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A CASE STUDY

Impact of technologies adoption in profitability in Alphonso mango production

Members of the Research Forum

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ABSTRACT : The average adoption index of low, medium and high adopters group was 45.14 per cent, 64.73 per cent and 90.22 per cent, respectively. Whereas, at overall level it was 66.69 per cent. The proportion of bearing trees with the mango growers in medium adopters group was comparatively more (75.73%) than in low (68.77%) and high adopters group (74.63%). At overall level, it was 75.18 per cent. The per hectare annual maintenance cost (cost C) of mango orchard in low, medium and high adoption group was Rs. 74214, Rs. 108004 and Rs. 118493, respectively with an overall average of Rs. 105809 with benefit cost ratio 1:1.11, 1:1.29, 1:1.42 with overall average of 1:1.30. The incremental benefits due to technology adoption were negative in medium adoption group and positive in high adoption group having incremental benefit cost ratio 0.92 and 1.13, respectively. This clearly indicated that technology adoption in mango cultivation has positive relationship in increasing profitability.

KEY WORDS : Technology adoption, Cost, Returns, Benefit cost ratio, Profitability

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The Konkan region is on the west coast of Maharashtra comprising four mango growing districts occupying 0.165 million ha of area under mango. It accounts for about 10 per cent of the total area under mango in the country with average productivity of about 2.5-3.0 t/ha. The trend of mango production goes on changing with the change in demand for fresh mango and other mango based products. Presently, more emphasis is given to increase area and production of mango. Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth was established in 1972 at Dapoli (dist. Ratnagiri) which undertake the research on various aspects of mango so as to improve the area and production of mango under Konkan region especially for the Alphonso variety of mango. This university has standardized various technologies for mango cultivation like spacing, stone grafting, new improved varieties, fertilizer application, insect-pest management etc. It has also developed technologies for packing fruits, preparing different products, various equipments for better mango production etc. All this gave impetus for establishment of large number of mango orchards as well as for adoption of improved technologies for increasing profitability in mango production.

RESEARCH METHODS

A cross sectional sample of 120 mango growers was selected randomly from south Konkan region of Maharashtra. The information for the agricultural year 2009-10 was obtained through personal interview with the sample farmers. The sample farmers were grouped into different categories on the basis of adoption of technology in mango production to study the impact of technology out of all the technologies recommended by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli as given below :

– Proportion of area under Alphonso mango in total mango plantation.
– Use of nitrogen (N), phosphorus (P) and potassium (K).
– Use of organic manure.
– Schedule for control of insect-pest and disease
– Use of cultar.
– Amar loranthus cutter.
– Measures for control of fruit drop.
– Measure for control of spongy tissue.

$$TAI= \frac{1}{K}\left(\frac{AX_1}{RX_1}+\frac{AX_2}{RX_2}+......+\frac{AX_K}{AX_K}\right)\times 100$$

where,
TAI_i = Technology adoption index
AX_i = Actual use of selected technology.
RX_i = Recommended use of selected technology.

The technology adoption index (TAI) for each sample farmer was worked out for all technologies and then the selected sample farmers were classified into three groups as low adopters, medium adopters and high adopters. The classification was carried out with the help of mean and standard deviation criteria, such as :

– Category I (low adopters) = Less than AM – SD.
– Category II (moderate adopters) = (AM - SD) to (AM + SD)
– Category III (high adopters) = Greater than AM + SD.

where,
AM – Arithmetic mean of technology adoption index of all the farmers.
SD – Standard deviation of technology adoption index.

Keeping in view of the objectives of study, the data collected from the selected farmers were analyzed by using suitable mathematical and statistical techniques such as percentages, ratios, average, frequency distribution etc. The analysis for estimation of cost, returns and profitability in each group was carried out to know the impact of technology on productivity and per quintal cost of cultivation of mango.

