International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(4): 544-549
© 2017 JEZS
Received: 05-05-2017
Accepted: 06-06-2017

SS Dhuri
Student M.Sc. (Agri.). Department of Agricultural Economics, College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth Rahuri, Maharashtra State, India

MS Jadhav
Assistant Professor, Department of Agricultural Economics, College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth Rahuri, Maharashtra State, India

SJ Misal
Student M.Sc. (Agri.), Department of Agricultural Economics, College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth Rahuri, Maharashtra State, India

Correspondence
SS Dhuri
Student M.Sc. (Agri.). Department of Agricultural Economics, College of Agriculture, Kolhapur, Mahatma Phule Krishi Vidyapeeth Rahuri, Maharashtra State, India

Economics of production of Alphonso mango in Sindhudurg district

SS Dhuri, MS Jadhav and SJ Misal

Abstract
The study was conducted in Sindhudurg district of Maharashtra. The objectives of study also examined resource use, cost and returns structure, resource use productivity, resource use efficiency of Alphonso mango in Sindhudurg district of Maharashtra. The study was based on the primary data of 90 Alphonso mango cultivators for the year 2014-15. The data was collected by survey method by conducting personal interviews using specially designed questionnaire for the study purpose. The data with respect to land use pattern, cropping pattern, input utilization and yield for mango crop was collected from cultivators. The functional analysis was carried out by using Cobb-Douglas type of production function. The study revealed that at the overall level, per hectare cost of establishment of mango orchard was worked out to Rs. 1,23,919.44. Per hectare total cost of maintenance (Cost C) at overall level of mango orchard was Rs. 2,12,196.22 out of which share of Cost-A was 50.45 per cent and Cost B was 93.00 per cent. Total benefit cost ratio of Alphonso mango was 1.30 at overall level. The results of production function analysis indicated that the selected ten variables jointly explained 0.64 per cent variation in production under Alphonso mango. The elasticity coefficient for Nitrogen (X_4) and number of plants (X_9) was positive and found statistically significant at 1 per cent and 10 per cent level of probability. The major constraint faced by 97.78 per cent sample mango growers was lack of cold storage facility. Therefore the present study was undertaken to analyze the "Economics of production of Alphonso mango in Sindhudurg District."

Keywords: Resource use, returns structure, resource use productivity, resource use efficiency

Introduction
Mango (*Mangifera indica* L.) belongs to family Anacardiaceae is one of the delicious fruit grown all over the world. Mango originated in South–East Asia. Generally, mango favours tropical and subtropical climate. Mango is known as 'National Fruit of India.' In many languages it is called as mother of all tropical fruits. The genus mangifera contains about 49 species. There are about 4000, or even more than that mango varieties grown all over the world but few of them grown commercially. World's area under mango cultivation is of 4946 thousand ha and production of 23 million tonnes. Increasing trend has been observed in world mango production averaging 22 million metric tonnes per year. Worldwide production is mostly concentrated in Asia, accounting for 75 per cent. India is largest producer of mango followed by China (4.3 Million MT), Thailand (2.6 Million MT) and Indonesia (2.13 Million MT). The economic importance of mango is evident from the fact that India ranks first among world's mango producing countries accounting for about 50 per cent of the world's mango production. During the year 2013-14, the area under mango in India is 2516 thousand ha. With production of 18431.3 thousand MT and productivity is 7.3 MT/ha. Mango contributes 20.7 per cent share in production among all fruit crops in India. The important mango growing states in India are Uttar Pradesh, Andhra Pradesh, Karnataka, Bihar, Gujarat, Tamil Nadu, Orissa, Jharkhand, Maharashtra and West Bengal. Uttar Pradesh stands first in the production of mango in India with production of 4300 thousand MT with highest productivity (16.4 MT/ha).

In Maharashtra state, during the year 2014 the area under mango is 485000 ha having production of 1212.5 thousand MT and productivity is 2.5 MT. Maharashtra stands first in the area under mango but still low in production. Area under this crop in the Konkan region is 1 lakh hectare out of which 0.23 lakh/ha area under only in Sindhudurg district. The area and production of Sindhudurg district is 27,595 ha and 16,236 MT respectively.

