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Economic viability of production of kokum (*Garcinia indica* Choicy) in Maharashtra, India

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Abstract

Financial feasibility analysis of capital investment in kokum (*Garcinia indica*) in South Konkan (Sindhudurg and Ratnagiri districts in Maharashtra) revealed profitability of the enterprise. The initial investment for establishing orchards raised from seedlings and grafts were Rs. 38,877 ha⁻¹ and Rs. 69,196 ha⁻¹, respectively. The total cost of production and gross returns were Rs. 26,417 ha⁻¹ and Rs. 42,820 ha⁻¹ and Rs. 44,931 ha⁻¹ and Rs. 45,572 ha⁻¹, respectively for orchards raised from seedlings and grafts, with a benefit : cost ratio of 1.11 and 1.70, respectively. The net present value for both the types of orchards were positive with a pay back period of 7-8 years.

Keywords: economic viability, *Garcinia indica*, kokum.

Introduction

Kokum (*Garcinia indica* Choicy), an important indigenous tree spice crop, is also highly valued for its pharmaceutical properties. Reliable information regarding the cultivated area of this crop in India is lacking because it is seldom planted in the form of an orchard and generally scattered trees are found in coconut and arecanut gardens along the Konkan region in India. No systematic documentation has been performed on the economics of production of this crop in South Konkan region. The present study was hence undertaken to study the investment pattern and financial viability of kokum plantation in this region.

Materials and methods

The South Konkan region of Maharashtra, consists of Ratnagiri and Sindhudurg districts where cultivation of kokum is concentrated. Hence, this area was selected purposively from each district; five taluks having maximum area were selected purposively on area proportionate basis. From each selected taluk, 12 farmers were selected randomly for the study. Thus 60 farmers from each district were selected randomly. The information on establishment cost, cost and returns for studying financial feasibility in both types of orchards, namely, seed and grafted seedling orchards collected during 2007-08 was used for the study. The discounted cash flow technique which has an advantage of

reducing cash flow to single point of time was used to facilitate the test of feasibility.

i) Net Present Value (NPV)

$$NPV = \sum_{i=0}^n \frac{A_i - C_i}{(1+r)^n}$$

where,

A_i = Cash inflow in the i^{th} year

n = No. of years

r = Discount rate

C_i = Cash out flow in the i^{th} year

ii) Internal Rate of Return (IRR)

IRR = Difference between two discount rate +

NPV at lower discount rate

—————
Absolute dif. bet. NPV at the two discount rates

iii) Pay Back Period (PBP)

$$PBP = \sum_{t=0}^{t^*} C_t = \sum_{t=0}^{t^*} R_t$$

where,

R_t = Return in period ' t '

C_t = Cost in period ' t '

iv) Benefit : Cost Ratio (BCR)

$$BCR = \sum_{t=0}^T \frac{R/(1+r)^t}{C(1+r)^t}$$

where,

T = Time

t = Period

R = Total returns

r = Rate of interest

C = Total cost

On the basis of criterion of pay back period, a project is worth undertaking if its payback period is not greater than the investor's desired maximum PBP. If NPV is positive, the investment is profitable according to the NPV criterion. The investment on the project is economically viable if a project guarantees an IRR, which is greater than the cost of borrowing i.e., prevailing rate of interest on

borrowing. Similarly, if the BCR is greater than unity, the investment is profitable by the BCR criterion.

Results and discussion

Establishment cost

The kokum orchard starts bearing after about 5 years from the year of planting in Konkan region of Maharashtra and the average economic life of an orchard is around 40 years. The grower has to invest a considerable amount for establishing the orchard till it starts bearing. This period is called gestation period and growers do not get any returns from the orchard. Therefore, the cost of establishment of kokum orchard can be regarded as an investment capital. The details of establishment cost incurred to develop kokum orchard by using grafts and seedlings till bearing period are presented in Tables 1 and 2. The cost of establishment of kokum orchard is estimated for the whole sample irrespective of each district. In the establishment of orchard at farm level, there was not much variation across different farms in the study area.

