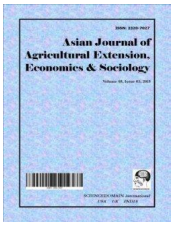

Asian Journal of Agricultural Extension, Economics & Sociology

18(3): 1-12, 2017; Article no.AJAEES.31837
ISSN: 2320-7027

Comparative Economics of Traditional *viz* High Density Mango Cultivation in Karnataka

M. G. Kerutagi[1], Mallu B. Deshetti[1*] and K. Abhilash[1]

[1]College of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka, India.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJAEES/2017/31837
Editor(s):
(1) Ian McFarlane, School of Agriculture Policy and Development, University of Reading, UK.
(2) Madhu S. Mohanty, Department of Economics, California State University, USA.
Reviewers:
(1) Onwusiribe Ndubuisi Chigozirim, Michael Okpara University of Agriculture, Nigeria.
(2) Levent Son, University of Mersin, Turkey.
(3) Gregory Yom Din, Open University of Israel, Israel.
(4) Shelley Gupta, JJT University and P G Moze College of Engineering, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/20154

Original Research Article

Received 27th January 2017
Accepted 22nd May 2017
Published 22nd July 2017

ABSTRACT

This study has examined (i) the growth in area, production and productivity of mango (ii) assess cost and return structure of Mango Cultivation, (iii) the financial feasibility of mango cultivation under traditional *viz* high-density planting orchard in Dharwad district. Using multistage random sampling technique (30) traditional and (30) High density plant orchard, with a total of 60 respondents were selected from two villages in Dharwad. The data were analysed using descriptive statistics and financial feasibility method. The study has indicated that, the annual maintenance cost of traditional mango (₹.21,783/Ac) was lower compared to HDP (₹48,132/Ac). Mango is harvested in a single season in a year. In high-density orchard, the average yield obtained was more (7.86 t/Ac) than in traditional orchard (3.50 t/Ac). However, the sale price was ₹.25,986, ₹.25,995 in both high-density and traditional orchard respectively. Feasibility analysis revealed that, the NPV @ 12 percent discount rate were positive with ₹. 1,16,032.25 and ₹. 4,34,686.29 in traditional and HDP. Similarly B: C ratios were 1.49 and 2.00 in traditional and HDP respectively. Pay Back Period was found to be higher in traditional i.e. 5.90 years whereas in high-density orchard it was 5.54 years. The internal rate of returns was calculated to be 18.20 percent & 26.00 percent in traditional & high-density planting. Therefore, investment in Mango was financially feasible in both the type of cultivation. In the other hand, processing units are not available locally which is one of the back drop under value

**Corresponding author: E-mail: mallu.deshetti@gmail.com;*
Email: mgkerutagi@yahoo.com;

addition sector, hence government should plan for establishing new processing units and involve in training the farmers in processing of mango (pickle, juice, pulp extract etc.), so that wastage of mango fruits can be reduced and value addition can serve as an alternative employment opportunity and also arrange for proper marketing set up in the region to safeguard the interest of mango growers.

Keywords: Traditional mango cultivation; HDP; financial feasibility.

1. INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important tropical and subtropical fruits of the world and is popular both in fresh and the processed forms [1]. It is called as "the king of fruits" [2,3] preferred by all sections of people for its delicious taste, flavour, attractive colour, nutritive value and superior fragrance [4]. India ranks 1st in production in the world among all the mango growing countries [5]. The important mango producing states of the country are Andhra Pradesh, Utter Pradesh, Karnataka, Bihar, Gujarat, Maharashtra, Tamil Nadu, West Bengal, Kerala and Orissa [6]. The productivity of mango found to be declining over the years. The average productivity of nation found to be below 10 tonnes per hectare [7,6].

Mango is cultivating since from 4000 years, is the most favourite fruit of the ages in the Indian subcontinent. In the present era, besides India, it has been cultivated all over world, especially in South & South-east Asian countries, African countries, tropical Australia, USA, Venezuela, Mexico, Brazil, Australia, West Indies Islands and Cambodia [8].

