendations for towards the increasing yield of mangoes. The research study was conducted with the following objectives:

1. To estimate the socio-economic status of mango growers in the study area.
2. To investigate the determinants influencing the mango yield.

### **MATERIALS AND METHODS**

The present study has been carried out in Lucknow district of Uttar Pradesh during 2016-17. In order to collect data with regard to the objectives planned for the research study, questionnaire and schedule were developed. Lucknow district was selected purposively to conduct present study because it is having highest area and production of mango in Uttar Pradesh and all over India. Lucknow, legislative and administrative capital of Uttar Pradesh is situated at 26.50° North and 80.50° East and 123 meters above sea level. It has almost uniformed tropical climate, it covers 2528Km<sup>2</sup> geographical area and 214.39 thousand hectare total

cropped area. It has four Tehsils consisting with eight community development blocks, namely Malihabad, Bakshi ka Talab (BKT), Chinhat, Gosaiganj, Mohanlaganj, Sarojani Nagar, Mal and Kakori. Among these eight blocks, two blocks *i.e.* Malihabad, Bakshi ka Talab have been selected purposively based on mango production and highest area under mango orchards.

The list of mango growers has been prepared separately for each corresponding village and consequently, the 100 growers and 10 sample villages have been selected from each selected blocks (pooling which made 200 mango growers and 20 sample villages) through simple random sampling of without replacement technique on the basis of total area devoted under mango cultivation. A pre-tested questionnaire, semi-structured interview schedule and open discussion method were used for data collection. To achieve the objectives of the study, the data collected from mango growers have been scrutinized, tabulated and analyzed by employing various analytical tools. Descriptive analysis has been applied to assess the socio-economic status of the growers. The multiple regression function [Equation (1)] has been fitted to investigate the determinants of mango yield in the study area. The following form of regression function is postulated as

$$Y = \hat{a}_0 + \hat{a}_1 X_1 + \hat{a}_2 X_2 + \hat{a}_3 X_3 + \hat{a}_4 X_4 + \hat{a}_5 X_5 + \hat{a}_6 X_6 + \hat{a}_7 X_7 + \hat{a}_8 X_8 + U_i$$

where,

- Y = Yield of mango (Quintal ha<sup>-1</sup>)
  - X<sub>1</sub> = Experience in mango farming (Year)
  - X<sub>2</sub> = Planting material (Cutting =1 Seedling=0)
  - X<sub>3</sub> = Age of orchard (Year)
  - X<sub>4</sub> = Planting density (No. of plant ha<sup>-1</sup>)
  - X<sub>5</sub> = Number of bearing trees in a orchard (Number)
  - X<sub>6</sub> = Number of labour engagement (No. ha<sup>-1</sup>)
  - X<sub>7</sub> = Application of fertilizer and plant protection chemical (Kg ha<sup>-1</sup>)
  - X<sub>8</sub> = Share of orchard income in total farm income (per cent)
- $\hat{a}_0, \hat{a}_1, \hat{a}_2, \hat{a}_3, \hat{a}_4, \hat{a}_5, \hat{a}_6, \hat{a}_7, \hat{a}_8$  are unknown parameters (constants to be estimated from the data)
- U<sub>i</sub> = Vector of random disturbance term

### **RESULTS AND DISCUSSION**

Socio-economic status of farmers is a combined measurement of economic and social position of an individual or a group in relation to others in the society. It has a profound role in determining one's accessibility to the common resources, livelihood pattern, standard of living, household food and nutritional security etc (Roy *et al.*, 2013). The analysis of socio-economic factors may furnish a base for further planning and

development of agriculture (Choudhary *et al.*, 2018). Socio-economic status of mango growers have been determined through various parameters, which have highlighted the production visage like age, education, gender, family size, religion, caste, occupation, orchard-holding size, farming experiences, family member engaged in mango farming and annual family income. The results of all these parameters have been presented in Table 1.

#### **Average area managed by growers under the mango production**

It is clear from Table 1 that the highest proportions of farmers belong to marginal category farmers (66.00%), followed by small (23.50%), semi-medium (8.50%) and medium category farmers (2.00%). The possible reason behind it is the per capita availability and size of agriculture land is decreasing and in another side the number of small and marginal agricultural land holding in the country has registered an increasing trend (10<sup>th</sup> Agriculture census, 2015-16).

#### **Age composition of mango growers**

The age group of the respondents has a keen relationship with their experience and performance of economic activities in the mango production. Usually the young, middle and the aged farmers are engaged in mango production. A perusal of Table 1 has clearly indicated that out of the 200 sample respondents, (47.00%) have been in the older age groups of above 50 years. The age group of years has been found to be relatively higher in the case of the medium category farmers (50.00%) in comparison to marginal farmers (48.48%), small farmers (44.68%) and semi-medium category farmers (41.18 %). It can be concluded that the majority of the farmers who are engaged in mango production attained the age above 50 years (47.00%) followed by middle age group (41.00%), young (12.00%). Singh *et al.* (2019) conducted the similar study in Haryana and revealed that majority of the farmers were middle aged group who generally possesses the risk taking attitude.

