Ind. Jn. of Agri. Econ.
Vol.65, No.2, April-June 2010

RESEARCH NOTES

An Economic Appraisal of Mango Processing Plants of Chittoor District in Andhra Pradesh

K. Vishwanatha Reddy and Pramod Kumar*

INTRODUCTION

Mango (*mangifera indica L.*) occupies a prominent place amongst the fruits grown in India because of its great utility, and is acknowledged as the king of fruits. Various types of products/processed food are prepared from mango like pickles, chutneys, amchoor, squash, nectar, jam, cereal flakes, custard powder, baby foods, mango leather and toffee. It is an outstanding source of Vitamin-A and Vitamin-C besides it has many minerals and other Vitamins. India with a production of 125.4 lakh tonnes of mango accounts for 40 per cent of total world production (312.5 lakh tonnes). About 2 million hectares of land in India is under this crop accounting for 46.2 per cent of world area (4.37 million hectares) under mango. Among the various states of India, Andhra Pradesh ranks first both in area and production and is followed by Uttar Pradesh. Mango is one of the important fruit crop of Andhra Pradesh cultivated in an area of 3.99 lakh hectares and producing 3.19 million tonnes (Government of India, 2005). The productivity of mango in Andhra Pradesh is 8.1 tonnes per hectare and is higher than the country's average productivity of 6.1 tonnes per hectare.

Mango is perishable in nature and due to unavailability of storage and transportation facilities, considerable amount of mango fruit goes waste every year. The extent of losses in mango is estimated to be 15 per cent (Atteri, 1994). One of the methods to avoid such losses of mango fruits is to process the fresh mangoes into different products. A number of processing firms operate in Andhra Pradesh, with Chittoor district accounting for largest share of the mango processing in the state. Most of the processed produce enters into the international market. Mango processing thus generates lot of income and employment opportunities in the region. However, low capacity utilisation, fluctuation in profitability of the processing firms is an issue often raised. It is also observed that the level of efficiency varies across size class of processing firms (Joshi *et al.*, 1999). It is therefore essential to study the economics and profitability of mango processing in Chittoor district of Andhra Pradesh. The present study is therefore, taken up with following specific objectives: (i) to study the status of mango processing and the nature of its forward and backward linkages; (ii)

*Research Scholar and Senior Scientist, respectively, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi-110 012.

It is part of M.Sc dissertation work carried out by senior author under the guidance of second author.

to assess the economic feasibility of mango processing plants of Chittoor district in Andhra Pradesh; and (iii) to examine the constraints faced by the processors and to suggest policies for enhancing the profitability and growth of processing plants in the region.

DATA AND METHODOLOGY

Multistage stratified random sampling technique was employed for the selection of mango processing plants following proportionate to population size criteria. In Andhra Pradesh, Chittoor district was purposively selected for the study as it has maximum area under mango cultivation and has large number of mango processing units. The list of processing units was prepared and fourteen units from small scale units, four from medium scale and two from large scale units were randomly selected following proportionate to population sampling technique. Primary data were collected from the selected mango processing units through survey method with the aid of pre-tested schedule designed for the purpose. From the processors, detailed information like ownership, pattern of investment, labour use, processing cost, techniques of production, etc., was collected. The data pertains to the agricultural year 2007-08. The various tools of analysis used to assess the feasibility of the processing units are:

(A) *Financial Efficiency Measures*

(a) *Capital Ratios*

(i) $$\text{Capital turnover ratio} = \frac{\text{Gross income}}{\text{Average capital investment}}$$

(ii) $$\text{Capital per unit of gross income} = \frac{\text{Total captial invested on the processing unit}}{\text{Gross income from the processing unit}}$$

(b) *Expense Income Ratio:*

(i) $$\text{Operating ratio} = \frac{\text{Total operating expenses}}{\text{Gross income}}$$

(ii) $$\text{Fixed ratio} = \frac{\text{Fixed expenses}}{\text{Gross income}}$$

(iii) $$\text{Gross ratio} = \frac{\text{Total expenses}}{\text{Gross income}}$$

(B) *Project Evaluation Techniques*

(a) *Net Present Worth (NPW)*

$$NPW = \sum_{t=1}^{t=n} \frac{B_t - C_t}{(1+i)^t}$$

Where, B_t is benefit in year t; C_t is cost in year t; t is time period taking values 1,2,3….,n; n is number of years; and i is interest (discount) rate.

(b) *Benefit Cost Ratio (BC Ratio)*

$$\text{BC Ratio} = \frac{\sum_{t=1}^{t=n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{t=n} \frac{C_t}{(1+i)^t}}$$

Where, B_t is benefit in year t; C_t is cost in year t; t is time period taking values 1,2,3….,n; n is number of years; and i is interest (discount) rate.

(c) *Internal Rate of Return (IRR)*

$$\text{IRR} = \text{Lower discount rate} + \text{Difference between the discount rates} * \left(\frac{\text{Present worth of incremental net benefit stream (cash flow) at the lower discount rate}}{\text{Sum of the present worth of the incremental net benefit streams (cash flows) at the two discount rates, signs ignored}} \right)$$

(C) *Break Even Analysis*

$$BEP = \frac{F}{(P - V)}$$

Where, F is fixed costs; P is price per unit metric tonnes; and V is variable cost per metric tonne.

RESULTS AND DISCUSSIONS

Status of Mango Processing and the Nature of Its Forward and Backward Linkages

(1) *Mango Production in Andhra Pradesh*

Mango is an important crop in India, and ranks first in world with respect to both area and production. Andhra Pradesh has the largest area under mango in the country accounting for 19 per cent of total area and 25 per cent of total production in the country. The popular mango varieties like Totapuri, Benishan, Malgoa, Neelam, Suvernarekha are produced in Andhra Pradesh. About 70 per cent of the mango and its products are exported to various destinations mainly to gulf countries. Andhra Pradesh also ranks among the top three major mango processing states of the country (Rao, 1993).

With regard to area, production and productivity of mango in Andhra Pradesh, Krishna district secured first rank with the area of 72,486 hectares and annual production of 5,79,888 tonnes. Chittoor was the next important district in Andhra Pradesh and occupied an area of 52,721 hectares and production of 4,21,768 tonnes. The third rank went to Khammam district with the area of 38,175 hectares and annual production of 3,05,256 tonnes. The other districts were of minor importance with regard to area and production.

(2) *Raw Material Availability in Chittoor District*

Chittoor district has good horticulture production base and enjoys an easy access to leading horticulture bases in Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. Mangoes, bananas, papayas and citrus are the major fruits grown in the district. The district also grows Tomatoes in sizeable quantity.

