



Economics of Mango Production, Marketing System and Constraints Faced by Growers in Lucknow District of Uttar Pradesh

Shyam Prakash Singh, A.K. Nandi¹

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ABSTRACT

Background: Mango is an important commercially grown fruit crop and it is very popular due to its wide range of adaptability and high nutritive value. The present study was conducted in Lucknow district of Uttar Pradesh to know the economics of mango production, marketing system and constraints faced by growers in production and marketing.

Methods: The study was based on primary data collected from 200 respondents with the help of personal interview using a pre-tested questionnaire, semi-structured interview schedule and open discussion method. Estimate the cost and return of mango cultivation by using simple cost and return equation. The marketing system of mango involved market channels, margin, cost, price spread, producer share in consumer's rupee and marketing efficiency was worked out by tabular analysis. The Garrett's ranking technique was adopted to rank the constraints faced by the growers in production and marketing of mango.

Result: The total cost of mango cultivation was found Rs.23450.67/ha. Out of which, the variable cost was constituted Rs.18316.39/ha (78.11%) and fixed cost was Rs.5134.28/ha (21.89%). The net return over the cost of cultivation was found to be highest as Rs. 62811.59/ha at the 4th growing stage of orchard. It was observed that net price received by growers, per cent share in consumer's rupees and market efficiency was highest in channel-III followed by channel-II and I, where the numbers of marketing intermediaries were involved lesser. The market margin, cost and price spread were highest in channel-I followed by Channel-II and III. The channel-III was found to be most efficient and profitable for farmers in the study area. Among the production and marketing constraints faced by mango growers, the shattering of flowers and premature fruit drop were cited as the most serious constraints. While alternate and irregular bearing creates glut with excess production in one year and results in low production in the next year was reported as second major constraint. Usually, contractors were not paying money to the orchard owner in the lump sum amount and at the appropriate time. Thus, the second major constraint was delayed and irregular payments to producers.

Key words: Constraints, Cost and returns, Growers, Mango, Marketing system.

INTRODUCTION

It is one of the important commercially grown fruit crop due to its broad range of adaptability, high nutritive value, richness in variety, delicious taste and excellent flavour. Mangoes account for approximately half of all tropical fruits produced world worldwide. India is the largest mango producer, accounting for about half of the global mango production (Gopalakrishnan, 2013). The production of mango is low input intensive as compared to food grain that means fewer requirements of resources 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 (Singh and Nandi, 2020). At present, India is the world's largest producer and prominent exporter of mangoes. Despite of this, the productivity of mango in India is one of the lowest in the world-even behind countries like Bangladesh and Pakistan (Singh *et al.*, 2018). About less than five per cent of produced mangoes are processed and mango pulp is the main export product both in terms of volume and value (Gopalakrishnan, 2013).

In India, Uttar Pradesh ranks first in mango production with a share of 23.46% and productivity (10.65 Mt/ha)

Technology Dissemination, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow-226 015, Uttar Pradesh, India.

¹Department of Agricultural Economics, Faculty of Agriculture, BCKV, Mohanpur, Nadia-741 252, West Bengal, India.

Corresponding Author: Shyam Prakash Singh, Technology Dissemination, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow-226 015, Uttar Pradesh, India.

Email: shyamsingh7296@gmail.com

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reported by (Singh *et al.*, 2018). In Uttar Pradesh, Lucknow division is main mango growing belt contributing 28 per cent of total production. From 2010-2015 Lucknow shows an increasing trend in production of mango as 488 thousand tons in 2010 and 564 thousand tons in 2015 (Yadav *et al.*, 2018). From facts, mango is considered one of the important fruit crop. The present study is focus to examine the

economics of mango production, marketing system and constraints faced by growers during the production and marketing of mango in Lucknow district of Uttar Pradesh.