#### **Education-wise distribution of mango growers**

Education is important factor to the improvement of agricultural productivity, resources utilization and rural economy. The level education is a basic for the development of an individual, society and the nation as a whole (Choudhary *et al.*, 2018). The education status of mango growers has been classified into six different categories *i.e.* illiterate, primary, middle, secondary, higher secondary and college/varsity education (Table 1). A perusal of the table indicates that at overall level most of the mango growers were educated (85.50 per cent). The literacy level among the growers varied from 83.00 per cent in case of small farmers to 100 per cent semi-medium farmers.

The education was relatively low among the small category farmers. Among the literate farmers, at overall basis about 6.50 per cent farmers have attained college/varsity, 25.50 per cent higher secondary, 13 per cent secondary, 23 per cent middle level and 18.00 per cent primary level. The proportion of higher education (graduation and post-graduation) of the farmers across all six categories have been higher in case of semi-medium and medium farmers in comparison of small and marginal categories. The similar study was also conducted by Kumar *et al.* (2018) in Western Uttar Pradesh revealed that the maximum number of the respondents (47.50 per cent) were having the educational status up to high school, followed by respondents were educational status up to the junior high school, primary school, intermediate, graduation, post graduate and above.

#### **Gender composition and family size of mango growing farmers**

The gender prospective of the mango growers who have undergone in production shows that 98.50 per cent respondent have been male and 1.50 per cent have been female. The majority of female respondent belongs to semi-medium followed by marginal category. The family size of the farmers has persuaded the family and farm operations as the number of persons available for carrying out the work and the mutual sharing of the workload by the members is possible. The Table 1 has given the details about the family size of the marginal, small, semi medium and medium category farmers. It has shown that 63 per cent of the respondents have family size more than seven members and left over 37 per cent of the sample farmers have a family size that is between five and seven members of their families.

#### **Religion and caste wise distribution of mango growers**

From Table 1, out of the 200 respondents, more than half of the farmers (62.50%) were belonged to the Hindu religions, 34.50% of the sample farmers were Muslims, the Sikh and Christians who are engaged in mango production have formed only 1.50%. The implication is that a very large number of the mango cultivators of the study area are belonged to the Hindu religion. The majority of the mango growers about more than one-third (46.50%) belonged to other backward classes (OBC), followed by schedule caste (32.50%) and the general category constituted about 21 per cent. The similar findings were also reported by Shakuntala and Chaman, (2000) and Kumar *et al.* (2018). They reported that the out of the total sample size, maximum 52.50 per cent respondents have been belonged to other backward class.