Mangoes dominate the horticulture resources of Chittoor district. Of the various varieties grown, Totapuri accounts for nearly 50 per cent, Neelam 25 per cent and other varieties 25 per cent. Further the per hectare yield of mangoes in the district is one of the highest. The high yields are attributed *inter alia* to the development of new orchards and adoption of improved crop management practices i.e., irrigation, fertiliser application and pest control by the cultivators. The orchards raised during the last ten years contribute about 40 per cent of the total production of mango in the district. With the present trend of farmers showing preference to raising mango orchards, mango production in the district is expected to increase considerably in future.

Chittoor district is surrounded by other fruit growing belts Cuddapah and Anantpur districts of Andhra Pradesh; North Arcot, South Arcot and Dharmapuri district of Tamil Nadu and Kolar district of Karnataka. There exists a lot of variation in the commencement seasons for various fruits across regions and varieties. For

instance, mango flowering and fruition in the coastal areas of Andhra Pradesh commence about one month ahead compared to Cuddapah and Chittoor districts (of Andhra Pradesh) or North Arcot and Dharmapuri districts of Tamil Nadu. Similarly, the arrivals of Alphonso variety of mangoes from Chennapatnam, Dharwad, Hubli, Pune and Ratnagiri areas commence towards beginning of May.

The type of fruits available in different seasons of the year indicating peak period is given in Table 1. It is observed that majority of the small scale and medium scale units start their processing operations during May-July months, covering 30-75 days, to produce mango pulp. The pulp is produced from Totapuri, Raspuri and Alphonso variety of mangoes which are considered the best for mango pulp. Most of the sampled units process mango as raw material to produce pulp. The main reason for not producing other products such as guava, papaya, banana and tomato is due to lack of demand for these products in the markets. However, the large scale units have the capacity to process mango, guava, tomato, tamarind, papaya, pineapple and banana puree and concentrates.

TABLE 1. SEASONAL TRENDS IN AVAILABILITY OF FRUITS

Type of fruit/vegetables (1)	Season (2)	Peak Months (3)
Mango (Alphonso)	May	May
Mango (Raspuri)	May, mid-June	May
Mango (Totapuri)	May-July	June, July
Tomato	November –May	December–February
Guava	August-October	September-October
Papaya	Almost throughout the year	December –February

The major portion of raw material (Totapuri- variety of mango) required by the processors in the district is procured from farmers and market yards of Chittoor, Damalcheru, Tirupati, Puttur in the district. Small quantities of Totapuri variety of mango is also procured from Dharmapuri and Arcot districts of Tamil Nadu; and Krishna district of Andhra Pradesh. Some of the units processing Alphonso and Rasapuri variety of mangoes for making pulp procure them from Karnataka and Maharashtra states.

(B) *Growth of Processing Industry in Chittoor District*

The fruit processing activity in Chittoor district commenced during 1965 with the enterprising fruit merchants, M/S Haneef and Sattar, setting up a small unit named HANSTAR, at Damalcheru to extract mango pulp which worked for few years only (Naidu, 2002). A more organised effort towards the growth of the cluster was initiated by a prominent mango grower Late Mr. Subramanya Reddy who established M/S India Canning Industries, the first merchandised fruit processing unit in the district. However, no new units were established during the period 1971 to 1980 (Table 2).

TABLE 2. GROWTH OF MANGO PROCESSING UNITS IN CHITTOOR DISTRICT

Sl. No.	Year	No. of units established	Cumulative No. of units
(1)	(2)	(3)	(4)
1.	1970	1	1
2.	1981	1	2
3.	1983	9	11
4.	1984	1	12
5.	1985	3	15
6.	1986	3	18
7.	1987	5	23
8.	1990	1	24
9.	1991	1	25
10.	1994	1	26
11.	1995	1	27
12.	1996	2	29
13.	1998	2	31
14.	1999	3	34
15.	2000	2	36
16.	2001	8	44
17.	2003	5	49
18.	2005	6	54
19.	2006	2	56
	Total	56	

Source: Naidu (2002); and the author's discussion with Mr. Balkrishna Reddy, Chairman, Chittoor district fruit processor's federation, Chittoor, Andhra Pradesh.

Thereafter, mango pulp units were established at frequent intervals. This resulted in the establishment of 23 units between 1981 and 1990. Subsequently, more units were established between 1991 to till date. The decades of 1980s and 2000s recorded spurt in the growth of mango processing industries. The list of mango processing firms with the data on quantity and value of mango pulp processed are given in Appendix 1.

A wide range of investment has been made towards setting up of mango processing units. The investment across different firms ranges from upto Rs.15 lakhs to Rs.1600 lakhs (Table 3). About 11 per cent of the firms have an investment between 10-16 crores falling under the category of large enterprises. While 18 per cent of the firm have an investment range of Rs. 5 to 10 crores and fall in the

TABLE 3. INVESTMENT PATTERN IN MANGO PROCESSING UNITS IN CHITTOOR DISTRICT

Sl. No.	Range of investment (Rs. lakhs)	Number of units
(1)	(2)	(3)
1.	Upto 15	1
2.	15-30	3
3.	30-40	10
4.	40-50	10
5.	50-100	8
6.	100-500	8
7.	500-1000	10
8.	1000-1600	6
Total		56

category of medium enterprises, the rest of the 72 per cent of the firms fall in the category of small and micro enterprises. The range of investment, however is mainly associated with escalation of cost of investment rather than the production capacity.

All the processing units in the district are covered under Fruit Products Order (FPO). The products such as pulp/concentrate produced shall confirm to the FPO specifications as enunciated in Fruits Products Order 1955; and Fruits Products Order 1977. The large firms have also acquired HACCP certification. There are technological differences across the various size classes of firms.

Status of Export of Processed Mango and other Horticultural Commodities from Chittoor District

There is an increasing trend in export of both mango fruits and mango pulp in both quantity and value terms. The export of mango pulp has shown a quantum jump from 13 thousand tonnes in the year 1999-2000 to 120 thousand tonnes in the year 2006-07, revealing the importance of mango processing industry of the region (Table 4). The low variability in the unit value realisation in the case of mango pulp as against the unit value realisation of mango fruits seems to suggest the need for greater incentives for the processing sector.

TABLE 4. EXPORTS OF MANGO AND MANGO PULP FROM CHITTOOR DISTRICT

	Fresh mango fruits			Mango Pulp		
Year (1)	Quantity (tonnes) (2)	Value (Rs. crore) (3)	Unit value (Rs./tonne) (4)	Quantity (tonnes) (5)	Value (Rs. crore) (6)	Unit value (Rs./tonne) (7)
1999-2000	275	0.55	20000	13538	25.72	18999
2000-01	288	0.53	18403	14487	28.00	19328
2001-02	540	0.99	18333	16785	37.00	22044
2002-03	760	1.67	21974	20410	45.00	22048
2003-04	360	0.67	18611	22413	49.31	21999
2004-05	580	1.16	20000	26224	57.69	21998
2005-06	600	0.60	10000	95360	190.72	20000
2006-07	200	0.20	10000	120200	264.44	22000

Source: AEZ Office, Chittoor.

