

**BUSINESS EFFICIENCY IN RICE MILLS – A
COMPARATIVE ANALYSIS OF CONVENTIONAL AND
MODERN RICE MILLS
IN DAVANGERE DISTRICT**

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By
SHWETHA M. K.

**DEPARTMENT OF AGRIBUSINESS MANAGEMENT
COLLEGE OF AGRICULTURE, DHARWAD
UNIVERSITY OF AGRICULTURAL SCIENCES,
DHARWAD - 580 005**

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(N. M. KERUR)

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1. INTRODUCTION

Rice is the most important crop of India and second most important one in the world. It is the staple food for more than 3 billion people in Asia, the world's most densely populated region and for hundreds of millions in Africa and Latin America.

World area under rice cultivation is around 152 million hectares. With an average per hectare productivity of 3.88 metric tons, the global rice production is 628 million metric tons. India and China are the biggest rice producers in the world with a share of 32.12 per cent and 22.68 per cent of world production in 2006 respectively.

With the largest share of 46.87 million hectares in the world paddy area, India ranks second in production next only to China. Paddy accounts for 36.8 per cent of the cultivated area and about 40 per cent of the total foodgrain production in the country. In some states of the country viz., Andhra Pradesh, Kerala and West Bengal, rice is a monoculture crop and the source of prosperity and livelihood of a majority of the population. Rice is the primary source of carbohydrates and protein besides, rice also contains small quantities of fat, ash, fibre and moisture. Vitamins and mineral are present largely in bran and germ. Its byproducts form important components of poultry and dairy feed.

Over 78 million tones of paddy are grown in India every year; to be thereafter processed by many rice milling units, small and big. Spread out all over the country were some 97,117 hullers, 6705 shellers, 9890 hullers cum shellers and 40513 modern rice mills during 2006-07. Paddy milling is designed to first split and then remove the coarse husk, and in doing so, some or all the bran and also the germ comes off. Such extensive polishing gives snow-white rice, which is in consumer demand. Over the years, the total number of all types of rice mills has increased. Upto 2006-07, there were 1, 54,225 rice mills in India including hullers, shellers, huller-cum shellers and modern rice mills. (Kalse, R.V, Kalyankar, S.P. and Patil, H.N.)

The byproducts which we get from paddy milling are rice bran and husk. The amount of rice bran is approximately five per cent of paddy processed. The rice bran is a pericarp or outer cuticle layer that remains beneath the hull. It gets removed during the milling process. About two decades back, rice bran was considered almost a waste and hence most of it was burnt. It is now viewed to have high nutritive value. Being rich in protein and natural B-Vitamin, rice bran is used as a cattle feed. The rice bran processing has now gained momentum, with increasing consumer demand for bran oil, extracted from bran.

Description of Rice Milling Operation:

Paddy in its raw form cannot be consumed by human beings. It needs to be suitably processed for obtaining rice. Rice milling is the process which helps in removal of hulls and barns from paddy grains to produce polished rice. Rice forms the basic primary processed product obtained from paddy and this is further processed for obtaining various secondary and tertiary products.

The basic rice milling processes consist of Pre Cleaning, De-stoning, Parboiling, Husking, Husk Aspiration (Separating the husk from brown rice/ unhusked paddy), Paddy Separation (Separating the unhusked paddy from brown rice), Whitening (Removing all or part of the bran layer and germ from brown rice), Polishing (Improving the appearance of milled rice by removing the remaining bran particles and by polishing the exterior of the milled kernel), Length Grading (Separating small and large brokens from head rice), Blending (Mixing head rice with predetermined amount of brokens, as required by the customer), Weighing and bagging (Preparing the milled rice for transport to the customer).

Importance:

Milling is the process wherein the rice grain is transformed into a form suitable for human consumption, therefore, has to be done with utmost care to prevent breakage of the kernel and improve the recovery. Brown rice is milled further to create more visually appealing white rice. After harvesting and drying, paddy is subjected to the primary milling operation which includes de-husking as well as the removal of bran layers (polishing) before it is consumed. In this process the rice which is obtained after milling is called raw rice. Another process through which rice is obtained after milling is called "Parboiling Rice." Nearly 60 per

cent of the total rice produced in India is subjected to parboiling. Rice milling losses may be qualitative or quantitative in nature. Quantitative or physical losses are manifested by low milling recovery while low head rice recovery or high percentage of broken kernel reflects the qualitative loss in rice grains.

