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ISSN: 2320 – 7051
Int. J. Pure App. Biosci. SPI: **6 (2):** 369-377 (2018)

Research Article

Comparative Economics of Rejuvenated and Non-Rejuvenated Mango Orchards in South Konkan region (M.S.)

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Received: 18.06.2018 | Revised: 27.07.2018 | Accepted: 7.08.2018

ABSTRACT

An attempt has been made to study the comparative economics of rejuvenated and non-rejuvenated mango orchards in South Konkan region (M.S.), was undertaken with a sample of 80 mango growers selected randomly out of which 40 farmers were among the rejuvenated group and 40 were among non-rejuvenated mango growers. The rejuvenated mango growers were divided in to 2 groups i.e. Group-I (age of rejuvenated orchards 1-4 years) and Group-II (age of rejuvenated orchards more than 4 years). At overall level, input cost incurred for rejuvenated orchards was Rs 36243, while it was Rs 33952 for non-rejuvenated orchards. The average per quintal cost of cultivation was Rs 3051 at overall level in rejuvenated group while it was Rs 4166 in non-rejuvenated group. At overall level in rejuvenated orchards it was observed that 'Cost-A', 'Cost-B' and 'Cost-C' was Rs. 71773, Rs.132214 and Rs. 147854 respectively. In the case of non-rejuvenated group it was Rs. 64663, Rs.113431 and Rs. 135896 respectively. The Benefit Cost Ratio of rejuvenated orchards at overall level was 1.49 while in non-rejuvenated orchards it was 1.16 respectively. The Benefit Cost Ratio of matured rejuvenated orchards (age of orchards 4-8 years) was 1.60.

Key words: *Mango, Anacardiaceae, Flavour, Fragrance.*

INTRODUCTION

Mango (*Mangifera indica* L.) belonging to family Anacardiaceae is the most important commercially grown fruit crop of Indian subcontinent and is believed to have originated from south east Asia. It is one of the most popular, nutritionally rich fruit with unique flavour, fragrance, taste and health promoting qualities making it a common ingredient in new functional food often called "The king of fruits" and rightly known as "National fruit of India".

India is the major mango growing country, contributing nearly 46.74 per cent of world's area and 40.48 per cent of world's production respectively. In India the area under mango cultivation is 2262.75 thousand ha and production is 19686.92 thousand MT with productivity 8.7 MT/ha. in Maharashtra state, approximately 514.87 thousand MT of mango is produced over an area of about 157.07 thousand ha indicating a meager productivity of 3.27 MT/ha as compared to the Indian productivity.

Cite this article: Kasare, P.P., Deorukhakar, A.C., Phuge, S.C., Thorat, V.A. and Mandape, A.M., Comparative Economics of Rejuvenated and Non-Rejuvenated Mango Orchards in South Konkan Region (M.S.), *Int. J. Pure App. Biosci.* SPI: **6(2):** 369-377 (2018).

The Konkan region in the Maharashtra state is famous for mango production with an area of about 0.1 million ha under mango cultivation. However, the production is only 1.34 Lakh MT with a productivity of about 2.07MT/ha. Particularly, the two districts of the region *viz.* Ratnagiri and Sindhudurg are known as 'Mango baskets'.

Rejuvenation is the process of pruning and after pruning management of the plants to make them productive by utilizing the existing root system, which mean restoring the productive capacity of the fruit trees. The rejuvenation makes the plant manageable, easy for adoption of appropriate package of practices, improving vigour and yield. Thus rejuvenation in mango is adoption of suitable pruning, adequate nutrient and plant protection management, development of appropriate canopy and other management operations in a holistic manner.

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli has developed and recommended rejuvenation of the old and senile orchards for increasing yield as well as fruit size of mango under the project "Centre of Excellence for Mango". Total 240 training cum awareness programmes were organized at village level through which more than 6900 farmers have been trained regarding the technology developed under the project in Ratnagiri and Sindhudurg district. Particularly in Konkan region age of mango orchards is bet when 40 to 60 years Alphonso mango get a low yield, because of old age orchard, difficult to manage the insect-pest control and other related management of Alphonso mango.