Therefore, the present study was undertaken to analyze the "Economics of Production of Alphonso mango in Sindhudurg District."

Objectives

1. To examine the resource use, cost and returns structure of Alphonso mango
2. To study resource use productivity and resource use efficiency of Alphonso mango

Methodology

Sindhudurg district is one of leading mango growing district in Maharashtra. Therefore, it is purposively selected for study. The total area under mango in Vengurla and Sawantwadi tahsil was 2910 and 2890 ha, respectively. Three villages from Vengurla tahsil and three villages from Sawantwadi tahsil were selected purposively on the basis of more area under sole crop mango. The selected sample growers were grouped into two categories on the basis of age of orchard. viz. below 15 years age and above 15 years age. From each village 8 mango orchards were selected of age below 15 years while 7 mango orchards were selected of age above 15 years. Total fifteen mango growers from each village were selected to constitute a total sample size of 90 sample growers.

A Cobb Douglas type of production function was used for estimating the resource use productivity of major inputs in mango at the overall levels.

Results

I. Information about mango orchard

The detail information of mango orchard grown by sample farmers in respect to size of orchard, age of orchard, number of bearing and non bearing trees is given in Table no. 1.

Table 1: Information about mango orchard

Sr. No.	Particulars	Group I (N=48)	Group II (N=42)	Overall (N=90)
1	Average age of the orchard (yrs.)	8.13	31.97	19.25
2	Average size of the orchard (ha.)	0.63	1.07	0.84
3	Average number of trees			
a) Per farm (Number of trees)				
	i. Bearing	54.35	93.62	72.68
		(89.59)	(90.56)	(90.17)
	ii. Non bearing	6.31	9.76	7.92
		(10.41)	(9.44)	(9.83)
	Total	60.67	103.38	80.60
		(100.00)	(100.00)	(100.00)
b) Per hectare (Number of trees)				
	i. Bearing	86.28	87.49	86.62
	ii. Non bearing	10.02	9.12	9.44
	Total	96.30	96.62	96.06

(Figures in the parentheses indicate percentage to the total)

It is observed from Table 1 that, at overall level age of mango orchard was 19.25 years. The average age of mango orchards in group I was 8.13 years and in group II it was 31.97. Per farm average size of orchard for sample farms was 0.84 ha. Average size of mango orchard was 0.63 ha in group I, 1.07 ha in group II. At overall level per farm number of trees grown were 80.60 and in group I and group II, 60.67 and 103.38 respectively. At the overall level number of bearing trees were 72.68 (90.17 per cent) and in group I and II were 54.35 (89.59 per cent) and 93.62 (90.56 per cent), respectively. At overall level the per hectare total number of mango trees grown by sample growers was 96.06, of which 86.62 per cent were bearing trees and only 9.44 per cent non-bearing trees.

II. Per hectare total establishment cost:

In order to determine the annualised establishment cost the fixed costs worked out have been apportioned over 45 years which is considered to be economic life of mango orchard. The information relating to operation wise per hectare cost for different size groups for the initial period of five years is presented in Table 2.

It is observed from the Table 2 that at the overall level, per hectare cost of establishment of mango orchard was worked out to Rs. 1,23,919.44 Among the different items of cost, the imputed cost on working capital was maximum i.e. Rs. 72,665.41(58.64 per cent) followed by cost incurred on total hired labour i.e. Rs. 49,306.35 (39.79 per cent), interest on fixed capital Rs.16,459.09 (13.28 per cent), rental value of land Rs.16,145.42 (13.03 per cent), family labour 13,431.02 (10.84 per cent), plant protection measures Rs. 9,630.21 (7.77 per cent), fertilizers Rs.5,612.05 (4.53 per cent), fencing Rs.4,679.86 (3.78 per cent), manures Rs.4,649.28 (3.75 per cent)., interest on working capital Rs.4,359.22 (3.52 per cent), seedling and planting material Rs.2,381.80 (1.92 per cent), depreciation charges including irrigation structure Rs.828.56 (0.67 per cent), land revenue Rs.30.00 (0.02 per cent).However, as regards to the items of cost of establishment in group I cost imputed was maximum in case of working capital Rs. 72,946.33 (55.95 per cent) followed by total labour cost Rs.49,977.30 (38.33 per cent) and minimum in case of land revenue Rs.30.16 (0.02 per cent). For group II, cost imputed was maximum in case of working capital Rs. 73,027.62 (60.60 per cent) followed by total labour cost Rs.49,216.93 (40.84 per cent) and minimum in case of land revenue Rs.30.12 (0.02 per cent).