It is also observed that a number of other processed horticultural commodities are being exported apart from mango such as gherkins, guava pulp, papaya pulp, etc. (Table 5). This trend is however noticeable in recent times though the export is of lower volume. This however, demands further incentive and support to the processing industries to enable them process and export large volume of other fruits and vegetables as well. The processing of other fruits and vegetable commodities also has an impact on the profitability and capacity utilisation.

TABLE 5. EXPORTS OF PROCESSED HORTICULTURAL COMMODITIES FROM CHITTOOR DISTRICT

Year (1)	Mango fresh fruits		Mango pulp		Gherkins	
	Quantity (tonnes) (2)	Value (Rs./crore) (3)	Quantity (tonnes) (4)	Value (Rs./crore) (5)	Quantity (tonnes) (6)	Value (Rs./crore) (7)
2002-03	-	-	50000	75.0	1975	4.35
2003-04	300	0.30	42130	84.2	774	1.70
2004-05	750	0.75	81500	175.2	573	1.25
2005-06	600	0.60	95360	190.7	420	0.91
2006-07	200	0.20	120200	264.4	349.45	0.84

Year (1)	Guava pulp		Pineapple		Total	
	Quantity (tonnes) (8)	Value (Rs./crore) (9)	Quantity (tonnes) (10)	Value (Rs./crore) (11)	Quantity (tonnes) (12)	Value (Rs./crore) (13)
2002-03	-	-	-	-	51975	79.35
2003-04	-	-	-	-	43204	86.20
2004-05	-	-	-	-	82823	177.22
2005-06	-	-	-	-	96380	192.21
2006-07	495	0.49	60	0.05	121305	265.98

Source: Deputy Director of Horticulture (FAC), AEZ, Chittoor.

Forward and Backward Linkages of Mango Processing Industry

The forward and backward linkages are very important from the point of view of farmers, processors and exporters. The mango processing industry is important for the economy of the Chittoor district and that of the country as it has greater backward and forward linkages. The prominent marketing channels for mango pulp in the study area are given in Figure 1.

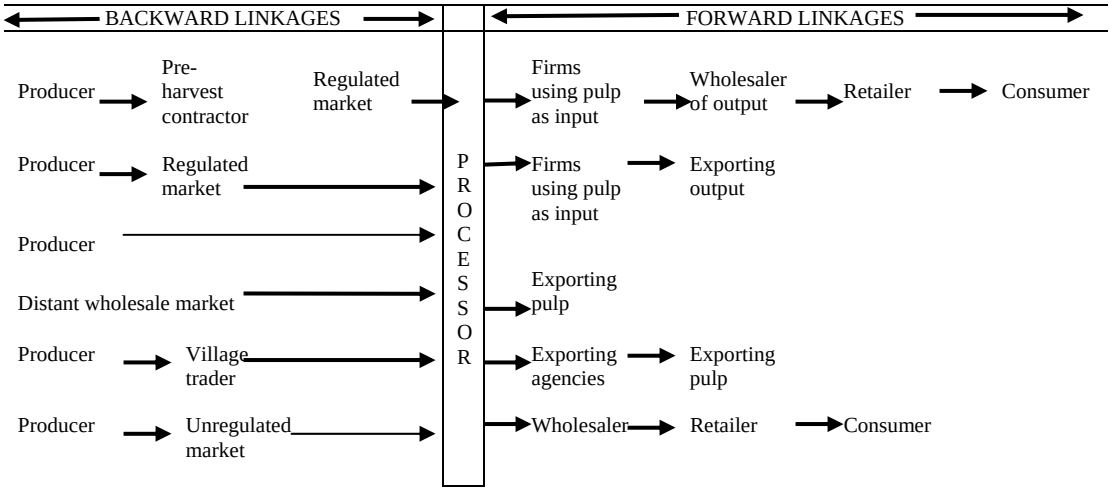

Figure 1. Backward and Forward Linkages of Mango Pulp Processing Industry

The processing industry is backwardly linked with six marketing channels basically to source the major raw material, i.e., mango pulp. Two of these six channels i.e., (1) Producer------- Processor; and (2) Producer-----Regulated market----Processor, account for about 80 per cent of the total procurement of the raw material by the processing firms.

The mangoes required for processing are supplied directly by the orchards. Normally, these orchards are owned by the promoters of the processing units. The traders located in the mandis are another important source of raw material supply. There are four major market yards set up in the district exclusively for mango trading in the season, located at Kattamanchi, Damalcheru, Tirupathi and Puttur.

The processing industry is forwardly linked with five market channels. The two of these five channels, i.e., (1) Processor---------Exporting pulp; and (2) Processor----------Exporting agency----------Exporting pulp, account for about 85 per cent of the disposal of the mango pulp by the processors.

The small firms have lesser access to international market and depend heavily on the merchant exporters to export mango pulp on pre-contract basis. This has a bearing on the profitability of the processing units.

Economic Feasibility of Mango Processing Plants of Chittoor District

Capacity, Investment and Commodities of Different Categories of Firms

Table 6 provides information on the capacity, investment, commodities processed by large scale, medium scale and small scale firms. The large scale firms process different commodities namely mango, guava, papaya and vegetables. These firms work almost throughout the year unlike medium and small scale firms which are processing only mango and guava fruits and work for three to four months in a year.

TABLE 6. PER FACTORY CAPACITY, INVESTMENT AND COMMODITIES PROCESSED BY DIFFERENT CATEGORY OF MANGO PROCESSING FIRMS

(*crores*)

Sl. No. (1)	Particulars (2)	Scale of production		
		Large scale (N=2) (3)	Medium scale (N=4) (4)	Small scale (N=14) (5)
1.	Capacity (tonnes)	13000	5200	2000
2.	Capacity utilised (per cent)	75	50	50
3.	Fixed cost	15.00 (57.87)	6.00 (60.98)	2.0 (61.35)
4.	Variable cost	10.92 (42.13)	3.84 (39.02)	1.26 (38.65)
5.	Total cost	25.92	9.84	3.26
6.	Commodities processed	Mango Papaya Guava Vegetables	Mango Guava	Mango Guava

The per firm capital investment varies for each category of firm, i.e., Rs. 15 crores in large scale firms, Rs. 6 crores in medium scale firms and 2 crores in small scale firms. The capacity utilisation is Rs. 75 per cent in large firms and is 50 per cent in the case of medium and small scale firms.

The employment details are depicted in Table 7. The large firms employ a large number of workers i.e., 700. The small firms on the other hand employ only 256 workers. However, most of the employment is on a part time basis, processing industry being a seasonal industry.