Rice has potential in a wide range of food categories. Besides having nutritional and medicinal benefits, the by-products of rice are equally important and beneficial. Byproducts from growing rice create many valuable and worthwhile products. The inedible parts which are discarded through the milling process and the edible part could be transformed into some of the following suggested products like rice husks, rice bran, broken rice, rice flour, rice milk, rice pudding, rice starch, rice straw. Rice is also used in beverage making, rice paper, rice glue, rice cakes, rice vinegar, rice soya milk and red yeast. Apart from every household, there are many bulk buyers like hospitals, caterers, restaurants, hostels, etc. With proper efforts, it is possible to enter into a long term contract with big traders or contractors.

History in India:

Many of the rice processing units in India are of the traditional huller type and are inefficient. Modern rice mills are having high capacity and are capital intensive, although efficient small modern rice mills have been developed.

In the year 1968, a study was conducted by the group of officials and they pointed out that pointed out that the overall supply of rice could be augmented substantially with additional yield obtained through modernization of the existing rice processing techniques. A number of studies were also undertaken and came out with the same findings. As a result, the policy of modernization of rice mills in India has since then pursued by the Government of India and various States within it. Thus, the industry has become fairly modernized and more important in economy of the country. Thus, with higher priority being given to paddy production programmes and the changing pattern of demand for rice, the milling industry has to adopt itself to the rice milling. Most of the small size mills are huller mills. Other various types are Battery of Huller mills, Huller-cum-Sheller mills, Sheller mills and modern mills.

The process for modernization of rice milling industry in the country was initiated in 1970 with a view to obtaining higher yields of rice and better quality of by-products such as bran and husk, suitable for edible oil/industrial oil extraction and as a source of fuel respectively. As a first step towards modernization, the Rice Milling Industry (Regulation) Act 1958 and the Rice Milling Industry (Regulation and Licensing) Rules 1959 were amended. In the initial phase of modernization, shellers-cum-hullers and multiple hullers were brought under purview of modernization. However, keeping in view various problems involved in the modernization of single huller mills, units existing on 27.7.1984 have been exempted from modernization. This relaxation is not available to new single huller mills set up after the date, except to certain categories enumerated under the Act and the rules made there under.

In view of the sustained efforts made by the Government, the number of modern/modernized rice mills has gone up from practically nil in 1970 to 41, 513 in 2006-07. Also the quantity of rice bran processed for oil extraction has increased from 1.87 lakhs tones in 1970-71 to 43.50 lakhs tones in 2006-07.(Sukumar, R, Business today, special issue on performance of rice milling industries).

Traditional Method

Before the advent of mechanical milling, hand-pounding traditional method of rice milling was in practice. In fact, hand-pounding rice has got more nutritive value as compared to machine milling rice. In hand-pounding, a variety of implements is used such as:

- Mortor and Pestle
- Dhenki
- Hand Stone (Chakki)

Mechanical Method

With the introduction of mechanized mills, hand-pounding method has steadily decreased because it could not compete with machine mills. The conventional mills in use can be categorized into three main types:

- Huller mills
- Sheller-Huller mills
- Sheller cum Cone Polisher mills.

