

during the period under study. The share of Madurai district in Tamil Nadu in production of mango was the highest 6.40 during the period 1996 and the lowest 1.66 per cent during the period 2004.

3.19 Summary

In this chapter the researcher has presented various aspects of Mango cultivation practices in the world. Mango is a tropical fruit. It can be grown at a height of 1500m above mean sea level. It is found in several types of soils such as lateritic, alluvial sandy loam and sandy soils. The production of mango in the world ranged from the minimum of 16903407 in 1990 to a maximum of 26286255 metric tonnes in 2004. Madurai being the 6th largest producer of mango in Tamil Nadu, the area of mango cultivation in Madurai district increased from 1998 to 2003.

83-102,104-111,113-118,120-125,127-132

4.1 Introduction

Agriculture is fraught with risk and uncertainty. As more than two-thirds of the cultivable land is dependent on monsoon, the farmers are often not sure about the outcome from agriculture due to weather and market induced risks. Concentration of

crop production alone results in high degree of uncertainty on farm income and employment. This chapter examined critically the mango production problems prevailing in the study area and also a brief background of sample growers.

4.2 Profile of the Sample Growers

In this part of chapter, the religion, age, educational status, experience, family size of the operational holdings, members of the family engaged in mango cultivation are analysed. These are the main criteria, which will highlight the production and marketing problems of mango produced farms in the study area.

4.2.1 Religion of the Mango Cultivators

Religion of the people plays a vital role in the family and economic life. Since the religions have an impact on social life of the people, it is necessary to study the religious background of the mango cultivators in Madurai district. Table 4.1 explains details of the religion of mango growers.

Table 4.1

Religion of Mango Cultivators

Sl.		Size Groups	Total
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No.	Religion of Mango Cultivators	Small	Large	
1.	Hindu	137 (91.33)	130 (86.67)	267 (89.00)
2.	Muslim	13 (8.67)	17 (11.33)	30 (10.00)
3.	Christian	--	3 (2.00)	3 (1.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is noted from Table 4.1 that out of 300 respondents, more than three-fourth of the farmers (89.00 per cent) are belonging to the Hindu religion, followed by 30 per cent (10.00 per cent) belonging to Muslim religion. Christians who are engaged in mango cultivation constitute only 1.00 per cent. The implication is that a large majority of the mango cultivators of this district are Hindus.

4.2.2 Age

The age of the sample respondents is expected to relate with their experience and performance in mango cultivation. Normally

middle and aged person are doing the mango cultivation systematically and seriously. The age-wise classification of the sample growers has been presented in Table 4.2.

Table 4.2

Age-wise Distribution of Sample Growers

Sl. No.	Age in Years	Size Groups		Total
		Small	Large	
1.	Upto 25	7 (4.67)	--	7 (2.33)
2.	26 – 35	19 (12.67)	22 (14.67)	41 (13.67)
3.	36 – 45	37 (24.66)	43 (28.67)	80 (26.67)
4.	46 – 55	63 (42.00)	51 (34.00)	114 (38.00)
5.	56 and above	24 (16.00)	34 (22.66)	58 (19.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is understood that from Table 4.2 that out of 300 respondents, more than 78 per cent are in the age group of 26 to 55. The age group of 46 to 55 is relatively higher in the case of the small growers (42 per cent). Large growers between the age group

26-35 constitute 14.67 per cent. It is zero per cent upto 25 years but 22.67 per cent in case of those above 55 years.

4.2.3 Literacy Level of Mango Cultivators

Education has a great impact on the economic life of the people. It makes the citizen very responsible in their business activities. Education creates better understanding of work and thereby increases the productivity. In the study area, the sample growers, on the basis of education, were classified in groups of illiterate, elementary, higher elementary, higher secondary, graduate and others who have correlation with the awareness of agricultural marketing information and effective utilization of resources. Table 4.3 highlights the educational status of the sample growers.

Table 4.3

Educational Level of Sample Growers

Sl. No.	Educational Level	Size Groups		Total
		Small	Large	
1.	Illiterate	54 (36.00)	29 (19.33)	83 (27.67)
2.	Elementary	28 (18.67)	31 (20.67)	59 (19.67)

3.	Higher Elementary	20 (13.33)	46 (30.67)	66 (22.00)
4.	Higher Secondary	41 (27.33)	26 (17.33)	67 (22.33)
5.	Graduate	5 (3.33)	11 (7.33)	16 (5.33)
6.	Post Graduate	2 (1.34)	7 (4.67)	9 (3.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

Table 4.3 inferred that out of the 300 respondents, 27.67 per cent were illiterate, 19.67 per cent were elementary, 22.00 per cent were higher elementary, 22.33 per cent were higher secondary, 5.33 per cent were graduates and 3.00 per cent had post graduation.

4.2.4 Family Size

The study area namely Madurai district and villages around is completely rural based and therefore the natural strength of the family is comparatively more than other regions. The family size of the growers influences the family operation as the number of hands available for work and the sharing of workload are vital. Table

4.4 gives the details of family size of the small and large growers of the study area.

Table 4.4
Family Size of Sample Growers

Sl. No.	Family Size	Size Groups		Total
		Small	Large	
1.	Less than 4	35 (23.33)	41 (27.33)	76 (25.33)
2.	4 to 6	15 (10.00)	28 (18.67)	43 (14.33)
3.	7 to 8	84 (56.00)	69 (46.00)	153 (51.00)
4.	Above 8	16 (10.67)	12 (8.00)	28 (9.34)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is found from Table 4.4 that 25.33 per cent of the respondents have family size upto three members. 14.33 per cent of the sample growers have the family size that ranges between four and six members. More than 50 per cent of the sample growers have the family size ranging between seven and eight members. Only 9.34 per cent have more than eight members in the family.

4.2.5 Members of Family Engaged in Cultivation

Madurai district is very popular for its mango cultivation. In the cultivation practices both hired labourers and family labourers have their role. Here, family labourer is an important factor contributing to greater production and productivity in agriculture. The following Table 4.5 stated the details of members engaged in mango cultivation.

Table 4.5
Number of Family Members Engaged in Cultivation

Sl. No.	Number of Family Member	Size Groups		Total
		Small	Large	
1.	Upto 2	13 (8.67)	38 (25.33)	51 (17.00)
2.	3 to 4	32 (21.33)	69 (46.00)	101 (33.67)
3.	5 to 6	92 (61.33)	28 (18.67)	120 (40.00)
4.	Above 6	13 (8.67)	15 (10.00)	28 (9.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is understood from Table 4.5 that 17 per cent of the sample growers could involve a maximum of 2 members from their

families. The participation of the cultivation of 3 to 4 members from the family constitutes 33.67 per cent and 5 to 6 members working on their field have 40 per cent. Participation of more than 6 members from a family is not a general practice. As such family constituted only 9.33 per cent.

4.2.6 Occupation in Agriculture

Mango cultivation in Madurai district is a very famous one. The growers are engaged in cultivation practices and doing other activities like business, government job and the like. Hence, the occupation is both main and secondary. Table 4.6 explains the details of the growers' occupation in agriculture.

**Table 4.6
Selection of Occupation in Agriculture**

Sl. No.	Occupation	Size Groups		Total
		Small	Large	
1.	Main	121 (80.67)	141 (94.00)	262 (87.33)
2.	Secondary	29 (19.33)	9 (6.00)	38 (12.67)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is found from Table 4.6 that out of 300 respondents, more than three fourth of the growers (87.33 per cent) selected the mango cultivation in main category, whereas only 12.67 per cent selected the cultivation on the secondary basis. The small and large growers are more or less same, 80.67 per cent and 94.00 per cent in the same group who selected the main category. A low 6 per cent selected the cultivation on a secondary basis, in large size growers, compared to small growers.

4.2.7 Experience

The experience of the growers in the cultivation of mango is another important factor for increasing the area, production and productivity of mango. Experience is helpful to a better understanding of work and thereby it makes the citizen very responsible in their cultivation and choosing the effective channel for marketing of mango. Table 4.7 indicates the classification of the sample grower based on their farming experience.