TABLE 7. EMPLOYMENT DETAILS OF DIFFERENT CATEGORIES OF MANGO PROCESSING FIRMS

		Nature of firms		
Sl. No.	Employment	Large	Medium	Small
(1)	(2)	(3)	(4)	(5)
1.	Executives	10	10	2
2.	Managers	5	2	2
3.	Workers			
(a)	Full time	100		6
(b)	Part time	600	500	250
4.	No of months operational	10	5	4

Large variation in investment ranging from Rs. 2 crores to Rs. 15 crores is observed across the size group of firms (Table 8). Three components of fixed assets, i.e., land, building and machinery accounts for 97 per cent of the total investment across all categories of the firms.

TABLE 8. INVESTMENT COST OF MANGO PROCESSING UNITS

(*Rs. lakh*)

Sl. No.	Particulars	Large	Medium	Small
(1)	(2)	(3)	(4)	(5)
1.	Land value	464	235.5	56
		(30.9)	(39.23)	(28.0)
2.	Buildings	600	200	100
		(40.0)	(33.3)	(50.0)
3.	Machinery	400	150	40
		(26.7)	(25)	(20.0)
4.	Effluent treatment plant	15	10	1
		(1.0)	(1.7)	(0.5)
5.	Vehicles	21	4.5	3
		(1.4)	(0.8)	(1.5)
	Total	1500	600	200

Table 9 depicts the per firm variable cost incurred in processing of pulp. The amount of variable cost incurred ranges from Rs. 123.53 lakhs (small firms) to Rs.1111.4 lakhs (large firms). The processing industry is raw material intensive with 58 to 67 per cent of the total variable cost accounting for by procurement of raw materials. The share of wages of casual labour ranges from 16 to 24 per cent and is the next major component of the total variable cost. This reflects the capacity of the processing industry to generate employment opportunity and also income to the farmer producers.

TABLE 9. PER FIRM VARIABLE COST OF PROCESSING MANGO IN DIFFERENT CATEGORIES OF PLANTS

(*Rs. lakh*)

Sr. No. (1)	Particulars (2)	Large (3)	Medium (4)	Small (5)
1.	Raw fruits			
(a)	Mango	720.00	250.00	67.50
		(64.78)	(60.47)	(54.64)
(b)	Guava	13.50	9.00	4.00
		(1.21)	(2.18)	(3.24)
(c)	Papaya	7.50		
		(0.67)		
(d)	Vegetables	8.00		
		(0.72)		
	Sub-total	749.00	259.00	71.50
		(67.4)	(62.6)	(57.9)
2.	Wages to casual labour	180.00	75.00	30.00
		(16.2)	(18.1)	(24.3)
3.	Energy charges	17.04	13.35	3.25
		(1.5)	(3.2)	(3.6)
4.	Sugar	1.92	0.96	0.32
		(0.2)	(0.2)	(0.3)
5.	Preservatives	0.06	0.03	0.01
		(0.01)	(0.01)	(0.01)
6.	Quality control	2.50	2.50	0.10
		(0.2)	(0.6)	(0.1)
7.	Cold storage	3.30		
		(0.3)		
8.	Interest on working capital	104.07	37.58	11.23
		(9.4)	(9.1)	(9.1)
	Total	1111.40	413.42	123.53

Note: Figures in parentheses are per cent to the total.

Per firm fixed cost of mango processing firms is depicted in Table 10. The fixed cost of establishment of processing plants varies from Rs. 26.85 lakhs (small firms) to Rs. 209.25 lakhs for larges firms. Wages of permanent employees accounts for the major share of the fixed capital. Depreciation of building and machinery accounts for about 50 per cent of the total fixed cost across all size of firms.

The cost and returns for the various size class of processing firms are summarised in Table 11. It is observed that the small firms produce 860 tonnes of mango pulp (average per unit) equivalent whereas the large firms produce upto 5995 tonnes of mango pulp equivalent. The large firms process a number of commodities i.e., mango, guava, papaya and vegetables. While the small and medium firms process only mango and guava and are thus operational during part of the year. The total revenue generated on an average varies from Rs. 161.25 lakhs for small firms to Rs.1361.6 lakhs for large firms. The variable cost constitutes more than 80 per cent of the total cost across all size class of firms. The total cost incurred in production of pulp is Rs.149.97 lakhs for small firms and Rs. 1320.67 lakh for large firms. Thus generating a total net revenue of Rs. 11.25 lakhs for small firms and Rs. 40.93 lakhs for large firms. Therefore, it is evident that the processing firms are profitable. The

TABLE 10. PER FIRM FIXED COST FOR PROCESSING MANGO

(*Rs. lakh)*

Sr. No (1)	Particulars (2)	Large (3)	Medium (4)	Small (5)
1.	Depreciation on vehicles	2.10	0.45	0.30
		(1.0)	(0.7)	(1.1)
2.	Depreciation on effluent treatment plant	1.50	1.00	0.10
		(0.7)	(1.6)	(0.4)
3.	Depreciation on building	60.00	20.00	10.00
		(28.7)	(31.3)	(37.3)
4.	Depreciation on machinery	40.00	15.00	4.00
		(19.1)	(23.5)	(14.9)
5.	Interest on fixed capital	7.00	2.50	0.90
		(3.3)	(3.9)	(3.4)
6.	Permanent labour	93.60	24.00	11.04
		(44.7)	(37.5)	(41.1)
7.	Land revenue	0.05	0.01	0.005
		(0.2)	(0.2)	(0.2)
8.	Rental value of owned land	5.00	1.00	0.50
		(2.4)	(1.6)	(1.9)
	Total	209.25	63.96	26.85

Note: Figures in parentheses are per cent to the total.

TABLE 11. COST AND RETURNS OF THE PROCESSING FIRMS

Sl. No. (1)	Particulars (2)	Large (3)	Medium (4)	Small (5)
1.	Mango pulp (tonnes) (average per unit)	5995	2280	860
2.	Total revenue (lakh Rs.)			
	Mango pulp	1214.40	446.25	131.25
	Guava pulp	55.20	51.00	30.00
	Papaya	34.50		
	Vegetables	57.50		
	Sub-total	1361.60	497.25	161.25
3.	Total costs (lakh Rs.)			
	Variable cost	1111.42	413.77	123.12
		(84.16)	(86.61)	(82.10)
	Fixed cost	209.25	63.96	26.85
		(15.85)	(13.39)	(17.90)
	Sub-total	1320.67	477.73	149.97
4.	Net returns	40.93	19.52	11.25
	Financial efficiency ratio			
(A)	Income expense ratio			
a.	Operating ratio	0.82	0.83	0.76
b.	Fixed ratio	0.15	0.13	0.17
c.	Gross ratio	0.97	0.96	0.93
(B)	Capital ratios			
a.	Capital turnover ratio	0.91	0.83	0.81
b.	Rate of returns on investment	0.027	0.033	0.056

financial analysis ratios i.e., income-expenditure ratio and capital ratio were computed and are presented in Table 11 to further understand the operational efficiency of these firms. The operating ratio ranges from 0.76 for small firms to 0.82 for large firms. This signifies that for every rupee of gross income a substantial portion of operation cost is incurred. The fixed ratio varies from 0.13 for medium firms to 0.17 for small firms indicating that for small firms, relatively large share of

gross income is used for meeting the fixed expenses. The gross ratio is less than one signifying the efficient operation of the firms. However, it is substantially high and varies from 0.93 for small firms to 0.97 for large firms. This reveals that a large portion of gross income is utilised for meeting the total expenses. It also reveals that the small firms are more efficient than the other size class of firms.