MATERIALS AND METHODS

The study is merely based on primary data were collected from sample farmers through the personal interview by survey method with the help of pretested structured schedules during 2017-18. Among the 75 districts of Uttar Pradesh, Lucknow district was selected purposively because it is contributed highest production of mango in the state during 2014-15. From the Lucknow, two blocks namely BKT and Malihabad were selected based on highest area and production of mango. Thus, a total of 100 farmers were selected from each block. Pooling which made 200 respondents that were interviewed to get information and to achieve the objectives of the study.

To measure the cost and return from mango cultivation by using simple equation as follows:

$$\text{Variable cost } VC_{ij} = \sum_{i=1}^n (X_{ij} P_{ij})$$

$$TC_{ij} = TVC_{ij} + TFC_{ij}$$

$$TVC_{ij} = VC_{ij} + IOC_{ij}$$

Where,

TC_{ij} = Total cost (Rs/ha)

TVC_{ij} = Total variable cost (Rs/ha)

TFC_{ij} = Total fixed cost (Rs/ha)

VC_{ij} = Variable cost (Rs/ha)

IOC_{ij} = Interest of working capital (Rs/ha)

X_{ij} = Quantity of inputs (Kg)

P_{ij} = Price of inputs (Rs/kg)

j = Number of crops (1,2,...,n)

i = Number of farmers (1,2,3,...,n)

Marketing system

In marketing system of mango, the major marketing channels involved were identified and analysed by tabular analysis Fig 1. Total marketing cost, margin and price spread incurred by the producer/seller and various intermediaries, market

efficiency and producer share in consumer's rupee were worked out using the following formula.

Price spread =

Price paid by the consumer- Net price received by farmer

Producer's share in consumer's rupee

Is the ratio of price received by the producer to the retail price paid by consumers. It is usually expressed in percentages. Mathematically,

$$PS = \frac{PF}{PC} \times 100$$

Where,

PS= Producer's share in consumer's rupee

PF= Price received by the producer

PC= Retail prices paid by the consumers

Marketing cost

Total marketing cost of mango=

Cost paid by the producer + Cost incurred by the middlemen

$$C = C_f + C_{m1} + C_{m2} + C_{m3} + \dots + C_{mi}$$

Where,

C= Total cost of marketing of mango.

C_f = Cost paid by the producer from the time the produce leaves till the sells it.

C_{mi} = Cost incurred by the i^{th} middlemen in the process of buying and selling the produce ($i=1,2,3,\dots, n$).

Market margin

It is refers to the difference between the price paid and received by a specific marketing agency, such as retailers or assemblers etc.

Market margin = Sale price per unit - (Purchase price per unit + Cost incurred on marketing)

Market efficiency

Is the ratio of the total value of mango marketed to the marketing cost. An increase in this ratio represents improved efficiency and vice-versa. The market efficiency was worked out with the help of market efficiency index, suggested by Shepherd (1972) and result has been presented in Table 5 and Fig 2.

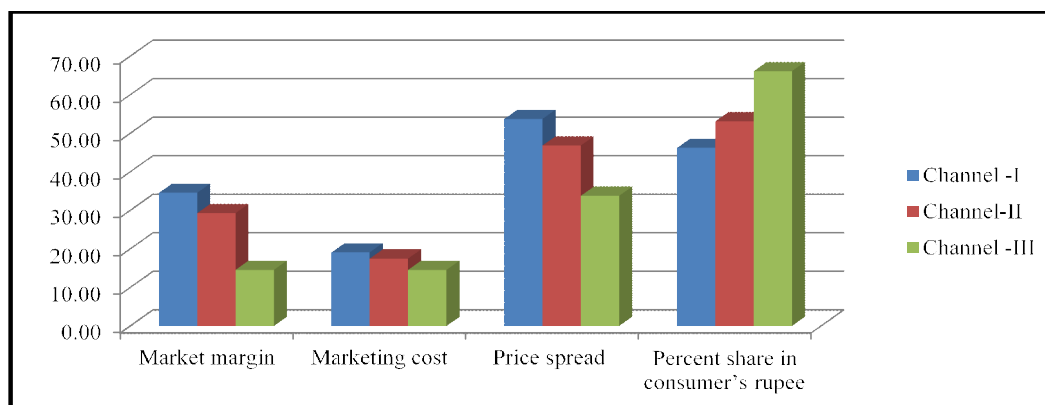


Fig 1: Market channel, margin, cost, price spread and producer share in consumer's rupee.