**Table 4.7
Experience of Sample Growers**

Sl. No.	Experience (in years)	Size Groups		Total
		Small	Large	

1.	Upto 10	7 (4.66)	19 (12.67)	26 (8.67)
2.	11 to 20	75 (50.00)	35 (23.33)	110 (36.67)
3.	21 to 30	55 (36.67)	33 (22.00)	88 (29.33)
4.	Above 30	13 (8.67)	63 (42.00)	76 (25.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is found from Table 4.7 that 36.67 per cent of the respondents have more than 11 years and upto 20 years of experience in the mango cultivation, 29.33 per cent of the respondents had experience of more than 21 and less than 30 years. Only 25.33 per cent in the small and large growers have experience of 30 years and above. In the small size, 50 per cent of the mango growers have got 11 to 20 years of experience but in the large size it is only 23.33 per cent.

4.2.8 Size of the Operational Holding

The size of the operational holding is an important factor in concluding the varieties of tree, utilization of resources, cost and returns and selection of buyers. In the study area, the details of operational holding pattern are shown Table 4.8.

Table 4.8
Size of Operational Holdings of Sample Growers

Sl. No.	Land Holding	No. of Growers	Percentage	Cumulative Percentage
1.	Upto 5 Acres	150	50	50
2.	Above 5 Acres	150	50	100
	Total	300	100	

In Table 4.8, the sample growers represented the Madurai district in equal per cent both in the small and large size growers. According to farm practice in India in mango cultivation, those who have below 5 acres of lands are called small size growers. Likewise those who have above 5 acres of land are called large size growers.

4.3 Production problems

The farmers have been including a variety of problems during the cultivation of mangoes. The problems may be associated with personal, social,

governmental and environmental resources. In this part of the chapter, the researcher has analysed the various problems related to production of mango.

4.3.1 Mango Trees Per Acre

The total mango production depends upon the total number of trees grown in the field. As per the recommendation of agricultural department, a farmer should grow below 30 trees in an acre. But the number of trees per acre varies from farmers to farmer. Table 4.9 illustrates the details of trees per acre.

Table 4.9
Mango Trees Per Acre

Sl.No.	Mango Trees Planted Per Acre	Number of Cultivators	Percentage
1.	30 – 40 trees	67	22.33
2.	41 – 50 trees	55	18.34

3.	Above 51 trees	178	59.33
	Total	300	100.00

It is inferred from the Table 4.9 that out of 300 respondents, majority of the cultivators (59.33 per cent) are growing more than 51 trees per acre in their field and 22.33 per cent of the cultivators between 30-40 trees. Only 18.34 per cent have been cultivating between 41 and 50 trees.

4.3.2 Soil Types of Mango Cultivation

The productivity of mango depends on the synergistic influence of several variables within and beyond farmers' control. The mango can be grown in different types of soil and it grows on any well-drained soil. The soil type of study area is not uniform. It can be changed from place to place. Table 4.10 explains the soil types of the study area.

Table 4.10
Type of Soil in the Mango Field

Sl.No.	Soil Type	Number of Cultivators	Percentage
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1.	Red Soil	102	34.00
2.	Red Sandy Soil	124	41.33
3.	Black Soil	23	7.67
4.	Loamy Soil	51	17.00
	Total	300	100.00

From Table 4.10, it is clearly understood that the highest range of the cultivators for their mango field occupied red sandy soil registering 41.33 per cent, followed by red soil that occupied 34 per cent. Very limited people have their field only loamy soil under mango cultivation registering 17 per cent. Remaining 7.67 per cent area is under black soil. Therefore soil of mango field is one of the important factors of the mango cultivation.

4.3.3 Soil Test in Mango cultivation

As per the recommendation of the Horticultural Department, the farmers, before planting mango plants in their field must do the soil test, water test and the like. The soil test which is very helpful to the farmers for the good growth of plants and high yielding good quality of mango. Table 4.11 explains the testing of soil in mango field by the growers.

Table 4.11

Testing of Soil in the Mango Field

Sl.No.	Soil Test	Number of Cultivators		
		Small	Large	Total
1.	Done	18 (12.00)	98 (65.33)	116 (38.67)
2.	Not done	132 (88.00)	52 (34.67)	184 (61.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

From Table 4.11 it is quite clear that the maximum of 61.33 per cent mango growers have not conducted the soil test and only 38.67 per cent of them have been adopting the soil test. 65.33 per cent of the large size growers conduct the soil test of their field, whereas it is lower in the case of small growers registering only 12 per cent. Majority of the small size sample growers accounting 88 per cent have not conducted the soil test. It is clearly understood from the above Table that the majority of the growers do not test the soil.

4.3.4 Fertilizers Used in Mango Cultivation

For want of healthy production and high quality of mangoes, proper manure and fertilizers must be used in their mango orchards. In the study area, the farmers used both organic and inorganic manures. It is helpful to the farmers for getting more quality and bigger type of mangoes. Table 4.12 explains the details of fertilizers used in mango cultivation.

Table 4.12

Fertilizers Used by the Mango Cultivators

Sl.No.	Types	Number of Cultivators		
		Small	Large	Total
1.	Organic	73 (48.67)	34 (22.67)	107 (35.67)
2.	Inorganic	58 (38.67)	92 (61.33)	150 (50.00)
3.	Both	19 (12.66)	24 (16.00)	43 (14.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is found from Table 4.12 that out of 300 respondents, majority of the growers accounting for 50 per cent have been using the inorganic types of fertilizers, 35.67 per cent are organic types and remaining 14.33 per cent of the growers are using both organic and inorganic types of fertilizers for their mango field. 61.33 per cent of the large size growers have used inorganic types. It is higher than small growers registering 38.67 per cent. 48.67 per cent small size respondents have used organic types, which is comparatively higher than the large growers registering 22.67 per cent.

4.3.5 Water Problems in Mango Cultivation

Irrigation is an important source of mango cultivation. The amount and frequency of irrigation to be given to mango orchard depend on the type of soil and climatic conditions especially rainfall and its distribution, age of the tree and the like. Water problems in mango cultivation can be divided into two categories, adequate and inadequate. Table 4.13 explains the details of adequacy of water facilities for the growers in the study area.

Table 4.13

Water Problems

Sl.No.	Water problems	Number of Cultivators		
		Small	Large	Total

1.	Adequate	13 (8.67)	36 (24.00)	49 (16.33)
2.	Inadequate	137 (91.33)	114 (76.00)	251 (83.67)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is clear from Table 4.13 that more than 83 per cent of the Mango growers have been facing water problems in mango cultivation. The rest of 16.33 per cent of the growers are getting sufficient water supply in their field. 91.33 per cent of the small size growers are facing inadequate water problems. The same problem in the other case is only 76 per cent.

4.3.6 Sources of Getting Mango Grafts

On enquiring the growers about the sources of getting saplings and grafts, it found that they obtain mango plants from various sources which include own source, private nursery, horticultural department and the like. Table 4.14 reflects the sources of getting mango grafts by the mango growers.

Table 4.14
Sources of Getting Mango Grafts

Sl.No.	Sources	Number of Cultivators		
		Small	Large	Total
1.	Own Source	--	9 (6.00)	9 (3.00)
2.	Private Nursery	133 (88.67)	87 (58.00)	220 (73.33)
3.	Horticultural Department	17 (11.33)	54 (36.00)	71 (23.67)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is clear from Table 4.14 that 73.33 per cent of the mango growers have collected mango grafts from private nursery. A small 3 per cent of the growers collect the grafts from their own sources. Remaining 23.67 per cent of the growers have procured them from horticultural departments. 88.67 per cent of small size growers and 58 per cent of large size growers depend on private nursery. In fact the large size farmers are only able to get the benefit of own grafting from their own nurseries in only 6 per cent, whereas for the small size growers it is zero per cent.

4.3.7 Major Varieties of Mango

In India there are thousands of varieties of mangoes cultivated, but only about 30 varieties are grown on commercial scale. The search for higher quality and better varieties of mangoes has been going on for many years. For successful mango growing, it is necessary that the varieties planted in a commercial orchard are productive, of good quality and adoptable to the climate of the tract. Different varieties are suitable for growing in different climate conditions. Table 4.15 explains the major variety of mangoes in the sample district.

