



INVESTMENT PATTERN AND MAINTENANCE COST IN SWEET ORANGE ORCHARD: AN ECONOMIC ANALYSIS

^aSidramayya, ^bGoudappa, S.B., ^cSuresh, S. Patil and ^dHiremath, G.M.

^aPhD Scholar, Department of Agricultural Extension Education, UAS, Raichur

^bProgramme Co-ordinator, KVK, Raddewadgi, Dist.:Gulbarga

^cDean, Agriculture College Bheemarayan gudi, UAS, Raichur

^dAssistant Professor, Department of Agricultural Economics, UAS, Raichur

ABSTRACT

The investigation was carried out in the year 2012-13 to study the investment pattern in sweet orange orchard and to compute the costs and returns in sweet orange cultivation in Raichur district of Karnataka, 120 respondents were purposively selected from the district for sampling. The data was elicited through personnel interview method and analyzed using mean, standard deviation, frequency and percentage. The major findings of the study were, the cost of establishment per acre was found to be Rs. 37,716 of which material cost constituted 43.35 and maintenance cost 56.65 per cent. The average per acre maintenance cost incurred by respondents was Rs. 49,293 during the first four years. The labour, material and fixed costs accounted for 43.56, 36.07, and 20.38 per cent, respectively. The average per ha maintenance cost incurred was Rs. 79,916 during the 5th year onwards up to 8th year of which, labour, material and fixed cost accounted for 41.94, 40.22 and 17.84 per cent to the total maintenance cost. The average per ac. yield was 5.73 tonnes and the net returns obtained were Rs. 99,531. The financial feasibility analysis revealed that on an average the investment in sweet orange orchard can be recovered within seven years. The net present values were positive and of higher magnitude indicating worth whileness of investment. The returns per rupee of investment in this orchard were capable of generating nearly Rs. 3.5 which was highly profitable venture. The internal rate of return was found to be 43.18 per cent which was much higher compared to the cost of capital (9.5%) and hence highly profitable. Overall, the proposition of growing sweet orange crop was highly profitable as revealed by the financial feasibility tests.

KEY WORDS: Investment pattern, Maintenance cost, Returns and Sweet orange.

INTRODUCTION

Horticulture is a fast growing sector and expects comparatively lower requirements of water and easy adaptability to adverse soil and waste land situations. The productivity of fruits and vegetables is of vital importance as it provides higher cash income than cereals per unit of land. India is one of the leading countries in sweet orange production and around 1.57 lakh hectare areas are under cultivation presently. Out of this, nearly 3400 hectare area is covered in Karnataka, which produces fruits 59.3 metric tonnes. In Raichur district of Karnataka, where the study has been conducted, sweet orange is being grown on commercial scale and it also has highest area in production and productivity in Karnataka. The area under sweet orange in the district is 1,093 ha. The important horticulture crops grown in the district are Lemon, Sweet orange, Papaya and Sapota. Study of the economics of sweet orange production is indispensable since there is no proper farm business data on its cost of production. The accurate figures on establishment cost, operating cost and input requirement of sweet orange orchard could be of great help to the sweet orange growers of Raichur district in particular. Therefore, an attempt was made to study the investment pattern in

sweet orange orchard and to compute the cost and returns in sweet orange cultivation in Raichur district.

MATERIALS & METHODS

This study was conducted in purposively selected Raichur district of Karnataka state. Out of the five talukas in the district, Raichur taluka was selected based on highest number of sweet orange growers in the villages. Among the list of villages with number of sweet orange growers arranged descendingly. The number of respondents making up to 120 sweet orange growers was selected as respondents for the study. A draft interview schedule against set objectives for measuring the variables of the study was first prepared and pre-tested with 20 sweet orange growers in the non-sample area. The data were collected through personal interview method using pre-tested tools and data was processed and analyzed with the help of suitable statistical tools. The technique of tabular analysis was employed for estimating the investment pattern, maintenance cost of sweet orange, pattern of labour use, yield and return structure of sweet orange etc. Tabular analysis was adopted to determine the resource structure, cost structure, returns and profits. Simple statistical tools like averages and percentages were used to compare, contrast and interpret results properly. In order to know the relative profitability of investment in

sweet orange cultivation measures of project evaluation by considering, Pay Back Period (PBP), Net Present Value (NPV), Benefit Cost Ratio (BCR) and Internal Rate of Return (IRR) were computed by using following formula.