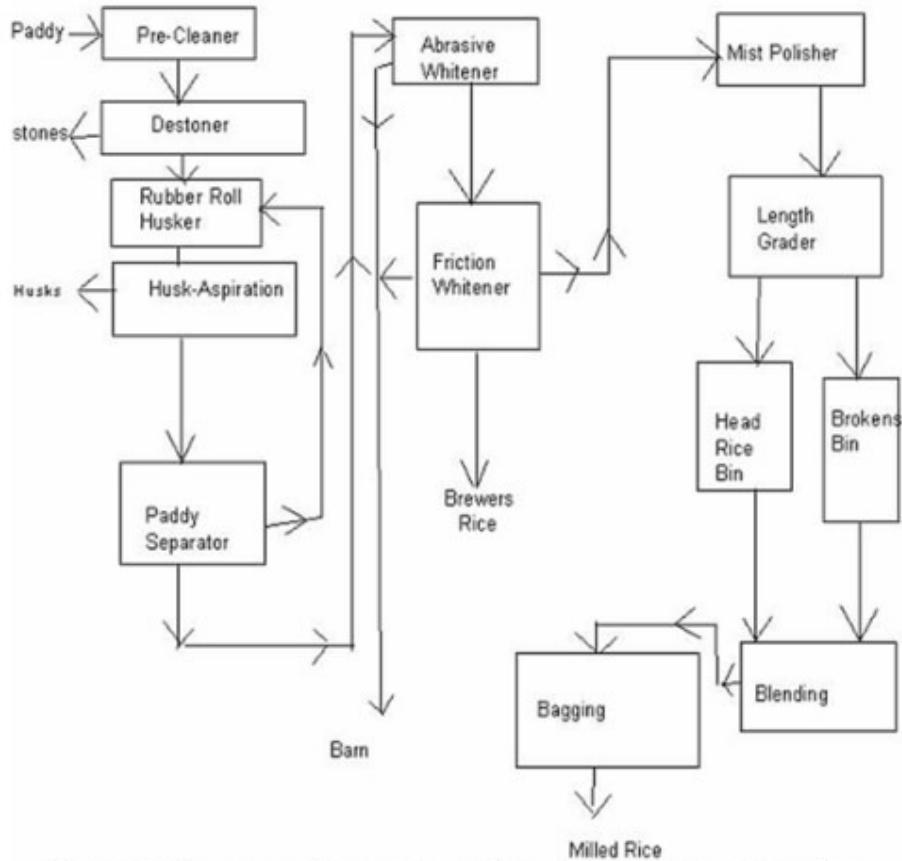


Figure.1 Diagrammatic representation of rice milling operations

Figure.1. Diagrammatic representation of rice milling operations

Present status of Rice milling units in India:

Rice milling is the oldest and the largest agro processing industry of the country. At present it has a turnover of more than Rs 36,500/- crores per annum. It processes about 85 million tones of paddy per year and provides staple food grain and other valuable products required by over 60 per cent of the population. Paddy grain is milled either in raw condition or after par-boiling, mostly by single hullers of which over 82,000 are registered in the country. Apart from it, there are also a large number of unregistered single hulling units in the country. A good number (60 per cent) of these are also linked with par-boiling units and sun -drying yards. Most of the tiny hullers of about 250-300 kg/hr capacities are employed for custom milling of paddy. Apart from it, double hulling units numbering over 5,600 units, under - run disc shellers – cum - cone polishers numbering 5,950 units and rubber roll shellers – cum - friction polishers numbering over 13,000 units are also present in the country. Further over the years there has been a steady growth of improved rice mills in the country. Most of these have capacities ranging from 20 quintals /hr to 100 quintals/ hr.

Need for Improved rice mills:

In Karnataka the area under paddy was 19, 32,600 hectare with the production of 52, 43,890 tonnes of paddy during 2006-2007. There are about 11, 453 hullers, 873 shellers, 2,230 hullers-cum shellers and 5,800 modern rice mills in the state. Tungabhadra project area being a major paddy producing area in Karnataka, rice milling forms an important agro-based industry.

Rice post harvest technology has come a long way over the past three decades. Now, more than 50 per cent of the overall rice production is processed by modern mills, with a growth of only about 40 per cent in traditional mills, and about 10 per cent by hand pounding. Fifty per cent of the total paddy production is parboiled. The CFTRI method of parboiling is used mostly by modern mills which drastically reduce soaking time and improve rice quality. However, the age-old practices of premilling treatments at the village level and traditional parboiling methods are still being followed in some commercial mills. Drying of paddy is carried out by sun drying in open drying yards and/or by mechanical drying in dryers in commercial mills.

The recovery of whole grains in traditional rice mills using steel hullers for dehusking is around 56-64 per cent. There is excessive loss in the form of coarse and fine broken. Further, loss of large portion of endosperm layers during the dehusking operation further accentuates the problem. Against it, the recovery per cent of whole grains in modern rice mills using rubber roll shellers for dehusking operation is around 72-74 per cent.

The sustained growth of any processing industry depends on the viability which is largely determined by the cost of production and management efficiency in processing. The cost of production is one of the important variables influencing the profits which are also an indicator of management efficiency. Rice milling is not an exception to this. Over years, many rice processing units have been closed down in the state, while many other units are performing well. This difference in position clearly points out in-effective management as an important reason among several other reasons. In this context, a comparative analysis of conventional and modern rice mills in Karnataka assumes importance. Such an analysis sheds light on differences that exist in various dimensions of management between two types of mills. Further, such a comparative study reveals the problems faced by milling units in the successful performance of their operations. At present, the studies that address these issues of rice milling in the state are inadequate. The present study is an attempt in this direction. The study addresses the above issues with respect to Davangere district of the state.