Table 4.15

Major Variety of Mango Cultivation

Sl.No.	Varieties	Number of Cultivators		
		Small	Large	Total

1.	Bangalara	103 (68.67)	98 (65.33)	201 (67.00)
2.	Neelam	29 (19.33)	18 (12.00)	47 (15.67)
3.	Palamani	6 (4.00)	13 (8.67)	19 (6.33)
4.	Banganapalli	12 (8.00)	21 (14.00)	33 (11.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is concluded from the above Table 4.15 that most of the farmers (67 per cent) cultivate Bangalara variety in their field and 6.33 per cent and 11 per cent Palamani and Banganappalli respectively. Remaining 15.67 per cent of them cultivate Neelam variety. It is also seen from the Table that between Neelam and Balamani varieties the highest level of small size growers and Banganapalli cultivated by large size growers is 14 per cent, whereas for small growers it is very low, 8 per cent.

4.3.8 Methods of Harvesting of Mango

The time and stage of harvesting the crop depends on the kind of fruit. The fruit should be harvested by using a harvesting device, while showing great care in picking them properly is very necessary. Otherwise it would be damaged at the time of ripening and storage. In developed countries, the farmers are using many types of equipments. The present practice of harvesting in general is still primitive as the fruits are harvested by shaking the branches. This causes to damage to both the tree branches and fruits. Table 4.16 explains the methods of harvesting of mango in the study area.

Table 4.16
Methods of Harvesting of Mango

Sl.No.	Method	Number of Cultivators		
		Small	Large	Total
1.	By Owns	52 (34.67)	39 (26.00)	91 (30.33)
2.	Mango Picker	64 (42.67)	59 (39.33)	123 (41.00)
3.	Mango Picker with Net	6 (4.00)	48 (32.00)	54 (18.00)
4.	All together	28 (18.66)	4 (2.67)	32 (10.67)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It could be observed from Table 4.16 that out of 300 respondents, 30.33 per cent harvest the mango on their own, whereas 41 per cent of the respondents have been engaging mango pickers. It is also clear that only 10.67 per cent of the farmers have used all the methods to harvest the mango. It is also found from the Table that 42.67 per cent of the small size growers are using mango pickers for plucking the mango. But 39.33 per cent of large farmers have used this facility.

4.3.9 Grading of Mango

The practice of systematic grading of mango, based on scientific grade standards, has not so far been followed by any agency engaged in the distribution of this fruit. The fruit is seldom graded in orchards. At best what grower does is to remove immature rotten or diseased fruits and better quality, bigger fruits from the bulk. Table 4.17 states the details of grading of mango by the cultivators.

Table 4.17

Grading of Mango

Sl.No.	Position	Number of Cultivators		
		Small	Large	Total

1.	Grading	18 (12.00)	57 (38.00)	75 (25.00)
2.	Not-Grading	132 (88.00)	93 (62.00)	225 (75.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is inferred from Table 4.17 that out of 300 respondents, three-fourths of the sample size growers are usually not grading their mango. Only 25 per cent of them grade the mangoes. The maximum of 132 (88.00 per cent) small size growers are not graded their produce, whereas 62 per cent of large size growers have coming under this category.

4.3.10 Problems of Fruit Losses

The production of mango is affected due to various reasons, which include diverse agro-climatic, technical and practical condition, diseases, wind, floods, over rain, under rain and the like. It is also known fact that the farmers have lost much due to careless handling of the fruits. Table 4.18 gives the percentage of mango fruits damaged at the time of harvesting every year.

Table 4.18**Mango Fruits Damaged at the Time Harvesting**

Sl.No.	Damage (in %)	Number of Cultivators		
		Small	Large	Total
1.	Up to 10	16 (10.67)	12 (8.00)	28 (9.33)
2.	10 - 20	25 (16.67)	36 (24.00)	61 (20.33)
3.	20 - 30	31 (20.66)	69 (46.00)	100 (33.34)
4.	Above 30	78 (52.00)	33 (22.00)	111 (37.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

Table 4.18 shows that maximum of 111 (37 per cent) respondents have incurred loss of damage every year. Among the farmers, the losses from 10 per cent to 30 per cent have incurred by small farmers less than the large size growers. Table 4.18 is also clear that 52 per cent of the small size growers incurred more than 30 per cent loss, whereas large size growers are facing 22 per cent loss only.

4.3.11 Problems in Mango Cultivation

In normal course of mango cultivation, the farmers were faced with a number of problems like high initial orchard investment, long juvenile period of fruit plants, lack of high quality fruit plants and lack of technical knowhow and the like. The problems of mango cultivation have been presented in Table 4.19.

Table 4.19

Problems of Mango Cultivation

Sl.No.	Problem	Number of Cultivators		
		Small	Large	Total
1.	High initial orchard investment	69 (46.00)	26 (17.33)	95 (31.67)
2.	Long juvenile period of plants	43 (28.67)	19 (12.67)	62 (20.67)
3.	Lack of high quality fruit plants	28 (18.66)	22 (14.67)	50 (16.66)
4.	Lack of technical know how	10 (6.67)	83 (55.33)	93 (31.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is concluded from the Table 4.19 that out of 300 respondents, almost an equal number of farmers have the problem of high initial orchard investment (31.67 per cent) and lack of technical know-how (31 per cent). It is also clear that 20.67 per cent of the growers consider long juvenile period of plants as the problem of cultivation, and the rest of 16.66 per cent feel the problem of lack of procuring high quality of fruit plants.

It is also noted from the Table 4.19 that maximum of 55.33 per cent of the large growers have complained of lack of technical knowhow as one of the problems in mango cultivation, whereas it is only a meager 6.67 per cent in the case of small size growers.

4.3.12 Input Problems in Cultivation

In order to assist the mango cultivation, agriculturists used a variety of inputs. Some inputs are available and some are not available in the market. The sample respondents of the study area have the problems like high cost of equipment, lack of equipment and non-availability of modern equipment and the like during the cultivation. Table 4.20 explains the details of input problems in mango cultivation.

Table 4.20

Input Problems in Mango Cultivation

Sl.No.	Problems	Number of Cultivators		
		Small	Large	Total
1.	High cost of equipments	29 (19.33)	20 (13.33)	49 (16.33)
2.	Lack of equipments	43 (28.67)	28 (18.67)	71 (23.67)
3.	Non-availability of modern equipment	69 (46.00)	83 (55.33)	152 (50.67)
4.	No problem	9 (6.00)	19 (12.67)	28 (9.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

From Table 4.20, it is understood that 50.67 per cent of the growers have explained the problem due to non-availability of modern equipment. They were followed by

23.67 per cent of respondents who have faced problem due to lack of equipment for their mango cultivation. It is also found from the Table that only 9.33 per cent of the respondents have not spoke of any problem during mango cultivation. It is also found that 46 per cent of the small size growers are facing the problem of non-availability of modern equipment and 55.33 per cent of large size growers have been facing the problems of non-availability of modern equipments.

4.3.13 Labour Problems in Mango Cultivation

The successful mango cultivation is mainly depending on the availability of efficient labourer. The cultivation practices require both outside and inside workers. Normally the workers are paid wages either on daily basis or weekly basis. In the process of mango cultivation, the growers are facing a number of labour problems. Table 4.21 depicts the labour problems in mango cultivation.

Table 4.21

Labour Problems in Mango Cultivation

Sl.No.	Problems	Number of Cultivators		
		Small	Large	Total

1.	Shortage of labour	75 (50.00)	82 (54.67)	157 (52.33)
2.	High cost of labour	46 (30.67)	18 (12.00)	64 (21.34)
3.	Inefficiency of labour	24 (16.00)	37 (24.66)	61 (20.33)
4.	No problem	5 (3.33)	13 (8.67)	18 (6.00)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

From Table 4.21 it is well known that the maximum number of mango growers (52.33 per cent) are affected the problems of shortage of labour at the time of mango cultivation. 21.34 per cent of the growers are facing the problems of high cost of labour. It is also clear that the 20.33 per cent of them suffer from the inefficiency of labourer and only 6 per cent of the growers are not facing any problem in this regard. It is also observed that small size and large size growers are facing the major problem of shortage of labour and 3.33 per cent and 8.67 per cent of each small and large size growers do not face any problems in mango cultivation.

4.3.14 Production Problems of Small Size Mango Growers

It could be observed from Table 4.22 that the severity of pest and disease of mango was the major problem with a mean score of 63.97. Inadequate finance was the next important problem faced by the growers with a mean score of 56.15. Irrigation problem and the non-availability of labour problem of growers were the third and fourth problem respectively.

