

Doubling the Income of Farmers through Rejuvenation Technology in Mango Orchards in Konkan Region of Maharashtra (India)

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ABSTRACT

Mango is an important rainfed horticultural cash crop of Konkan region. The variety Alphonso which is grown in Konkan region is very popular in national and international markets. But the productivity of Alphonso mango is very low as compared to state and national level coupled with alternate bearing habit of this variety.

There are several reasons for the low productivity and quality of mango which are being compensated by adopting rejuvenation technique. Large number of mango orchards in the age group of 40-60 and above have either gone unproductive or showing marked decline in productivity.

Rejuvenation is the process of pruning and after pruning, management of the plants to make them productive by utilizing the existing root system and proper management practices.

India having 2.209 millionha area under mango crop with production of 186.43 lakh MT with productivity 8.44 MT/ha. Maharashtra contributing 7.34 per cent share in area and 2.48 per cent production in 2015-16 (NHB database 2015-16). In Konkan region the area of about 0.17 million ha is under mango cultivation, but production is only 1.34 MT with productivity of about 2.07 MT/ha. Most of the orchards are above 50 years age which gives very low yield. The height and canopy of these old trees is very high and due to long spreaded branches harvesting of the fruits is a major problem to the farmers. Similarly, spraying of insecticides and pesticides is also difficult and time consuming. There is huge scope to increase productivity by rejuvenation of old mango plantation. In Konkan region of Maharashtra state, mango is grown mainly in Ratnagiri and Sindhudurg districts. Most of the mango orchards in this region are very old and their productivity is also low. Therefore, this study was conducted in this region during the year 2016-17. The sample of 60 non-rejuvenated and 60 rejuvenated orchards having 40 to 60 years age were selected randomly.

The per hectare yield of non rejuvenated orchard was 32.24 q, while per hectare yield of rejuvenated orchards was 61.55 q. The benefit cost ratio was 1.18 for non rejuvenated mango orchard and that of rejuvenated mango orchard it was 1.35. It shows that per hectare incremental yield was 29.31q. and incremental netreturns were ₹53,189/-. Similarly, per hectare saving in expenditure on labour for spraying and harvesting of fruits was 32.26 per cent. The constraints regarding rejuvenation practice were also analysed. The farmers are psychologically not prepared as during the initial period of 1 to 3 years after rejuvenation the yield levels are very low. There is a need to motivate the farmers to adopt this practice by providing them technical know how and showing demonstrations in producing area. This can be done with the help of extension agencies of Agricultural Universities as well as Agricultural Departments of Government

In support with national agenda of doubling of farmers income there is a large scope if the old mango orchards which are low productive will be converted into rejuvenated orchards.

INTRODUCTION

Mango is the leading fruit crop India and is considered to be the king of tropical fruits. India is the leading country sharing 42.1 per cent of world's mango production. One of the reasons for low productivity is large number of old mango orchard in the age group of 30 to 60 and above have either gone unproductively or showing marked decline in the productivity. This attributed to overcrowded

and intermingled branches and meager foliage, allowing poor light availability to growing shoots within the canopy, this renders them uneconomical.

Mango is an important rainfed horticultural cash crop of Konkan region. The variety Alphonso which is grown in Konkan region is very popular in national and international markets. But the productivity of Alphonso mango is very low as compared to state and national level coupled with

alternate bearing habit of this variety. Rejuvenation is the process of pruning and after pruning, management of the plants to make them productive by utility the existing root system, which mean restoring the productivity by utility the existing root system, which mean restoring the productive capacity of the fruit trees.

Advantages of Rejuvenation

- Increase the productivity and economic age of plant.
- Convert the low yielding and inferior varieties/seedling origin trees into superior and high yielding trees.
- Exploit the better root system of a plant who has survived in adverse soil and climatic conditions.
- Lessen the time of gestation period.
- Increase the orchard income.
- Lessen the incidence of diseases and pests.