India ranks first among world's mango producing countries, accounting for 50 per cent of the world's total mango production [6]. It produces 19.50 million tonnes over an area of 2.20 million hectares and it accounts for 22.1 percent of the total area under fruit crops [9]. Alphanso and Kesar from western India, Banganapalli, Totapuri and Neelum varieties are majorly cultivated in southern states of the country. Fazli from eastern states and Langra, Chausa and Dusheri from northern states [10]. Among different Mango cultivating states of the country, Karnataka stands fifth in production (16.46 lakh MT) with the area of 1.75 lakh ha (2014-15). Dharwad district stands in fifth position of overall Mango cultivating areas of Karnataka [11].

1.1 Concept of High-density Mango Orcharding

"High-density planting technique is a modern method of Mango cultivation involving the planting of mango trees densely, allowing small or dwarf plants with modified canopy for better light interception and distribution and ease of mechanized field operation" [11]. HDP orchard gives increased yield as well as returns/unit area due to increasing the number of trees/unit area [12,13]. It is possible by regular pruning and use of growth regulators for maintaining the size and shape of the tree [14,11]. But the traditional system of cultivation has often posed problems in attaining desired level of productivity due to the large tree canopy [15,16].

1.2 Comparison between Traditional System and HDP System of Mango Growing

Attributes	Traditional system	HDP system
Plant spacing	10x10 meter	5x5 meter
Tree numbers	100 plants/acre	160 plants/acre
Bearing	After ten years	After four year
Production	Lower yield	Higher yield
Management	Difficult to manage due to large tree size	Easy to manage due to small tree size
Labour requirement	Requires more labour	Requires less labour
Production cost	Higher cost of production	Lower cost of production
Harvesting	Difficult	Easy
Quality	Large canopy, poor sunlight penetration, and poor quality fruits	Small canopy, better air and sunlight penetration, mini disease incidence and high-quality fruits with good colour development

1.3 Advantages High-density Planting

- Best utilization of land and resources.
- Higher yield per unit area with quality fruits.
- Facilitate better utilization of solar radiation and increase the photosynthetic efficiency of the plant.
- It is amenable to modern inputs application techniques such as drip irrigation, fertigation, mechanization etc.
- Early economic returns. [7]

In this context, the present study attempts to estimate the growth in the area, production and productivity of mango, assess the cost and return structure and to analyze the financial feasibility of Mango cultivation under traditional and high-density planting orchard in Dharwad district.

2. MATERIALS AND METHODS

The present study was conducted in Dharwad district of Karnataka. The primary data of mango cultivation under traditional *viz* high-density planting orchard were collected for the year 2015-16. The multistage random sampling technique was fallowed to select (30) traditional and (30) High density plant orchards, with a total of 60 respondents were selected from two villages in Dharwad. The data were analysed using descriptive statistics and financial feasibility method.

2.1 Estimation of Compound Growth Rate

Several methods are available to estimate growth rates. In this study exponential function was used to estimate the compound growth rate by making time as the independent per unit of time and they are termed as 'Geometric' or compound Growth rate [17].

Compound growth rates were estimated by fitting exponential trend equation of the following type.

$$Y= ab^t$$

Where,

Y= area/ production/ productivity
T= time variable in years
a = constant

and

$$B= (1+r)$$

Where,

R = Compound growth rates

The equations (1) take the linear form by taking logarithms of both sides of equations as follows,

$$\log y = \log a + t \log b$$

The compound growth rate is compounding using the following formula

Compound growth rate (CGR) = (Antilog (log b) -1) X 100

2.2 Estimation of Financial Feasibility

For the estimation of financial feasibility, Net present value (NPV), pay-back period, internal rate of return (IRR) and benefit- cost ratio (BCR) were assessed using the technique given by [18].