Long gestation period (V) and lack of latest technical know-how (V1) are also important problems of the small size mango growers. The growers after planting the mango grafts wait for a long period to get the yield, as they did not know about modern techniques of mango cultivation. Pilferage (VII) and lack of equipment and machinery (VIII) are also some of the other important problems encountered by the growers at the time of mango cultivation. The least considered problem was the perishable nature of fruits of mango (IX) by the growers with the mean score of 43.59.

Table 4.22

Production Problems of Small Size Growers

Sl.No.	Problem	Garrett's Mean Score	Rank
1.	Severity of pest and disease	63.97	I
2.	Inadequate finance	56.15	II

3.	Irrigation	52.60	III
4.	Labour Problem	49.23	IV
5.	Long gestation period	46.93	V
6.	Lack of latest technical know-how	46.10	VI
7.	Pilferage	45.11	VII
8.	Lack of equipment and machinery	45.03	VIII
9.	Perishable nature of fruits	43.59	IX

4.3.15 Production Problems of large size Mango Growers

The large size mango growers were also asked to rank the problems they faced in the production of mango. The rankings based on the most difficult to the least difficult problems adopt the Garrett Ranking Technique. The problems encountered and the ranks given by the middlemen are furnished in Table 4.23.

Table 4.23

Production Problem of Large Size Growers

Sl.No.	Problem	Garrett's Mean Score	Rank
1.	Severity of pest and disease	66.98	I

2.	Labour problem	60.87	II
3.	Inadequate finance	55.24	III
4.	Lack of equipment and machinery	46.69	IV
5.	Pilferage	43.98	V
6.	Long gestation period	43.59	VI
7.	Lack of latest technical know-how	43.57	VII
8.	Irrigation	41.86	VIII
9.	Perishable nature of fruits	40.29	IX

It could be seen from Table 4.23 small size growers rank severity of pest and disease first as in the case of large size farmers. labour problem and inadequate finance are the second and third major problems of large size mango growers with respective mean score of 60.87 and 55.24. Lack of equipment and machinery ranks fourth and pilferage ranks fifth with mean score of 46.69 and 43.98. Long gestation period (mean score 43.59) ranks sixth and lack of technical knowhow is in the seventh rank. The growers are exposed to irrigation and the perishable nature of fruits was the least considered problem with the mean score respectively 41.86 and 40.29.

4.3.16 Problems Faced by the Growers at the time of Blossoming Days

The mango growers met various problems during the blossoming period due to natural and biological reasons. Blossoming period is very vital in the mango yield. Sometime, the mango flowers highly fall, due to over rain or under rain or disease. As a result the mango yield might be seriously affected. To avoid these problems, the growers are taking various preventive measures. Table 4.24 explains the various problems faced by the growers during blossoming periods.

Table 4.24
Nature of Problems

Sl.No.	Problems	Number of Cultivators		
		Small	Large	Total
1.	Disease	65 (43.33)	52 (34.67)	117 (39.00)
2.	Monsoon	39 (26.00)	83 (55.33)	122 (40.67)
3.	Both the above	46 (30.67)	15 (10.00)	61 (20.33)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is clear from Table 4.24 that out of 300 respondents, 40.67 per cent have fewer yields due to monsoon problems like over rain or under rain during the blossoming days and another 122 respondents constituting 39 per cent having fewer yields due to disease. The remaining 61 respondents registering 20.33 per cent have fewer yields due to both disease and monsoon problems.

4.3.17 Diseases in Mango Cultivation

The wide range of climatic conditions and environmental situation in which mango grows indicates the nature and the diversity of the associated disease problems. Mango is subject to a number of diseases at all stages of its growth, right from plants in the nursery to the fruits in storage or transit. The agencies responsible for mango disease are many and varied. Table 4.25 explains the details of diseases that crippled the mango cultivation.

Table 4.25

Major Disease Attacked in Mango Cultivation

Sl.No.	Name of the Disease	Number of Cultivators	Percentage
1.	Powdery Mildew	59	19.67
2.	Black tip	174	58.00
3.	Die-back	23	7.66
4.	Mango malformation	44	14.67

	Total	300	100.00
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The analysis of Table 4.25 showed that more than 50 per cent of the sample growers were seriously affected by a disease called ‘black tip’ followed by 19.67 per cent who had the problem of powdery mildew. 14.67 per cent of the farmers were affected by mango malformation and the remaining 7.66 per cent of the growers have been affected by the disease of mango malformation.

4.3.18 Reasons for declining Yield

The production of the mango is varying from season to season. In one season it reaches the maximum and in another season it declines to the lower level due to various practical and technical reasons. Table 4.26 explains the different reasons for the declining mango yield.

**Table 4.26
Reasons for Declining the Mango Yield**

Sl.No.	Reasons	Number of Cultivators		
		Small	Large	Total
1.	Inadequate rainfall	29 (19.33)	24 (16.00)	53 (17.67)

2.	Disease	47 (31.33)	38 (25.33)	85 (28.33)
3.	Winds	21 (14.00)	41 (27.33)	62 (20.67)
4.	Wrong manuring	19 (12.67)	28 (18.67)	47 (15.67)
5.	All the above	34 (22.67)	19 (12.67)	53 (17.66)
	Total	150 (100.00)	150 (100.00)	300 (100.00)

Note: Figures in parentheses indicate percentages.

It is noted from Table 4.26 that out of 300 respondents, 28.33 per cent of them were affected by Disease. Wrong manuring was the main reason for the decline of the mango yield for 15.67 per cent of respondents. 20.67 per cent of the growers suffered due to wind velocity. It is also noted from the Table 4.17 that the maximum of the respondents registering 31.33 in small and 25.33 per cent in large size growers were affected due to disease problems.

4.3.19 Mango Yield in Different Seasons

The mango output is determined by many factors including climate conditions. The growers should follow proper fertilizing and cultivation methods to get maximum profit. Though the total mango production of the country is highly satisfactory, output per acre is not upto the mark. The harvesting of mango is varying from season to season and person to person. Table 4.27 explains the details of mango yield per acre.

Table 4.27

Total Mango Yield in Different Seasons

Sl.No.	Periods (Seasons)	Number of Cultivators	Rank
1.	1999-2000	32	IV
2.	2000-2001	85	II
3.	2001-2002	13	V
4.	2002-2003	51	III
5.	2003-2004	119	I
	Total	300	

It shows from Table 4.27 that the mango production of one season is very high and another season is very low due to various agro climatic conditions. It is also clear from the table that the year 2003–04 occupied number one position for the production of mango than all other seasons followed by 2000 - 2001 season.

4.4 Cost and Return Analysis

An analysis of cost and return is very much essential to study the profitability of any commercial activity. Mango being a perennial crop, it needs a huge establishment and maintenance cost. In this part, the researcher attempts to find the cost and return structure of mango cultivation in Madurai district.

4.4.1 Establishment Cost

The establishment cost includes both variable and fixed cost incurred during the first five years till the harvesting of mango. This included the cost incurred in the establishment of mango plantation such as the cost of digging pits, cost of planting, cost of manures, cost of fertilizers, cost of irrigation, cost of labourers and the like. The details of establishment cost for mango cultivation for the first five years are presented in Table 4.28 and Figure 4.1.

Table 4.28

Establishment Cost of Mango Cultivation

Sl.No.	Cost Components	Amount in Rs.per acre	Percentage
I.	Variable Cost		

1.	Tillage practice	1418.85	1.36
2.	Mango grafts	2300.25	2.21
3.	Labour	4022.90	3.85
4.	Manure	5750.15	5.52
5.	Pesticide	2040.00	1.96
6.	Irrigation	5013.18	4.81
7.	Fertilizer	3124.50	3.00
8.	Watch and Ward	3849.35	3.69
9.	Interest on Working Capital	8677.25	8.32
10.	Total Variable Cost	36196.43	34.72
II.	Fixed Cost		
1.	Land tax	750.00	0.72
2.	Rental value of Land	23000.00	22.06
3.	Other Fixed Costs	44317.05	42.50
4.	Total Fixed Costs	68067.05	65.28
	Total Establishment Cost (I + II)	104263.48	100.00
	Value of Mango output during the V year	9845.75	
	Net Establishment cost (15 – 16)	94417.73	
	Annual share of Net Establishment cost	1716.69	

It is inferred from Table 4.28 that the total establishment cost per acre worked out to Rs.104263.48, which includes variable cost of Rs.36196.43 and fixed cost of Rs.68067.05.