Pay Back Period (PBP)

Payback period represents the length of time required for the stream of cash proceeds produced by the investment to be equal to the original cash outlay *i.e.*, the time required for the project to pay for itself. In the present study, payback period was calculated by successively deducting the initial investment from the net returns until the initial investment is fully recovered.

Net Present Value

The present value represents the discounted value of the net cash inflows to the project. In the present study, a discount factor of 9.5 per cent was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by-

$$NPV = \sum_{t=1}^n \frac{Y_n}{(1+r)^n} - I$$

Where,

Y_n = refers to the net cash inflows in the year n

r = refers to the discount factor

I = Initial investment

Benefit Cost Ratio

The Benefit Cost Ratio (BCR) was worked out by using following formula

$$B: C = \frac{\text{Discounted cash inflows}}{\text{Discounted cash outflow}}$$

Internal Rate of Return (IRR)

The rate at which the net present value of project is equal to zero is Internal Rate of Return (IRR) to the project. The net cash inflows were discounted to determine the present worth following the interpolation technique.

The method of interpolation followed is as under:

$$IRR = \text{Lower discount rate} + \text{Difference between two discount rates} \times$$

$$\left[\frac{\text{Present worth of cash flows at lower discount rate} - \text{Absolute difference between present worth cash flows stream at the two discount rates}}{\text{Absolute difference between present worth cash flows stream at the two discount rates}} \right]$$

RESULTS & DISCUSSION

The cost of establishing a sweet orange orchard up to bearing can be broadly classified into establishment cost and maintenance cost. So, the cost of establishing a sweet orange orchard up to bearing can be broadly classified into establishment cost and maintenance cost. So, the establishment cost included not only the costs incurred in the zero years that is at the time of planting but also the costs incurred in maintaining the plants till the time of bearing that is up to four years of planting. For establishing, sweet orange orchard investment has to be made on land, pump set, plant material, digging of pits and

sprayer and these costs together constituted the material costs of establishment. These costs have to be invested during the year of establishment of the orchard and are considered as the costs incurred during zero year in the study. During next four years farmers have to maintain the orchard by applying fertilizers, manures, chemicals, irrigation, *etc.* The costs incurred by the farmers on all these items for the four years are grouped together as cost of maintenance. The total costs of establishment (Table 1) was found to be Rs. 87,008.00 per acre of which material costs constituted 43.35 per cent and maintenance costs 56.65 percent.

TABLE 1: Investment pattern in sweet orange orchard (Rs. /ac)

Sl. No.	Particulars	Value	Percentage
A.	Establishment costs		
1	Rental value of land	1,580.00	1.82
2	Bore well	17,620.00	20.25
3	Sprayer	510.00	0.59
4	Planting material	4,620.00	5.31
5	Investment in digging of pits	2,964.00	3.41
6	Pit filling, planting and staking	504.00	0.58
7	Fencing	1,420.00	1.63
8	Drip irrigation	8,498.00	9.77
	Total	37,716.00	43.35
B.	Maintenance cost up to bearing period		
	I Year	10,279.00	11.81
	II Year	10,317.00	11.86
	III Year	13,116.50	15.08
	IV Year	15,579.50	17.91
	Total (I + II + III + IV)	49,292.00	56.65
	Total establishment cost (A + B)	87,008.00	100.00

Similar results were obtained by Koujalagi (1990). The establishment cost (Rs. 87,008) consisted of material cost in the initial year (43.35%) and maintenance cost (56.65%) upto bearing period. The material cost includes the value of land, planting material, cost of digging of pits and planting, well, bore well, and sprayer. The per acre total establishment cost worked out to be Rs. 87,008 and returns per orchard was Rs. 99,531. The purchase of drip irrigation and fencing formed the bulk of the material cost of the total establishment cost. The maintenance cost per year up to bearing stage was found to range from 11.81 per cent to 17.91 per cent of the total establishment. This showed that during the establishment period plants require input factors like labour, manures, fertilizers and plant protection chemicals.