3. RESULTS AND DISCUSSION

3.1 Compound Annual Growth Rate

Growth rates in the area, production and productivity of mango in Dharwad district, Karnataka state and for all India level were worked out and the results are presented in Table 1. It can be observed from the table that the area under mango in Dharwad recorded compound annual growth rate (CAGR) of 15.34 percent, for all India level CAGR was 2.52 percent and in Karnataka it was observed to be 2.52 percent respectively which were significant at 1 percent probability level. On the other hand, CAGR for the production of mango in India and Karnataka were 4.37 percent and 4.72 percent respectively which were significant at 1 percent probability level, while in case of Dharwad, it was 23.62 percent per annum, which was significant at 5 percent level.

In a similar manner, the productivity of mango in Dharwad district, Karnataka state and for all India level were 1.80 percent, 0.35 percent and 7.18 percent respectively which were not-significant. This was mainly because of drastic variation in climatic condition and also poor maintenance of the orchards.

3.2 Investment Cost of Mango Orchard

The cost of establishing mango 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. So, total costs of establishment (Table 2) were found to be 1,84,823 and 2,98,676 per acre of which material costs constituted 33.73 and 28.37 percent and maintenance costs 66.27 and 71.63 percent in traditional and high-density orchard respectively. Similar results were obtained by [19,20].

3.3 Maintenance Cost of Mango during Gestation Period (1st to 4th year)

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 in a traditional mango orchard. It was observed that out of total maintenance cost the major component was fixed cost followed by variable cost. Under the variable cost, the labour cost formed an important cost accounting nearly 23 percent 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 the basin, watch and ward and land preparation etc. Among material cost the major components are PPC, fertilizers and manure. Because of drastic variation in the climatic condition in the recent years attack of disease and pest, hormonal imbalances are the major factors that lead to fruit drop. Hence to control these problems the farmers have been trying with different chemicals. Thus the expenses on these items were found to be higher. So far as fixed cost is concerned 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 ofmango crops. Even for the farmer who has been entering this crop on their own land where imputed the rental value taking into consideration ongoing rental rate the cost worked out to be higher (43%). Since the opportunity cost of land was taken into consideration for calculating the rental value of land was found to vary over the years.

Table 1. Compound annual growth rate and instability index of mango

(Per cent per annum)

Particulars	Compound annual growth rate		
	Area	Production	Productivity
Dharwad	15.34*	23.62**	7.18NS
Karnataka	4.35*	4.72*	0.35NS
India	2.52*	4.37*	1.80NS

*Note: * and ** indicates significance at 1 and 5 per cent level respectively*
Figure in parentheses indicates percentage

Table 2. Investment pattern in mango orchard in the study area

(₹/Acre)

Sl. no.	Particulars	Traditional		HDP	
		Value	%	Value	%
A.	**Investment costs**				
1.	Rental value of land	13250	7.17	13250	4.44
2.	Bore	20218	10.94	21310	7.13
3.	Pump set	22348	12.09	25418	8.51
4.	Sprayer	733	0.40	1328	0.44
5.	Plant material	2600	1.41	9750	3.26
6.	Digging of fit & planting	2800	1.51	12188	4.08
7.	Staking	400	0.22	1500	0.50
8.	Fencing	-	0	-	0
	Sub Total	**62349**	**33.73**	**84744**	**28.37**
B.	**Maintenance cost up to bearing period**				
	Istyear	31118	16.84	55364	18.54
	IIndyear	30452	16.48	52856	17.70
	IIIrdyear	30452	16.48	52856	17.70
	IVthyear	30452	16.48	52856	17.70
	Subtotal (I+II+III+IV)	122474	**66.27**	**213932**	**71.63**
	Total Establishment Cost (A+B)	**184823**	**100.00**	**298676**	**100.00**

Table 3. Maintenance cost of traditional mango orchard during gestation period in the study area

(₹/Acre)