The annualized per hectare establishment cost was worked out to Rs. 15,740.95, Rs. 14,549.25 for group I and group II, respectively and at the overall level Rs. 14,961.57. In between two age groups, per hectare establishment cost was highest in case of group I (Rs. 1,35,214.13) followed by group II (Rs. 1,25,302.56)

Table 2: Per hectare total establishment cost of mango Amount (Rs.)

Sr. No.	Inputs	Group I	Group II	Overall
1	Hired human labour			
	Male labour	23772.12	23379.54	23434.58
		(18.23)	(19.40)	(18.91)
	Female labour	26205.18	25837.39	25871.77
		(20.10)	(21.44)	(20.88)
	Total labour cost	49977.30	49216.93	49306.35
		(38.33)	(40.84)	(39.79)
2	Seedlings and planting material	2411.54	2379.28	2381.80
		(1.85)	(1.97)	(1.92)
3	Manuring	4707.33	4644.36	4649.28
		(3.61)	(3.85)	(3.75)
4	Fertilizers	5682.12	5606.12	5612.05
		(4.36)	(4.65)	(4.53)
5	Plant protection measures			
	Sulphur based fungicide(kg)	3030.99	3147.96	3093.14
	Carbamate (kg)	3927.50	3927.50	4027.75
	Organophosphate (lit)	2266.89	2683.61	2509.32
	Total	9225.38 (7.08)	9759.06 (8.10)	9630.21 (7.77)
6	Irrigation charges	904.76	903.60	900.12
		(0.69)	(0.75)	(0.73)
7	Incidental charges	89.94	66.64	65.18
		(0.07)	(0.06)	(0.05)
8	Fencing	4523.81 (3.47)	4819.23 (4.00)	4679.86 (3.78)
9	Working capital	72946.33	73027.62	72665.41
		(55.95)	(60.60)	(58.64)
10	Interest on working capital	4376.77	4381.65	4359.92
		(3.36)	(3.64)	(3.52)
11	Depreciation charges including irrigation structure	873.10	804.68	828.56
		(0.67)	(0.67)	(0.67)
12	Land revenue	30.16	30.12	30.00
		(0.02)	(0.02)	(0.02)
13	Cost A	78226.37	78244.08	77883.91
		(60.00)	(64.93)	(62.85)
14	Rental value of Land	15686.72	16572.64	16145.42
		(12.03)	(13.75)	(13.03)
15	Interest on fixed capital	20193.27	14067.24	16459.09
		(15.49)	(11.67)	(13.28)
16	Cost B	114106.36	108883.95	110488.42
		(87.52)	(90.36)	(89.16)
17	Family labour			
	Male labour	7738.14	5520.07	6384.23
		(5.94)	(4.58)	(5.15)
	Female labour	8530.17	6100.38	7046.79
		(6.54)	(5.06)	(5.69)
	Total labour	16268.31	11620.45	13431.02
		(12.48)	(9.64)	(10.84)
18	Total establishment cost	130374.67	120504.40	123919.44
		(100.00)	(100.00)	(100.00)
19	Amortization cost	15740.95	14549.25	14961.57

(Figures in the parentheses indicate percentage to total)

III. Cost of maintenance of mango orchards

The per quintal cost of cultivation of mango was worked out and it was Rs. 10,199.46 at overall level, Rs. 16,095.04 and Rs. 6,289.55 in case of group I and group II respectively. The per quintal cost of group I was higher than group II and overall level because the per hectare yield of group I is (33.74 q) is lower than group II (39.23 q) and overall yield (36.85 q).