The capital turnover ratio ranges from 0.81 for small firms to 0.91 for large size firms revealing that for every rupee of investment by the small firms generates gross income of 81 paisa. This measure however, shows that the large firms are more efficient than the small firms. The rate of return on investment gives a better picture of efficiency. The value of rate of return to investment varies from 0.027 for large firms to 0.056 for small firms, revealing that every rupee of capital investment generates a net return of 3 paisa to 6 paisa. This measure reveals that the small firms are more efficient than the large firms.

Feasibility of Processing Firms

The present value of cost and returns at different discount rates for the different size class of firms has been depicted in the Appendix 2 to 4. It is assumed that the processing units continue to be operational for a period of 25 years. These values have been used to compute the various project analysis tools such as Net Present Value, B: C Ratio, Internal Rate of Return. The results of various discounted and undiscounted measures are shown in Tables 12A and B.

All the three class of firms are feasible as per both NPV and BC ratio criteria (Table 12A). The B: C ratio of small firms is higher than that of large firms for all the discount rates. This reveals that the small firms rank higher than the large firms. On the other hand the NPV criteria shows that the large firms rank higher than small and medium firms and are able to produce substantially higher net present worth than the other two size class of firms.

TABLE 12A. FEASIBILITY OF MANGO PROCESSING PLANTS

Discount rate (per cent)	Large		Medium		Small	
	NPV	BCR	NPV	BCR	NPV	BCR
(1)	(2)	(3)	(4)	(5)	(6)	(7)
10	679.7	1.07	159.1	1.04	129.6	1.11
12	399.4	1.04	66.8	1.02	86.4	1.08
15	72.4	1.01	-40.6	0.98	35.9	1.04
20	-219.5	0.96	-135.3	0.94	-9.6	0.98

Table 12B depicts the feasibility of mango processing plants using the criteria of IRR and pay back period. It is observed that the IRR of small firms (19.31 per cent) is the highest followed by that of large firms (17.5 per cent) and medium firms (13.87 per cent). All the three size class of firms are viable as their IRR is greater than the opportunity cost of capital. Thus, the small firms rank the highest and the medium firms rank the lowest as per the IRR criteria.

TABLE 12B. FEASIBILITY OF MANGO PROCESSING PLANTS

Feasibility measure (1)	Large firms (2)	Medium firms (3)	Small firms (4)
IRR (per cent)	17.50	13.87	19.31
Pay Back Period (years)	5.99	6.89	5.25

The pay back period explains the number of years in which the investment is paid back by the project. It is observed that the investment in mango processing plant has least pay back period for small firms (5.25 years) followed by that of large firms (5.99 years) and medium firms (6.89 years). The shorter pay back period for mango processing plants provides an important opportunity for an entrepreneur.

The break even analysis helps the entrepreneur in taking managerial decisions as to what should be the level of operation of the firm. Both the variable cost of production and the output price per tonne of processed products is the lowest in case of small firms and highest for large firms (Table 13). The large firms have access to the international market; where as the small firms depend on merchant exporters to dispose the product in the international market. The large firms adhere better to the quality standards demanded in the international market as compared to small firms. These are the major reasons for the differential in the output prices across the firm size groups.

TABLE 13. BREAK EVEN ANALYSIS FOR MANGO PROCESSING

(*Rs.*)

Sl. No. (1)	Particulars (2)	Scale of production		
		Large scale (3)	Medium scale (4)	Small scale (5)
1.	Price per tonne of processed products	22712.26	21889.21	18750
2.	Variable cost per tonne of processed products	18539.16	18147.71	14316.63
3.	Money terms (BEP)	113885016	38096852.9	11353519
4.	Tonnes (BEP)	5014.25	1746.82	605.52

The break even point for small firms (Rs. 113.54 lakhs) is the lowest followed by medium firms (Rs. 380.97 lakhs) and large firms (Rs. 1138.85 lakhs) respectively. The break even point in physical terms for small firms with 605.52 tonnes is the least followed by medium and large firms, with production of 1746.82 tonnes and 5014.25 tonnes respectively. It is implied that the firms should operate at a level generating gross revenue and producing output above these values by the respective firm size classes to be profitable.

CONSTRAINTS FACED BY THE PROCESSORS AND POLICY IMPLICATIONS FOR ENHANCING THE PROFITABILITY AND GROWTH OF PROCESSING PLANTS IN THE REGION

The mango pulp industry in Chittoor district faces a number of constraints (Table 14). Among the infrastructural constraints, inadequate supply of power was reported

to be the major problem by 60 per cent of the firms. High cost of credit was reported to be the major problem by 60 per cent of the firms.

The processing sector is very labour intensive, with majority of labourers coming from within the region to meet the labour deficit of the neighbouring regions. In recent years there has been spurt in wages of the labourers adding to the cost of production of the processing firms. About 80 per cent of those employed in processing sector are women and only 20 per cent are the men folk. This is mainly because the activities involved are more suited to women folk, secondly to minimise cost of production also the processors favour employment of women folk. However, more than 75 per cent of the firms reported the problem of inadequate supply of labour and high cost of labour.

TABLE 14. CONSTRAINTS FACED BY THE MANGO PROCESSORS

Sl. No. (1)		Constraints (2)	No. (3)	Per cent (4)
(A)		Infrastructural constraints		
	1.	Inadequate storage facilities	7	35
	2.	Inadequate transport facilities	9	45
	3.	Power shortages	10	60
(B)		Credit constraints		
	1.	Non- availability of credit	2	10
	2.	High cost of credit	12	60
(C)		Labour related constraints		
	1.	Irregular supply of labour	15	75
	2.	High cost of labour	16	80
(D)		Raw material supply constraints		
	1.	Inadequate availability of mango	6	30
	2.	Unreliable supply of raw materials other than mango	13	65
	3.	Availability of poor quality raw materials	4	20
(E)		Market constraints		
	1.	Wide out put price fluctuations	18	90
	2.	Low domestic demand	15	75
	3.	Demand fluctuation in the international market	14	70
	4.	Lack of knowledge of quality issues	1	5

The processing industry is raw material intensive. The industry faces a number of problems related to raw material supply. The supply is not consistent owing to dependence of production on weather variations. In years of deficit the firms meet out the raw material supply with procurements from nearby regions and neighbouring states. The mango fruit is available for processing only for 120 days, during the other periods processing of other fruits and vegetables could be taken up by the processing firms. Some firms are processing guava, papaya, tomato, etc. The large firms take up processing of a number of commodities however, the small firms process only mango and to certain extent guava. This has implications on capacity utilisation.