Sl. no.	Particulars	Traditional					
		I	II	III	IV	Total	%
I.	**Variable cost**						
A.	**Labour cost**						
1.	Land preparation	1750	1750	1750	1750	7000	5.72
2.	Gap filling	250	-	-	-	250	0.20
3.	FYM Application	695	695	695	695	2780	2.27
4.	Fertilizer application	078	078	078	078	312	0.25
5.	Weeding	445	445	445	445	1780	1.45
6.	Inter cultivation	1855	1855	1855	1855	7420	6.06
7.	PPC spraying	388	388	388	388	1552	1.27
8.	Irrigation	1750	1750	1750	1750	7000	5.72
	Total Labour Cost	7211	6961	6961	6961	28094	**22.94**
B.	**Material Cost**						
1.	Seedling for gap	355	-	-	-	355	0.29
2.	FYM	880	880	880	880	3520	2.87
3.	Fertilizers	1756	1756	1756	1756	7024	5.74
4.	PPC	2250	2250	2250	2250	9000	7.35
	Total Material Cost	5241	4886	4886	4886	19899	16.25
1.	Premium paid	-	-	-	-	-	
2.	Managerial Cost (10% of TC)	2829	2768	2768	2768	11133	9.09
	Total Variable Cost	15281	14615	14615	14615	59126	**48.28**
II.	**Fixed cost**						
1.	Rental value of land	13250	13250	13250	13250	53000	43.27
2.	Land Revenue	35	35	35	35	140	0.11
3.	Depreciation	1112	1112	1112	1112	4448	3.63
4.	Interest on fixed capital @ 10%	1440	1440	1440	1440	5760	4.70
	Total Fixed cost	15837	15837	15837	15837	63348	**51.72**
	Total Cost (I+II)	31118	30452	30452	30452	122474	100.00

Table 4. Maintenance cost of high density mango orchard during gestation period in the study area

(₹/Acre)

Sl. no.	Particulars	High density plant					
		I	II	III	IV	Total	%
III.	**Variable cost**						
A.	**Labour cost**						
A.	Land preparation	1275	1275	1275	1275	5100	2.38
1.	Gap filling	1330	-	-	-	1330	0.62
2.	FYM Application	1400	1400	1400	1400	5600	2.62
3.	Fertilizer application	1424	1424	1424	1424	5696	2.66
4.	Weeding	1352	1352	1352	1352	5408	2.53
5.	Inter cultivation	1850	1850	1850	1850	7400	3.46
6.	PPC spraying	992	992	992	992	3968	1.85
7.	Irrigation	2195	2195	2195	2195	8780	4.10
8.	**Total Labour Cost**	11818	10488	10488	10488	43282	**20.23**
B.	**Material Cost**						
1.	Seedling for gap	950	-	-	-	950	0.44
2.	FYM	3200	3200	3200	3200	12800	5.98
3.	Fertilizers	4218	4218	4218	4218	16872	7.89
4.	PPC	3210	3210	3210	3210	12840	6.00
	Total Material Cost	11578	10628	10628	10628	43462	**20.32**
1.	Premium paid	950	950	950	950	3800	1.78
2.	Managerial Cost (10% of TC)	5033	4805	4805	4805	19448	9.09
	Total Variable Cost	29379	26871	26871	26871	109992	**51.41**
IV.	**Fixed cost**						
1.	Rental value of land	20118	20118	20118	20118	80472	37.62
2.	Land Revenue	35	35	35	35	140	0.07
3.	Depreciation	3470	3470	3470	3470	13880	6.49
4.	Interest on fixed capital @ 10%	2362	2362	2362	2362	9448	4.42
	Total Fixed cost	25985	25985	25985	25985	103940	**48.59**
	Total Cost (I+II)	55364	52856	52856	52856	213932	100.00

In High-density plant orchard, the maintenance cost (Table 4) included the wages of labour as well as cost of materials utilized and the fixed costs. It was observed that variable cost formed an important component followed by and fixed cost. Under the variable cost the labour cost accounting nearly 20 percent of total maintenance cost, since the crops require higher amount labour to perform the important activity like loosening the soil around the trunk and formation of basin, watch and ward pruning and land preparation etc. Among material cost the major components were fertilizers, PPC and manure. Since the mango crop is responsive to nutrient as well as in the recent year changes in climatic condition leads to drop of fruits, the pest and diseases like hopper, inflorescence midge, anthracnose, die back have created lot of problem hence to control these pests and diseases the farmers have been trying with different chemicals thus the expenses on these items were found to be higher. So far as fixed cost was concerned the rental value of land formed the major cost component and it was observed to be 38 percent, based on the ongoing rental value of land, the cost worked out to be higher.