The maintenance cost (Table 2) as indicated in the results included the wages of labour as well as cost of materials utilized and fixed costs. It was observed that out of total maintenance cost the major component was variable cost followed by material cost and fixed cost. Under the variable

cost the labour cost formed an important cost accounting 43.56 per cent of total maintenance cost, since the crops require higher amount labour involvement to prefer the important activity like loosening the soil around the trunk and formation of basin, watch and ward, pruning and training and land preparation *etc.* Among material cost the major component fertilizers, PPC and manure. Since the sweet orange crop is responsively to nutrient and as well as in the recent year the diseases like citrus decline and gummosis have created lot of problem hence to control these diseases the formers have been trying with different chemicals thus the expenses on these items were farm to higher. So for as fixed cost concern the rental value of land formed the major cost component and it is observed that because of the higher productivity of the land and crops which are higher profit fronted the farmers to go for renting of land for the production of sweet orange crops. Even for the farmer who has been entering this crop on their own land where imputed the rental value taking in to consideration ongoing rental rate the cost worked out to be higher.

TABLE 2: Maintenance cost of sweet orange orchard during gestation period (up to 4 years) (Rs. /ac)

Sl. No.	Particulars	I Year	II Year	III Year	IV Year	Total	%
I.	Variable cost						
A.	Labour cost						
1	Land preparation	450.00	500.00	550.00	580.00	2,080.00	4.22
2	Soil loosening around trunk & basin formation	1,500.00	1,600.00	1,650.00	1,680.00	6,430.00	13.04
3	FYM application	240.00	300.00	330.00	380.00	1,250.00	2.54
4	Weeding	800.00	950.00	1,100.00	1,200.00	4,050.00	8.22
5	Fertilizer application	180.00	200.00	240.00	320.00	940.00	1.91
6	Pruning and training	0.00	0.00	540.00	600.00	1,140.00	2.31
7	PPC spraying	240.00	300.00	320.00	400.00	1,260.00	2.56
8	Irrigation, watch and ward	1,020.00	1,050.00	1,100.00	1,150.00	4,320.00	8.76
	Total	4,430.00	4,900.00	5,830.00	6,310.00	2,1470.00	43.56
B.	Material cost						
1	Manure	2,400.00	1,350.00	2,000.00	2,650.00	8,400.00	17.04
2	Fertilizers	484.00	770.50	1,260.00	1,640.50	4,155.00	8.43
3	PPC	180.00	250.00	700.00	1,270.50	2,400.50	4.87
4	Interest on working capital @ 9.5 %	580.00	700.00	740.00	802.00	2,822.00	5.73
	Total	3,644.00	3,070.50	4,700.00	6,363.00	17,777.50	36.07
	Total variable cost	8,074.00	7,970.50	10,530.00	12,673.00	39,247.50	79.62
II	Fixed cost						
1	Rental value of land	1,684.00	1,814.00	2,040.00	2,345.50	7,885.00	16.00
2	Land revenue	8.50	8.50	8.50	8.50	34.00	0.07
3	Depreciation	290.0	294.00	298.50	301.50	1183.00	2.40
4	Interest on fixed capital @ 9.5 %	222.50	230.00	239.50	251.00	943.50	1.91
	Total	2,205.00	2,346.50	2,586.50	2,906.50	10,045.50	20.38
	Total cost (I+II)	10,279.00	10,317.00	13,116.50	15,579.50	49,292.00	100.0

The maintenance cost (Table 3) as indicated in the results included the wages of labour as well as cost of materials utilized and fixed costs. It was observed that out of total maintenance cost the major component was variable cost followed by material cost and fixed cost. Under the variable cost the labour cost formed an important cost accounting 41.94 per cent of total maintenance cost, since the crops require higher amount labour involvement to prefer the important activity like loosening the soil around the trunk and formation of basin, watch and ward, pruning and training and land preparation *etc.* Among material cost the

major component fertilizers, PPC and manure. Since the sweet orange crop is responsively to nutrient and as well as in the recent year the diseases like citrus decline and gummosis have created lot of problem hence to control these diseases the formers have been trying with different chemicals thus the expenses on these items were farm to higher. So for as fixed cost concern the rental value of land formed the major cost component and it is observer that because of the higher productivity of the land and crops which are higher profit fronted the farmers to go for renting of land for the production of sweet orange crops. Even for

the farmer who has been entering this crop on their own land where imputed the rental value taking in to consideration ongoing rental rate the cost worked out to be higher. Similar results were obtained by Ramachandra (2006). Maintenance costs were the recurring costs incurred after the establishment of the orchard *i.e.*, from 5th year onwards for upkeep of the plants so that good yield can be obtained over the economic lifespan of the plants. The maintenance cost included the expenditure towards the use of labour and other material inputs per year along with fixed cost for different

age group of orchards. Under variable cost the labour cost formed an important cost accounting 41.94 per cent of total maintenance cost. The labour activities like harvesting, watch and ward and harrowing application of manure and fertilizers. Among material cost them major component FYM, PPC and fertilizers. The supply of nutrient through manure it was found necessary to improve yield of orchard during bearing period. So for as fixed cost concern the rental value of land formed the major cost component.