In India, mango was cultivated on area of 2516 thousand ha. in the year 2014-15. The production was around 18431.3 thousand MT with productivity of 7.34 tonnes per ha. (Horticulture at a glance 2016)

Maharashtra stands first in the area under mango (500 thousand ha) but still low in production (3.4 Thousand MT). The major mango growing districts in Maharashtra are Ratnagiri, Sindhudurg, Thane, Raigad and Palghar, which come in the *Konkan* region.

Mango is cultivated on an area of 1,84,000 ha in *Konkan* region. About 90 per cent area of mango is under Alphonso variety. *Alphonso* mango from *Konkan* region of Maharashtra is known world wide for its flavour, taste, attractive colour and shape. The average annual production of *Konkan* region is around 3,30,000 tonnes. The productivity of mango orchards in *Konkan* is very low (2.5 t/ha). Among the several reasons leading to low productivity, existing old and senile orchards, poor management, incidence of pests and diseases and frequently

changing climatic conditions are the most prominent. Traditionally mango orchards in *Konkan* are planted at 10 x 10 m spacing. Presently in about 40 per cent orchards, these plants have grown up to a very tall height leading to weak and unhealthy canopy. The insufficient sunlight perception in such orchards lead to poor photosynthesis and carbohydrate accumulation leading to senile and low productive.

The 'Centre of Excellence for mango' was established at Dapoli under Indo-Israel work funded by National Horticultural Mission through Maharashtra state Medicinal and Horticulture Plant Board, Pune with major objective is to develop good agricultural practices i.e. rejuvenation, high density plantation etc. for increasing productivity of mango other objectives of there centre are.

- To products vigorous pest and disease free mango grafts in protected conditions.
- To promote value addition, marketing and export by developing post harvest handling system.
- To conduct training of farmers regarding adoption of good agriculture practices (GAP) for improving yield and quality.

Dr. B.S.K.K.V., Dapoli has done lot of research on rejuvenation of mango orchards and farmers have accepted this technology.

Rejuvenation Technology:

The following technology have been developed by the University.

1. March and October are appropriate seasons for pruning in *Konkan* region for rejuvenation.
2. Severe and rigorous pruning as suggested by Israel experts in mango orchard above 20 years age is harmful for *Konkan* conditions. A gradual pruning in two or three phases as suggested by the university is appropriate in *Konkan* region.
3. After pruning the appropriate canopy

development and aftercare to avoid stem borer infestation are critical points in rejuvenation. The advice given by Israel experts helped to develop appropriate plant architecture in *Alphonso* rejuvenated orchards.

4. For maintenance of canopy, continuous and non-selective pruning is detrimental. For induction of flowering, selective maintenance pruning is essential.
5. The fruits of rejuvenated plants are better with respect to quality and taste. Operations such as bagging can be done to protect the fruits from adverse climatic conditions as well as from pest and diseases. The operations like manure and fertilizer application, spraying for plant protection, harvesting becomes much easier.
6. After rejuvenation, the low density orchards planted at 10 X 10 m spacing can be converted into high density orchard by inter planting of additional mango plants at 5 m x 5 m.

Dissemination of Technology :

Demonstrations of technology of rejuvenation as well as high density planting were simultaneously organized on the farmer's field in Ratnagiri and Sindhudurg districts. During the "Center of excellence for mango" project tenure 2010-11 to 2014-15 more than 500 demonstrations in most than 108 villages by pruning 1402 plants have been completed. Number of farmers were 202 and total number of trees pruned were 1402.

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. Considering the

importance of this technology the study on "Economics of Rejuvenated Mango Orchards in South *Konkan* region" of Maharashtra was undertaken with following specific objectives.

Objectives :

- 1) To study the input utilization pattern in rejuvenated and non-rejuvenated mango orchards.
- 2) To workout cost, returns and profitability of mango orchards.
- 3) To study the resource use efficiency in mango orchards.
- 4) To identify the constraints in rejuvenation of mango orchards.