Grafted orchard

The establishment cost for initial five years was Rs. 69,196 ha⁻¹ out of which major cost was incurred for labour (55.85%), followed by material cost (44.15%). In total cost of establishment, irrigation cost was highest (26.64%) followed by manures (18.54%), and chemical fertilizers (15.15%).

Seedling orchard

The establishment for initial five years was Rs. 38,771 ha⁻¹, out of which major cost was incurred on labour (61.04%) followed by material cost (38.96%). In total establishment cost, highest cost was on irrigation (22.60%), followed by manures (16.21%) and chemical fertilizers (14.27%).

Cost and return

Grafted orchard

The total cost of maintenance (cost C) of grafted seedling orchard was Rs. 42,820 ha⁻¹

Table 1. Cost of establishment (Rs. ha⁻¹) of grafted kokum orchard in South Konkan region

Sl. No.	Item of cost	Years					Total
		I	II	III	IV	V	
I. Labour cost							
a.	Cleaning and leveling of land	1448 (9.64)	666 (3.86)	580 (4.59)	973 (8.41)	315 (5.37)	3982 (5.75)
b.	Garden layout	264 (1.21)	—	—	—	—	264 (0.38)
c.	Digging of and filling of pits	1990 (9.12)	—	—	—	—	1990 (2.88)
d.	Planting and staking	1191 (5.46)	750 (4.34)	—	—	—	1941 (2.80)
e.	Manuring	866 (3.97)	1620 (9.39)	1061 (8.39)	1179 (10.20)	1183 (20.16)	5909 (8.54)
f.	Irrigation	4294 (19.68)	5005 (29.01)	6484 (51.27)	2656 (22.98)	—	18,439 (26.64)
g.	Mulching	539 (2.47)	249 (1.44)	169 (1.34)	267 (2.31)	117 (2.00)	1341 (1.94)
h.	Spraying of plant protection chemicals	280 (1.28)	187 (1.08)	150 (1.19)	140 (1.21)	42 (0.72)	799 (1.16)
i.	Cultural operations	1621 (7.43)	1117 (96.47)	556 (4.40)	492 (4.26)	198 (3.38)	3984 (5.76)
	Sub total	1,24,943 (57.27)	9594 (55.61)	9000 (71.17)	5707 (49.37)	1855 (31.64)	38,649 (55.85)
II. Material cost							
a.	Kokum grafts	3315 (15.19)	829 (4.80)	—	—	—	4144 (5.99)
b.	Chemical fertilizers	787 (3.61)	3463 (20.07)	1388 (10.98)	3013 (26.07)	1835 (31.27)	10,486 (15.15)
c.	Manures	4126 (18.91)	2445 (14.17)	1695 (13.40)	2425 (20.98)	2140 (36.47)	12,831 (18.54)
d.	Plant protection chemicals	640 (2.93)	462 (2.68)	96 (0.76)	109 (0.95)	94 (1.61)	1401 (2.03)
e.	Mulching material	455 (2.09)	460 (2.67)	467 (3.69)	303 (2.62)	—	1685 (2.44)
	Sub total	9323 (42.73)	7659 (44.39)	3646 (28.83)	5850 (50.63)	4069 (69.35)	30,547 (44.15)
III Grand total (I + II)		21,816 (32.58)	17,253 (25.76)	12,646 (18.88)	11,557 (17.26)	5924 (8.76)	69,196 (100.00)

Figures in parentheses indicate percentage to the total

with gross return of Rs. 45,572 ha⁻¹. The profit at cost C was Rs. 2752 ha⁻¹ realizing a benefit cost ratio of 1.11 (Table 3). Except variation in wages rates there was not much variation in the cost structure of these two districts. Farmers in Ratnagiri District were benefited with better returns and compensated for increased cost of production.

Seedling orchard

The total cost of maintenance (cost C) of seedling orchard was Rs. 26,417 ha⁻¹ with gross returns of Rs. 44,931 ha⁻¹ with benefit cost ratio of 1.70 (Table 4).