Substantially a large proportion of firms (65 per cent) reported unavailability of raw materials other than mango as a major constraint.

The prices of raw fruits and processed products are highly fluctuating in domestic as well as international markets, thereby causing higher risk particularly to small scale processing units. Consequently, the small scale units were not working on own account, instead they were working on pre-contract basis.

Lack of domestic demand for mango pulp was reported to be a major problem by 75 per cent of the firms. The domestic demand acts as a cushion against the demand and price fluctuations in international markets. There is a need to enhance domestic consumption through campaigns, product diversification, etc.

About 70 per cent of the firms reported fluctuations in demand as the major problem. This could be overcome through bilateral negotiations, joining various trade blocks, etc. This demands extra effort by the policy makers and government towards minimising the demand fluctuations in the international markets.

Volatility in the output price is reported to be the major problem by 90 per cent of the firms. This is mainly because of the competition in international markets. The international market also demands the domestic industry to adhere to stricter quality controls. The huge investment in the adoption of quality standards adds to the dilemma of technological upgradation of majority of the small firms. The market demands aseptic packaging of the pulp. The installation of the aseptic packaging system calls for heavy investment, which is unaffordable by the small firms.

POLICY IMPLICATIONS AND SUGGESTIONS

- Growth and sustainability of small firms is important as they constitute about 72 per cent of the total firms. Since the small firms are viable, the support and incentive should be given so that they overcome the competition due to opening up of economy.
- The mango processing industry should be supported as the unit value realisation of mango pulp is more stable than that of raw mango. It also has a number of forward and backward linkages benefiting the economy of the region.
- Contract farming should be promoted to ensure timely and adequate supply of raw materials and to minimise the cost of raw materials. It will minimise the marketing margin in the supply of raw materials to processing industry.
- Domestic consumption should be promoted through campaigns and by producing diversified products to serve as a cushion to the mango processing industry against fluctuation in the demand at the international market.
- The cooperative societies should be set up to help the small firms to increase their access to the international market and realise higher price for their output.
- Small firms are poor in adopting the adequate quality standards and the technology used is not favouring the market. This calls for the support and

nurturing by government to help technology upgradation and to adopt Hazard Analysis Critical Control Point (HACCP).

- Government should promote the production of mango and other horticultural commodities in the region to promote the adequate supply of raw materials throughout the year for increasing the capacity utilisation of the firms.

Received September 2008. *Revision accepted February 2010.*

REFERENCES

Atteri, B.R. (1994), "A Study on Physical and Economic Losses of Dasheri and Chausa Varieties of Mango in Delhi Market", *Bihar Journal of Agricultural Marketing*, Vol.2, No.4, pp. 325-329.

Government of India (2005), *Horticulture Database 2005*, National Horticulture Board, Ministry of Agriculture, New Delhi.

Joshi, M.G., S.S. Wadkar, P.D. Veerkar and A.G. Powar (1999), "Comparative Economics of Scale of Processing Alphonso Mango into Pulp in South Konkan Region", *Bihar Journal of Agricultural Marketing*, Vol.7,No.2, pp. 190-194.

Naidu, P.D. (2002), *Survey Report on Mango Production and Marketing in Chittoor District*, ATMA, NATP, Chittoor District, Andhra Pradesh.

Suryaprakasa Rao (1993), "Mango Processing Industry in Andhra Pradesh", Paper presented at workshop on Mango Production, Processing, Marketing and Export by Peddi Reddy Timma Reddy Foundation, November, 1993, Hyderabad.

APPENDIX 1

QUANTITY AND VALUE OF MANGO PROCESSED BY DIFFERENT MANGO PROCESSING FIRMS IN CHITTOOR DISTRICT OF ANDHRA PRADESH, 2005

Sl. No. (1)	Name of the processing unit (2)	Total quantity processed (tonnes) (3)	Percentage to the total (4)	Total value in Rs. crore (5)	Percentage to the total (6)
1.	Suvera processed foods pvt. Ltd.	1600	1.67	3.20	1.67
2.	Ravindranath Fruit Canning Industries	2450	2.57	4.90	2.57
3.	Ranga Fruit Products	3000	3.14	6.00	3.14
4.	India Canning Industries	1400	1.46	2.80	1.46
5.	Anand Processed Foods	700	0.73	1.40	0.73
6.	Sreenivasa Processed Foods	750	0.78	1.5	0.78
7.	Chittoor Canning pvt. Ltd.	5400	5.66	10.80	5.66
8.	Venugopal Fruit Processing Industries	1600	1.67	3.20	1.67
9.	Sri Balaji Fruit Canning Industries	1750	1.83	3.50	1.83
10.	Creative Seasonal Canning	1200	1.25	2.40	1.25
11.	Sri Krishna Fruit Canning Industries	850	0.89	1.70	0.89
12.	BRVM Fruit Products	1400	1.46	2.80	1.46
13.	Nava Bharathi Food Products	1300	1.36	2.60	1.36
14.	Sai Krishna Food Products	900	0.94	1.80	0.94
15.	Maruthi Fruit Canning Industries	1800	1.88	3.60	1.88
16.	Sri Manjunatha Fruit Canning Industries	900	0.94	1.80	0.94

(Contd.)

APPENDIX 1 (CONCLD.)