4.4.2 Tillage Practice

It consists of digging of pits in the orchard, ploughing of land, harrowing and the like. The cost of such practices is included in this item. The overall average cost of such operation was Rs. 1418.85 per acre. The cost of tillage practice accounted for 1.36 per cent of the total establishment cost.

4.4.3 Mango Grafts

The growers are procuring mango grafts from sources like own nurseries, horticulture department and private nursery. The cost of mango grafts is wide ranging considerably depending upon the sources from which they were purchased, variety and the distance of transportation. It was noted from the Table 4.14 that 73.33 per cent of the sample growers have purchased from the private nursery. It was also found from Table 4.9 that 41-50 trees were planted per acre. The cost incurred towards the mango grafts amounted to Rs.2300.25 meeting 2.21 per cent in the total establishment cost.

4.4.4 Labour

It was found from the study that the farmers have been engaging both hired labours and family labours. Normally the hired labour is more than the family labour. The amount of labour used in the production of mango was to some extent less when compared to the other perennial crops. The cost of labour included the labour employed for digging pits for planting the mango grafts, ploughing of land and orchard protection which is necessary to provide favourable condition for early establishment and growth of trees, planting, application of fertilizer, manure, irrigation and pesticide. The labour cost includes the wages paid for hired labour and imputed wages for family labour. The total labour cost incurred was Rs. 4022.90 per acre. The share of labour cost in the total establishment cost was 3.85 per cent.

4.4.5 Manure

Mango requires the use of organic and inorganic manure at the initial stage. The total average cost of manure was Rs.5750.15 per acre, which is 5.52 per cent of the total establishing cost and ranked second among the various costs component of establishment cost.

4.4.6 Pesticide

Pesticide is very much an integral part of mango cultivation especially during the time of blossoming period. The farmers are using pesticides to control pests in order to improve the mango output. The cost of pesticide amounted to Rs. 2040.00 per acre. The percentage share of establishment cost was found to be 1.96 per cent.

4.4.7 Irrigation

Irrigation is one of the essential sources at the time of the growing stages of mango grafts. The charges for electricity or fuel used was calculated at the actual prices paid. If hiring the oil engine for the irrigation, then the hire charges were included. The overall average cost of irrigation was Rs. 5013.18 per acre, which accounts for 4.81 per cent of the total establishment cost.

4.4.8 Fertilizer

The usage of fertilizer is essential in the mango cultivation from the grafts stage to the bearing stage. The application of

chemical fertilizer helped the fast growth of the tree resulting in a rich yield of quality mangoes. The total expenditure on fertilizer was Rs. 3124.50 per acre and its share to total establishment cost was 3.00 per cent.

4.4.9 Watch and Ward

Mango has a good commercial value in local markets, national and international markets. The watch and ward is essential for safeguarding the mango trees and also minimizing the damage of mango fruits. The cost of watch and ward was Rs.3849.35 per acre and its percentage in the total establishment cost is 3.69.

4.4.10 Fixed Cost

The fixed cost includes rental value of land and land tax. The fixed cost amounted to Rs.68067.05 and the percentage share of total fixed cost to the total establishment cost incurred was 65.28 per cent. The rental value of land for the first five years worked out to Rs.23000.00 per acre and had represented 22.06 per cent of the total establishment cost. The other fixed cost includes the land revenue, interest on fixed capital, depreciation on capital assets, staff salary and the like. The other fixed cost worked out to Rs.44317.05 pre acre registering 42.50 per cent of the total

establishment cost. The land tax amounted Rs.750.00 per acre for five years and represented only small share of 0.72 per cent of the total establishment cost.

4.4.11 Annual Share of Net Establishment Cost of Mango Cultivation

In working out the unit cost of production of mango, the annual share of net establishment cost was also taken into account since the productivity of mango also depends on the expenditure incurred during the establishment period. Mango grafts come into bearing the yielding stage only in the sixth year though a small amount of mango is obtained in the fifth year. The total value of mango output obtained during the fifth year was deducted from the total establishment cost that incurred during the first five years to work out the net establishment cost. The net establishment cost was apportioned among the remaining economic life period of 55 years and the annual share of net establishment cost per acre was calculated as Rs.1716.69.

4.4.12 Operation and Maintenance Cost

The operation and maintenance cost of mango cultivation includes all the recurring costs incurred every year during the bearing period. It includes the cost of labour, manure, pesticide, watch and ward, irrigation, fertilizer and interest on working capital. The input wise distribution of annual operation and maintenance cost

of mango production per acre from sixth year onwards was computed and presented in Table 4.29.

Table 4.29

Average Annual Operation and Maintenance Cost of Mango

Sl.No.	Cost Component	Amount in Rs. Per Acre	Percentage
1.	Labour	2694.93	20.69
2.	Manure	2234.14	17.15
3.	Pesticide	1983.60	15.23
4.	Watch and Ward	432.15	3.32
5.	Irrigation	1918.35	14.73
6.	Fertilizer	2017.00	15.48
7.	Interest on Working Capital	1745.61	13.40
8.	Total Operation and Maintenance cost	13025.78	100.00

From the Table 4.29 it is clear that the total average annual operation and maintenance cost per acre was Rs.13025.78. Among these costs, the cost of labour constitutes the maximum portion followed by the cost of manure. The cost of labour includes the expenditure on labour employed for application of manure, pesticide, harvesting mango, weeding, ploughing, mulching, earthing up around the tree and the like. The average cost of labour was Rs.2694.93 per acre, which contributed 20.69 per cent of the operation and maintenance cost.

Cost of manures are placed second among the important component of the operation and maintenance cost of the mango cultivation. The average expenditure on manure amounted to Rs.2234.14 and the percentage share to the total operation and maintenance cost is 17.15 per cent. The average expenditure on pesticide amounted to Rs.1983.60 per acre and the percentage of share to the total operation and maintenance cost was reported at 15.23 per cent.

4.4.13 Cost of Production of Mango

The cost of production of mango includes both variable and fixed cost. The variable cost includes annual operation and maintenance cost and fixed cost includes land revenue, rental value of land and annual share of establishment cost and other

fixed costs. The detailed cost of production of mango per acre was worked out and it is presented in Table 4.30.

Table 4.30
Average Cost of Production of Mango

Sl.No.	Cost Component	Amount in Rs. Per Acre	Percentage
I.	Total Variable Cost	13025.78	43.83
	Fixed Cost		
1.	Land Tax	150.00	0.50
2.	Rental Value of Land	4600.00	15.48
3.	Other Fixed Cost	10466.93	35.23
4.	Annual share of Net Establishment Cost	1475.30	4.96
II	Total Fixed Cost (1 to 4)	16692.23	56.17
III.	Total Cost of Production (I + II)	29718.01	100.00

Table 4.30 explains that the total cost of production of mango per acre was worked out at Rs.29718.01. The total variable cost per acre was worked out at Rs.13025.78 and its share is 43.83 per cent of the total cost of production. It was found that the total fixed cost worked out to Rs.16692.23 per acre, constituting 56.17 per cent of the total cost of production.

The imputed rental value of land was the major item among the various components of total fixed cost. The rental value of land may depend upon the level of fertility of the land and its proximity to approach road and market centres. It was

observed that the rental value of land was worked out at 4600.00 per acre, constituting 15.48 per cent of the total cost of production. The second important component of the total fixed cost was the annual share of net establishment cost. On an average, the annual share of net establishment cost was worked out at 1475.30 per acre accounting for 4.96 per cent of the total cost of production. Amount other fixed costs worked out at Rs.10,466.93 per acre and its contribution to total cost of production was 35.23 per cent.

4.4.14 Cost of Cultivation as per Cost Concepts

The cost of cultivation of mango according to cost concepts has been computed and analysed for group of sample growers of different sizes.

In the cost concept, costs are categorised as Cost A, Cost B and Cost C for the purpose of suitable analysis. Each of the categories contains a separate set of elements. The category and the elements are given below.

Cost A

Wages of hired labour,

Value of manure owned and purchased,

Cost incurred for watch and ward,

Cost of pesticides purchased,

Expenses of irrigation charges,

Value of fertilizer purchased,

Depreciation, repairs and maintenance cost of implements and farm buildings,
land and other taxes, interest on working capital.

Cost B

Cost A + imputed rental value of owned land + imputed interest on owned fixed capital.

Cost C

Cost B + imputed value of family labour.