TABLE 3: Maintenance cost of sweet orange orchard in bearing period (5th year onwards) (Rs. /ac)

Sl. No.	Particulars	V Year	VI Year	VII Year	VIII Year	Total	%
I.	Variable cost						
A.	Labour cost						
1	Land preparation	1,250.00	1,250.00	1,375.00	1,450.00	5,325.00	6.66
2	Soil loosening around trunk & basin formation	1,700.00	1,750.00	1,850.00	1,900.00	7,200.00	9.01
3	FYM application	340.00	380.00	430.00	480.00	1,630.00	2.04
4	Weeding	1,300.00	1,360.00	1,420.00	1,480.00	5,560.00	6.96
5	Fertilizer application	380.50	410.00	430.00	460.00	1,680.50	2.10
6	Pruning and training	600.00	680.00	730.00	760.00	2,770.00	3.47
7	PPC spraying	450.00	480.00	520.00	560.00	2,010.00	2.52
8	Irrigation, watch and ward	1,200.00	1,280.00	1,350.00	1,430.00	5,260.00	6.58
9	Harvesting	400.00	480.00	560.00	640.00	2,080.00	2.60
	Total	7,620.50	8,070.00	8,665.00	9,160.00	3,3515.50	41.94
B.	Material cost						
1	Manure	2,800.00	3,000.00	3,200.00	3,500.00	1,2500.00	15.64
2	Fertilizers	2,100.00	2,420.00	1,260.00	1,640.50	7,420.50	9.29
3	PPC	1,540.00	1,800.00	2,300.00	2,800.00	8,440.00	10.56
4	Interest on working capital @ 9.5 %	860.00	940.00	980.00	1,000.50	3,780.50	4.73
	Total	7,300.00	8,160.50	7,740.00	8,941.00	3,2141.50	40.22
	Total variable cost	14,920.50	16,230.50	16,405.0	18,101.00	65,657.00	82.16
II	Fixed cost						
1	Rental value of land	2,684.00	2,814.00	3,040.00	3,345.50	11,883.00	14.87
2	Land revenue	8.50	8.50	8.50	8.50	34.00	0.04
3	Depreciation	304.0	308.00	310.50	316.00	1,238.50	1.55
4	Interest on fixed capital @ 9.5 %	262.50	270.00	279.50	291.00	1,103.00	1.38
	Total	3,259.00	3,400.50	3,638.50	3,961.00	14,259.00	17.84
	Total cost (I+II)	18,179.50	19,631.00	20,043.5	22,062.00	79,916.00	100.00

It was observed from the Table 4 that, the average quantity of fruit produced per acre was 5.73 tons. The yield rate in sweet orange orchard varied with the size of the orchard as well as the age of sweet orange tree. During the initial years (5th to 8th year) the yield was less. The yield was maximized from 9th year on wards and remained same up to 15th year because the yield rate changes with age of the orchard. 16th

year onwards the yield starts declining due to the replacement of dead trees which was rarely carried out by the farmers. Also poor management and inefficient use of inputs were attributed for the low yield. Similar results were recorded from the studies conducted by Ravikumar *et al.* (2011).