Garrett's ranking technique

The Garrett's ranking technique was adopted to rank the constraints faced by the growers during production and marketing of mangoes. The sample growers are being enquired for converting the qualitative information into quantitative form regarding the constraints faced by them. The ranks given for constraints by the farmers were changed into per cent position by using the following formula:

$$\text{Per cent position} = 100 \times (R_{ij} - 0.50) / N_j$$

Where,

R_{ij} = Rank given for i^{th} constraints by j^{th} individual growers,

N_j = Number of constraints ranked by j^{th} individual growers.

The per cent of rank for a single constraint are being added for all growers to priorities the overall (average) percent position. It is calculated by dividing sum of percent position for total sample for a constraint by the number of respondents. The average percent positions have converted into scores by referring to the transmutation table given by (Garrett's and Woodsworth, 1969). The ranks are finally assigned by arranging the scores in descending order.

RESULTS AND DISCUSSION

Cost and return structure

The total cost of mango cultivation were classified into three categories *i.e.* establishment and maintenance cost. The pre-bearing costs incurred in the establishment of mango upto gestation period (7 years) was estimated at the prevailing market prices and wage rate. The maintenance cost is the recurring cost which would be incurred after the establishment of the orchard normally from seventh year onwards for the up- keeping of the trees so that good yield can be obtained over the economic lifespan of the trees. The maintenance cost is comprised of the expenditure towards the use of labour and other material inputs along with fixed costs. The maintenance cost of orchards was further classified into fixed cost and variable costs, the summation of these two costs are called total costs. The operation and items under fixed cost has been considered accordingly, planting materials, gap filling, watch and ward, depreciation charge of farm building, machinery and

equipment, land revenue charge and interest on fixed capital invested by orchardist in their orchards.

On overall basis the average total cost was Rs. 23450.67/ha out of which average variable cost was Rs.18316.39/ ha (78.11%) and average fixed cost was Rs.5134.28/ha (21.89%). Among the fixed costs, the highest cost was constituted by watch and ward Rs.3142.46/ha (61.21%) pursued by interest on fixed capital Rs.1239.12 ha/ (24.13%), depreciation Rs.493.97/ha (9.62%). In the average variable cost, major cost share incurred by application of plant protection chemicals Rs.4282.54/ha (23.38%), fruit plucking Rs.4165.75/ha (22.74%), intercultural operations Rs.2659.28/ha (14.52%), plant nutrients Rs.2639.21/ha (14.41%), interest on working capital constitutes 13.00 percent (Table 1). However, the results can be summarized that mango orcharding requires more variable cost than the fixed cost. In variable cost, the highest cost being application of plant protection chemicals and harvesting of fruits. Among the fixed watch and ward of orchard and interest on fixed capital costs incurred maximum in the study area.

Mango being a perennial crop, its lifetime extends over a long period of time. At various stages, cost of production and net return was estimated through the cost and return figures. The age group of the mango orchard was classified into six different stages according to ten year class interval in order to equal frequency distribution. Among all six stages of mango orchard, first stage considerate as establishment phase or gestation phase and the remaining five stages are considerate as productive or economic phase. Upon the 7th year, the establishment phase of the orchard involves cost and no yield takes place.