The individual cost items are included in total the cost that its cost C also has been grouped into operational cost and fixed cost as under:

Operational Cost = Wages of Hired Labour + Value of Manure Owned and Purchased + Cost incurred for Watch and Ward + Cost of Pesticide purchased + Expenses of Irrigation Charges + Value of Fertilizer Purchased + Depreciation, Repairs and Maintenance Cost of Implements and Farm Buildings + Land + and Other Taxes + Interest on Working Capital.

Fixed Cost = Cost C – Operational Cost

The Table 4.31, Figures 4.2 and 4.3 explain details of cost of cultivation as per cost components.

Table 4.31

Cost of Cultivation as per Cost Components

(Rs./Acre)

Sl. No.	Cost Components	Farm Size		
		Small	Large	Overall
I.	Cost A			

1.	Hired Human Labour	1746.17	1928.73	1837.45
2.	Manure	2250.90	2217.38	2234.14
3.	Watch and Ward	428.11	436.18	432.15
4.	Pesticide	1975.20	1992.00	1983.60
5.	Irrigation	1894.07	1942.63	1918.35
6.	Fertilizer	1998.00	2036.00	2017.00
7.	Land Tax	150.00	150.00	150.00
8.	Other Fixed Cost	8940.73	11993.12	10466.93
9.	Interest on Working Capital	1763.17	1728.05	1745.61
10.	Total I	21146.35	24424.09	22785.22
II.	Cost B			
1.	Rental Value of Land	1050.00	1100.00	1075.00
2.	Interest on Fixed Capital	4125.12	5608.65	4866.89
3.	Annual Share of Net Establishment Cost	1475.30	1475.30	1475.30
4.	Total II	6650.42	8183.95	7417.19
5.	Cost B (I + II)	27796.77	32608.04	30202.41
III.	Cost C			
1.	Family Labour	1075.90	639.05	857.48
	Cost C (I + II + III)	28872.67	33247.09	31059.88

Table 4.31 shows that the aggregate of cost A is the largest in the case of large size growers due to more hired labourers and more amount spent on involving cultivation practices.

Both the levels of sample growers have incurred cost in pesticide and fertilizer almost the same. The small growers due to more expenses on manure and more amounts spent on involving cultivation practices. The irrigation cost of the large size growers is related to higher than the small growers. Cost A cost B and Cost C of small growers are found to be the lowest notwithstanding the fact that their input cost is higher but the establishment cost is equal to both growers.

4.4.15 Returns from Mango Cultivation

The gross returns of mango growers were computed and presented in Table 4.32.

Table 4.32**Statement of Income from Mango Cultivation**

Sl.No.	Particulars	Amount Rs. Per Acre
1.	Gross Sales	39348.60
2.	Less: Marketing Cost	4817.30
3.	Gross Return	34531.30
4.	Less: Variable Cost	13025.78
5.	Contribution	21505.52
6.	Less: Fixed Cost	15767.73
7.	Net Profit	5737.79

From Table 4.32 it could be observed that the gross returns were 34531.30 per acre, which was computed after deducting the marketing cost incurred by the growers from the sale proceeds of mangoes. The contribution was calculated at Rs.21505.52

per acre after deducting the variable cost from gross returns. The net profit per acre arrived at after subtracting the fixed cost from the contribution was Rs.5737.79.

4.4.16 Comparative Analysis for Two size of Growers

The analysis of cost and return structure for small and large growers on the basis of land holding was made and results obtained are presented in the following Table. The objective of this analysis is to find the types of expenses incurred, the variations between them and reason for such difference. This analysis also aims to emphasize the factors influencing profitability of three types of landholder. The average variable cost of mango cultivation for small and large growers was computed and presented in Table 4.33 and Figure 4.4.

Table 4.33

Average Variable Cost of Cultivation for Different Growers

(Rs./Acre)

Sl. No.	Cost Component	Farm Size		
		Small	Large	Overall
1.	Labour	2822.07	2567.78	2694.93
2.	Manure	2250.90	2217.38	2234.14

3.	Watch and Ward	428.11	436.18	432.15
4.	Pesticide	1975.20	1992.00	1983.60
5.	Irrigation	1894.07	1942.63	1918.35
6.	Fertilizer	1998.00	2036.00	2017.00
7.	Interest on working capital	1763.17	1728.05	1745.61
8.	Annual share of Establishment Cost	1475.30	1475.30	1475.30
	Total	14606.82	14395.32	14501.08

It is could be observed from the Table 4.33 that in the middle of the variable expenses, the cost of labour, manure and interest on working capital is more in the case of small growers, while the larger growers incurred more expenses on ward and watch, pesticide and irrigation.

The average total cost of cultivation for small and large growers was computed and presented in Table 4.34.

Table 4.34

Average Total Cost of Cultivation for Different Growers

(in Rs Acre)

Sl.No.	Cost Component	Farm Size		
		Small	Large	Overall
I.	Total Variable Cost	14606.82	14395.32	14501.07
	Fixed Cost			
1.	Rental Value of Land	1050.00	1100.00	1075.00
2.	Interest on Fixed Capital	4125.12	5608.65	4866.89
3.	Annual Share of Net Establishment Cost	1475.30	1475.30	1475.30
II.	Total Fixed Cost	6650.42	8183.95	7417.19
III.	Total Cost of Cultivation (I+II)	21257.24	22579.27	21918.26

It shows from Table 4.34 that the fixed cost is higher for the large growers than the small growers. The cost incurred in the total fixed cost for small and large is growers respectively Rs.6650.42 and Rs.8183.95. But the cost of cultivation is lower for small growers (Rs.21257.24 per acre) than the large growers (Rs.22579.27 per acre).

4.4.17 Analysis of Net Profit on the basis of Growers

The gross return and net profits were computed for the sample growers and the results are analysed and presented in the Table 4.35.

Table 4.35

Returns on Cultivation for Different Growers

(Rs./Acre)

Sl. No.	Cost Component	Farm Size		Overall
		Small	Large	
1.	Sales of Mango	38733.50	39963.70	39348.60
2.	Less: Marketing Cost	4826.27	4808.33	4817.30
3.	Gross Return	33907.23	35155.37	34531.30
4.	Less: Variable Cost	14606.82	14395.32	14501.07
5.	Contribution	19300.41	20760.05	20030.23
6.	Less: Fixed Cost	6650.42	8183.95	7417.19
7.	Net Profit	12649.99	12576.10	12613.04

It could be inferred from Table 4.35 that the income realised from the sale of mango is the highest in the case of small growers. The small size growers sell their produce to the local consumption area so they would get the price of mango immediately. At the same time the large size growers would not market their mango into local market but only urban market through proper marketing channel. The price

of mango is determined on the basis of size of mango, taste and colour offered at that time of marketing. In this case of the large size growers they are in an adverse position in getting the uncertain favourable price for this mango hence their revenue per acre is low.

4.5 Functional Analysis

The analysis of cost and return from mango cultivation showed that it gives reasonable margin to the growers not enduring the size of holdings. In this segment, Cobb-Douglas Production Function could successfully be used to ascertain the possibility or not to increase the production through increase of the doses of important inputs.

4.5.1 Determinants of Gross Return

The determinants of gross return was analysed by using Cobb-Douglas Type Production Function. The function is as follows:

$$\begin{aligned} \text{Log } Y &= \beta_0 + \beta_1 \log X_1 + \beta_2 \log X_2 + \beta_3 \log X_3 + \beta_4 \log X_4 + \beta_5 \log X_5 \\ &+ \beta_6 \log X_6 + U \end{aligned}$$

where

Y = Yield of mango per acre (in Rs.),

X_1 = Watch and Ward per acre (in Rs.),

X_2 = Pesticide per acre (in Rs.),

X_3 = Manure per acre (in Rs.),

X_4 = Human labour per acre (in Rs.),

X_5 = Irrigation per acre (in Rs.),

X_6 = Fertilizer per acre (in Rs.) and

U = Disturbance term

$\beta_0, \beta_1, \beta_2, \dots, \beta_6$ are parameters to be estimated.

β_0 = Regression constant

β_1 to β_6 = Partial elasticity of yield with respect of the factors X_1 to X_6 respectively

The above fitted model is to test the relationship between the yield of mango and the independent variables for yield of small farmers, large farmers and overall farmers and the results are given in Table 4.36.