3.4 Maintenance Cost of Mango during Bearing Period

Maintenance costs (Table 5) as indicated in the results that, 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 42 percent and 33 percent in traditional and high-density planting orchard respectively. The labour activities like harvesting, pruning, hoeing, irrigation and application of fertilizers etc. Among material cost the major

Table 5. Maintenance cost of mango orchard in bearing period (Vyear & onwards) in the study area

(Rs./Ac/Year)

Sl. no.	Particulars	Traditional		HDP	
		Value	%	Value	%
I.	**Variable cost**				
A.	**Labour cost**				
1.	Ploughing/ harrowing	1435	6.59	1220	2.53
2	Application of FYM	895	4.11	950	1.97
3.	Application of Fertilizers	250	1.15	1458	3.03
4.	Application of PPC	995	4.57	995	2.07
5.	Weeding	1300	5.97	1350	2.80
6	Hoeing/ Agati	634	2.91	2415	5.02
7.	Irrigation	1750	8.03	2195	4.56
8.	Harvesting	1125	5.16	2800	5.82
9.	Miscellaneous/ Pruning	872	4.00	2428	5.04
	Total Labour cost	**9256**	42.49	**15811**	32.85
B.	**Material cost**				
1.	FYM	1488	6.83	3200	6.65
2.	Fertilizers	1884	8.65	4218	8.76
3.	PPC	2541	11.67	3945	8.20
4.	Total material cost	5913	27.15	11363	23.61
5.	Premium if paid	-	0.00	950	1.97
6.	Managerial Cost (10%)	1973	9.06	4376	9.09
	Subtotal (A+B)	**17142**	78.69	**32500**	67.52
II.	**Fixed cost**				
	Land revenue	35	0.16	35	0.07
	Apportioned Establishment cost	3080	14.14	9956	20.68
	Depreciation	1112	5.10	4220	8.77
	Interest on fixed capital	414	1.90	1421	2.95
	Total fixed cost	**4641**	**21.31**	**15632**	**32.48**
	Grand Total (I+II)	**21783**	**100.00**	**48132**	**100.00**

component fertilizers, PPC, and FYM. The supply of nutrient through fertilizers, it was found necessary to improve the yield of orchard during bearing period. So far as fixed cost concern the apportioned establishment cost formed the major cost component.

3.5 Annual Yields and Returns in Mango Production

It was observed from Table 6 that the average quantity of fruit produced per acre in case of HDP and traditional orchards were 7.48 and 3.50 tons respectively. The fruits produced in the beginning year's fetched lesser price than the succeeding years, due to its size, taste and external appearance. As the plant grows older, the size of fruit increases and fetch higher price than the earlier once. However, the attainment of old age depends on the type of maintenance of orchards. The yield rate in mango orchard varies with the size of the orchard as well as the age of mango trees. During the initial years (5th and 6th year) the yield was less in HDP orchard and it was maximized from 8th year onwards and remained same up to 24th year because, the yield rate changes with age of the orchard. The average yield was more in a high-density plant orchard than compare to traditional method. On 20th year onwards the yield starts declining due to poor management and inefficient use of inputs. However, in the case of traditional method yield was in increasing trend but less than HDP method.

In this section cost and returns of different periods of growth are discussed. The cost incurred and returns obtained in both mango orchards were presented in Tables 7 and 8. The annual costs per acre in both traditional and high-density orchards 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 cost per acre remained the same during the 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.