Economic evaluation of investment

The investment made in kokum orchard in

Table 2. Cost of establishment (Rs. ha⁻¹) of seedling kokum orchard in south Konkan region

Sl. No.	Item of cost	Years					Total
		I	II	III	IV	V	
I. Labour cost							
a.	Cleaning and leveling of land	713 (4.41)	402 (5.66)	338 (5.22)	575 (10.01)	431 (12.73)	2459 (6.63)
b.	Garden layout	2161 (13.37)	—	—	—	—	2161 (5.55)
c.	Digging and filling of pits	3177 (19.65)	—	—	—	—	3177 (8.17)
d.	Planting and staking	1213 (7.50)	115 (1.61)	—	—	—	1228 (3.11)
e.	Manuring	519 (3.21)	813 (11.45)	749 (11.56)	869 (15.13)	633 (18.67)	3583 (9.21)
f.	Irrigation	949 (5.87)	2952 (41.53)	3117 (48.06)	1657 (28.87)	—	8675 (22.60)
g.	Spraying of plant protection chemicals	123 (0.76)	10 (0.15)	20 (0.31)	10 (0.18)	20 (0.59)	184 (0.47)
h.	Cultural operations	1500 (9.28)	211 (3.08)	301 (4.64)	144 (2.50)	—	2156 (5.56)
	Sub total	10,355 (64.06)	4503 (63.51)	4525 (69.78)	3255 (56.70)	1084 (32.01)	23,622 (61.04)
II Material cost							
a.	Kokum seedlings	1902 (11.77)	250 (3.52)	—	—	—	2152 (5.53)
b.	Chemical fertilizers	1567 (9.69)	755 (10.64)	906 (8.23)	1187 (20.67)	1137 (33.52)	5552 (14.27)
c.	Manures	1942 (12.02)	1237 (17.42)	798 (7.25)	1204 (20.98)	1123 (33.15)	6304 (16.21)
d.	Plant protection chemicals	72 (0.45)	4 (0.06)	4 (0.03)	12 (0.20)	36 (1.05)	128 (0.32)
e.	Mulching material	326 (2.02)	345 (4.86)	250 (2.27)	83 (1.45)	9 (0.26)	1013 (2.60)
	Sub total	5809 (35.94)	2591 (36.49)	1958 (30.22)	2486 (43.30)	2305 (67.99)	15,149 (38.96)
III Grand total (I + II)		16,164 (41.58)	7094 (18.28)	6484 (17)	5741 (14.76)	3389 (8.71)	38,771 (100.00)

Figures in parentheses indicate percentage to the total

terms of capital out flow and in flow was spread over the period of 11 years (1995-2007) for both Sindhudurg and Ratnagiri districts. To study the economic feasibility, the data were discounted at 8%, 10% and 12% rates (Table 5).

The NPV for seedling orchard at 8%, 10% and 12% discount rates in Sindhudurg District were Rs. 2,78,431, Rs. 1,96,077 and Rs. 1,41,349, respectively. The respective figures for grafted orchard were Rs. 51,847, Rs. 42,953

and Rs. 35,162 respectively. The NPV values at 8%, 10% and 12% discount rates for seedling and grafted orchards were positive and the pay back period in these two types of orchard was 8 years. The IRR was 34% for seedling orchard and 27% in grafted orchard and these IRR values were greater than prevailing rate of interest (12%) on borrowing.

The financial feasibility analysis of kokum cultivation in Ratnagiri District showed that