METHODOLOGY

Selection of sample

Since the initiation of Indo-Israel project in Dr. B.S.K.K.V., Dapoli the rejuvenation technology has become popular in *Konkan* region. But number of farmers who have adopted the technology is still not satisfactory. Therefore sample selection of farmers was done purposively. Ratnagiri and Sindhudurg district of South *Konkan* region were selected as maximum area under mango is in these two districts. List of farmers who have adopted this technology was obtained from Indo-Israel project as well as TAOs of respective tahsils. In all 41 farmers from Sindhudurg district and 19 farmers from Ratnagiri district were selected purposively for the study. Similarly equal number of farmers having orchards more than 40 years and who have not adopted the technology were selected for purpose of comparison. Thus final sample consisted was 60 non-rejuvenated and 60 rejuvenated farmers from South *Konkan* region. The data pertained to the agricultural year 2016-17.

Sample

Total 60 farmers in rejuvenated group and 60 farmers in non-rejuvenated group from Ratnagiri and Sindhudurg districts by giving equal weightage to different tahsils and villages were selected for the study.

Analysis of data

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

I category : < Arithmetic mean (A.M.)
Standard deviation (S.D.)

II category : A.M.-S.D. to mean + S.D.

III category : > A.M. + S.D.

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

RESULTS AND DISCUSSION

1. Composition of sample farmers

The selected sample farmers were classified into three different categories of rejuvenation age specified in the methodology. The composition of farmers is given in Table 1.

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 low, medium and high on the basis of age of orchard after rejuvenation practice. Accordingly 17 farmers were found in category-I (age of orchard up to 3.06 years after rejuvenation), 29 farmers were found in category-II, where age of orchard was 3.07 to 6.83 years after rejuvenation and 14 farmers were found in category III where age of orchard was more than 6.84 after rejuvenation.

2. Information of non rejuvenated and rejuvenated mango orchard

The information of rejuvenated and non-rejuvenated mango orchards given Table 2.

It is observed from Table 2 that average size of farm on non rejuvenated mango orchards was 1.77 ha. Among the different size groups of rejuvenated orchards size of the farm was 0.12 ha. 0.20 ha. and 2.95 ha. on low, medium and high group with overall average of 0.81 ha. Per farm number of trees in rejuvenated mango orchards were 10, 17 and 297 on low, medium and high group with overall average of 81.

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

Sr. No.	Category	Age (years)	No. of farmers	Average size of farm (ha.)
1.	Low	Upto 3.06	17	0.12
2.	Medium	3.07 to 6.83	29	0.20
3.	High	6.84 and above	14	2.95
Total			60	
Mean = 4.95				
Standard Deviation = 1.89				

Table 2
Information of non-rejuvenated and rejuvenated mango orchard

Sr. No.	Particulars	Non Rejuvenated orchards (N=60)	Rejuvenated orchards			
			Low (N=17)	Medium (N=29)	High (N=14)	Overall (N=60)
1.	Average size of farm (ha.)	1.77	0.12	0.20	2.95	0.81
2.	Per farm number of trees rejuvenated (No.)	-	10	17	297	81
3.	Average age of plant (Years)	25.57	36.24	37.21	42.86	38.25
4.	Per hectare yield after rejuvenation (q)	-	11.82	32.67	61.55	33.50
5.	Per hectare yield of non-rejuvenated mango orchard (q)	32.24	-	-	-	-

Average age of trees in non rejuvenated mango orchards was 25.57 years. In rejuvenated mango orchards the average age of tree was 36.24 years, 37.21 years and 42.86 years in group I, II and III respectively, with overall average of 38.25 years. It indicated the rejuvenated practice was followed when age of the orchard was between 35-40 years. At this age productivity start declining and harvesting problem becomes severe due to long spreaded and heighted branches of mango trees.