TABLE 4: Yield and return structure of sweet orange over the years

Period	Yield (tonnes / ac)	Price (Rs. / tonnes)	Gross returns (Rs.)
5 th year	2.0	14,000	28,000
6 th year	3.5	16,000	56,000
7 th year	4.0	16,000	64,000
8 th year	5.6	17,500	98,000
9 th year	7.0	18,000	1,26,000
10 th year	7.0	18,000	1,26,000
11 th year	7.0	18,000	1,26,000

12 th year	7.0	18,000	1,26,000
13 th year	7.0	18,000	1,26,000
14 th year	7.0	18,000	1,26,000
15 th year	7.0	18,000	1,26,000
16 th year	6.4	17,500	1,12,000
17 th year	6.0	17,000	1,02,000
18 th year	5.7	17,000	96,900
19 th year	5.2	16,000	83,200
20 th year	4.4	16,000	70,400
Total	91.80		15,92,500
Average	5.73		99,531

The annual costs per acre were higher in the first four years mainly because more labour required during this period for ploughing, application of fertilizers, FYM, PPC, weeding, watch and ward and loosening of soil around the trunk and formation of basin *etc.* The per acre cost remained the same from 8th to 15th year during bearing period of orchards, since, they were applying the same quantity of inputs and also the labour employment remained same for different operations during this period. The returns varied according

to age yield pattern of trees. They increased up to 14th year and maximized during 15th to 20th year. Returns decreased from 16th year onwards. This finding was in contradiction with Ravikumar *et al.*, (2011). The per acre net returns increased in fifth year from then onwards it remained same up to 15th year then onwards it showed declining trend. For these net returns, the discounting factor was worked out at the rate of 9.5 % to know the financial feasibility of investment in the sweet orange enterprise.

TABLE 5: Cash flow analysis of sweet orange orchard

Sl. No.	Cash outflow	Discounted cash outflow	Cash inflow	Discounted cash inflow	Net cash flow	D. F @ 9.5%	Discounted net cash flow
0	87,008.00	-	0	-	-87,008.00	-	-87,008.00
1	10,279.00	9,353.89	0	0	-10,279.00	0.91	-9,353.89
2	10,317.00	8,563.11	0	0	-10,317.00	0.83	-8,563.11
3	13,116.50	9,968.54	0	0	-13,116.50	0.76	-9,968.54
4	15,579.50	10,905.65	0	0	-15,579.50	0.70	-10,905.70
5	18,179.50	11,634.88	28,000.00	17,920.00	9,820.50	0.64	6,285.12
6	19,631.00	11,385.98	56,000.00	32,480.00	3,639.00	0.58	21,094.02
7	20,043.50	10,623.06	64,000.00	33,920.00	43,956.50	0.53	23,296.95
8	22,062.00	10,589.76	98,000.00	47,040.00	75,938.00	0.48	36,450.24
9	22,062.00	9,707.28	1,26,000.00	55,440.00	1,03,938.00	0.44	45,732.72
10	22,062.00	8,824.80	1,26,000.00	50,400.00	1,03,938.00	0.40	41,575.20
11	22,062.00	8,162.94	1,26,000.00	46,620.00	1,03,938.00	0.37	38,457.06
12	22,062.00	7,501.08	1,26,000.00	42,840.00	1,03,938.00	0.34	35,338.92
13	22,062.00	6,839.22	1,26,000.00	39,060.00	1,03,938.00	0.31	32,220.78
14	22,062.00	6,177.36	1,26,000.00	35,280.00	1,03,938.00	0.28	29,102.64
15	22,062.00	5,736.12	1,26,000.00	32,760.00	1,03,938.00	0.26	27,023.88
16	19,483.50	4,481.20	1,12,000.00	25,760.00	92,516.50	0.23	21,278.80
17	18,820.00	3,952.20	1,02,000.00	21,420.00	83,180.00	0.21	17,467.80
18	17,780.00	3,556.00	96,900.00	19,380.00	79,120.00	0.20	15,824.00
19	16,584.00	2,985.12	83,200.00	14,976.00	66,616.00	0.18	11,990.88
20	15,580.50	2,492.88	70,400.00	11,264.00	54,819.50	0.16	8,771.12
Total	4,58,898.0	1,53,441.10	15,92,500	5,26,560	11,33,602		3,73,118.90

TABLE 6: Financial feasibility of investment in sweet orange orchard

Sl. No.	Particulars	Units	
1	Payback period	Years	7.00
2	Net present value (@ 9.5 % discount rate)	Rs. / ac	2,86,110.90
3	Benefit cost ratio (@ 9.5 % discount rate)	Returns per rupee of investment	3.40
4	Internal rate of return	Per cent	43.18

