

## A STUDY ON GROWTH AND PRODUCTION OF MANDARIN (*CITRUS RETICULATA*) IN JHALAWAR DIST. OF RAJASTHAN, INDIA

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Key words :

(Received ..... February, 2014; accepted ....., 2014)

### ABSTRACT

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The present investigation was carried out in Jhalawar district of Rajasthan to study the growth rates, cost of cultivation and production of mandarin. A sample of 60 mandarin cultivators was selected for detailed study. The study relates to the agriculture year 2010-11. Study of cost of cultivation revealed that the total cost of cultivation of mandarin was estimated at Rs. 46933.16 per hectare with Rs. 5941.55 per hectare per year as establishment cost and Rs. 40991.61 per hectare per year as maintenance cost. The per hectare return from mandarin cultivation on an average was estimated at Rs. 1,12,000 for the life span of one year. The average net return of mandarin cultivation was worked out to Rs. 65066.84 per hectare. Compound growth rates were estimated by using the exponential function of the form  $Y = ab^t$ . The growth rates were lowest in the year 1991-92-2000-01 and highest in the year 2001-02-2010-11.

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### INTRODUCTION

Mandarin (*Citrus reticulata*), is most common among citrus fruits grown in India. It is perennial shallow rooted shrub of Rutaceae family. Mandarin is originated from tropical and sub-tropical region of south-east Asia, particularly in India, China and in the region between these two countries. Mandarin is cultivated in every state, certain belts have emerged as the leading producers. Mandarin is chiefly grown in Satpura hills of central India. In south India, Wynad, Nilgiri and Shvroy hills are major mandarin growing belts. In Assam, Brahmaputra Velly and Dibrugarh district are famous for mandarin production. In

Rajasthan, Mandarin is chiefly cultivated in Jhalawar district. Jhalawar has been synonymous with "Chhota Nagpur" because of production of best quality mandarin

From its economic point of view mandarin is a most important cash crop which is locally known as "Nagpur Santra". India exported mandarins especially to Bangladesh, Iran, Bahrein, Singapore, Nepal, Switzerland, Kuwait and Qatar. The mandarins exported to Bangladesh shared maximum i.e. 90.23 per cent of total export (National Horticulture Board, 2009).

The total fruit production in India was 63503 thousand MT with an area of 5775 thousand ha and pro-

ductivity of 11.0 MT/ha during 2008-09. The citrus production of India was 8191887 MT which is 12.9 of the total fruit production with an area of 383575 ha with productivity of 9.0 MT/ha during 2008-09. Thus, India has the 3rd rank in citrus area and production. The total fruit production of Rajasthan was 401.9 thousand metric tonnes with an area of 27.6 thousand hectares and productivity of 14.6 MT/ha. Rajasthan contributes 253.4 thousand MT of citrus production with an area of 14.4 thousand hectares and productivity of 17.6 MT/ha. Thus, Rajasthan having 6th rank in area and 3rd rank in production (2008-09). In Rajasthan highest production of mandarin is contributed by Jhalawar district ranking at first place.

The total fruit production of Jhalawar was 104647.59 metric tonnes with an area of 8054.34 hectares and productivity of 12.99 metric tonnes per hectare during 2008-09. The area under mandarin in Jhalawar district was 9072.31 hectares and production 92480.75 metric tonnes with a productivity of 10.19 MT/ha during 2010-11.

Growth rates of area, production and productivity of mandarin were non-beneficial before the implementation of new economic policy i.e. before the mid 1991. After that when the new economic policy was implemented i.e. after the mid 1991, the area and production of mandarin in Jhalawar district increased on a continuous basis. The increased production in turn resulted in the increased marketed surplus in and around of Jhalawar market. The area, production and productivity of mandarin in Jhalawar district during the period of mid 1991 to 2010-11 shows that cultivation of mandarin in Jhalawar district is economically viable and technically feasible.

Keeping above facts in view the present study was conducted in Jhalawar district of Rajasthan with following specific objective:

- (i) To estimate the per unit cost and return from mandarin production.
- (ii) To estimate the growth rates of area, production and productivity of mandarin in Jhalawar district of Rajasthan.