Table 6. Yield and returns structure of mango in the study area

Particulars period	Traditional		HDP	
	Yield (t/Ac)	Total value (Rs.)	Yield (t/Ac)	Total value (Rs.)
5th	2.00	52000	6.10	158600
6th	2.00	52000	6.10	158600
7th	2.45	63700	7.68	199680
8th	2.45	63700	7.68	199680
9th	2.45	63700	7.68	199680
10th	3.6	93600	7.68	199680
11th	3.6	93600	7.68	199680
12th	3.6	93600	7.68	199680
13th	3.6	93600	7.68	199680
14th	3.6	93600	7.68	199680
15th	3.6	93600	7.68	199680
16th	3.6	93600	8.62	224120
17th	3.6	93600	8.62	224120
18th	3.6	93600	8.62	224120
19th	3.6	93600	8.62	224120
20th	3.6	93600	8.62	224120
21th	4.00	104000	8.62	224120
22th	4.00	104000	8.62	224120
23th	4.00	104000	8.62	224120
24th	4.00	104000	8.62	224120
25th	4.00	104000	7.57	196820
26th	4.00	104000	7.57	196820
27th	4.00	104000	7.57	196820
28th	4.00	104000	7.57	196820
29th	4.00	104000	7.57	196820
30th	4.00	104000	7.57	196820
Average	**3.50**	**90950.00**	**7.86**	**204320.00**

Table 7. Cash flow analysis of traditional mango orchard in the study area

Sl. no.	Cash out flow	Cash in flow	Net cash flow	D.F at 12%	Discounted net cash flow
0	62349	0	-62349	0.8929	-55668.75
1	31118	0	-31118	0.7972	-24807.08
2	30452	0	-30452	0.7118	-21675.13
3	30452	0	-30452	0.6355	-19352.80
4	30452	0	-30452	0.5674	-17279.28
5	21783	52000	30217	0.5066	15308.87
6	21783	52000	30217	0.4523	13668.64
7	21783	63700	41917	0.4039	16929.57
8	21783	63700	41917	0.3606	15115.69
9	21783	63700	41917	0.3220	13496.15
10	21783	93600	71817	0.2875	20645.67
11	21783	93600	71817	0.2567	18433.64
12	21783	93600	71817	0.2292	16458.60
13	21783	93600	71817	0.2046	14695.18
14	21783	93600	71817	0.1827	13120.70
15	21783	93600	71817	0.1631	11714.91
16	21783	93600	71817	0.1456	10459.74
17	21783	93600	71817	0.1300	9339.05
18	21783	93600	71817	0.1161	8338.44
19	21783	93600	71817	0.1037	7445.04
20	21783	93600	71817	0.0926	6647.35
21	21783	104000	82217	0.0826	6794.62
22	21783	104000	82217	0.0738	6066.62
23	21783	104000	82217	0.0659	5416.63
24	21783	104000	82217	0.0588	4836.28
25	21783	104000	82217	0.0525	4318.10
26	21783	104000	82217	0.0469	3855.45
27	21783	104000	82217	0.0419	3442.37
28	21783	104000	82217	0.0374	3073.54
29	21783	104000	82217	0.0334	2744.23
30	21783	104000	82217	0.0298	2450.21
	Total				**116032.25**

They increased up to 24th year in high-density orchard and maximized. Returns decreased from 25th year onwards till 30th year. Mango is a perennial fruit crop, once established continue to bearing up to.

3.6 Financial Feasibility of Investment in Mango Cultivation

The foregoing results presented in the Table 7 revealed that the Pay Back Period was found to be lower in high-density plating i.e. 5.54 years whereas in traditional it was 5.90 years. Therefore investment on mango would be recovered before 5.90 years at 12 percent rate of interest in both orchards. The Net Present Value at 12 per cent discount rate for the entire life period of the mango (30 years) was positive and it was ₹.4,39,117 and ₹.1,16,032 in high-density plant and traditional orchards respectively. The Benefit cost ratio was 2.00 in HDP and 1.49 in traditional orchards. However, the ratios were greater than unity for both the orchards indicating remunerative returns per rupee of investment in mango. The internal rate of returns was found to be 26.00 percent in HDP, while in traditional orchard, it was 18 percent. In the entire study area, the internal rate of return was observed to be above the current bank rate and it was higher in HDP compared to traditional orchards. Thus, the results of this study justified farmers' investment in mango cultivation. The financial feasibility results of the present study are in line with the study of mango cultivation, in Dharwad and Bangalore district of Karnataka with the benefit cost ratios of 2.13 and 2.01 [21].