Davangere is one of the major paddy growing areas, and it has the largest number of rice mills in the state. The district nearly consists of around 150 traditional, 215 modern rice mills. Besides, there is a vast scope for upgradation and modernization of traditional mills for the efficient use of the resources and to increase the efficiency of milling in rice mills in the district.

The specific objectives of the study are as follows

SPECIFIC OBJECTIVES OF THE STUDY

1. To analyze the Investment pattern and financial feasibility of conventional and modern rice milling units.
2. To analyze the processing and marketing management in the selected units.
3. To analyze the paddy inventory management in the selected units.
4. To analyze the costs and returns structure in selected units.
5. To analyze the problems faced by rice mills in processing and marketing operations.

SCOPE OF THE STUDY

The present study would critically analyze the efficiency aspects of conventional and modern paddy processing units. It attempts to compare different types of rice mills with different efficiencies. It compares the efficiency of different types of mills by employing certain business ratios. The study further attempts to bring out the attention pertaining to capacity utilization of each type of processing unit, which would help in modernizing the processing units. Finally the study aims at identifying the problems in paddy processing into different

products so that suitable policy measures could be suggested to improve the conditions of paddy processing units through necessary financial and marketing facilities.

LIMITATIONS OF THE STUDY

Due to the problems in collecting data on the products like bran oil, wax and oil cakes and others from the milling units integrated with bran oil extraction facility, the study was confined only to conventional and modern units engaged in milling rice and preparing poha to the exclusion of the integrated units.

2. REVIEW OF LITERATURE

In this chapter, an attempt has been made to critically review the literature of the past research works having relevance to the present study.

- 2.1 Investment pattern and financial feasibility
- 2.2 Feasibility of investment:
- 2.3 Processing and marketing management
- 2.4 Cost and Returns structure
- 2.5 Inventory management
- 2.6 Problems faced by the processing industries

2.1 Investment Pattern in rice mills

In the recent years, there has been a phenomenal growth in the number of agro processing units and as such, several of the studies have been conducted to identify the Investment patterns of such units. Some important studies have been reviewed hereunder.

Gupta and George (1974) studied the stages of modernization in the rice milling industry in Punjab state. The investment pattern of the modernized rice mills revealed that land, buildings and machinery constituted 88 per cent of the total investment followed by transportation, equipments and other fixtures. The results also indicated that the fixed cost per mill increased with an increase in the size of the mill. The fixed cost was higher for modern mills than for traditional ones. The average variable cost for all the mills together was Rs 2.33 per quintal of paddy milled from the point of the view of operating cost (fixed and variable) alone, one tonne capacity mill appeared to be the most efficient mill size.

Singh (1974) studied the economies of scale in groundnut processing unit in Punjab and found that per quintal fixed cost in large, medium and small groundnut mills was Re 0.50, Rs 1.14 and Re 0.58, respectively. The variable cost per quintal of groundnut oil was Rs 118.72, Rs 119.74 and Rs 118.27 in large, medium and small mills, respectively. The per quintal total cost in these mills were Rs 119.23, Rs 120.87 and Rs 118.85, respectively.

Muralidharan (1981) compared the establishment costs of three processing units namely sugar, gur and khandsari units in Mandya district of Karnataka. He found that establishment cost of the three units to be in the order of Rs. 4, 40, 28, 322.03 lakhs for sugar units, Rs. 46, 329.83 lakhs for gur unit and Rs. 9, 16, 722.38 lakhs for khandsari unit.

Ipte and Borude (1982) studied the economics of marketing and processing of cashew nut in Ratnagiri/ Sindhudurg districts of Maharashtra state observed that capital investment in different groups of factories was Rs. 18, 54,710 lakhs of which 12.96 per cent was fixed capital. The important items of fixed capital were investments on building and roasting machinery, while the items of working capital were raw nuts, wages and salaries, fuel, containers, packing and packaging. The capital investment was lowest (Rs. 5.21 lakhs) in small factories and highest (Rs. 71.70 lakhs) in large size factories. It was also found that there was positive relationship between the size of the factory and capital invested.

Srivastava (1989) indicated that with subsequent secondary and tertiary processing of various raw materials, the value added as well as the price of finished products would be increased. He observed that agro-processing units' accounted for 39 per cent of all factories (agro-based and non-agro-based industries), 12 per cent of fixed capital, 13 per cent of working capital and 15 per cent of total capital employed in the industry in the organized sector. This 15 per cent of capital investment generated 25 per cent of the total employment, 26 per cent of the output and 21 per cent of the net added value. He noticed that capital productivity in agro-industries was 0.35, while labour productivity was less than half when compared to non-agro based industries.