Regarding per hectare yield it was observed that yield of rejuvenated mango orchards was 32.24 q. In first group i.e. below 3.06 years after rejuvenation per ha yield was 11.82 q., among 2nd group it was 32.67 q. while in 3rd group it was 61.55 q. with over all average yield of 33.50 q. per ha. This revealed that after rejuvenation of mango orchards yield starts increasing and it gradually goes on increasing in later period.

3. Operationwise labour used and expenditure incurred for rejuvenation of mango orchard.

The information regarding per hectare expenditure incurred on rejuvenation of mango orchard is given in Table 3.

It is seen from Table 3 that average per ha labour used at overall level for rejuvenation of orchard were 142 days among which 100 were male and 42 were female days. Maximum labour days were utilized for cleaning of orchard for rejuvenation, followed by actual rejuvenation practice (32 man day). For fertilizer application 26 labour days and for spraying of orchard 15 labour days were used. Within the groups maximum labour days were required in high (158 days) followed by medium (140 days) and low (131 days).

Expenditure incurred for performing various operations of rejuvenation of mango orchards is given in Table 5. At overall level, total expenditure incurred for performing various operations was ₹38092/- Out of total expenditure maximum amount was incurred for rejuvenation practice (₹12254/-) followed by cleaning of orchard for rejuvenation (₹11906/-).

Groupwise expenditure incurred for performing various operations showed that maximum expenditure was incurred in high group (₹41769/-) i.e. orchards above 6.84 years of age after rejuvenation followed by medium (₹40358/-).

Table 3
Per hectare expenditure incurred for rejuvenation of mango orchards

Sr. No.	Particulars	Unit	Low (N=17)			Medium (N=29)			High (N=14)			Overall (N=60)		
			Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1.	Cleaning of orchard for rejuvenation	days	24	27	51	27	15	42	33	45	78	28	25	53
		Value (₹)	6843	4242	11085	7889	2323	10212	9721	6691	16412	8020	3886	11906
2.	Rejuvenation of orchard	days	29	0	29	31	2	33	34	0	34	31	1	32
		Value (₹)	8258	0	8258	13560	265	13825	13854	0	13854	12126	128	12254
3.	Irrigation to rejuvenated orchard	days	9	5	14	11	8	19	9	4	13	10	6	16
		Value (₹)	2374	669	3043	3322	1219	4541	2473	580	3053	2855	914	3769
4.	Fertilizer application	days	19	8	27	17	9	26	17	4	21	18	8	26
		Value (₹)	4823	1010	5833	5119	1378	6497	5038	0	5038	5016	952	5968
5.	Spraying to rejuvenated orchard	days	10	0	10	15	5	20	12	0	12	13	2	15
		Value (₹)	2980	0	2980	4461	822	5283	3412	0	3412	3797	397	4194
	Total	days	91	40	131	101	39	140	105	53	158	100	42	142
		Value (₹)	25278	5921	31199	34351	6007	40358	34498	7271	41769	31815	6278	38092

4. Operationwise labour utilization in mango orchards.

Per hectare operationwise labour used and expenditure incurred for mango orchards is shown in Table 4.

It is observed from Table 4 that the labour utilization in rejuvenated gardens in high group compared with non rejuvenated mango orchards there was considerable saving in labour utilization operation like spraying, cleaning and harvesting. In all 33 labour were save which has the minimize the problems of the producer.

It is also observed from the Table 4 that there

is saving of 33 human labours per hectare and expenditure saving of ` 11358/- in high group of rejuvenated mango orchards; compared to non rejuvenated mango orchards due to big canopy and heighted and spreading branches was higher for the operations like cleaning of orchard, spraying and harvesting as compared to rejuvenated mango orchard.

5. Comparative cost of production of rejuvenated and non rejuvenated mango orchard

Per hectare comparison of cost of cultivation of rejuvenated and non rejuvenated orchards is worked out and presented in Table 5.