Table 4.36

Estimated Regression Results of Determinants of Yield of Mango for Small Farmers

Sl. No.	Variable	Regression Co-efficient	Standard Error	't' Value
1.	Intercept	5.4563	1.0243	
2.	Watch and Ward (X₁)	0.0581*	0.0276	2.091
3.	Pesticide (X₂)	0.0547	0.0361	1.512
4.	Manure (X₃)	0.1701*	0.0843	2.029
5.	Human Labour (X₄)	0.0213	0.0552	0.385
6.	Irrigation (X₅)	0.0371	0.0345	1.079

7.	Fertilizer (X₆)	0.3402*	0.0619	5.519
	R²	0.8071		
	F-Statistics	47.564		
	Number of Observations	150		

*** Significant at 5 per cent level.**

It could be inferred from Table 4.36 that the small farmers in the study area are concentrated out of six independent variables that were watch and ward, pesticide, manure, human labour, irrigation and fertilizer. Among these independent variables watch and ward, manure and fertilizer are found to be statistically significant at five per cent level except irrigation, human labour and pesticide.

The level of watch and ward utilised has significantly influenced the yield of mango. The yield is expected to increase by 0.0581 per cent from its mean level for every one per cent increase in the level of labour utilised keeping all other factors constant.

In the same direction, the regression coefficient for the cost of manure was 0.1701, which indicates that by increasing the expenditure on manure by one per cent the yield of mango would increase 0.1701 per cent keeping all other factors constant.

The regression coefficient of fertilizer 0.3402 was significant at five per cent level. This indicates that for every one per cent increase from the present level of fertilizer and irrigation the yield would increase by 0.3402 per cent from their mean value *ceteris paribus*.

The coefficient of determination (R^2) was 0.8071, indicating that 80.71 per cent of variation in the output of mango could be explained by the entire six explanatory variables included in the production function

This analysis illustrated that the small size farmers in the study area have better scope for increasing the yield of mango by effective utilisation of fertilizer.

The estimated regression results of Cobb-Douglas type production function for large size farmers are presented in Table 4.37.

Table 4.37

Estimated Regression Results of Determinants of Yield of Mango for
Large Farmers

Sl. No.	Variable	Regression Co-efficient	Standard Error	't' Value
1.	Intercept	8.9651	0.4901	
2.	Watch and Ward (X₁)	0.0482	0.0293	1.670
3.	Pesticide (X₂)	0.0041	0.0172	0.286
4.	Manure (X₃)	-0.1372*	0.0583	-2.351
5.	Human Labour (X₄)	0.1973*	0.0630	3.148
6.	Irrigation (X₅)	0.0126	0.0176	0.715
7.	Fertilizer (X₆)	0.1511*	0.0713	2.125
	R²	0.8476		
	F-Statistics	63.002		
	Number of Observations	150		

*** Significant at 5 per cent level.**

Table 4.37 shows that the production elasticities out of six independent variables, three explanatory variables namely manure, human labour and fertilizer were found to be statistically significant at five per cent level. The regression

coefficient for the cost of manure was -0.1372 which indicates an increase in the expenditure on manure by one per cent, there would be an increase in yield of mango by -0.1372 per cent *ceteris paribus*, implying that there was better scope for increase use of manures to increase the yield over the mean level.

The regression coefficient of labour was 0.1973 , which indicates an increase of labour by one per cent may result in an increase in mango yield by 0.1973 per cent *ceteris paribus*.

The level of fertilizer applied also is statistically significantly influenced the yield of mango. The analysis indicated that every one per cent increase in the cost of fertilizer, *ceteris paribus*, could increase the yield by 0.1511 per cent from its mean level.

The coefficient of determination (R^2) was 0.8476 , indicating that 84.76 per cent of variation in the output of mango could be explained by the entire six explanatory variables included in the production function

The Cobb-Douglas Type Production function estimate results for overall sample farmers are presented in Table 4.38.

Table 4.38

Estimated Regression Results of Determinants of Yield of Mango for

Overall Farmers

Sl. No.	Variable	Regression Co-efficient	Standard Error	't' Value
1.	Intercept	7.4401	0.4451	
2.	Watch and Ward (X₁)	0.0682*	0.0201	3.364
3.	Pesticide (X₂)	0.0032	0.0172	0.198
4.	Manure (X₃)	0.0311	0.0513	0.617
5.	Human Labour (X₄)	-0.0101	0.0172	-0.639
6.	Irrigation (X₅)	0.0392*	0.0174	2.250
7.	Fertilizer (X₆)	0.3322*	0.0332	9.987
	R²	0.7791		
	F-Statistics	89.042		

	Number of Observations	300
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*** Significant at 5 per cent level.**

It is observed from Table 4.38 that the coefficient of determination (R^2) was 0.7791, indicating that 77.91 per cent of variation in the output of mango could be explained by the entire six explanatory variables included in the production function. The F-value indicated that the fitted Cobb-Douglas type production was significant at one per cent level and is valid to draw inference.

Out of six independent variables, watch and ward, irrigation and fertilizer would influence that output as in the case of overall types of farmers in a significant manner. The yield of mango could be increased by 0.0682 per cent, 0.0392 per cent and 0.3322 per cent by one per cent increase in the present level of watch and ward, irrigation and fertilizer respectively allowing the respective input to vary while the other factors remain constant.

4.6 Capital Productivity Analysis

Mango is a perennial crop. Its life span extends from 60 to 80 years or even more¹³¹, but in the study area the growers cut the tree and the replantation of crops after 50 to 60 years. The researcher to calculate the mango yield an economic life is average 60 years and the commercial production will be started from the 6th year onwards. So considerable investment is made over several years before the crop starts to yield. Therefore, it is necessary to know the present value of the expected future income to justify the investments made. A resonance appraisal technique should be used to measure the economic worth of the investment in mango orchard.

4.6.1 Analytical Framework

In the present study the following capital budgeting techniques¹³² are used to measure the economic worth of investment in mango production.

4.6.2 Pay-Back Period

Pay-back period measures the number of years required to recover the original cash outlay invested in the project. The maximum acceptable pay back period is fixed by taking into account the reciprocal of the cost of capital. This can be termed as cutoff point. Generally a project having a pay-back period of more than cutoff point is not entertained.

4.6.3 Benefit-Cost Ratio

Benefit-cost ratio is the ratio of present value of returns, at the required rate of return, to the present value of costs. When the benefit cost ratio exceeds one, the investment is considered feasible at the required rate of return.

$$\text{Benefit-Cost Ratio} = \frac{\text{Present Value of Returns}}{\text{Present Value of Costs}}$$

Symbolically,

¹³¹ A. K. Sacheti, **Fruit production**, NCERT, New Delhi, 1999, p.23

¹³²S.N. Maheswari, *Principles of Management Accounting*, Sultan Chand & Sons, New Delhi, 1997, pp. c251-260.

$$\mathbf{B-C} = \frac{\sum_{t=1}^n \frac{\mathbf{B}_t}{(1+i)^t}}{\sum_{t=1}^n \frac{\mathbf{C}_t}{(1+i)^t}}$$

where,

- n** = Life period of the project in years
- B_t** = Returns in the year 't',
- C_t** = Costs in the year 't'
- i** = Discount rate.

4.6.4 Net Present Value

Net present value is found out by subtracting present value of cost from the present value of returns. A project whose net present value is greater or equal to zero is considered as worthy investment.

Net present value = Present Value of Returns – Present Value of Cost
Symbolically,

$$\mathbf{NPV} = \sum_{t=1}^n \frac{\mathbf{B}_t - \mathbf{C}_t}{(1+i)^t} = \mathbf{0}$$

Where, the symbols used are the same as in the case of benefit-cost ratio.

4.6.5 Internal Rate of Return

Internal Rate of Return is the rate of discount at which NPV is zero. If the IRR exceeds cutoff rate (opportunity cost of capital) the investment is economically viable.

Symbolically,

n

$$IRR = \frac{\sum_{t=1} (B_t/C_t)}{(1+i)^t} = 0.$$

Where, the symbols used are the same as in the case of benefit-cost ratio.

National Bank for Agricultural and Rural Development (NABARD) considers an agricultural project which yields a return of 15 per cent and above as an economically viable project.¹³³ Hence in this study the required rate of return is taken as 15 per cent.

To compute the pay back period, net present value, benefit-cost ratio and internal rate of return for mango cultivation, incremental cost, present value of cost and return at 15 per cent discount factor were calculated and presented in Table 4.39.