Nagesh (1990) in his study on investment in production and marketing of cashew in Karnataka, indicated that the capital investment was the highest in building (72.81 %) followed by machinery and equipments (15.42 %) and land (11.77 %) at an overall level of the

units. Further, it was observed that the processing units utilized only 55.80 per cent of their capacity.

Venkatasheshiah (1992) evaluated the groundnut processing units in Andhra Pradesh. It was found that there was a direct relationship between the total capital invested and the size of oil mills. It was also indicated that the capital requirement per quintal of oil production was Rs 161.01 in baby expeller mills, Rs 112.24 in 2 – chamber expeller mills and Rs 83.86 in 3-chamber expeller mills.

Amrutha (1994) studied economics of processing paddy into rice, Poha, Murmura and popped rice in Chitradurga and Dharwad districts of Karnataka state. The results showed that the capital investment on rice mill, poha mills, murmura mills and popped rice units was Rs. 17, 92,250, Rs 5, 33,225, Rs. 16,740 and Rs. 20,786 respectively.

Singh *et al.* (1994) while studying the economics of marketing and processing of pulses in Bhundelkhand region (Uttar Pradesh), estimated that of the total cost, land/building accounted for the highest share being (51.97 %) followed by machinery and equipment (40 %), electricity fitting (4.72 %) and other fixed capitals (3.31 %) in arhar processing plant. In case of grain processing unit land/building, machinery, electricity and other fixed capital accounted for 50.26, 42.19, 4.77 and 2.78 per cent, respectively.

Maurya *et al.* (1995) in their study on economics of production and processing of Aonla in Varanasi district of Uttar Pradesh worked out the cost of Aonla processing plant and its establishment. The total establishment cost (fixed cost) per quintal was Rs. 8.00. It was the highest for depreciation, (Rs. 3.40/q) followed by interest on fixed capital (Rs. 2.50/q), insurance (Rs. 1.00/q), maintenance cost (Rs. 0.60/q) and electricity and water charges (Rs. 0.50/q).

Kalse *et al.* (1996) found that the Initial investment for the establishment of oil industries, dal mills and cotton ginning industries was Rs. 3.19 lakhs and 5.63 lakhs respectively. The cost of machinery was the major item contributing 61.43 per cent and 59.12 per cent in dal mill and cotton ginning industry respectively. The average capacity utilization of oil industry, dal mill and cotton ginning industry was 41.67 per cent, 71.20 per cent and 47.79 per cent, respectively.

Rachhapal and Darshan (1996) conducted the study to examine performance of co-operative sector infrastructure in Punjab market canneries. The study showed that the gross value of the fixed assets stood at Rs. 152.77 lakhs. The depreciation accumulated was Rs 92.13 lakhs. The present value of fixed assets was computed at Rs. 60.64 lakhs.

Sakia and Talukdar (1996) studied the economic potentialities of commercial processing firms at farm level for major spices in Nagaon district of Assam. It was observed that the average capital investments in commercial processing units were Rs. 1.20 lakhs, Rs. 0.94 lakhs and Rs. 0.78 lakhs and investment in machinery and equipment was highest followed by opportunity cost of own land.

Dev (1998) in his study on management appraisal of cashew processing industry in Uttar Kannad found that the total capital investment directly varied with the size of the unit. Further, he concluded that the total capital investment was Rs. 117.5 lakhs for large scale units and 36.32 lakhs for small scale units, wherein the marketing capital accounted for about 25 per cent of the total capital investment with the majority of the fixed capital investment of about (80 %) was in building and machinery.

Joshi *et al.* (1999) studied the capital investment pattern in the home, cottage, small and large scale mango pulp processing units. Fixed capital accounted for 1.01, 1.6, 1.8 and 20.7 lakhs and the working capital was 2.25, 11.35, 4.34 and 21.03 lakhs, respectively. The working capital was of more proportion than fixed capital in all the categories. Analysis also indicated processing of mango pulp was more economical as indicated by higher scale efficiency than all the other categories.

2.2 Feasibility of investment:

Anand (1994) examined the economics of drip and flood irrigation methods for guava in kolar district of Karnataka. He estimated the NPV from drip irrigation, as Rs 580007,

benefit cost ratio was 4.82 and IRR to the investment worked out to 142.05 per cent indicating that drip irrigation was economically sound and self supporting.