Table 3: Per hectare maintenance cost of mango orchard (Rs.)

Sr. No.	Inputs	Group I	Group II	Overall
	Hired human labour			
1	Male labour	23020.88	28482.32	26214.57
		(11.26)	(12.98)	(12.35)
		10016.48	9917.58	9932.95
2	Female labour	(4.90)	(4.52)	(4.68)
	Total labour cost	33037.37	38399.90	36147.51
		(16.16)	(17.51)	(17.03)
3	Manuring	34609.50	39763.57	37591.71
		(16.93)	(18.13)	(17.72)
4	Fertilizers	2814.30	2739.18	2757.29
		(1.38)	(1.25)	(1.30)
5	Plant protection measures	13757.76	11665.04	12478.38
		(6.73)	(5.32)	(5.88)
6	Cultar (lit)	7933.22	7580.88	7703.98
		(3.88)	(3.46)	(3.63)
7	Irrigation charges	1023.54	1673.43	1407.80
		(0.50)	(0.76)	(0.66)
8	Fencing	3001.58	1506.01	2104.09
		(1.47)	(0.69)	(0.99)
9	Working capital	96497.39	103685.35	100537.63
		(47.19)	(47.27)	(47.38)
10	Interest on working capital	5789.84 (2.83)	6221.12 (2.84)	6032.26 (2.84)
11	Depreciation charges including irrigation structure	418.48 (0.20)	438.35 (0.20)	429.27 (0.20)
12	Land revenue	60.03	60.24	60.01
		(0.03)	(0.03)	(0.03)
13	Cost A	102765.74	110405.06	107059.17
		(50.26)	(50.33)	(50.45)
14	Rental value of land	51202.79	63300.89	58276.89
		(25.04)	(28.86)	(27.46)
15	Interest on fixed capital	20097.57	14067.24	16459.09
		(9.83)	(6.41)	(7.76)
16	Amortization cost	16247.88	15128.56	15541.69
		(7.95)	(6.90)	(7.32)
17	Cost B	190313.98	202901.75	197336.84
		(93.08)	(92.50)	(93.00)
18	Family labour			
	Male labour	9866.09	12206.71	11234.81
		(4.83)	(5.56)	(5.29)
	Female labour	4292.78	4250.39	3624.57
		(2.10)	(1.94)	(1.71)
	Total labour	14158.87	16457.10	14859.38
		(6.92)	(7.50)	(7.00)
19	Cost C	204472.85	219358.84	212196.22
		(100.00)	(100.00)	(100.00)
20	Per qtl cost	16095.04	6289.55	10199.46

(Figures in the parentheses indicate percentages to total)

Per hectare total cost of maintenance (Cost C) at overall level of mango orchard was worked out to Rs. 2,12,196.22 out of which share of Cost-A was Rs.1,07,059.17 (50.45 per cent) and Cost B was Rs.1,97,336.84 (93.00 per cent). The item wise cost at overall level, it was found that the maximum cost was incurred for working capital i.e. Rs. 1,00,537.63 (47.38 per cent) followed by rental value of land Rs.58,276.89 (27.46 per cent), manuring Rs.37591.71 (17.72 per cent) and hired human labour Rs. 36147.51 (17.03 per cent).