Table 8. Cash flow analysis of high density mango orchard in the study area

Sl. no.	Cash out flow	Cash in flow	Net cash flow	D.F at 12%	Discounted net cash flow
0	84744	0	-84744	0.8929	-75664.29
1	55364	0	-55364	0.7972	-44135.84
2	52856	0	-52856	0.7118	-37621.86
3	52856	0	-52856	0.6355	-33590.94
4	52856	0	-52856	0.5674	-29991.91
5	48132	158600	110468	0.5066	55966.53
6	48132	158600	110468	0.4523	49970.11
7	48132	199680	151548	0.4039	61207.70
8	48132	199680	151548	0.3606	54649.73
9	48132	199680	151548	0.3220	48794.40
10	48132	199680	151548	0.2875	43566.43
11	48132	199680	151548	0.2567	38898.60
12	48132	199680	151548	0.2292	34730.89
13	48132	199680	151548	0.2046	31009.72
14	48132	199680	151548	0.1827	27687.25
15	48132	199680	151548	0.1631	24720.76
16	48132	224120	175988	0.1456	25631.66
17	48132	224120	175988	0.1300	22885.41
18	48132	224120	175988	0.1161	20433.40
19	48132	224120	175988	0.1037	18244.11
20	48132	224120	175988	0.0926	16289.38
21	48132	224120	175988	0.0826	14544.09
22	48132	224120	175988	0.0738	12985.79
23	48132	224120	175988	0.0659	11594.46
24	48132	224120	175988	0.0588	10352.20
25	48132	196820	148688	0.0525	7809.21
26	48132	196820	148688	0.0469	6972.51
27	48132	196820	148688	0.0419	6225.46
28	48132	196820	148688	0.0374	5558.44
29	48132	196820	148688	0.0334	4962.90
30	48132	196820	148688	0.0298	4431.16
	Total				**439117.45**

Table 9. Financial feasibility of investment in mango orchard in the study area

Sl. no.	Particulars	Traditional	High Density Plant
1	Pay Back Period (Years)	5.90	5.54
2	NPV (Rupees/ha)	₹1,16,032.25	₹4,39,117.45
3	B: C Ratio	1.49	2.00
4	IRR (%)	18%	26%

Note: Discount rate @ 12%

4. DISCUSSION AND CONCLUSION

Horticulture sector provides excellent opportunities in raising the income of the farmers even in the dry tracts and also provides higher unit productivity. With this background in the mind, an attempt was made to assess the economics of mango cultivation in Dharwad district. The study implied that mango cultivation was more attractive in high- density plant compared to traditional method, because of lower cost of labour and inputs in HDP. The maintenance cost of the orchard increased as the age of the crop increases. Farmers of high-density planting method were more experienced than traditional method of mango cultivation and hence crop management strategies were well known by them and accordingly higher yield were obtained coupled with lower per acre cost, which made mango cultivation to be more profitable in high-density orchard.

Investment in mango was financially feasible in both traditional and high density orchards, hence the farmers need to be encouraged to take up the cultivation of this crop in large areas, but on the other hand high initial investment in mango hinders the farmers to go for the mango cultivation and hence financial assistance may be up scaled and provided by the institutional agencies at reasonable rate of interest on easy terms will minimize their dependence on marketing intermediaries.