MATERIAL AND METHODS

For present study two districts namely Ratnagiri and Sindhudurg were selected purposively. From each district two tehsils, from each tehsils five villages and from each village two rejuvenated and two non-rejuvenated orchards were selected randomly. Thus data were collected from 40 rejuvenated and 40 non-rejuvenated mango growers. The data were collected by survey method through personal interviews from the selected farmers, with the help of pre-tested comprehensive schedule specially designed for the purpose.

Selected sample farmers were classified according to the age of orchards after rejuvenation of mango. This stratification is carried out with the help of mean and standard deviation as follows.

Group-I: A.M. – S.D. to mean + S.D

Group-II: > A.M. + S.D.

The data collected from mango growers were analyzed with simple statistical tools and presented to draw meaningful conclusions.

a) Tabular analysis

The data were processed for arriving at desired conclusion and it was arranged in suitable tables and cross tables. Simple statistical tools such as arithmetic mean, percentage and ratios were used.

b) Cost concepts used in analysis

Standard cost concept used in farm management studies viz. cost -A, cost –B and cost -C were used to work out cost of cultivation of mango.

d) Terms Used in the study:

1) Input cost

2) Hired Labour:

The cost of hired labour was calculated by considering the actual wages paid by the selected mango growers to the hired labour.

3) Family Labour:

It was calculated on the basis of wages paid for hired labour.

4) Other inputs:

For purchased inputs like manure, fertilizers etc., actual purchase price was taken whereas, for home produced inputs the opportunity cost was considered.

5) Interest on working capital:

It was worked out at the rate of 13 per cent per annum on working capital.

6) Interest on fixed capital:

It was worked out at the rate of 10 per cent per annum on fixed investment made on the farm for production of mango.

7) Rental value of land:

Rental value of owned land was worked out as one sixth of the gross return from mango orchard, whereas, for leased in land, the actual rent paid was considered.

8) Depreciation of tools, implements and machinery

Generally, small hand tools, implement, and machinery were used for mango cultivation. Therefore, considering the average life of these hand tools, implements, and machinery the depreciation was worked out by using following formula.

$$\text{Annual Depreciation} = \frac{\text{Original price} - \text{Junk value (Rs.)}}{\text{Expected working life of the assets (yrs)}}$$

9) Cost of cultivation per quintal:

The per quintal cost of cultivation was computed by using following formula.

$$\text{Per quintal cost of cultivation} = \frac{\text{Total cost} - \text{Value of by product}}{\text{Total output (qtl.)}}$$

10) Benefit-cost ratio (B-C ratio):

To judge the profitability of mango production B-C ratio was work out with the help of following formula.

$$\text{Benefit-cost Ratio} = \frac{\text{Total returns (Rs.)}}{\text{Total cost (Rs.)}}$$

RESULT AND DISCUSSION

A) Composition of sample farmers according to age of rejuvenation of mango orchards

The selected sample farmers were classified in to two categories of rejuvenation age specified in the methodology, the composition of farmer is given in Table 1 indicated that selected farmers were grouped in two categories. Group-I means orchards which were rejuvenated before four year and Group-II i.e. age of rejuvenated orchards was more than 4 year.

In rejuvenation technology after pruning of tree in first year there is no any yield. Then gradually the yield goes on increasing. Thus farmers were categorized as group-I and group-II on the basis of age of orchard after rejuvenation practice. Accordingly 9 farmers were found in group-I (age of rejuvenated orchards was less than 4 years), 31 farmers were found in group-II (age of rejuvenated orchards was more than 4 years). The area under rejuvenated orchards in group-I was 6 ha. While in group-II it was 20.02 ha. The average size of rejuvenated farm was 0.67 and 0.65 ha in group-I and group-II respectively.

B) Composition of sample farmers of non-rejuvenated mango orchard

For comparison purpose 40 farmers from non-rejuvenated group were selected. The details of non-rejuvenated mango orchards are given in Table 2.

Table 2 revealed that the average size of mango orchard was 2.84 ha with average number of trees 291.00. Out of total number of trees per farm bearing trees was 261 and non-bearing tree was 30. Per hectare proportion of bearing trees was 89.47 per cent and non-bearing tree was 10.53 per cent. The average age of orchards was 42.46 years.

C) Information of non-rejuvenated and rejuvenated mango orchards

The information of rejuvenated and non-rejuvenated mango orchards is given in Table 3.