## METHODOLOGY

The study was conducted in two major mandarin growing tehsils of Jhalawar district namely Jhalrapatan and Pirawa. Three villages from each tehsil were selected. All mandarin growers from all the villages were categorized into three groups viz., Group

I- 1-5 years, Group II- 6-12 years and Group III- above 12 years on the basis of age of orchard establishment. Under each group an equal number of growers i.e. 20 were selected randomly.

The primary data required for the study were collected through personally interviewing the respondents mandarin growers with the help of schedule. Mandarin is a perennial crop, since the cost structure of mandarin cultivation was studied under two sub heads viz., establishment cost and maintenance cost. All the costs incurred by mandarin growers from preparation of land to just before the first cutting were termed as establishment cost and the subsequent cost as the maintenance cost. Costs and returns per hectare for mandarin crop on different group of farmers were analyzed by developing the enterprises budget.

To study the pattern of growth in area, production and productivity of mandarin, secondary data from 1983-84 to 2010-11 were collected from the Horticulture, Department of Jhalawar (Rajasthan). Growth rates of area, production and productivity of mandarin for the period of 1983-84 to 2010-11 were calculated for the Jhalawar district and the Rajasthan State as a whole with the help of exponential function of the form of  $Y = ab^T$ .

Where,

$Y$  = Area/production/productivity of mandarin,

$T$  = Time element i.e. year which takes the value

1, 2 ...n,

$U_t$  = Disturbance term

$b$  = Growth rate over a time period.

## RESULTS AND DISCUSSION

In this section an attempt has been made to discuss the cost of cultivation of mandarin in Jhalawar district of Rajasthan. This has been achieved by detailed study of the investment incurred in establishment of crop and maintenance cost of crop as well as returns from the mandarin crop. The costs incurred on mandarin cultivation have been classified into following two categories :

- 1) Establishment cost
- 2) Maintenance cost

The establishment cost of mandarin crop on an average, was estimated Rs. 71584.97 per hectare. Out of this, operational and fixed costs accounted for Rs. 44327.86 (61.92 per cent) and Rs. 27257.11 (38.07 per cent), respectively. Component wise, the cost or earned value of rented land formed the single largest cost items with 22.60 per cent share in the overall

**Table 1 .** Establishment cost of mandarin on sample farms in Jhalawar district (2010-11); (Rs/ha)

S.N.	Particulars	Farm group			Overall
		Group-I (1-5 years)	Group-II (6-12 years)	Group-III (12 years onwards)	
<b>A</b>	<b>Operational cost</b>				
1.	Land preparation	7524.59(10.45)	7500.69(10.31)	6487.54(9.25)	7170.94(10.01)
2.	Digging and filling of pits	8128.75(11.29)	7244.94(9.96)	6442.74(9.19)	7272.14(10.15)
3.	Cost of plants	7650.43(10.63)	7860.35(10.80)	7900.61(11.27)	7803.79(10.90)
4.	Plantation cost	1356.07(1.88)	1215.36(1.67)	1150.42(1.64)	1240.61(1.73)
5.	Manures and fertilizers	4990.46(6.93)	4750(6.53)	4540.32(6.47)	4760.26(6.64)
6.	Weeding and hoeing	3246.60(4.51)	3998.70(5.49)	3128(4.46)	3457.76(4.83)
7.	Irrigation charges	5264.54(7.31)	4298(5.91)	3547.25(5.06)	4369.93(6.10)
8.	Plant protection measures	3625(5.03)	3542(4.87)	3342(4.76)	3503(4.89)
9.	Interest on working capital	5014.37(6.97)	4849.20(6.66)	4384.66(6.25)	4749.41(6.63)
	Total operational cost (A)	46800.81(65.05)	45259.24(62.23)	40923.54(58.38)	44327.86(61.92)
<b>B</b>	<b>Fixed cost</b>				
10.	Interest on fixed capital	6432.25(8.94)	7428.35(10.21)	7948.30(11.33)	7269.63(10.15)
11.	Depreciation	3477.41(4.83)	3809.45(5.23)	3982.76(5.68)	3756.54(5.24)
12.	Land revenue	46.25(0.06)	48.35(0.06)	50.00(0.07)	48.20(0.06)
13.	Earned value of rented land	15180.32(21.10)	16177.40(22.24)	17190.50(24.52)	16182.74(22.60)
	Total fixed cost (B)	25136.23(34.94)	27463.55(37.96)	29171.56(41.61)	27257.11(38.07)
	Total establishment cost (A+B)	71937.04(100.00)	72722.79(100.00)	70095.10(100.00)	71584.97(100.00)