Mango has good commercial potential and area under this crop is significantly increasing in the study area but on the other hand, processing units are lacking in the study area is one of the back drop under value addition sector, hence government should plan for establishing new processing units and involve in training the farmers in indigenous processing of mango (pickle, pulp extract, Juice etc.),so that wastage of mango fruits can be reduced and value addition can serve as an alternative employment opportunity in the region to safeguard the interest of mango growers.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ahmed THM, Mohamed ZMA. A key for identification of mango (*Mangifera indica* L.) cultivars in Shendi area. International Journal of Contemporary Applied Sciences. 2016;3(2):189-201.
2. Acema D, Asiku B, Odama E, Egama D. Assessment of mango pests, diseases and orchard management practices in West Nile Zone of Uganda. Agriculture, Forestry and Fisheries. 2016;5(3):57-63.
3. Bijle SM. Studies on Alphonso mango. Available:http://kokannews.org/wp-content/uploads/2013/09/Studies-on-Alphonso-Mangoes.pdf [13 March 2016]
4. Banerjee GD. Economics of mango cultivation. National Bank for Agriculture and Rural Development. Occasional Paper. 2011;58:186. Available:http://article.sciencepublishinggroup.com/pdf/10.11648.j.aff.20160503.15.pdf
5. Sekhar C, Selvarajan M, Pounraj A, Prahadeeswaran M, Vidhyavathi A. Production and export of mango in India – A paradigm to the developing nations. American International Journal of Research in Humanities, Arts and Social Sciences. 2013;4(1):78-87.
6. NHB. Mango [Online]. National Horticulture Board; 2016. Available:http://nhb.gov.in/report_files/mango/MANGO.htm [13 March 2016]
7. Biswas BC, Lalitkumar. Revolution in mango production- Success stories of some farmers. Fertilizers Marketing News. 2011;1-23.
8. Tripuraneni Jaggaiah. Returns on mango orchard and economic feasibility tests of mango orchard in Chittoor District of Andra Pradesh. 2015;5(7):598-600.
9. Chattopadhayay KS, Roy D. Impact study of the national horticulture mission scheme in West Bengal. Agro - Economic Research Centre, Visva – Bharati Santiniketan. Study No. 2011;166:72.
10. Patil SV. A study of marketing of mangoes in India. Online International Interdisciplinary Research Journal [e-journal]. 2013;3(Special Isssue):232-238. ISSN: 2249-959. Available:http://www.oiirj.org/oiirj/nov2013-special-issue/28.pdf [13 March 2016].
11. Anonymous. High density planting; 2016. Available:http://tmnehs.gov.in/writereaddata/Chap-6.pdf [13 March 2016]
12. Goswami AK, Jai Prakash, Singh AK. High density planting system in tropical fruits. HortFlora Research Spectrum [e-journal], 2014;3(3):298-300. ISSN: 2250-2823. Available:http://oaji.net/articles/2015/1192-1444014098.pdf [13 March 2016]
13. Mishra DS, Goswami AK. High density planting in fruit crops. HortFlora Research Spectrum [e-journal]. 2016;5(3):261-264. ISSN: 2250-2823. Available:http://oaji.net/articles/2016/1192-1481552045.pdf
14. Balamohan TN, Mekala P, Rajadurai S, Priyadarshini G, Prakash K, Soorianathasundara K, Kumar N. Canopy management in mango. TNAU Offset and Printing Press. Coimbatore. 2016;27.
15. Choudhary HD, Khandelwal SK, Choudhary MK, Gadawal OP, Choudhary MR. High density and meadow orchard planting system in fruit crops. Horticulture

Research Report of S K N College of Agriculture, Jobner. 2015;1-5.
16. Singh Gorakh. High density and meadow orcharding of Guava. Central Institute of Subtropical Horticulture, Lucknow. Extension Bulletin. 2008;35:1-20.
17. Vikram R, Muniyandi B. Trends of mango cultivation among Indian states- An economic analysis. European Academic Research. 2015;3(6):6167-6180.
18. Price Gittinger J. Economic analysis of agricultural projects. Economic Development Institute, International Bank for Reconstruction Development, Washington D. C., USA; 1974.
19. Gummagolmath KC. Economics of production and marketing of mango in Dharwad district, Karnataka. M.Sc (Agri.) Thesis, University of Agricultural Sciences, Dharwad; 1994.
20. Ravikumar KT, Hosamani SB, Mamle Desai NR, Suresh D Ekbote, Ashalatha KV. Investment pattern and maintenance cost in pomegranate orchards: An economic analysis. Karnataka J. Agric. Sci. 2011;24(2):164-169.
21. Hegde PDV, Patil BL. An appraisal of financial feasibility of investment in mango scion blocks. Karnataka J. Agric. Sci. 2005;18(4):1126-1128.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/20154