It is observed from Table 3 that average size of farm on non-rejuvenated mango orchards was 2.84 ha. Among different size groups of rejuvenated orchards size of the farm was 0.67 and 0.65 on group-I and group-II respectively, with overall average of 0.66 ha. Per farm number of trees in rejuvenated mango orchards were 62 and 70 on group-I and group-II respectively, with overall average of 68.It means that farmers have not

rejuvenated all trees on their farm but few trees or orchards were rejuvenated.

Average age of trees in non-rejuvenated mango orchards was 42.46 years. In rejuvenated mango orchards the average age of trees was 36.25 years and 41.80 years on group-I and group-II respectively. It indicated that the rejuvenated practice was followed when age of the orchards was between 35-45 years. At this age productivity starts declining and harvesting problem becomes difficult due to long spreaded and heighted branches of mango trees.

Regarding per ha yield it was observed that yield of non-rejuvenated mango orchards was 32.62q. In group I per hectare yield was 34.78 q., among group II it was 52.14 q. with overall average yield of 48.46 q per ha. This revealed that after rejuvenation of mango orchards yield starts increasing and it gradually goes on increasing in later period.

Table 3 shows that per hectare incremental increase in the yield was 2.16 quintal among non-rejuvenated and rejuvenated group-I. In group-II the increase in the yield over non-rejuvenated orchards was 19.52 quintal. While at overall level orchards incremental yield over non-rejuvenated orchards was observed 15.84 quintal. It means as age of rejuvenated tree increases per hectare yield goes on increasing.

Similar results were observed by Lal and Padaris[2] in their study on rejuvenated of mango orchards in Lucknow.

D) Per hectare expenditure incurred for rejuvenation of mango orchards

Labour is the major input in all operations of mango cultivation. The important operation of rejuvenated orchards are pruning of branches, collection of cut branches of the tree and maintain sanitation in orchards, thinning of new srouts, strengthening of maintained new shoots, irrigation after pruning, application of plant protection chemicals, application of F.Y.M and fertilizers etc. The operation wise per hectare labour utilization and expenditure incurred for rejuvenation of mango orchards is given in Table 4.

It is clear from the Table 4 that, at overall level per hectare total labour utilized for different operations were 151 days among which 71 were family 80 hired labour days. Maximum labour days were utilized for pruning of branches followed by collection of cut branches of the rejuvenated tree and maintain sanitation on orchards 24 labour days, application of plant protection chemicals 20 labour days, for strengthening of maintained new shoots 16 labour days and for fertilizer application 15 labour days were used. Within the group maximum labour days were required in group-II (159 labour days) as compare to group-I (132 labour days).

Expenditure incurred for performing various operations of rejuvenation of mango orchards is given in table 4. At overall level, total expenditure incurred for performing various operations was Rs 25940. Out of total expenditure maximum amount was spend for pruning of branches which was about Rs 10750, followed by collection of cut branches of tree and maintain sanitation in orchards was Rs 2400. Groupwise expenditure incurred for performing various operations showed that maximum expenditure incurred in group-II (Rs 27420) i.e. orchards above 4 years of age after rejuvenation followed by group-I (Rs 22230).

E) Operation wise labour utilization and expenditure incurred in mango orchards (After rejuvenation)

The important operation in mango orchards are cutting grasses and removing of old bushes, digging trenches for manuring, application of F.Y.M and fertilizers, application of cultar/growth regulator, removal of loranthus, earthing up to mango tree, application of plant protection chemicals, supervision of orchards, harvesting and repair of fencing etc. The operation wise per hectare labour utilization and expenditure incurred for rejuvenation of mango orchards is given in Table 5.

It is clear from the table that, at overall level per hectare total labour utilized at rejuvenated mango orchards for different operations were 180 days among which 82 were family and 98 hired labour days. Similarly for non-rejuvenated mango orchards

per hectare total labour utilized for different operations were 228 days among which 114 were family 114 hired labour days.