Table 4.39

Computation of Pay-Back Period, Benefit Cost Ratio, Net Present Value and Internal Rate of Return for Mango

Age	Cost Rs/acre	Returns Rs/acre	Income Benefit	Disc.15%	Present value of Cost	Present Value of Return
1	23,085.83	0.00	-23,085.83	0.8696	20074.63	0.00
2	12,595.50	0.00	-12,595.50	0.7561	9524.01	0.00
3	10,932.30	0.00	-10,932.30	0.6575	7188.16	0.00
4	9,542.50	0.00	-9,542.50	0.5718	5455.96	0.00
5	8,885.65	9,848.43	962.78	0.4323	3841.51	4257.75
6	7,496.37	15,895.17	8,398.80	0.4972	3727.02	7902.71
7	6,633.25	19,654.29	13,021.04	0.4323	2867.74	8497.09

¹³³S. Shanmugaiah, *An Economic Analysis of Production and Marketing of Lime in Tirunelveli District*, M.Sc. (Agri.) Dissertation submitted to Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, 2000.

8	6,236.95	23,362.73	17,125.78	0.3759	2344.70	8782.92
9	6,092.69	25,965.72	19,873.03	0.3269	1991.71	8488.24
10	5,917.45	27,857.18	21,939.73	0.2843	1682.11	7918.75
11	6,289.53	23,294.28	17,004.75	0.2472	1554.68	5757.99
12	6,255.72	25,574.00	19,318.28	0.2149	1344.62	5496.96
13	6,200.12	26,975.27	20,775.15	0.1869	1158.85	5041.87
14	6,193.00	27,356.49	21,163.49	0.1625	1006.54	4446.19
15	6,150.74	28,958.49	22,807.75	0.1413	869.28	4092.66
16	6,939.91	30,579.64	23,639.73	0.1229	852.88	3758.07
17	6,119.15	31,489.46	25,370.31	0.1069	653.92	3365.11
18	6,215.63	34,948.00	28,732.37	0.0929	577.59	3247.57
19	6,486.54	33,756.84	27,270.30	0.0808	524.15	2727.73
20	6,734.12	37,497.32	30,763.20	0.0703	473.18	2634.76
21	6,890.84	34,548.51	27,657.67	0.0611	421.03	2110.92
22	6,967.48	35,655.91	28,688.43	0.0531	370.19	1894.42
23	7,010.52	34,783.49	27,772.97	0.0462	323.89	1607.02
24	7,059.36	36,987.14	29,927.78	0.0402	283.61	1485.94
25	7,011.52	37,458.71	30,447.19	0.0349	244.94	1308.59
26	7,028.45	37,546.24	30,517.79	0.0304	213.51	1140.57
27	7,050.35	38,853.21	31,802.86	0.0264	186.24	1026.32
28	7,095.46	38,416.33	31,320.87	0.0230	162.98	882.42
29	7,078.64	39,714.12	32,635.48	0.0200	141.39	793.24
30	7,065.81	39,947.46	32,881.65	0.0174	122.72	693.83
31	9,458.84	34,947.43	25,488.59	0.0151	142.86	527.81
32	9,659.48	38,257.19	28,597.71	0.0131	126.86	502.44
33	9,894.36	32,487.48	22,593.12	0.0114	112.99	371.01
34	9,859.28	36,721.46	26,862.18	0.0099	97.91	364.66

Table 4.39 Contd.

Age	Cost Rs/acre	Returns Rs/acre	Income Benefit	Disc.15%	Present value of Cost	Present Value of Return
35	9,718.86	35,124.54	25,405.68	0.0086	83.92	303.31
36	9,523.40	36,254.14	26,730.74	0.0075	71.51	272.23
37	8,492.66	35,146.74	26,654.08	0.0065	55.45	229.49
38	8,366.26	36,741.87	28,375.61	0.0057	47.50	208.61
39	8,412.96	37,241.82	28,828.86	0.0049	41.54	183.87
40	8,352.27	34,855.27	26,503.00	0.0043	35.86	149.64
41	8,297.15	38,421.94	30,124.79	0.0037	30.98	143.44
42	8,258.17	40,512.89	32,254.72	0.0032	26.81	131.52
43	8,235.40	44,215.59	35,980.19	0.0028	23.25	124.81
44	8,214.23	38,125.00	29,910.77	0.0025	20.16	93.58
45	8,246.51	36,249.16	28,002.65	0.0021	17.60	77.37
46	8,242.71	34,879.45	26,636.74	0.0019	15.30	64.74
47	8,260.35	36,458.49	28,198.14	0.0016	13.33	58.84
48	8,237.53	33,645.28	25,407.75	0.0014	11.56	47.22
49	8,218.19	33,588.28	25,370.09	0.0012	10.03	40.99
50	8,219.18	32,846.48	24,627.30	0.0011	8.72	34.86
51	7,198.64	33,468.27	26,269.63	0.0009	6.64	30.88
52	7,947.15	32,468.99	24,521.84	0.0008	6.38	26.05
53	7,814.99	31,577.47	23,762.48	0.0007	5.45	22.03
54	6,758.00	30,846.48	24,088.48	0.0006	4.10	18.72
55	6,654.96	30,394.58	23,739.62	0.0005	3.51	16.04
56	6,577.47	29,451.67	22,874.20	0.0005	3.02	13.51
57	7,450.32	28,641.93	21,191.61	0.0004	2.97	11.43

58	5,524.15	27,487.24	21,963.09	0.0003	1.92	9.54
59	4,364.81	26,789.74	22,424.93	0.0003	1.32	8.08
60	3,214.53	23,851.29	20,636.76	0.0003	0.84	6.26
					71214.01	103452.63

4.6.6 Pay Back Period

The pay-back period computed on the basis of undiscounted cumulative value for the investment made in mango cultivation was 3.54 years indicating that the growers can recover the initial investment made in mango orchard in 3.54 years. The cut off year at 15 per cent cost of capital is 6.67 years and the calculated pay back period is less than the cut off year. Hence it may be calculated that the investment in mango cultivation is a viable one.

4.6.7 Benefit-Cost Ratio

Benefit-cost ratio computed on the basis of discounted cost and returns for the investment in mango cultivation is presented in Table 4.40.

Table 4.40
Benefit-Cost Ratio of Mango Cultivation

Present Value of Return (Rs. per acre)	Present Value of Cost (Rs. per acre)	Benefit-Cost Ratio	Nature of Benefit-Cost Ratio
103452.63	71214.01	1.45	>1

Source: Computed data.

At the discounted rate of 15 per cent the benefit-cost ratio was 1.45 which indicates that on an average for one rupee invested in mango cultivation, the benefit received would be 1.45. Since the ratio is larger than unity the investment in mango cultivation at the specified rate of discount is worthwhile.

4.6.8 Net Present Value

It is the most valid technique of evaluating an investment project. It is generally consistent with the objective of maximising wealth. The net present value of mango production was computed on the basis of estimates in Table 4.39 and the results are presented in Table 4.41.

Table 4.41
Net Present Value of Mango Cultivation

Present Value of Return (Rs. per acre)	Present Value of Cost (Rs. per acre)	Net Present Value (Rs. in acre)	Nature of Net Present Value
103452.63	71214.01	32238.62	Positive

Source: Computed data.

It is found from the Table that the net present value was Rs.32238.62 at 15 per cent discount rate. Since the net present value is positive and large it is inferred that the capacity to generate more wealth is large in mango orchards. Therefore, investment in mango cultivation is economically beneficial.

4.6.9 Internal Rate of Return

Internal Rate of Return is the rate at which the sum of discounted cash inflows equals the sum of discounted cash outflows. It is the maximum rate of interest which an organisation can afford to pay on the capital invested in a project. The computed value of internal rate of return was 19 per cent for the samples. As compared to the opportunity cost of capital (cut-off rate) which was taken as 15 per cent, the rate of return on investment made in mango cultivation is very high. It indicates the economic viability of investment in mango cultivation.

From the capital productivity analysis, it is inferred that mango cultivation is an economically viable one. The investment in mango cultivation can be preferred to other alternatives that yield less than the 19 per cent internal rate of return.

4.7 Summary

In this chapter, the researcher has analysed the production problems of mango cultivation of Madurai District. It is found from the analysis that the total cost of mango per acre was Rs.29718, which includes 13,025 as variable cost. It is also found that majority of the farmers have lost their mango production due to diseases.