Table 4
Comparison of per hectare labours used and expenditure incurred on rejuvenated and non rejuvenated mango orchards

Sr. No.	Particulars	Unit	Non Rejuvenated orchards (N=60)			Low (N=17)			Medium (N=29)			High (N=14)		
			M	F	Total	M	F	Total	M	F	Total	M	F	Total
1.	Cleaning of orchard	days	28	17	45	24	15	39	22	26	48	14	29	43
		Value (₹)	8288	2584	10872	7298	2247	9545	6634	3980	10614	3672	4331	8003
2.	Fertilizer application	days	22	7	29	21	3	24	20	8	28	21	5	26
		Value (₹)	6512	924	7436	6212	227	6439	5976	1113	7089	6098	728	6826
3.	Spraying of pesticides/fungicides	days	31	3	34	15	2	17	12	2	14	20	1	21
		Value (₹)	9269	444	9713	4545	227	4772	3657	212	3869	5777	58	5835
4.	Cleaning of inflorescences	days	12	0	12	7	0	7	8	0	8	10	0	10
		Value (₹)	3420	0	3420	1616	0	1616	2469	0	2469	2921	0	2921
5.	Harvesting of fruits	days	39	8	47	15	3	18	21	3	24	31	3	34
		Value (₹)	11973	1192	13165	4874	379	5253	6424	490	6914	9223	440	9663
	Total	days	132	35	167	82	23	105	83	39	122	96	38	134
		Value (₹)	39462	5144	44606	24545	3080	27625	25160	5795	30955	27691	5557	33248
Saving in labour over non rejuvenated mango orchards														
	Days											36	-3	33
	Expenditure (₹)											11771	-413	11358

Table 5
Comparative per hectare cost of production of non-rejuvenated and rejuvenated mango orchards

Sr. No.	Particulars	Non Rejuvenated orchards (N=60)	Rejuvenated orchards			
			Low (N=17)	Medium (N=29)	High (N=14)	Overall (N=60)
1.	Total Cost	129401	130542	167903	221346	154006
2.	Yield (q)	32.24	11.82	32.67	61.55	33.50
3.	Rate (₹/q.)	4748	4530	4687	4845	4679
4.	Gross returns	153076	53545	153124	298210	156747
5.	Net returns	23675	-76997	-14779	76864	2740
6.	BC Ratio at Total Cost	1.18	0.41	0.91	1.35	1.02
7.	Cost per Quintal	4014	11044	5139	3596	4597

From Table 5 it is revealed that per ha total cost (Cost C) of production of non rejuvenated orchard was ₹ 1,29,401/- as against ₹ 1,54,006 of rejuvenated orchards at overall level. At Group III i.e. about 7 years after rejuvenation it was ₹ 2,21,346/-. Per hectare yield of non rejuvenated orchard was 32.24 q. and in rejuvenated orchards at overall level it was 33.50 q. In fully matured rejuvenated orchard it was 61.55 q. After rejuvenation, per hectare incremental yield was 29.31 q. and incremental net returns were ₹ 53,189/-. Similarly, per hectare saving in expenditure on labour of spraying and harvesting of fruits was 32.10 per cent.

The gross returns of non rejuvenated orchard were ₹ 1,53,076/-, while in rejuvenated orchard it was ₹ 2,98,210/- in third group. The benefit cost ratio was 1.18 at non rejuvenated orchards as against 1.35 at rejuvenated orchards. Per quintal production cost of non rejuvenated orchard was ₹ 4014/- as against ₹ 3596/- in rejuvenated orchard. Thus it is clear that as age of rejuvenated orchard increases the productivity is also increases. The detail information is given in the Appendix-I.

Constraints faced by farmers in rejuvenation of mango orchards:

Dr. B.S.K.K.V., Dapoli has given technologies for rejuvenation of old and senile orchards. Some demonstration have also arranged on farmers' fields for awareness of this technology among the farmers. Some questions were posed to farmers regarding constraints in following this practice on the field. The said information is show in Table 6.