Out of total labour utilized, maximum labours among the rejuvenated group were utilized for the operation supervision of orchards i.e. about 68 labour days, followed by harvesting i.e. about 28 labour days. It is observed from the table that also in non-rejuvenated group maximum labours utilized were for the operation supervision of orchards i.e. about 73 labours days followed by harvesting 45 labours days. It is also seen that least number of labours were required for earthing up in both the groups i.e. about 6 man days in rejuvenated group and 8 man days in non-rejuvenated group. It is observed from Table 5 that the labour utilization in rejuvenated gardens as compared to non rejuvenated mango orchards there was considerable saving in labour utilization. In all 48 labours were saved which has minimize the problem of the producers.

It is concluded that labour utilized in rejuvenated orchards were comparatively less than non-rejuvenated orchards. This might be because the non-rejuvenated trees have big canopy and long spreaded branches. Due to dense branches sunlight cannot come inside and bearing of fruit take place at end point of branches which becomes difficult for spraying of the insecticides/pesticides and harvesting of the fruits also becomes very difficult and expensive, Cent percent harvesting is not possible. At the time of harvesting immatured fruits are also harvested many fruits are dropped from rippers while harvesting. Due to which farmers have to bear losses.

Due to these reasons labour utilized for maintenance of non-rejuvenated orchards was more. In rejuvenated orchards as height of tree is short, maintenance of orchards is less expensive.

F) Saving in the labour in rejuvenated orchards

Saving in labour was more in application of plant protection chemicals and harvesting of fruit. That information is separately and is shown in Table 6

Table 6 revealed that total mandays required for spraying and harvesting of non-rejuvenated orchards were 68 days and expenditure was Rs 15275. In rejuvenated group at overall level it was 47 days and Rs10325 respectively. Thus, there was saving of 21 man days and Rs 4952 per hectare. In terms of percentage due to rejuvenation there was saving of 30.88 per cent man days and 32.40 per cent expenditure over non-rejuvenation orchards. It clearly indicated that rejuvenation practice was beneficial to the farmers.

G) Per hectare comparative cost of cultivation of non-rejuvenated and rejuvenated mango orchards

The economics of rejuvenated and non-rejuvenated orchards was worked out separately by considering all standard cost concepts and the information is presented in Table 7.

From the data presented in Table 7, it is seen that, the per hectare total cost of cultivation (cost-C) for non-rejuvenation group was Rs 135896 while for rejuvenated group at overall level it was Rs 147854 Out of which for group-I it was Rs 125199 and for group-II was Rs 158829 respectively. This indicated that the cost of cultivation was maximum in group-II as compared to group-I for rejuvenated group. Also it is indicated from the table that cost-C was maximum at overall level for rejuvenated group as compared to non-rejuvenated group. However, 'cost A' was less in case of non-rejuvenated orchards was Rs 64663 while in to rejuvenated orchards it was Rs 71773. Among the rejuvenated orchards it was observed that 'cost-A' was high in case of group-II (Rs 76847) as compared to group-I (Rs 60848) respectively. This indicated that input cost increase with an increases in the age of orchards.

On the basis of per hectare total cost of cultivation, per quintal cost was worked out at overall level, the per quintal cost of cultivation for rejuvenated group was worked to Rs 3051 while for non-rejuvenated group it was Rs 4166. The per quintal cost of cultivation for rejuvenated orchards group-I

was higher (Rs 3600) as compared to group-II (Rs 3046).

The gross returns of non-rejuvenated orchards were Rs 158207 while in rejuvenated orchards at overall level it was Rs 220008 respectively. Among the rejuvenated orchards it was found that group-II had high gross return Rs 253922 as compared to group-I which was Rs 157553.

The benefit cost ratio was 1.16 for non-rejuvenated group as against 1.49 rejuvenated orchards at overall level. Among the group of rejuvenated it was found that group-II had high Benefit Cost ratio i.e. 1.60 as against group-I which was 1.26. Thus it is clear that as age of rejuvenated orchards increases the productivity also goes on increasing.