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Distribution of sample of mango growers :

The distribution of sample of mango growers was done according to technology adoption index (TAI). The technology adoption index (Table 1) for all the selected mango growers was measured as per methodology explained above and they were classified into three categories.

Details of mango orchard :

The information in respect of the orchard, per farm number of bearing and non-bearing trees is given in Table 2.

It is seen from Table 2 that at overall level, average age of the orchard was 27.90 years, whereas maximum (32.50 years) in case of high adopters group. Average size of the orchard in low adopters group was 0.91 ha, in medium adopters group it was (2.94 ha), however, it was maximum in high adopters group (5.16 ha) (Mehta and Sonawane, 2012).

At overall level the average size of the mango orchard was 3.08 ha. The proportion of bearing trees with the mango growers in medium adopters group was comparatively more (75.73%) than in low (68.77%) and high adopters group (74.63%). At overall level, it was 75.18 per cent. Similar results were also observed by Mandape (2009) while studying resource use efficiency in mango production in Ratnagiri district (Maharashtra).

Per hectare cost of cultivation of sample mango orchard :

The per hectare itemwise cost of cultivation of mango orchards was worked out and is given in Table 3.

Table 1 : Classification of sample farmers on the basis of technology adoption index (TAI)			
Sr. No.	TAI Range (%)	Number of farmers	Adoption level
1.	Upto 53.82	14	Low
2.	53.83 to 79.57	86	Medium
3.	Above 79.58	20	High
	Total	120	
	Arithmetic mean (TAI)	66.69	
	Standard deviation (TAI)	12.875	

It is seen from the Table 3 that, at the overall level per hectare total cost of cultivation (cost C) of adult mango orchards worked out to be Rs. 105809. Cost A and cost B were calculated to Rs. 57422 and Rs. 90846, respectively. As regards the itemwise cost of cultivation at the overall level, the share of rental value of land was

Table 2 : Details of mango orchard of sample farmers					
Sr. No.	Particulars	Low adopters (n=14)	Medium adopters (n=86)	High adopters (n=20)	Overall (n=120)
1.	Average age of the orchard (yrs.)	22.00	27.79	32.50	27.9
2.	Average size of the orchard (ha.)	0.91	2.94	5.16	3.08
3.	Average number of trees				
	Per farm				
	Bearing	61.64 (68.77)	218.15 (75.73)	374.25 (74.63)	225.91 (75.18)
	Non-bearing	28.00 (31.23)	69.90 (24.27)	127.25 (25.37)	74.57 (24.82)
	Total	89.64 (100.00)	288.05 (100.00)	501.50 (100.00)	300.48 (100.00)
	Per hectare				
	Bearing	66.66	74.15	72.60	73.01
	Non-bearing	31.45	23.80	24.51	24.82
	Total	98.11	97.95	97.11	97.83

Figures in the parentheses indicate percentage to the total

Table 3 : Per hectare cost of cultivation of sample mango orchard						(Figures in Rs.)
Sr. No.	Item of cost	Low adopters (n=14)	Medium adopters (n=86)	High adopters (n=20)	Overall (n=120)	Per cent
1.	Hired labour					
	Male	6687	8948	8691	8641	8.17
	Female	1717	1866	2001	1872	1.77
2.	Manures	5644	7272	7783	7168	6.77
3.	Fertilizers					
	Nitrogen	1525	1813	1846	1785	1.69
	Phosphorus	787	967	1052	960	0.91
	Potassium	2326	2743	3235	2776	2.62
4.	Plant protection chemicals (kg/ lt)	14413	18080	19133	17828	16.85
5.	Paclobutrazol	878	13507	15244	12323	11.65
	Total input cost	33977	55196	58986	53353	50.42
6.	Land revenue and other cessess	43	41	41	41	0.04
7.	Depreciation and repairing charges	122	304	364	293	0.28
8.	Interest on working capital (@ 7%)	2378	3864	4129	3735	3.53
	Cost – A	36520	59406	63520	57422	54.27
9.	Interest on fixed capital (@ 10%)	886	636	987	723	0.68
10.	Rental value of land (1/6th of the gross return – land revenue)	13687	23166	28062	22876	21.62
11.	Amortization value	9825	9825	9825	9825	9.29
	Cost – B	60918	93033	102394	90846	85.86
12.	Family labour					
	Male	8339	7595	8146	7774	7.35
	Female	1305	1435	1601	1447	1.37
13.	Supervision charges (@ 10% on cost A)	3652	5941	6352	5742	5.43
	Cost – C	74214	108004	118493	105809	100
14.	Gross returns	82381	139241	168615	137503	
15.	Per quintal cost	2565	3272	3161	3184	
16.	Input-output ratio	01:01.1	01:01.3	01:01.4	01:01.3	