Table 6 reveal that cent per cent farmers stated that after rejuvenation particularly pruning of trees the yield levels are very low during first 3 years. Skilled labours who knows rejuvenation technology are also not available. High wage rates of labour was the constraint faced by 83.33 per cent farmers. On pruned branches of trees there is attack of pests and insects particularly stem borer was the problem faced by 80 per cent farmers in the study area. Other problems faced by the farmers were lack of technical guidance and non-availability of insecticide, pesticides as when required was posed by 75 per cent and 58.33 per cent farmers, respectively.

Table 6
Constraints faced by the farmers in Rejuvenation of mango orchards

Sr. No.	Particulars	Frequency	Percentage
1.	Non availability of skilled labours for rejuvenation of orchards	55	91.66
2.	High wage rates of skilled labour	50	83.33
3.	Attack of insects and pest particularly stem borer on pruned branches and stem which causes damage to the trees	48	80.00
4.	After rejuvenation in initial years production is very low	60	100.00
5.	Lack of technical guidance in time	45	75.00
6.	Non availability of insecticides and pesticides in time	35	58.33

Table 7
Opinions of farmers regarding Rejuvenation

Sr. No.	Particulars	Frequency distribution	Percentage
1.	Age old orchards above forty years have low yield and hence rejuvenation practices good	60	100.00
2.	Rejuvenation technology is good solution as harvesting of fruits is a problematic and expensive in old orchards due to long and spreaded branches	58	96.66
3.	After rejuvenation old and senile plants give good yield	52	86.66
4.	In old orchards expenditure on harvesting is more.	50	83.33
5.	Immature harvested fruits fetch low prices in market. After rejuvenation harvesting of only matured fruits is possible	40	66.66
6.	In old, senile orchards plant population is low. After rejuvenation of old orchards number of plants per hectare can be increased	36	60.00

Opinions of farmers regarding rejuvenation practice

In a schedule designed for collecting data from the farmers, opinions of respondent farmers were also taken. The information regarding it is shown in Table 7.

According to Table 7 that, cent per cent farmers opined that as orchards above 40 years of age give very low yield and therefore rejuvenation practice is good. In old orchards branches of mango trees are so long and heighted that cent per cent harvesting does not become possible. Therefore about 97 per cent farmers were agreed with rejuvenation practice. About 86.66 per cent farmers remarked that good yields are obtain after rejuvenation. Of the sample farmers 83.33 per cent respondents reported that expenditure on spraying and harvesting is more in old orchards. Nearly 66.66 per cent farmers opined that in old orchards some times immature fruits are harvested. These fruits do not fetch good prices in the market. At overall level farmers have accepted this technology but proper dissemination of this technology among the farmers is needed.

CONCLUSIONS

1. Average size of mango orchard was 1.77 ha. in non rejuvenated group with average productivity of 32.24 q while it was 2.95 ha. in high group of rejuvenated orchards with average productivity of 61.55q.
2. Per hectare labour required for rejuvenated mango orchard was 142 human days and expenditure incurred was ` 38092/- at overall level.
3. There was saving of 33 human labours per hectare and saving of ` 11358/- on total expenditure in high group of rejuvenated mango orchards as compared to non rejuvenated mango orchards. In non

rejuvenated mango orchards because of big canopy as well as heighted and spreaded branches the requirement of labour was more on different operations like cleaning of orchard, spraying and harvesting.

4. Per hectare total cost (Cost C) of production of non rejuvenated mango orchard was ` 1,29,401/- as against ` 2,21,346/- of high group of rejuvenated mango orchard and gross return of ` 1,53,076/- and ` 2,98,210/-, respectively. The benefit cost ratio was 1.18 for non rejuvenated mango orchard and 1.35 in high group of rejuvenated mango orchard.
5. Major constraints in rejuvenation of mango orchard were, low yield in the initial period, non availability of skilled labours, high wage rates, problem of pest and diseases on pruned branches and stems.
6. Farmers opined that rejuvenation practice is important for the age old orchards. About 97 per cent farmers remarked that there is a saving in the labour for the operations like spraying and harvesting after rejuvenation. Farmers have accepted this technology but proper dissemination of this technology in producing areas is needed.