The growing stages-wise per hectare total cost and returns of mango orchard have been calculated and furnished in the (Table 2). It was observed that establishment cost of mango orchard accounted to be Rs. 16784.83/ha. The second stage of orchard considered as an initial bearing stage, in this stage the average cost increased and continue up to the fourth stage of orchard. In the fifth stage, total cost declined even less than the cost of establishment. The eventually (6th) stage, total cost was increased and considered as higher. The gross return of mango orchard

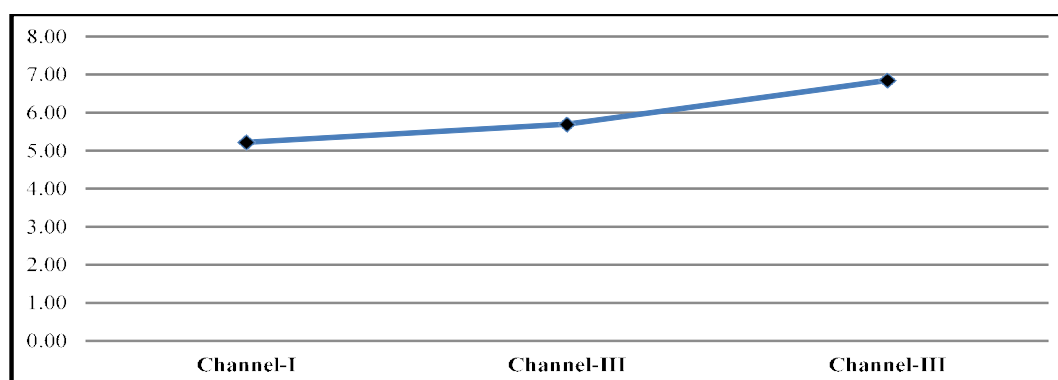


Fig 2: Marketing efficiency index.

Table 1: Operation-wise undiscounted cost structure of mango production in different stages.

Operation's	Growing stages of mango orchard's						Overall
	Up to 7	8-17	18-27	28-37	38-47	>47	
	(Stage-I)	(Stage-II)	(Stage-III)	(Stage-IV)	(Stage-V)	(Stage-VI)	
A. Fixed cost							
Seedling/planting materials	2250.52 (20.44)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	10.94 (0.21)
Gape filling or replanting	965.48 (8.77)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	4.69 (0.09)
Watch and ward	5865.21 (53.27)	2781.56 (59.36)	3700.22 (62.92)	4399.63 (65.54)	1832.93 (52.44)	7190.53 (75.80)	3142.46 (61.21)
Depreciation of farm building, machinery and eqpt.	466.00 (4.23)	486.62 (10.38)	576.68 (9.81)	515.33 (7.68)	405.46 (11.60)	617.57 (6.51)	493.97 (9.62)
Land revenue or land tax	240.03 (2.18)	232.68 (4.97)	262.74 (4.47)	293.91 (4.38)	206.68 (5.91)	274.58 (2.89)	243.10 (4.73)
Interest on fixed capital @ 10%	1223.19 (11.11)	1185.05 (25.29)	1341.31 (22.81)	1504.13 (22.41)	1050.49 (30.05)	1403.07 (14.79)	1239.12 (24.13)
Sub-total	11010.43 (65.60)	4685.91 (21.67)	5880.95 (22.30)	6713.00 (22.15)	3495.56 (21.97)	9485.75 (20.95)	5134.28 (21.89)
B. Variable cost							
Digging, filling and planting/staking	380.60 (6.59)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	1.85 (0.01)
Intercultural operations (tillage, mulching, weeding, training and pruning)	1992.25 (34.50)	2296.90 (13.56)	2694.27 (13.15)	3459.10 (14.66)	1930.60 (15.55)	4248.54 (11.87)	2659.28 (14.52)
Irrigation charges and water source dev.	940.92 (16.29)	1265.77 (7.47)	1504.97 (7.35)	1587.14 (6.73)	983.00 (7.92)	1479.83 (4.13)	1265.23 (6.91)
Fencing/hedging	460.86 (7.98)	774.35 (4.57)	998.41 (4.87)	1228.56 (5.21)	593.28 (4.78)	1529.43 (4.27)	923.28 (5.04)
Manures and fertilizers application	748.89 (12.97)	2494.31 (14.73)	3426.11 (16.72)	3850.28 (16.32)	1190.48 (9.59)	5326.88 (14.88)	2639.21 (14.41)
Application of plant protection chemicals	824.70 (14.28)	3955.53 (23.35)	4077.71 (19.91)	5719.57 (24.24)	2703.37 (21.77)	10214.44 (28.54)	4282.54 (23.38)
Fruit plucking/harvesting	0.00 (0.00)	3680.50 (21.73)	4550.58 (22.21)	4860.65 (20.60)	2680.82 (21.59)	8250.78 (23.05)	4165.75 (22.74)
Interest on working capital @6.5%	426.18 (7.38)	2470.10 (14.58)	3233.21 (15.78)	2886.47 (12.24)	2335.88 (18.81)	4740.45 (13.25)	2379.25 (12.99)
Sub-total	5774.40 (34.40)	16937.46 (78.33)	20485.26 (77.70)	23591.77 (77.85)	12417.43 (78.03)	35790.35 (79.05)	18316.39 (78.11)
Total cost (Fixed + Variable cost) or (A+B)	16784.83 (100.00)	21623.37 (100.00)	26366.21 (100.00)	30304.77 (100.00)	15912.99 (100.00)	45276.10 (100.00)	23450.67 (100.00)