maximum (Rs. 22876) followed by labour (Rs. 19734), plant protection measures (Rs. 17828), manures and fertilizers (Rs. 12689).

It is further revealed from Table 3 that, the per hectare total cost of cultivation (cost C) in case of orchards in low adopters group was Rs. 74214, in medium adopters group was Rs. 108004 and it was Rs. 118493 in case of orchards in high adopters group (Garg and Yadav, 1975; Patil, 1997 and Misal, 2002). This indicated that, the cost of cultivation was continuously increasing with adoption level. This may be because of the growers in high adopters group were using comparatively higher quantities of almost all the inputs than the growers in low adopters group.

The per quintal cost of cultivation was maximum (3272) in case of farms in medium adopters group than the farms in high adopters group (3161) and low adopters group (2565). The per hectare value of the produce received was Rs. 82381 in case of low adopters group farms, Rs. 139241 in case of medium adopters group farms and Rs. 168615 in case of high adopters group farms, whereas, it was Rs. 137503 at the overall level. Regarding input output ratio it was 1.30 at the overall level, while it was 1.11, 1.29 and 1.42, respectively in case of farms in low, medium and high adopters group (Chavda, 1981 and Patil *et al.*, 1983). The benefit cost ratio was more than one in all the groups, indicating that mango production was profitable in the study area and it has shown increasing trend with increase in adoption of

technology. The increasing trend of gross returns and input output ratio underlines the importance of technology adoption.

Profitability of mango production :

The per hectare profitability of mango orchards is presented in Table 4.

It is observed from the Table 4 that, at the overall level per hectare yield of mango orchards was 33.28 q which valued at Rs. 137503. At overall level, the profit at cost A, cost B and cost C was Rs. 80081, Rs. 46657 and Rs. 31694, respectively. Regarding the profitability among the groups, the orchards in high adopters group were more profitable than the orchards in medium adopters group followed by the orchards in low adopters group at different cost levels.

The incremental benefits due to technology adoption were negative in medium adoption group and positive in high adoption group having incremental benefit cost ratio 0.92 and 1.13, respectively.

Constraints faced by the farmers in technology adoption of mango :

The information regarding various constraints faced by the mango growers in adoption of recommended technologies is presented in Table 5.

It is seen from the Table 5 that, at overall level, out of 120 growers, 96.66 per cent growers faced the problem of lack of knowledge about control measures for spongy

Sr. No.	Particulars	Low adopters (n=14)	Medium adopters (n=86)	High adopters (n=20)	Overall (n=120)
	Table 4 : Profitability of mango cultivation at various technology adoption levels				
1.	Yield (q)	28.93	33.01	37.49	33.28
2.	Increase in output (%)	0	14.10	29.59	15.04
3.	Gross returns (Rs.)	82381	139241	168615	137503
4.	Cost (Rs.)				
	Cost A	36520	59406	63520	57422
	Cost B	60918	93033	102394	90846
	Cost C	74214	108004	118493	105809
5.	Profit at (Rs.)				
	Cost A	45861	79835	105095	80081
	Cost B	21463	46208	66221	46657
	Cost C	8167	31237	50122	31694
6.	Benefit cost ratio	1.11	1.29	1.42	1.30
7.	Incremental benefits (Rs.)				
	Increase in cost	0	33790	44279	-
	Increase in benefits	0	31237	50122	-
	Incremental profit	0	- 2553	5843	
	Benefit cost ratio	0	0.92	1.13	-