Policy implication

After rejuvenation of old and senile mango orchards in South Konkan region, per hectare incremental yield was 29.31 q. and incremental net returns were ` 53,189/-. Similarly, per hectare saving in expenditure on labour of spraying and harvesting of fruits was 32.26 per cent. Therefore, it is recommended that mango growers in producing area be trained by extension agencies to adopt rejuvenation technology of mango orchards of DBSKKV, Dapoli for higher yield and gross income.

Table 8
Comparative per hectare cost of production of non-rejuvenated and rejuvenated mango orchard

(Figures in ₹)

Sr. No.	Particulars	Non Rejuvenated orchards (N=60)			Low (N=17)			Medium (N=29)			High (N=14)			Overall (N=60)		
		Qty.	Rate	Amount (₹)	Qty.	Rate	Amount (₹)	Qty.	Rate	Amount (₹)	Qty.	Rate	Amount (₹)	Qty.	Rate	Amount (₹)
1.	Hired Labour	99	323	31977	130	288	37440	138	323	44574	151	309	46659	140	307	42980
	a) Male	26	144	3744	47	143	6721	59	151	8909	68	141	9588	58	146	8468
	b) Female	125		35721	177		44161	197		53483	219		56247	198		51448
2.	Machine power			983			7375			8255			9570			8313
3.	Organic Manures (FYM/Compost)	2823	4.04	11405	3197	3.14	10039	2485	3.47	8623	4195	4.77	20010	1595	5	7413
4.	Total Fertilizers	419	17.29	7245	446	11.85	5285	579	15.58	9021	813	16.35	13293	256	16	4145
5.	Pesticides/Fungicides (Carbendazim/Bordomixture)	5.58	677.52	3781	9.57	537.84	5147	15.17	517.40	7849	43.32	283.42	12278	13	297	3814
6.	Paclotrazol	0		0	0		0	0		0	0.024	7800	187	0	7800	53
	Working capital			59134			72007			87231			111585			75185
7.	Interest on working capital (6%)			3548			4320			5234			6695			4511
8.	Land revenue and cesses			50			50			50			50			50
9.	Depreciation on farm implements			843			843			843			843			843
10.	Other (repairing charges)			195			275			325			370			321
I				63770			77495			93683			119543			80910
11.	Rental value of land			25463			8874			25471			49652			26074
12.	Interest on fixed capital			800			800			800			800			800
13.	Amortization cost			21500			21500			21500			21500			21500
II	Cost 'B'			111533			108669			141453			191494			129285
14.	Family Labour	33	323	10659	43	288	12384	46	323	14858	50	309	15450	47	307	14429
	a) Male	9	144	1296	16	143	2288	19	151	2869	23	141	3243	19	146	2774
	b) Female	42		11955	59		14672	65		17727	73		18693	66		17203
15.	Supervision charges @ 10 % on input cost			5913			7201			8723			11158			7519
III	Cost 'C'			129401			130542			167903			221346			154006
16.	Yield & Gross returns															
	i) Main Product (q)	32.24	4748	153076	11.82	4530	53545	32.67	4687	153124	61.55	4845	298210	33.50	4679	156747
	Gross returns			153076			53545			153124			298210			156747
17.	Net returns at(i) Input cost			93942			-18462			65894			186625			81562
	ii) Total cost			23675			-76997			-14779			76864			2740
18.	BC Ratio at Input Cost			2.59			0.74			1.76			2.67			2.08
19.	BC Ratio at Total Cost			1.18			0.41			0.91			1.35			1.02
20.	Cost per Quintal			4014			11044			5139			3596			4597

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