Table 3. Cost of production (Rs. ha⁻¹) and returns of grafted kokum orchard

Sl. No	Item of cost	Sindhudurg	Ratnagiri	Overall
1	Hired labour			
a.	Male	1888(7.48)	4194(8.19)	3040(7.09)
b.	Female	1322(3.35)	3623(7.08)	1518(3.54)
	Total hired labour	3210(8.13)	7818(15.27)	4558(10.64)
2	Manures	4378(11.09)	3240(6.33)	3711(8.67)
3	Chemical fertilizers	6082(15.40)	5203(10.16)	5774(13.48)
4	Plant protection chemicals	100(0.25)	393(0.76)	272(0.63)
	Total input cost	16,980(43.03)	24,471(47.82)	18,873(44.07)
5	Land revenue and other costs	23(0.05)	27(0.05)	25(0.06)
6	Depreciation and repairing charges	813(2.06)	358(0.70)	493(1.15)
7	Interest on working capital (@13%)	2207(5.59)	3181(6.21)	2453(5.73)
I	Cost A	20,023 (50.74)	28,037(54.80)	21,844(51.01)
8	Interest on fixed capital (@10%)	57(0.14)	29(0.06)	37(0.09)
9	Rental value of land (1/6 th of gross returns)	7238(18.34)	9569(18.70)	8403(19.62)
10	Amortization value	9001(22.80)	9001(17.59)	9001(21.01)
II	Cost B	36,319(92.04)	46,636(91.15)	39,285(91.74)
11	Family labour			
	a) Male	834(2.11)	668(1.30)	751(1.75)
	b) Female	608(1.54)	1411(2.75)	897(2.09)
	Total family labour	1443(3.65)	2079(4.06)	1648(3.85)
12	Supervision charges (@10% on input cost)	1698(4.30)	2447(4.78)	1887(4.40)
III	Cost C	39,460(100)	51,162(100)	42,820(100)
13	Yield (quintal)	60	62	61.5
14	Gross returns	43,426	57,414	45,572
15	Per quintal cost of production	658	824	696
16	Profit at cost A	23,403	29,377	23,788
17	Profit at cost B	7107	10,778	6287
18	Profit at cost C	3966	6252	2752
19	Benefit:cost ratio	1.10	1.12	1.11

Figures in parentheses indicate percentage to the total

all the NPVs were positive indicating viability of both types of orchards. The NPVs with respect to seedling orchard at 8%, 10% and 12% discount rates were Rs. 5,11,874, Rs. 4,07,515 and Rs. 3,33,007/-, respectively. The respective figures for grafted orchard were Rs. 1,08,477, Rs. 95,131 and Rs. 83,366 which were comparatively higher than in Sindhudurg District. This indicated that kokum orchards

in Ratnagiri District were more economically feasible than in Sindhudurg District. The IRR values for seedling and grafted orchards were 31% and 46% respectively, and were greater than prevailing rate of interest on borrowing. Under this situation the pay back period in case of seedling orchard was 8 years and in grafted orchard it was 7 years. At the overall level in both the type of orchards, similar

Table 4. Cost of cultivation (Rs. ha⁻¹) of seedling kokum orchard

Sl. No	Item of cost	Sindhudurg	Ratnagiri	Overall
1	Hired labour			
a.	Male	1593(7.15)	3446(10.22)	2671(10.10)
b.	Female	765(3.43)	1668(4.95)	1435(5.43)
	Total hired labour	2358(10.59)	5114(15.18)	4106(15.54)
2	Manures	351(1.58)	912(2.70)	492(1.86)
3	Chemical fertilizers	197(0.88)	923(2.74)	533(2.01)
4	Plant protection chemicals	18(0.08)	1621(4.80)	338(1.28)
	Total input cost	5282(23.72)	13,684(40.62)	9575(36.24)
5	Land revenue and other costs	23(0.10)	27(0.08)	25(0.09)
6	Depreciation and repairing charges	813(3.65)	358(1.06)	493(1.87)
7	Interest on working capital (@13%)	687(3.08)	1779(5.28)	1245(4.71)
I	Cost A	6805(30.56)	15,848(47.04)	11,338(42.92)
8	Interest on fixed capital (@10%)	58(0.26)	29(0.08)	37(0.14)
9	Rental value of land (1/6 th of the gross returns)	7850(35.25)	7618(22.61)	7127(26.97)
10	Amortization value	5478(24.60)	5478(16.26)	5478(20.73)
II	Cost B	20,191(90.67)	28,974(86.01)	23,980(90.77)
11	Family labour			
	a) Male	830(3.73)	1287(3.82)	812(3.07)
	b) Female	720(3.23)	1054(3.12)	668(2.52)
	Total family labour	1550(6.96)	3341(9.91)	1480(5.60)
12	Supervision charges (@10% on input cost)	528(2.37)	1368(4.06)	957(3.62)
III	Cost C	22,269(100)	33,682(100)	26,417(100)
13	Yield (quintal)	65	61	63
14	Gross returns	47,100	42,763	44,931
15	Per quintal cost of production	343	552	419
16	Profit at cost A	40,295	26,915	33,593
17	Profit at cost B	26,909	13,790	20,951
18	Profit at cost C	24,831	9081	18,514
19	Benefit: cost ratio	2.11	1.26	1.70

Figures in parentheses indicate percentage to the total

results were observed. These results are in conformity with findings of Talathi *et.al.* (2001) for kokum plantation.