**Table 1: Socio-economic status of mango growers (N=200)**

Sl. No.	Particulars	Average area under mango production (Hectare)				
		Marginal (0.59)	Small (1.33)	Semi-medium (2.72)	Medium (4.85)	Overall (1.03)
1.	<b>Farmer/Grower (Number)</b>	132(66.00)	47(23.50)	17(8.50)	4(2.00)	200(100.00)
2.	<b>Age composition of mango grower (Year)</b>					
	Young ( 18 to 35)	17 (12.88)	5 (8.51)	2(11.76)	0(0.00)	24(12.00)
	Middle (35 to 50)	51(38.64)	21(44.68)	8(47.06)	2(50.00)	82(41.00)
	Old (above 50)	64(48.48)	21(44.68)	7(41.18)	2(50.00)	94(47.00)
3.	<b>Education (Number)</b>					
	Illiterate	20(15.15)	8(17.02)	1(5.88)	0(0.00)	29(14.50)
	Primary (0-5 standard)	26(19.70)	5(10.64)	4(23.53)	1(25.00)	36(18.00)
	Middle (Up to 5-8 standard)	33(25.00)	10(21.28)	3(17.65)	0(0.00)	46(23.00)
	Secondary (Up to 10 standards)	16(12.12)	8(17.02)	1(5.88)	1(25.00)	26(13.00)
	Higher secondary (Up to 12 standard)	32(24.24)	12(25.53)	5(29.41)	1(25.00)	50(25.50)
	College/varsity education	5 (3.79)	4(8.51)	3(17.65)	1(25.00)	13(6.50)
4.	<b>Gender (Number)</b>					
	Male	130(98.48)	47(100.00)	16(94.12)	4(100.00)	197(98.50)
	Female	2 (1.52)	0(0.00)	1(5.88)	0(0.00)	3(1.50)
5.	<b>Family- size (Number)</b>					
	Medium (5-7 member)	56 (42.42)	12(25.53)	6(35.29)	0(0.00)	74(37.00)
	Large (> 7 members)	76 (57.58)	35(74.47)	11(64.71)	4(100.00)	126(63.00)
6.	<b>Religious composition (Number)</b>					
	Hindu	77(58.33)	36(76.60)	11(64.71)	1(25.00)	125(62.50)
	Muslim	51(38.64)	11(23.40)	4(23.53)	3(75.00)	69(34.50)
	Sikh	1(0.76)	0(0.00)	2(11.76)	0(0.00)	3(1.50)
	Christian	3(2.27)	0(0.00)	0(0.00)	0(0.00)	3(1.50)
7.	<b>Caste composition (Social group)</b>					
	General	15(11.36)	18(38.30)	8(47.06)	1(25.00)	42(21.00)
	Other Backward Classes	72(54.55)	13(27.66)	5(29.41)	3(75.00)	93(46.50)
	Schedule Caste	45(34.09)	16(34.04)	4(23.53)	0(0.00)	65(32.50)
	Schedule Tribes	0(0.00)	0(0.00)	0(0.00)	0(0.00)	0(0.00)
8.	<b>Main occupation (Number)</b>					
	Agriculture	108(81.82)	43(91.49)	17(100.00)	4(100.00)	172(86.00)
	Animal husbandry	24(18.18)	4(8.51)	0(0.00)	0(0.00)	28(14.00)
9.	<b>Mango farming experience (Year)</b>					
	Low (<10)	16(12.12)	13(27.66)	3(17.65)	1(25.00)	33(16.50)
	Medium (10 to 40)	96(72.73)	29(40.43)	10(58.82)	2(50.00)	137(68.50)
	High(>40)	20(15.15)	5(10.64)	4(23.53)	1(25.00)	30(15.00)
10.	<b>Family member engaged in mango production</b>					
	Up to 2 members	4(3.03)	1(2.13)	1(5.88)	1 (25.00)	7(3.50)
	3 to 4 members	59(44.70)	20(42.55)	9(52.94)	2(50.00)	90(45.00)
	5 to 6 members	54(40.91)	21(44.68)	7(41.18)	1(25.00)	83(41.50)
	Above 6 members	15(11.36)	5(10.64)	0(0.00)	0(0.00)	20(10.00)
11.	<b>Annual family income (INR)</b>	50K-1.5L	1.5L-2.5L	2.5L-3.5L	3.5L-6L	1.5L-1.6L

Note: \*Figures in the parentheses indicate percentage of the total

#### Major occupation wise distribution of mango growers

The sample farmers were engaged in the cultivation practices along with their other various activities such as carrying on business, employed in government jobs

and the like. Hence, their occupation has been consisted of both main and subsidiary activities. Table 1 has presented the occupational details about the farmer's activities. Generally, the sample farmers were engaged in two major activities one is agriculture and another is

animal husbandry. A perusal of the table indicates that more than three-fourths (86.00%) of mango growers have perceived the agriculture as their main and per dominating occupation, whereas only 14.00% have been doing the agriculture as their secondary occupation as the main source of livelihood security. The semi-medium and medium category farmers have been found cent per cent income earned from agriculture as the main source. Almost 81.82 per cent of the marginal and 91.49 per cent of the small farmers have considered mango production as a primary source of income. The remaining 18.18 per cent of the marginal and 8.51 per cent of the small farmers have measured mango cultivation as their secondary occupation.

#### **Farmers having experience of mango farming**

The Table 1 also reveals that majority of the farmers (68.50 per cent) were having the mango farming experience between 10 to 40 years, 16.50 per cent farmers were having the mango farming experience less than 10 years, while 15 per cent farmers were having above 40 years experience of mango farming.

#### **Family member engaged in mango production**

The cultivation practices of both the hired labourers as well as the family members are more vital in mango production. The number of family members is an important factor for contributing towards greater production and productivity in the field of agriculture as also in mango cultivation. The Table 1 has shown details about the number of the family members who have engaged in the mango production. It is understood that 3.50%, of the sample farmers *i.e.* 7 families were involved a maximum number of only 2 members from their families. The involvement in the production of mango by 3 to 4 members of their family has constituted nearly 45.00%, 83 families of 5 to 6 members working in their field were found to constitute nearly (41.50 %) and more than six members of a family have been engaged in mango cultivation constitute only 10 per cent, of the families.

#### **Distribution of mango growers based on annual family income**

The annual family income of the responder is directly correlated with the standard of living and adoption of the level of production technology. The average annual income received by mango growers from all sources could be observed from Table 1. The average annual family income earned by mango growing farmers was Rs. 1.55 lakhs per farm at aggregate level, which ranged from Rs. 0.50 lakh in case of marginal farmers, Rs. 1.5 to 2.5 lakhs in case of small farmers, Rs. 2.5 to 3.5 lakhs in case of semi-medium farmers and Rs. 4.5 to 6.0 lakhs in case of medium category farmers.