Note:* Figures are the weighted averages and the figures in the parentheses indicate percentage of average total value.

Table 2: Growing stages-wise undiscounted cost and returns of mango orchard (Rs.ha⁻¹).

Stage of the orchard	Average TC/ha	Average GR/ ha	Net return (TC-GR)
Up to 07	16784.83	0.00	-16784.83
08-17	21623.37	68375.26	46751.89
18-27	26366.21	88581.69	62215.48
28-37	30304.77	93116.36	62811.59
38-47	15912.99	44221.97	28308.98
>47	45276.10	75335.77	30059.67
Overall	23450.67	59481.28	36030.61

increased continuously up to 4th stage, after that orchard enter in declining stage. Among the all productive stages of mango orchard, the lowest gross return was observed in the fifth stage of the orchard. After the end of this stage gross

return start to increase but less than the initial fruiting (second stage), third and fourth productive stage of the orchard.

The net return obtained the growers from mango orchard after attaining the age of seven-year onward. In the first

Table 3: Marketing channels, marketing cost, margin and price spread of mango.

Marketing channel	Respondents	Percent
Channel-I	108	54.00
Channel-II	57	28.50
Channel-III	35	17.00
Total	200	100.00
Marketing channel-I	Rs./quintal	Percent share in consumer's rupee
Net price received by producers	1600	46.24
Producers sale price/village trader purchase price	1600	46.24
Total cost incurred by village trader	185	05.35
Village trader sale price/wholesaler purchase price	2275	65.75
Total cost incurred by wholesaler	210	06.07
Wholesaler or pre-harvest contractor sale price/ retailer purchase price	2780	80.35
Total cost incurred by retailer	268	07.75
Retailer sale price/consumer purchase price	3460	100.00
Market margin of village trade, wholesaler and retailer		
(a) Village trader	490	14.16
(b) Wholesaler	295	8.53
(C) Retailer	412	11.91
Total margin	1197	34.60
Total marketing cost	663	19.16
Price spread	1860	53.76
Marketing channel-II	Rs./quintal	Percent share in consumer's rupee
Net price received by producers	1780	53.13
Producer sale price/wholesaler purchase price	1780	53.13
Total cost incurred by wholesaler	218	06.51
Wholesaler sale price/retailer purchase price	2430	72.54
Total cost incurred by retailer	370	11.04
Retailer sale price/ consumer purchase price	3350	100.00
Market margin of wholesaler and retailer		
(a) Wholesaler	432	12.90
(b) Retailer	550	16.42
Total margin	982	29.31
Total marketing cost	588	17.55
Price spread	1570	46.87
Marketing channel-III	Rs./quintal	Percent share in consumer's rupee
Net price received by producers	1985	66.17
Producers sale price/ retailer purchase price	1985	66.17
Total cost incurred by retailer	438	14.60
Retailer sale price/ consumer purchase price	3000	100.00
Market margin of retailer		
(a) Retailer	577	19.23
Total margin	577	19.23
Total marketing cost	438	14.60
Price spread	1015	33.83