The study indicated that cultivation of kokum by using both types of planting material in the study area was economically feasible. However, seedling orchards took up more years to recover the invested amount, while

the grafted orchards took relatively lesser period in recovering the invested amount.

Production and disposal pattern

The information on per farm production, fruit losses at farm level, fruits used for marketing and in home scale processing is presented in Table 6. At the overall level, the average per farm kokum fruit production was

Table 5. Economic evaluation of investment in kokum orchard

Sl. No.	Particulars/	Sindhudurg District			Ratnagiri District			Overall		
		Discount rate								
		8%	10%	12%	8%	10%	12%	8%	10%	12%
I Seedling orchard										
i.	Net present value (Rs.)	2,78,431	1,96,077	1,41,349	5,11,874	4,07,515	3,33,007	3,95,153	1,21,796	2,37,178
ii.	Benefit : cost ratio	7.83	5.90	4.59	6.07	4.51	3.49	6.95	5.20	4.04
iii.	Internal rate of return (%)		34.0			31.0			32.5	
iv.	Pay back period (years)		8.0			8.0			8.0	
II Grafted orchard										
i.	Net present value (Rs.)	51,847	42,953	35,162	1,08,477	95,131	83,366	31,162	69,042	59,264
ii.	Benefit : cost ratio	2.64	2.29	2.06	2.51	2.48	2.25	2.57	2.4	2.20
iii.	Internal rate of return (%)		27.0			46.0			31.5	
iv.	Pay back period (years)		8.0			7.0			7.5	

Table 6. Production (q) and disposal (q) of kokum fruits per farm in South Konkan region

Particulars	Sindhudurg District	Ratnagiri District	Overall
Area (ha)	0.49	0.33	0.35
Production	38.86 (100)	34.47 (100)	38.16 (100)
Disposal			
Home scale processing	15.49 (39.86)	8.55 (24.80)	12.02 (31.49)
Gift to relatives and friends	0.23 (0.59)	0.21 (0.60)	0.22 (0.58)
Losses at farm level	2.89 (7.44)	0.80 (2.33)	1.84 (4.83)
Sale through village trader	20.25 (52.11)	24.91 (72.27)	24.08 (63.10)

Figures in parentheses indicate percentage of total

38.16 q of which 63% fruits were marketed through different market intermediaries and 31.49% were used for home scale processing. The remaining 4.83% fruits were lost at farm level and 0.58% were gifted to relatives and friends.

Marketing of kokum fruits

In the marketing of kokum fruits, the growers were observed to sell their produce through channel I: Grower – Trader –

Processor. The grower had realized Rs. 15 kg⁻¹ of kokum fruits as net price which brought 68.10% as his share in the processor's rupee (Rs. 10.50 kg⁻¹). Thus the remaining 40.67% was shared by the village trader which was on higher side mainly due to spoilage of fruits during handling (Table 7). The price realization across different farms ranged from Rs. 6/- to Rs. 10/- kg⁻¹ at producer's level. The availability of fruits is

Table 7. Producer's share in processor's (consumer's) rupee in kokum fruit marketing in South Konkan

Particulars	Rs. kg ⁻¹
Net price received by producer	7.15
Cost incurred by producer	0.30
Purchase price of village trader	7.45
Cost incurred by village trader	0.57
Profit margin of village trader	2.18
Processor/consumer purchase price	10.50
Total market margin	3.05
Producers share in processors/ consumers rupee (%)	68.10

limited by seasonality of production in contrast to demand for processed products of kokum. The processed products have longer shelf life and year round demand locally and in distant markets for house hold consumption. Hence, the less risk for marketing of fruits which was also evidenced by the opinion of processors in the study area.

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