IV: Production function analysis

Table 4: Cobb-Douglas Production Function

Sr. No.	Variables	Regression Coefficients
1	Constant (Intercept)	3.8346 (1.87)
2	Male labour days (X_1)	0.6025^{NS} (0.40)
3	Female labour days (X_2)	0.2065^{NS} (0.35)
4	Manures in quintal (X_3)	0.0153^{NS} (0.086)
5	Fertilizers	
	N(X_4)	5.116*** (1.46)
	P(X_5)	-7.6675*** (1.47)
	K(X_6)	0.0307^{NS} (0.31)
6	Plant protection chemical (X_7)	-0.1472^{NS} (0.18)
7	Cultar (X_8)	-0.4612* (0.25)
8	No. of plants(X_9)	0.2003* (0.10)
9	Irrigation (X_{10})	0.1515^{NS} (0.16)
10	R^2	0.6418

(Figures in parentheses indicate standard error)
***-Significant at 1% level ** - Significant at 5% level
* - Significant at 10% level NS- Non significant

Results of Cobb-Douglas type of production function

The elasticity coefficient for Nitrogen (X_4) and number of plants (X_9) was positive and found statistically significant at 1 per cent and 10 per cent level of probability. Phosphorus (X_5) was negatively significant at 1 per cent level. Plant protection chemicals (X_7) with negative coefficient found non significant. Cultar (X_8) was negatively significant at 10 per cent level of significance. Whereas, the elasticity coefficients for Male labour (X_1), Female labour (X_2), Manures (X_3), Potassium (X_4) and irrigation (X_{10}) though positive but were found statistically non significant indicating no significant effect of these variables on yield of mango. Phosphorus, plant protection chemicals and cultar was observed to be over utilized. The R^2 was 0.6418 indicating 64.18 per cent variation in the yield of mango caused by the input factors.

Table 5: Marginal value product in mango orchard

Sr No	Resources	G.M.	M.P.P.	M.V.P	MVP /PX	Remark
1	Male labour Man days (X_1)	151.154	0.189	1.904	0.008	-
2	Female labour Man days (X_2)	77.198	0.127	1.278	0.006	-
3	Manures in Quintals (X_3)	22.835	0.032	0.322	0.003	-
4	N (Kg) (X4)	78.465	3.095	31.145	4.449	Under Utilization
5	P (Kg) (X5)	56.933	-6.391	-64.319	-8.040	Excess Utilization
6	K (Kg) (X6)	95.003	0.015	0.154	0.008	-
7	Plant protection measures (X7)	13310.31	-0.001	-0.005	-0.005	-
8	Cultar (X8)	4.060	-5.392	-54.266	-0.027	Excess Utilization
9	No. of trees (X9)	64.468	0.147	1.484	1.484	Under Utilization
10	Irrigation (X10)	984.897	0.007	0.073	0.073	-

It is seen that, at the overall level the ratio of MVP/P_X is greater than unity in case of nitrogen and number of trees indicated the under utilization of these resources. The ratio of MVP/P_X is less than unity in case of male, female labour, manures, phosphorus, potassium, plant protection measures, cultar etc. which showed excess utilization of these resources. Use of these resources should be curtailed down for maximization of profit.

Table 6: Problems faced by the farmer in mango production

Sr. No.	Particulars	No. of Farmers	Percentage
1	High cost of labour	68	75.56
2	High cost of fertilizer	40	44.44
3	High cost of seedling	15	16.67
4	Losses due to insect pest	73	81.11
5	Watch and ward Problems	78	86.67
6	Lack of cold storage facility	88	97.78
7	Lack of technical knowledge for pesticide application	45	50.00
8	High cost of pesticide	47	52.22
9	Lack of skilled labour for harvesting of mango	54	60.00
10	Irregularity in electric supplies	15	16.67

It is seen from Table that, the major constraint faced by 97.78 per cent sample mango growers was lack of cold storage facility. The other constraints faced by the mango growers were, watch and ward problem (86.67 per cent), losses due to insect pest (81.11 per cent), high cost of labour (75.56 per cent), lack of skilled labour for harvesting of mango (60.00 per cent), high cost of pesticide (52.22 per cent), lack of technical knowledge (50.00per cent), high cost of fertilizer (44.44 per cent), high cost of seedling (16.67 per cent) etc.

Conclusions

The per hectare cost of establishment of mango orchard was worked out to Rs. 1,23,919.44 Among the different items of cost, the imputed cost on working capital was maximum i.e.