Sweet orange is a perennial fruit crop, once established continues to bear up to 20 years. Average returns are expected only after four years of planting. Till then heavy investment is required. Resources once committed retrieval is impossible. Further this needs vast resources and income is spread over a number of years. Therefore, costs and

returns have to be analysed carefully to test the worthiness of investment in sweet orange enterprise. This analysis helps farmers in decision making. Hence, the technique of project evaluation such as payback period, net present value, benefit-cost ratio, and internal rate of return were employed in sweet orange crop. In analysing the investment feasibility

the establishment costs, maintenance costs and gross returns (four years) were considered at 9.5 per cent discount rate representing the opportunity cost of capital. The initial investment on per ac. of sweet orange was Rs. 10,279.00 in the first year, Rs. 10,317.00 in the second year, Rs. 13,116.50 in third year and Rs. 15,579.50 during the fourth year. The maintenance cost of bearing orchard was Rs 18,179.50 in the fifth year, Rs. 19,631.00 in the sixth year, Rs. 20,043.50 in seventh year and Rs. 22,062.00 during the eighth year, which was assumed to be constant from fourth to 15th year. The streams of costs and benefits during establishing period (four years) and maintenance/ bearing period (fifth to twenty years) have been annualized at 12.00 per cent discount rate. The Pay Back Period for sweet orange orchards was 7.0 years. This clearly indicates that about seven years would require to get back the initial investment. This could be attributed with the fact that the high initial investment besides higher rate of returns. The Pay Back Period to recover the initial investment forms to lower.

Net present value (NPV) criterion helps to evaluate the benefits accrued and costs incurred during the project life. One advantage of NPV is that it gives an idea about surplus money that would be generated by a project at a given discount rate. It is an absolute measure and varies with level of investment and discount rates. In this study NPV was calculated by discounting net cash inflows. The NPV of sweet orange on per acre at 9.5 per cent discount rate were Rs. 2,86,110.89. The formal selection criterion of NPV is to accept all the projects with positive values. Applying this principle, net present value of sweet orange clearly indicated its financial soundness and economic feasibility. Benefit cost ratio is another tool for appraising the worthiness of investment and it helps to ascertain the profitability of an enterprise. In sweet orange cultivation, initial investment was to be made to establish the orchard and maintenance costs were to be incurred during subsequent years. During these years of maintenance, the cash inflows or benefits exceeded the cash outflows or costs and therefore the costs in the coming years would be met out of returns obtained. The decision in the B: C ratio frame work is to select the projects where the ratio is more than one. The B:C ratio was 3.4 at 9.5 per cent discount rate which satisfies the rule indicating the worthiness of investment on sweet orange orchard. The benefit cost ratio indicates expected returns for each rupee of investment in sweet orange enterprise. Thus, it

could be concluded that investment in sweet orange orchard was economically viable and financially feasible.

Internal rate of return is suggested to be very suitable measure for evaluating the profitability of investment on different projects. The IRR is the rate at which the present worth of project is zero or the discounted costs are equal to the discounted returns. It is superior over the other measures since it takes into consideration the reinvestment opportunities of enterprises during the life span. The formal selection criterion of IRR is to accept the projects with IRR more than the opportunity cost of capital. The internal rate of return was 43.18 per cent. The IRR represents the maximum rate of interest at which the growers can borrow from lending agencies and invest on sweet orange orchard. In other words, it is the earning power of money invested on sweet orange during its life span. Since IRR was more than the opportunity cost of capital it clearly indicated that investment on sweet orange orchard is a financially sound and economically viable proposition. Thus, all the four criteria of investment feasibility revealed that investment in sweet orange is a profitable and financially attractive proposition. Similar results were recorded from the studies conducted by Ramachandra (2006) and Ravikumar *et al.* (2011).

REFERENCES

- Anonymous (2011) Horticultural crop statistics of Karnataka at a glance. Directorate of Horticulture, Lalbagh, Bangalore, 1-45.
- Koujalagi, C.B. (1990) An economic analysis of production and marketing of pomegranate in Bijapur district, Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad (India).
- Ravikumar, K.T., Hosamani, S.B., Mammedesai, N.R., Suresh, Ekbote, D. and Ashalatha, K.V. (2011) Investment pattern and maintenance cost in pomegranate orchards: An economic analysis. *Karnataka J. Agric. Sci.*, 24 (2):164-169
- Raikar, N.A. (1990) Investment in production and marketing of cashew in Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad (India).
- Ramachandra, V.A. (2006) Production and marketing of sapota in Northern Karnataka – An economic analysis. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad (India).