Figures in parenthesis are the percentage of total establishment cost

**Table 2.** Maintenance cost of mandarin on sample farms in Jhalawar district (2010-11) ; (Rs/ha)

S.N.	Particulars	Farm group			Overall
		Group-I (1-5 years)	Group-II (6-12 years)	Group-III (12 years onwards)	
<b>A</b>	<b>Operational cost</b>				
1.	Weeding and hoeing	2845(6.95)	2678(6.48)	2437(5.97)	2653.33(6.47)
2.	Training and pruning	3844(9.39)	3674(8.90)	3524(8.64)	3680.66(8.97)
3.	Manures and fertilizers	3852(9.41)	3745(9.07)	3561(8.73)	3721.33(9.07)
4.	Plant protection measures	4589(11.21)	4458(10.80)	4256(10.43)	4434.33(10.81)
5.	Irrigation charges	5244.6(12.81)	5148.30(12.47)	4987.25(12.22)	5126.61(12.50)
6.	Harvesting	4520(11.04)	4489(10.87)	4329(10.61)	4446(10.84)
7.	Transportation	2220.20(5.42)	2190.40(5.30)	2092(5.12)	2167.53(5.28)
8.	Interest on working capital	3253.77(7.95)	3165.92(7.67)	3022.35(7.41)	3147.57(7.67)
	Total operational cost (A)	30368.57(74.20)	29548.62(71.60)	28208.6(69.16)	29377.36(71.66)
<b>B</b>	<b>Fixed cost</b>				
9.	Interest on fixed capital	2216.12(5.41)	2714(6.57)	2974(7.29)	2634.70(6.42)
10.	Depreciation	738.70(1.80)	904.66(2.19)	991.33(2.43)	878.23(2.14)
11.	Land revenue	11.56(0.02)	12.08(0.02)	12.50(0.03)	12.04(0.02)
12.	Earned value of rented land	7590.16(18.54)	8088.7(19.60)	8595.25(21.07)	8091.37(19.73)
	Total fixed cost (B)	10556.54(25.79)	11719.44(28.39)	12573.08(30.83)	11616.35(28.33)
	Total maintenance cost (A+B) (Cost C2)	40925.11(100.00)	41268.06(100.00)	40781.68(100.00)	40991.61(100.00)

Figures in parenthesis are the percentage of total maintenance cost

establishment cost. Cost of plants, digging and filling of pits, land preparation, manures and fertilizers and interest on working capital were the other major

components of establishment cost constituting 10.90, 10.15, 10.01, 6.64 and 6.63 per cent, respectively (Table 1).

The overall maintenance cost for the mandarin crop was estimated at Rs. 40991.61 per hectare. Out of this the share of operational and fixed costs were Rs. 29377.36 per hectare (71.66 per cent) and Rs. 11616.35 per hectare (28.33 per cent), respectively. Category wise the total maintenance cost of mandarin was estimated at Rs. 40925.11, Rs. 41268.06 and Rs. 40781.68 on group I, group II, group III farmers, respectively. Item wise, the cost of earned value of rented land (19.73 per cent), irrigation (12.50 per cent), harvesting (10.84 per cent) and plant protection measures (10.81 per cent), had maximum share in overall maintenance cost (Table 2).

The average total cost (amortized establishment cost and maintenance cost) of cultivation of mandarin crop was estimated Rs. 46933.16 per hectare with Rs. 5941.55 per hectare as establishment and Rs. 40991.61 per hectare as maintenance cost.

Mandarin crop started giving economic yield from fifth year onwards. The gross return from one hectare mandarin crop was Rs. 1,12000. The per hectare net return of mandarin cultivation was Rs. 65066.84.