Table 1: Composition of sample farmers according to age of rejuvenation of mango orchards

Sr. No.	Category	Age (years)	No. of farmers	Area under rejuvenated mango orchards (ha)	Average size of farm (ha)
1	Group –I	< 4	9	6.00	0.67
2	Group –II	>4	31	20.02	0.65
	Total		40	26.02	
Mean = 3.00			Standard Deviation = 1.24		

Table 2: Composition of sample farmers of non-rejuvenation of mango

Sr. No.	Particulars	
1	Area per orchard (ha)	2.84
2	Age of orchard (year)	42.46
3	Number of trees	
A)	Per farm (No.) i) Bearing	261 (89.69)
	ii) Non-bearing	30 (10.31)
	Total	291 (100.00)
B)	Per hectare (No.) i) Bearing	85 (89.47)
	ii) Non-bearing	10 (10.53)
	Total	95 (100.00)

(Figures in parentheses are percentage to total)

Table 3: Information of non-rejuvenated and rejuvenated mango orchards

Sr. No.	Particulars	Non-rejuvenated orchards (N=40)	Rejuvenated orchards		
			Group -I (N=9)	Group- II (N=31)	Overall (N=40)
1	Size of farm (ha)	2.84	0.67	0.65	0.66
2	Per farm number of trees rejuvenated (No.)	-	62.00	70.00	68.00
3	Age of tree (years)	42.46	36.25	41.80	40.55
4	Per hectare yield (q)	32.62	34.78	52.14	48.46
5	Per hectare increase yield over non- rejuvenated orchard (q)	-	2.16	19.52	15.84

Table 4: Per hectare expenditure incurred for rejuvenation of mango orchards

Sr. No.	Particulars	Unit	Group -I (N=9)			Group -II (N=31)			Overall (N=40)		
			Family	Hired	Total	Family	Hired	Total	Family	Hired	Total
1	Pruning of branches	Days	15	20	35	20	25	45	19	24	43
		Value (₹)	3750	5000	8750	5000	6250	11250	4750	6000	10750
2	Collection of cut branches of the tree and maintain sanitation in orchard	Days	10	12	22	11	13	24	11	13	24
		Value (₹)	1000	1200	2200	1100	1300	2400	1100	1300	2400
3	Thinning of new srouts/shoots	Days	5	9	14	6	5	11	6	6	12
		Value (₹)	600	1080	1680	720	600	1320	720	720	1440
4	Strengthening of maintained new shoots	Days	5	7	12	9	8	17	8	8	16
		Value (₹)	750	1050	1800	1350	1200	2550	1200	1200	2400
5	Irrigation after pruning	Days	4	4	8	6	4	10	5	4	9
		Value (₹)	400	400	800	600	400	1000	500	400	900
6	Application of plant protection material	Days	6	11	17	10	12	22	9	11	20
		Value (₹)	1200	2200	3400	2000	2400	4400	1800	2200	4000
7	Application of F.Y.M/Compost	Days	4	6	10	6	7	13	6	6	12
		Value (₹)	600	900	1500	900	1050	1950	900	900	1800
8	Application of Fertilizers	Days	5	9	14	9	8	17	7	8	15
		Value (₹)	750	1350	2100	1350	1200	2550	1050	1200	2250
	Total	**Days**	**54**	**78**	**132**	**77**	**82**	**159**	**71**	**80**	**151**
		Value (₹)	**9050**	**13180**	**22230**	**13020**	**14400**	**27420**	**12020**	**13920**	**25940**

Table 5: Comparison of per hectare labours used and expenditure incurred on rejuvenated and non-rejuvenated mango orchards