tissue, 92.50 per cent reported the problem of labour, mainly during the peak periods (like harvesting and spraying the orchards) and price fluctuations in the market (Sharma, 1997 and Kiran, 2003). Similarly, 80.83 per cent growers reported lack of knowledge about control measure of fruit drop. The results are contrary to Naik (2005) in his study entitled an economic analysis of mango production, processing and export in south

Sr. No.	Particular	Low adopter (n=14)	Medium adopter (n=86)	High adopter (n=20)	Overall farmers (n=120)
	Table 5 : Constraints in adoption of recommended technologies for mango cultivation				**(Figures in %)**
	Fertilizer application				
1.	Inadequate supply	57.14	51.16	55.00	52.50
2.	High cost	78.57	54.65	50.00	56.67
3.	Non-availability in time	71.43	52.33	45.00	53.34
4.	Market at distance	50.00	40.70	50.00	43.34
	Plant protection measures				
1.	Inadequate supply	71.43	68.60	70.00	69.16
2.	High cost	85.71	56.98	60.00	60.84
3.	Non-availability in time	57.14	52.33	65.00	55.00
4.	Non-availability of equipments at peak period	71.43	58.14	45.00	57.50
	Labour constraints				
1.	High wage rates	71.43	56.98	55.00	58.34
2.	Non-availability at peak period	78.57	97.67	80.00	92.50
	Constraints regarding Amar loranthus cutter				
1.	Non-availability	50.00	58.14	55.00	56.67
2.	High cost	64.29	63.95	50.00	61.66
3.	Unsatisfactory result	71.43	56.98	60.00	59.17
4.	Local equipments are useful	78.57	70.93	75.00	72.50
	Constraints regarding nutan mango harvester				
1.	Non-availability	42.86	50.00	55.00	50.00
2.	High cost	71.43	47.67	45.00	50.00
3.	Unsatisfactory result	35.71	54.65	50.00	51.67
4.	Local equipments are useful	57.14	59.30	40.00	55.83
	Constraints regarding cultar application				
1.	Non-availability	57.14	54.65	60.00	55.83
2.	High cost	64.29	72.09	80.00	72.50
3.	Unsatisfactory result	71.43	52.33	50.00	54.17
	Constraints regarding yield and price				
1.	Low production	64.29	80.23	70.00	76.67
2.	Fluctuation in yield and price	92.86	93.02	90.00	92.50
	Lack of capital investment	85.71	75.58	60.00	74.17
	Lack of technical know-how	92.86	79.07	70.00	79.17
	Lack of knowledge about control measure of fruit drop	78.57	82.56	75.00	80.83
	Lack of knowledge about control measure of spongy tissue	100.00	97.67	90.00	96.66
	Lack of proper guidance	78.57	79.07	70.00	77.50
	Small size of holding	64.29	44.19	35.00	45.00

Konkan region of Maharashtra. Aski and Hirevenkanagoudar (2010) in their study of extent of adoption of improved mango cultivation practices by the KVK trained farmers. More or less similar findings were obtained by Jadav and Solanki (2009) and Jadhav *et al.* (2009).

Conclusion :

Per hectare input-output ratio in low, medium and high adoption group was 1:1.11, 1:1.29, 1:1.42, respectively, overall it was 1:1.30. Due to adoption of technologies per hectare yield and gross returns were increased. The incremental benefits due to technology adoption were negative in medium adoption group and positive in high adoption group having incremental benefit cost ratio 0.92 and 1.13, respectively.

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