bearing stage of orchard, net return amounted to Rs. 46751.89/ha and increases continuously up to 4th productive stage of mango orchard, thereafter it begins to decline up to Rs. 28308.98/ha in fifth stage. In the last productive stage, net return starts to slightly go up Rs. 30059.67/ha. The overall on an average per hectare cost of production was observed in the study area to be Rs. 23450.67, gross return Rs. 59481.28 and net return was Rs. 36030.61/ha. It concludes that all productive stages of mango orchard were profitable; while, third stage of mango orchard was more profitable.

Marketing of mango

In the study area, the major commercial varieties of mango were marketed by growers and traders like Dashehari, Langra, Chausa, Lucknow Safeda, Ramkela, Bombay Green etc.

Marketing channels

Based on data collected from the growers, traders and representatives of processing units, it was observed that mangos reach to the consumers through three different marketing channels:

- Grower-village trader-wholesalers-retailer consumer.
- Grower-wholesaler-retailer-consumer.
- Grower-retailer-consumer

Out of these identified channels (Table 3), Channel-I and II were most dominated in study area 54.00 per cent growers were sold their mango through channel-I, 28.50 per cent growers were sold mango through Channel-II and remaining 17.50 per cent farmers were sold their produce through Channel-III. The net price received by the growers was Rs.1600/quintal and producer share in consumer's rupee was 46.24 per cent in channel-I. The marketing cost incurred by all the intermediaries in this channel was Rs.663/quintal. The total market margin earned by different functionaries was Rs.1197/quintal and it was higher at village trader's level (Rs.490/quintal) followed by retailers (Rs.412/quintal) and wholesalers (Rs.295/quintal), constituted 14.16, 11.91 and 8.53 percent of consumer's price, respectively. The price spread was about Rs.1860/quintal in channel-I.

The channel-II revealed that mango moves from grower to consumers through retailers. In this channel net price received by the growers was Rs.1780/quintal and producer share in consumer's rupee was 53.13 per cent. The marketing cost incurred by all the intermediaries was Rs.588/quintal. The total market margin obtained by different market functionaries was Rs. 982/quintal, it was higher at retailer's level (Rs.550/quintal) followed by wholesaler (Rs.432/quintal). The consumer's share was constituted by 12.90 and 16.42 per cent, respectively. The price spread was found in this channel was Rs. 1570 which is less than channel-1.

Table 4: Constraint faced by growers during mango production.

Constraints during production	Per cent	Score	Rank
Excessive price of elite planting material	53.27	49	12
Tricky management practices	14.08	72	6
High establishment cost	21.93	66	8
Lack of avail authentic inputs and high price	29.22	61	9
Outbreak of insect, pest and disease	06.50	80	2
Shattering of flower and dropping of premature fruit	05.56	81	1
Alternate (Biennial) and Irregular bearing	07.24	78	3
Lack of knowledge to tackle the natural calamity	12.34	73	5
Scarcity of labour supply and high wage rate	33.29	59	10
Wait a long period for returns	08.23	77	4
Lack of availability of loan and insurance facility	18.56	68	7
Exhalation of industry and brick pits	46.72	52	11

Table 5: Constraints faced by growers during marketing of mango.