Sr. No.	Particulars	Unit	Non-rejuvenated (N=40)			Rejuvenated orchards								
						Group -I (N=9)			Group -II (N=31)			Overall (N=40)		
			Family	Hired	Total	Family	Hired	Total	Family	Hired	Total	Family	Hired	Total
1	Cutting grasses and removing of old bushes	Days	5	9	14	5	7	12	4	8	12	5	8	13
		Value (₹)	875	1575	2450	875	1225	2100	700	1400	2100	875	1400	2275
2	Digging trenches for manuring	Days	3	7	10	4	5	9	3	9	12	5	6	11
		Value (₹)	540	1260	1800	720	900	1620	540	1620	2160	900	1080	1980
3	Application of F.Y.M/Compost	Days	4	6	10	3	5	8	5	6	11	4	5	9
		Value (₹)	700	1050	1750	525	875	1400	875	1050	1925	700	875	1575
4	Application of Cultar/ growth regulator	Days	5	7	12	5	5	10	4	5	9	4	4	8
		Value (₹)	825	1155	1980	825	825	1650	660	825	1485	660	660	1320
5	Application of Fertilizer	Days	6	8	14	5	6	11	6	6	12	5	6	11
		Value (₹)	990	1320	2310	825	990	1815	990	990	1980	825	990	1815
6	Removal of loranthus	Days	5	6	11	-	-	-	-	-	-	-	-	-
		Value (₹)	875	1050	1925	-	-	-	-	-	-	-	-	-
7	Earthing up to mango tree	Days	3	5	8	2	3	5	3	4	7	2	4	6
		Value (₹)	480	800	1280	320	480	800	480	640	1120	320	640	960
8	Application of plant protection chemicals	Days	10	13	23	4	11	15	12	8	20	10	9	19
		Value (₹)	1750	2275	4025	700	1925	2625	2100	1400	3500	1750	1575	3325
9	Supervision of orchards	Days	43	30	73	35	38	73	30	39	69	33	35	68
		Value (₹)	8170	5700	13870	6650	7220	13870	5700	7410	13110	6270	6650	12920
10	Harvesting	Days	27	18	45	8	12	20	13	17	30	12	16	28
		Value (₹)	6750	4500	11250	2000	3000	5000	3250	4250	7500	3000	4000	7000
11	Repair of fencing	Days	3	5	8	2	4	6	3	5	8	2	5	7
		Value (₹)	510	850	1360	340	680	1020	510	850	1360	340	850	1190
	Total	**Days**	**114**	**114**	**228**	**73**	**96**	**169**	**83**	**107**	**190**	**82**	**98**	**180**
		Value (₹)	**22465**	**21535**	**44000**	**13780**	**18120**	**31900**	**15805**	**20435**	**36240**	**15640**	**18720**	**34360**
	Saving in labour over non-rejuvenated mango orchards.													
	Days											32	16	48
	Expenditure											6825	2815	9640

Table 6: Per hectare saving in labour on spraying and harvesting after rejuvenation of orchards

Sr. No.	Particular Operation	Non-rejuvenated orchards		Rejuvenated orchards	
		Days	Expenditure (Rs)	Days	Expenditure (Rs)
1	Application of plant protection chemicals	23	4025	19	3325
2	Harvesting of fruit	45	11250	28	7000
	Total	68	15275	47	10325
	Saving			21	4950
	Saving in terms of percentage			30.88	32.40

Table 7: Per hectare comparative cost of cultivation of non-rejuvenated and rejuvenated mango orchard. (Amt. Rs)

Sr. no.	Particulars	Non-rejuvenated orchards (N=40)	Rejuvenated orchards		
			Group I (N=9)	Group II (N=31)	Overall (N=40)
1	Hired labour				
	a) Male	15135	11394	15687	14640
	b) Female	6400	6726	4748	4080
	Total	21535	18120	20435	18720
2	Machine	985	8200	8255	8243
3	Manure	6600	4200	7350	6641
4	Fertilizers	9675	9060	11373	10853
5	Paclobutrozol/Growth regulator	5870	2070	3340	3054
6	Plant protection chemicals	11807	11407	16415	15178
	Input Cost	56472	53057	67168	62689
7	Interest on working capital	7341	6897	8732	8150
8	Depreciation on implements	800	843	895	883
9	Land revenue and other cesses	50	51	52	51
	Cost –A	64663	60848	76847	71773
10	Rental value of land	26367	27014	42321	36668
11	Interest on fixed capital	900	945	985	976
12	Amortization value (A)	21500	21500	21500	21500
	Amortization value (B)	-	1112	1371	1297
	Cost –B	113431	111419	143024	132214
13	Family labour				
	a) Male	17910	8651	11952	12240
	b) Female	4555	5129	3853	3400
	Total	22465	13780	15805	15640
14	Cost-C	135896	125199	158829	147854
15	Yield in quintal	32.62	34.78	52.14	48.46
	Rate	4850	4530	4870	4540
16	Value of produce	158207	157553	253922	220008
17	Benefit cost ratio	1.16	1.26	1.60	1.49
18	Net returns at				
	a) Cost –A	93544	96705	177075	148235
	b) Cost –B	44776	46134	110898	87794
	c) Cost-C	22311	32354	95093	72154
19	Per quintal cost of cultivation	4166	3600	3046	3051

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