**Table 3.** Average cost and return from mandarin orchards ; Rs/ha

Particulars	Amount
Establishment cost amortized over 22 years @ 12 per cent per year	5941.55
Average maintenance cost	40991.61
Total cost per year	46933.16
Average gross income per year	1,12000.00
Net income per year	65066.84

For calculating the economic feasibility of mandarin cultivation amortization method was used. The benefit cost ratio and net present values were worked out as 2.38 and Rs. 463275.9, respectively. The minimum net income required before replantation of orchard was Rs. 5941.55.

**Table 4.** Economic feasibility of mandarin cultivation; Rs/ha

Measures of investment worth	Value
Benefit- cost ratio	2.38
Net present worth (Rs)	463275.90
Minimum net income required before re plantation of orchard (Rs)	5941.55

### Compound Growth Rate

In this study efforts have been made to discuss the growth rates of area, production and productivity of mandarin in Jhalawar district of Rajasthan.

The aggregate production of a crop is the resultant effect of area and productivity of that crop. The growth pattern of area, production and productivity of mandarin in this context is important. Compound growth rates of area, production and productivity of mandarin were worked out for Jhalawar district and for Rajasthan to assess the direction of change in these aspects over time.

Compound growth rates of area production and productivity of mandarin for Jhalawar and Rajasthan state as a whole were calculated and results indicated that production of mandarin was positively increased at a growth rates of 15.09, 11.18 and 31.35 percent per annum during the 1983-84 to 2010-11, 1991-92 to 2010-11 and 2001-02 to 2010-11, respectively. Further, the production of mandarin decreased at a growth rates of 10.39 and 4.72 per cent per annum during 1983-84 to 1990-91 and 1991-92-2000-01, respectively.

### CONCLUSIONS

1. Establishment cost of mandarin crop on an average was worked out to be Rs. 71584.97 per hectare. It varied from as high as Rs. 72722.79 per hectare on group II farms to as low as Rs. 70095.10 per hectare on group III farms.
2. The overall maintenance cost for the mandarin crop was estimated at Rs. 40991.61 per hectare. It varied from as high Rs. 41268.06 per hectare on group-II farms to as low as Rs. 40781.68 per hectare on group III farms.
3. The average total cost (amortized establishment cost plus maintenance cost) of mandarin crop was estimated at Rs. 46933.16 per hectare. The share of amortized establishment and maintenance cost accounted for Rs. 5941.55 and Rs. 40991.61 per hectare of total cost, respectively.
4. The average gross returns per hectare were found to be Rs. 1,12000 for one year. The net returns per hectare was Rs. 65066.84 for one year.
5. The benefit-cost ratio and net present worth were found to be 2.38 and Rs. 463275.90, respectively. The minimum net income required before replantation of orchard was Rs. 5941.55.

**Table 5.** Compound growth rates of area, production and productivity of mandarin in Jhalawar district and in Rajasthan; (Per cent per annum)

Particular Years	Area		Production		Productivity	
	Rajasthan	Jhalawar	Rajasthan	Jhalawar	Rajasthan	Jhalawar
1983-84—2001-02	10.13	10.29	14.71	15.09	4.16	4.35
1983-84--1990-91	14.85	14.19	10.32	10.39	-3.94	-3.32
1991-92--2010-11	9.19	9.68	10.53	11.18	1.22	1.36
1991-92--2001-02	9.84	10.73	4.47	4.72	-4.88	-5.43
2001-02--2010-11	6.94	7.13	30.55	31.35	22.08	22.60

6. The compound growth rates of area, production and productivity were positively increasing during the period of 1983-84 to 2010-11, 1991-92 to 2010-11 and 2001-02-2010-11 while they were decreasing during the period of 1983-84 to 1990-91 and 1991-92 to 2000-01.

**RECOMMENDATION**

1. It was observed in the study area that some of the sample mandarin farmers faced the problem of credit, because at the time of the establishment of mandarin orchard, it was costly phenomenon and till the fifth years, there was no production obtained from the orchard. Thus, efforts should be directed towards expansion and strengthening of the institution to meet farmers need.

2. It was also observed in the study area that there was no processing unit. So, the government should take up initiative to establish the processing facilities in the nearby tehsil or district level to safeguard the interest of the farmers.

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