#### **Determinants influencing the mango yield**

Despite of India is top global producer and prominent exporter of fresh mangoes, the average yield per hectare is one of the lowest in world even behind countries like Brazil, Pakistan and Bangladesh (Singh and Nandi 2018). This may be due to numbers of determinants such as experience in mango farming, planting material, age of orchard, planting density, number of bearing trees in an orchard, labour engagement, application of fertilizer and plant protection chemical and share of orchard income in total farm income or of dependency of farmers' income. These determinants could influence the mango yield. The influences of all determinants studied and estimated through multiple regression model were explained in research methodology. The results of multiple regression model is presented in Table 2. The coefficient of multiple determinants  $R^2$  was 0.9415, which indicated that 94.15 per cent variation in mango production have been explained by all independent variables and adjusted  $R^2$  was 94.13% which can be regarded as quite a good fit. The F-value was 7956.83 and highly significant at 5% level of significance, implies that the multiple regression model was well fitted in view of primary data involved in this study.

The regression coefficients of planting material was negative (-1.141) and it was highly significant at 1% level of significance. It implies that one per cent decrease in the number of mango trees developed in a orchard through cutting or grafting the yield would be declined by 1.14%, keeping the all other determinant constant. It is concluded that the grafted mango trees are best performed toward the higher yield. The coefficient of mango orchard age was positive (0.022) at 5 % level of significance, which indicated that one year increase in the age of orchard the yield would be increase by 2.2 per cent. The regression coefficient of number of bearing trees in an orchard was positive (0.124) and highly significant at 1% level of significance, it indicated that 1 per cent increase the number of bearing trees in an orchard, the mango yield would be increased by 12.4 per cent.

The coefficient of labour engagement and application of fertilizer and plant protection chemical were positive (0.036 and 0.158) and significant at 1% level of significance, which implied that one unit increase in labour engagement in orchard management practices and 1 Kg increase in NPK fertilizer and plant protection chemical application would be increase the yield by 3.6% and 15.8%. This finding is supports the view expressed by Lantican and Bathan (2009) was reported that the fertilizer, labour and chemicals application significantly and positively influenced the yield performance of mango. This implies that a 10% increase in all these inputs would result in yield improvement of mango by 6.8%.

All other determinants such as experience of farmers in mango farming, planting density and share of orchard income in total farm income of farmer were statistically non significant and considered to be not influencing the mango yield. The positive coefficients of variables like application of fertilizer and plant protection chemical, number of bearing trees in an orchard, labour engagement, planting density and age of orchard,

indicate that the greater the values of these variables contributing towards higher mango yield. The coefficients of fertilizer and plant protection chemical points out that additional use of these variables can further enhance yield of mango if and only if these variables will be used according to the recommendation given by expert.

**Table 2: Estimated value of coefficients and their level of significance of determinants influencing the mango yield**

Variables	Coefficients	Standard error	t Stat	P-value	95% confidence interval	
					Lower 95%	Upper 95%
Intercept	1.911	0.701	2.725	0.007	0.528	3.294
X1	-0.019	0.012	-1.537	0.126	-0.043	0.005
X2	-1.141***	0.218	-5.233	0.000	-1.571	-0.711
X3	0.022**	0.011	1.960	0.051	0.000	0.044
X4	0.023	0.015	1.543	0.124	-0.007	0.053
X5	0.124***	0.015	8.074	0.000	0.094	0.155
X6	0.036***	0.012	3.070	0.002	0.000	0.086
X7	0.000	0.000	-0.188	0.851	0.000	0.000
X8	0.158***	0.059	2.665	0.008	0.275	0.041
R-Square = 0.9415, Adjusted R-Square = 0.9413			F value =7956.83, df = 8			

Note: \* significant at 10%, \*\* significant at 5%, \*\*\* significant at 1% level of probability

## CONCLUSION

In the study area, about 90 per cent marginal and small farmers have been engaged in mango orcharding as source of income and food security. The majority of the mango growing farmers was in the old age group (above 50 years) and studied up to intermediate level. The aggregate income earned by mango growing farmers was Rs. 1.55 lakhs, which ranged from Rs. 0.50 lakh in case of marginal farmers and Rs. 4.5 to 6.0 lakhs in case of medium category farmers. Most of the determinants studied were found positively contributing towards higher mango yield. However, effects of fertilizer and plant protection chemical, number of bearing trees, labour engagement, planting density and age of orchard were highly significant. Horticulture institutes should emphasize to train the farmers and dissemination of improved production technologies, implementation of schemes that enhance the mango yield through proper farm inputs and cultural practices.

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