Sl. No. (1)	Name of the processing unit (2)	Total quantity processed (tonnes) (3)	Percentage to the total (4)	Total value in Rs. crore (5)	Percentage to the total (6)
17.	Hayat Foods	2100	2.20	4.20	2.20
18.	Poorna Processed Foods	1800	1.88	3.60	1.88
19.	New Ranga Fruit Products	2200	2.20	4.40	2.20
20.	Bhagya Lakshmi Fruit Canning Industries	1600	1.67	3.20	1.67
21.	Jayabhaskar Processed Foods	1200	1.25	2.40	1.25
22.	Gold Cuits Agro Pvt. Ltd.	1400	1.46	2.80	1.46
23.	United Canning Co. Pvt. Ltd.,	1000	1.04	2.00	1.04
24.	Clean Foods Corporation Ltd.,	19000	19.92	38.00	19.92
25.	Sun Star Food Products	750	0.78	1.50	0.78
26.	Vinsari Fruit Tech Ltd.,	750	0.78	1.50	0.78
27.	Sri Parandama Fruit Products	800	0.83	1.60	0.83
28.	Sri Sai Fruit Products	750	0.78	1.50	0.78
29.	Venu Gopal Semi Foods	500	0.52	1.00	0.52
30.	Sarvani Food Products Ltd.,	650	0.68	1.30	0.68
31.	Navarasa Food Products Ltd.,	1460	1.53	2.92	1.53
32.	Sree Srinivasa Fruit Processing Industries	900	0.94	1.80	0.94
33.	Sun Gold Processed Foods	2800	2.93	5.60	2.93
34.	KNN Food Products	2650	2.77	5.30	2.77
35.	Sri Dhanalakshmi Fruit Canning Industries	1750	1.83	3.50	1.83
36.	New Parle Bisleri Pvt. Ltd.,	950	0.99	1.90	0.99
37.	New Parle Bisleri Pvt. Ltd.,	1600	1.67	3.20	1.67
38.	Capricorn	2400	2.51	4.80	2.51
39.	Parrot Processed Foods	650	0.68	1.30	0.68
40.	Chengalva Agro Tech Ltd.,	4100	4.30	8.20	4.30
41.	Sri Varadaraja Fruit Products	750	0.78	1.50	0.78
42.	Vallivedu Fruit Canning	1100	1.15	2.20	1.15
43.	Venus Fruit Canning	1450	1.52	2.90	1.52
44.	Ala Foods, Gollmadugu	750	0.78	1.50	0.78
45.	Cool Beach Industries	1000	1.04	2.00	1.04
46.	Krishnapriya Food Processing Unit	900	0.94	1.80	0.94
47.	Varsha Food Products	600	0.63	1.20	0.63
48.	R.M.M. Food Products	1300	1.36	2.60	1.36
49.	K.K. Foods	850	0.89	1.70	0.89
50.	Foods And Inns	2000	2.09	4.00	2.09
51.	Galla Foods	3900	4.08	7.80	4.08
Total		95360	100.00	190.72	100.00

Source: Deputy Director of Horticulture, AEZ, Chittoor.

APPENDIX 2

PRESENT VALUE OF COST AND RETURNS AT DIFFERENT DISCOUNT RATES FOR LARGE SCALE FIRMS

Years	Fixed cost (Rs. lakhs)	Operating cost (Rs. lakhs)	Total cost (Rs. lakhs)	Total benefits (Rs. lakhs)	Present value of benefits				Present value of cost			
					10 per cent	12 per cent	15 per cent	20 per cent	10 per cent	12 per cent	15 per cent	20 per cent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	1500.0	0.0	1500.0	0.0	0.0	0.0	0.0	0.0	1363.7	1339.4	1304.4	1250.0
2.	0.0	1111.4	1111.4	1361.6	1125.2	1085.5	1029.5	945.5	918.5	886.0	840.3	771.8
3.	0.0	1111.4	1111.4	1361.6	1023.0	969.2	895.3	788.0	835.0	791.1	730.8	643.2
4.	0.0	1111.4	1111.4	1361.6	930.0	865.3	778.6	656.7	759.1	706.3	635.5	536.0
5.	0.0	1111.4	1111.4	1361.6	845.4	772.6	677.0	547.2	690.1	630.6	552.6	446.7
6.	0.0	1111.4	1111.4	1361.6	768.6	689.8	588.6	456.0	627.4	563.0	480.5	372.2
7.	0.0	1111.4	1111.4	1361.6	698.8	615.9	510.9	380.0	570.4	502.7	417.0	310.2
8.	0.0	1111.4	1111.4	1361.6	635.2	550.0	445.1	316.7	518.5	448.9	363.3	258.5
9.	0.0	1111.4	1111.4	1361.6	577.5	491.0	387.1	263.9	471.4	400.8	316.0	215.4
10.	0.0	1111.4	1111.4	1361.6	524.9	438.4	336.6	219.9	428.5	357.9	274.7	179.5
11.	0.0	1111.4	1111.4	1361.6	477.2	391.5	292.6	183.3	389.6	319.5	238.8	149.6
12.	0.0	1111.4	1111.4	1361.6	433.8	349.5	254.5	152.8	354.1	285.3	207.7	124.7
13.	0.0	1111.4	1111.4	1361.6	394.5	312.1	221.3	127.3	322.0	254.7	180.6	103.9
14.	0.0	1111.4	1111.4	1361.6	358.5	278.6	192.4	106.1	292.6	227.4	157.0	86.6
15.	0.0	1111.4	1111.4	1361.6	326.0	248.8	167.3	94.5	266.1	203.1	136.6	77.1
16.	0.0	1111.4	1111.4	1361.6	296.3	222.1	145.6	73.7	241.8	181.3	118.8	60.1
17.	0.0	1111.4	1111.4	1361.6	269.3	198.2	126.5	61.4	219.8	161.8	103.3	50.1
18.	0.0	1111.4	1111.4	1361.6	245.0	177.0	110.0	51.2	199.9	144.5	89.8	41.8
19.	0.0	1111.4	1111.4	1361.6	222.6	158.1	95.7	42.6	181.7	129.0	78.1	34.8
20.	0.0	1111.4	1111.4	1361.6	202.3	141.2	83.2	35.5	165.2	115.3	67.9	29.0
21.	0.0	1111.4	1111.4	1361.6	184.0	126.1	42.1	29.5	150.2	102.9	34.3	24.1
22.	0.0	1111.4	1111.4	1361.6	167.2	112.5	35.7	24.6	136.5	91.8	29.1	20.1
23.	0.0	1111.4	1111.4	1361.6	152.1	100.5	30.2	20.6	124.1	82.0	24.7	16.8
24.	0.0	1111.4	1111.4	1361.6	138.2	89.7	25.6	17.2	112.8	73.2	20.9	14.0
25.	0.0	1111.4	1111.4	1361.6	125.7	80.1	21.8	14.3	102.6	65.4	17.8	11.7
Total					11121.1	9463.4	7493.0	5608.4	10441.4	9064.0	7420.7	5827.9