Rs. 72,665.41(58.64 per cent) followed by cost incurred on total hired labour i.e. Rs. 49,306.35 (39.79 per cent), interest on fixed capital Rs.16,459.09 (13.28 per cent), rental value of land Rs.16,145.42 (13.03 per cent), family labour 13,431.02 (10.84 per cent), plant protection measures Rs. 9,630.21 (7.77 per cent), fertilizers Rs.5,612.05 (4.53 per cent), fencing Rs.4,679.86 (3.78 per cent), manures Rs.4,649.28 (3.75 per cent)., interest on working capital Rs.4,359.22 (3.52 per cent), seedling and planting material Rs.2,381.80 (1.92 per cent), depreciation charges including irrigation structure Rs.828.56 (0.67 per cent), land revenue Rs.30.00 (0.02 per cent). The annualized per hectare establishment cost was worked out to Rs. 15,740.95, Rs. 14,549.25 for group I and group II, respectively and at the overall level Rs. 14,961.57. In between two age groups, per hectare establishment cost was highest in case of group I (Rs. 1,35,214.13) followed by group II (Rs. 1,25,302.56). Per hectare total cost of maintenance (Cost C) at overall level of mango orchard was worked out to Rs. 2,12,196.22 out of which share of Cost-A was 50.45 per cent and Cost B was 93.00 per cent. As regards the item wise cost at overall level, it was found that the maximum cost was incurred for working capital i.e. 1,00,537.63 (47.38 per cent) followed by rental value of land (27.46 per cent), manuring (17.72 per cent) and hired human labour (17.03 per cent). The per quintal cost of cultivation of mango was worked out and it was Rs.10,199.46 at overall level, Rs. 16,095.04 and Rs. 6,289.55 in case of group I and group II respectively. The per quintal cost of group I was higher than group II and overall level because the per hectare yield of group I is (33.74 q) is lower than group II (39.23 q) and overall yield (36.85 q). B:C ratio obtained at overall level was 1.30. Group II having higher B:C ratio i.e.1.33 than group I (1.25). At the overall level the value of coefficient of multiple determinations (R^2) was 0.64, indicated that 64 per cent variation in mango production was explained by variables included in the function. The elasticity coefficient for nitrogen (X_4) and number of plants (X_9) was positive and found statistically significant at 1 per cent and 10 per cent level of probability. Phosphorus (X_5) and Plant protection chemicals (X_7) found non significant. Cultar (X_8) was negatively significant at 10 per cent level of significance. Whereas, the elasticity coefficients of Male labour (X_1), Female labour (X_2), Manures (X_3), Potassium (X_4) and irrigation (X_{10}) though positive but were found statistically non significant indicating no significant effect of these variables on yield of mango. Over utilization of phosphorus, plant protection chemicals and cultar is observed in the selected study area.

References

1. Banerjee GD. Economics of mango production, NABARD, Occasional paper no. 2011, 58.
2. Chavan AK. An economic analysis of investment in mango orchards in Deogad tahsil of Sindhudurg district' (M.S.). M. Sc. (Agri.) Thesis (Unpublished) submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, 2006.
3. Gummagolmath KC, Hiremath GK, Kulkarni B. Mango cultivation in Dharwad district.' An analysis of cost and resource productivity. The Bihar J. of Agril. Mktg., 2002; 10(2):148-152.
4. Mandape RR. A study of resource use efficiency in mango production in Ratnagiri district (Maharashtra). M.Sc. (Agri.) Thesis (Unpublished) submitted to Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (M.S.), 2009.
5. Naik VG. An economic analysis of mango production, processing and export in South Konkan region of Maharashtra. Ph. D. thesis (Unpublished), submitted to Konkan Krishi Vidyapeeth, Dapoli, 2005.
6. Wadkar SS, Veerkar PD, Bagade SR. Resource use efficiency in production of Alphonso mango in Sindhudurg district- An economic analysis. Agril. Econ. Res. Rev. 2006; 19:21.