Constraints during marketing	Per cent	Score	Rank
Irrational deduction by the commission agent's	68.69	40	10
Delay in auctioning of produce and low bidding price	19.82	67	5
Huge no. of middlemen and menace by many middlemen	14.74	71	4
Uneven market demand and high bargaining	10.02	76	3
Complex marketing system	53.78	48	6
High marketing charges	57.23	47	7
Perishable and bulkiness in nature	08.26	78	2
Dearth of basic infrastructure	06.13	81	1
Credit sales (orchard and fruit)	71.28	38	11
Lack of market information	66.83	42	9
Difficulties in to quality standard	60.45	44	8

It was also depicted from (Table 3) out of total 200 mango growers, 35 (17.00%) growers were sold their mango through channel-III. The net income received by growers in this channel was Rs. 1985/quintal and producer share in consumer's rupee was 66.17 percent. The market cost incurred by retailers was Rs.438/quintal. The market margin earned by retailers this channel was Rs.577/quintal and price spread was Rs.1015/quintal. The percent shares of consumers were 19.23, 14.60 and 33.83 per cent. It is concluded that the growers received net price, per cent share in consumer's rupees and market efficiency was highest in channel-III followed by channel-II and I, where the numbers of intermediaries were lesser. The involvement of market intermediaries, market margin, marketing cost and price spread were highest in channel-I followed by Channel-II and III. The channel-III was found to be most efficient and profitable for farmers in the study area.

Constraints faced by growers in production and marketing of mango

Mango production is providing an excellent base of livelihood for farmers and workers engaged in its production and allied activities viz. transportation and distribution, trade, storage, nursery growing and mango processing, etc. On the other hand, there are plentiful constraints in mango gardening, production, processing and marketing. The constraints along with mean score and rank have been presented in (Table 4). These constraints were making the cultivation is risky business. Among production constraints, there were twelve constraints reported by the farmers in the study area. Shattering of flower and premature fruit dropping have greater impact on fruit bearing was cited as a major constraints with a mean score 81. Outbreak of insect, pest and diseases, farmers opined that even after a careful mango orcharding fruits are being infected with spots (mango diseases), due to which it is fetching the remunerative price was ranked third serious problem (mean score 80).

As evident from the (Table 5), mango growers were faced eleven major constraints for disposal of their products. It reveals that dearth of basic infrastructure like transportation, storage, mechanical grading, processing, proper packaging facilities were major constraints with a mean score of 81. The perishable and bulky nature of mango have more probability of spoilage in the shortest length of time and farmers cannot easily transport to long track of destination having a mean score equal to 78 was ranked the second. Uneven market demand and high bargaining power were depicted as third major constraint with mean score of 76. Excessive number of middlemen and menace of many middlemen ranked as fourth major constraints. Delay in auctioning and low bidding prices in the market

during the production glad leads more supply in the market, which, recorded as fifth major constraints with, mean score of 67. Complex marketing system, high marketing charges and difficulties in achieving quality standards due to lack of awareness about export quality production, majority of farmer are not technically aware about global acceptable quality production have been considered to the other major constraints in mango marketing and ranked sixth, seventh and eighth, respectively. Lack of market information about arrivals, prices and irrational deduction by the commission agents are also important and it needs government intervention for the interest of the growers.

CONCLUSION

In mango cultivation, growers needed more variable cost followed by fixed cost. All productive stages of mango orchard are profitable, while the fourth stage of the orchard is more profitable, which was succeeded by second, fourth, fifth and sixth stage. The growers received net price, percent share in consumer's rupees and market efficiency was highest in channel-III where the numbers of intermediaries were lesser. The involvement of market intermediaries, market margin, marketing cost and price spread were highest in channel-I followed by Channel-II and III. The channel-III was found to be most efficient and profitable for farmers in the study area. The necessary infrastructure was basic crux which affects the greater quantity of produce. Therefore, need to establish a proper market as well as to set up pack houses at the major production hub. The pack houses need to be designed in such a manner so that they can facilitate year-round operations, taking into consideration of the availability of other perishable products in the region. These should ally with supply chain in terminal market.

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