APPENDIX 3

PRESENT VALUE OF COST AND RETURNS AT DIFFERENT DISCOUNT RATES FOR MEDIUM SCALE FIRMS

Years	Fixed cost	Operating cost (Rs. lakhs)	Total cost (Rs. lakhs)	Total benefits (Rs. lakhs)	Present value of benefits				Present value of cost			
					10 per cent	12 per cent	15 per cent	20 per cent	10 per cent	12 per cent	15 per cent	20 per cent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	57.50	0.0	400.0	0.0	0.0	0.0	0.0	0.0	522.7	513.4	500.0	479.1
2.	0.0	413.8	413.8	497.3	410.9	396.4	376.0	345.3	341.9	329.9	312.8	287.3
3.	0.0	413.8	413.8	497.3	373.6	353.9	326.9	287.8	310.9	294.5	272.1	239.4
4.	0.0	413.8	413.8	497.3	339.6	316.0	284.3	239.8	282.6	262.9	236.6	199.6
5.	0.0	413.8	413.8	497.3	308.7	282.1	247.2	199.8	256.9	234.8	205.7	166.3
6.	0.0	413.8	413.8	497.3	280.7	251.9	215.0	166.5	233.6	209.6	178.9	138.6
7.	0.0	413.8	413.8	497.3	255.2	224.9	186.6	138.8	212.3	187.1	155.2	115.5
8.	0.0	413.8	413.8	497.3	232.0	200.8	162.6	115.7	193.0	167.1	135.3	96.2
9.	0.0	413.8	413.8	497.3	210.9	179.3	141.4	96.4	175.5	149.2	117.6	80.2
10.	0.0	413.8	413.8	497.3	191.7	160.1	122.9	80.3	159.5	133.2	102.3	66.8
11.	0.0	413.8	413.8	497.3	174.3	143.0	106.9	66.9	145.0	119.0	88.9	55.7
12.	0.0	413.8	413.8	497.3	158.4	127.6	92.9	55.8	131.8	106.2	77.3	46.4
13.	0.0	413.8	413.8	497.3	144.1	114.0	80.8	46.5	119.9	94.8	67.2	38.7
14.	0.0	413.8	413.8	497.3	130.9	101.7	70.3	38.7	108.9	84.7	58.5	32.2
15.	0.0	413.8	413.8	497.3	119.0	90.8	61.1	34.5	99.1	75.6	50.9	28.7
16.	0.0	413.8	413.8	497.3	108.2	81.1	53.2	26.9	90.0	67.5	44.2	22.4
17.	0.0	413.8	413.8	497.3	98.4	72.4	46.2	22.4	81.8	60.2	38.4	18.7
18.	0.0	413.8	413.8	497.3	89.5	64.6	40.2	18.7	74.4	53.8	33.4	15.6
19.	0.0	413.8	413.8	497.3	81.3	57.7	35.0	15.6	67.7	48.0	29.1	13.0
20.	0.0	413.8	413.8	497.3	73.9	51.6	30.4	13.0	61.5	42.9	25.3	10.8
21.	0.0	413.8	413.8	497.3	67.2	46.0	15.4	10.8	55.9	38.3	12.8	9.0
22.	0.0	413.8	413.8	497.3	61.1	41.1	13.0	9.0	50.8	34.2	10.8	7.5
23.	0.0	413.8	413.8	497.3	55.5	36.7	11.0	7.5	46.2	30.5	9.2	6.2
24.	0.0	413.8	413.8	497.3	50.5	32.8	9.3	6.3	42.0	27.3	7.8	5.2
25.	0.0	413.8	413.8	497.3	45.9	29.2	8.0	5.2	38.2	24.3	6.6	4.3
Total					4061.4	3456.0	2736.4	2048.2	3902.3	3389.2	2777.0	2183.5

APPENDIX 4

PRESENT VALUE OF COST AND RETURNS AT DIFFERENT DISCOUNT RATES FOR SMALL SCALE FIRMS

Years	Fixed cost	Operating cost (Rs. lakhs)	Total cost (Rs. lakhs)	Total benefits (Rs. lakhs)	Present value of benefits				Present value of cost			
					10 per cent	12 per cent	15 per cent	20 per cent	10 per cent	12 per cent	15 per cent	20 per cent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	200.0	0.0	150.0	0.0	0.0	0.0	0.0	0.0	181.8	178.6	173.9	166.7
2.	0.0	123.1	123.1	161.3	133.3	128.5	121.9	112.0	101.7	98.2	93.1	85.5
3.	0.0	123.1	123.1	161.3	121.1	114.8	106.0	93.3	92.5	87.6	81.0	71.3
4.	0.0	123.1	123.1	161.3	110.1	102.5	92.2	77.8	84.1	78.2	70.4	59.4
5.	0.0	123.1	123.1	161.3	100.1	91.5	80.2	64.8	76.4	69.9	61.2	49.5
6.	0.0	123.1	123.1	161.3	91.0	81.7	69.7	54.0	69.5	62.4	53.2	41.2
7.	0.0	123.1	123.1	161.3	82.8	72.9	60.5	45.0	63.2	55.7	46.2	34.4
8.	0.0	123.1	123.1	161.3	75.2	65.1	52.7	37.5	57.4	49.7	40.2	28.6
9.	0.0	123.1	123.1	161.3	68.4	58.1	45.8	31.3	52.2	44.4	35.0	23.9
10.	0.0	123.1	123.1	161.3	62.2	51.9	39.9	26.0	47.5	39.6	30.4	19.9
11.	0.0	123.1	123.1	161.3	56.5	46.4	34.7	21.7	43.2	35.4	26.5	16.6
12.	0.0	123.1	123.1	161.3	51.4	41.4	30.1	18.1	39.2	31.6	23.0	13.8
13.	0.0	123.1	123.1	161.3	46.7	37.0	26.2	15.1	35.7	28.2	20.0	11.5
14.	0.0	123.1	123.1	161.3	42.5	33.0	22.8	12.6	32.4	25.2	17.4	9.6
15.	0.0	123.1	123.1	161.3	38.6	29.5	19.8	11.2	29.5	22.5	15.1	8.5
16.	0.0	123.1	123.1	161.3	35.1	26.3	17.2	8.7	26.8	20.1	13.2	6.7
17.	0.0	123.1	123.1	161.3	31.9	23.5	15.0	7.3	24.4	17.9	11.4	5.6
18.	0.0	123.1	123.1	161.3	29.0	21.0	13.0	6.1	22.1	16.0	9.9	4.6
19.	0.0	123.1	123.1	161.3	26.4	18.7	11.3	5.0	20.1	14.3	8.7	3.9
20.	0.0	123.1	123.1	161.3	24.0	16.7	9.9	4.2	18.3	12.8	7.5	3.2
21.	0.0	123.1	123.1	161.3	21.8	14.9	5.0	3.5	16.6	11.4	3.8	2.7
22.	0.0	123.1	123.1	161.3	19.8	13.3	4.2	2.9	15.1	10.2	3.2	2.2
23.	0.0	123.1	123.1	161.3	18.0	11.9	3.6	2.4	13.8	9.1	2.7	1.9
24.	0.0	123.1	123.1	161.3	16.4	10.6	3.0	2.0	12.5	8.1	2.3	1.6
25.	0.0	123.1	123.1	161.3	14.9	9.5	2.6	1.7	11.4	7.2	2.0	1.3
Total					1317.0	1120.7	887.4	664.2	1187.5	1034.3	851.5	673.8