Mahesh .V.Chidri (1999) studied the financial feasibility of investment in Tur processing units. The study revealed the proportion of working capital was more in large units as compared to small units due to higher capacity utilization. The net present value (NPV) of the investment was Rs 15.98 lakhs for small units, Rs 41.60 lakhs for large units. The benefit cost ratio in small and large Tur processing units was worked out to be 4.56 and 7.44 respectively. The IRR was 93.12 per cent in large units and 76.60 per cent in small units. The payback period was found to be 2.21 and 1.32 years in small and large units respectively.

Patil *et al.* (2000) evaluated the economic feasibility of teak plantation in Nagpur forest circle in Maharashtra state. For testing the economic viability, project evaluation techniques were used. The BCR, NPV, payback period and IRR at 12 per cent discount rate were 5.77, RS.1, 02,275, 9 years and 34.24 per cent, respectively, the corresponding figures at 15 per cent discount rate were 4.2, Rs 52.003, 9 years and 34.24 per cent. This indicated that all the parameters of economic feasibility proved economic viability of the project.

Singh *et al.* (2000) conducted an economic feasibility analysis of acacia species under agro-forestry system of plantation in Sultanpur district of Uttar Pradesh. To test the economic feasibility, the net present value, benefit cost ratio, and internal rate of returns of acacia were worked out, which happened to be 3.72 and 44.22 per cent respectively indicating economic viability of the project.

Shiva kumara (2008) conducted study on production and marketing of vermicompost in Karnataka: A case study of Dharwad District. To examine the financial feasibility in vermicompost production, NPV, BC ratio, IRR and PBP were worked out. The study revealed that the net present value was Rs 99827, benefit cost ratio at 12 per cent discount rate was 3.44, internal rate of return was 38 per cent and payback period was 1.71 years. This indicated the economic feasibility of vermicompost enterprise.

2.3 Processing and marketing management

Gupta *et al.* (1974) in their study on modern rice mills in west Godavari district of Andhra Pradesh found that in the total cost, 92.69 per cent was the raw material (paddy) cost, 75 per cent was the fixed cost, while processing and other variable costs accounted for 5.56 per cent.

Nandal (1986) studied the price structure of rapeseed and mustard in Haryana. He found that the processing cost of rapeseed and mustard was Rs 11.05 and Rs 16.55 per quintal respectively.

Hassan and Raghuram (1987) in their study on cashew processing and marketing in Prakasam district of Andhra Pradesh observed that drying of nuts, roasting of nuts, shelling of nuts, drying of shelled kernels, peeling of kernels, grading of kernels, conditioning of graded kernels and packing of graded kernels were the major stages in processing. The study reported that 80 kg of raw nuts when processed resulted in 22 kg of kernels (28 % recovery). The processor incurred Rs. 87.06 as processing cost of which labour constituted 56.6 per cent and material cost stood at 42.5 per cent. Within the labour cost shelling accounted for higher proportion followed by peeling.

Vinayak rao (1992) examined the economics of rice milling in shimoga district of Karnataka. The efficiency in milling was analyzed by examining the recovery per cent (out turn) of rice and by- products. The out turn of head rice was much higher in modern mills (69.90 %) when compared to conventional mills (64 %). The recovery of broken and bran was 3.00 and 4.21 per cent for modern rice mills whereas, it was 3.42 and 4.26 per cent for conventional mills, respectively. On the whole, the average recovery was 77.17 per cent in modern mills as against 73.95 per cent in conventional mills.

Amrutha (1994) studied the economics of processing paddy into rice, murmura, poha and popped rice in Chitradurga and Dharwad districts of Karnataka. Wherein the per quintal fixed cost in large and small rice mills was Rs 16.68 and Rs 25.55 respectively. The variable cost per quintal in rice mill was Rs 477.89 and Rs 655.95 in small and large units.

Balasubramanaia *et al.* (1996) in a study on pricing and transaction trend of raw cashew nut in India, observed that of the total cost of processing of cashew nut, cost of raw cashew nut was maximum (70%) followed by labor (10.50%), purchase tax (5%), handling charges (5%) and packing material (4.50%). The cost of minor items like transportation cost, fuel, factory overhead, administrative overhead and depreciation 0.1 per cent each.

Singh *et al.* (1996) in a study on economics of marketing and processing of pulses in Banda district (Uttar Pradesh) observed that per quintal cost of processing of arhar, gram and lentil was Rs 831.67, Rs 823.47 and Rs 752.05, respectively.

Dev (1998) in his study on management appraisal of cashew processing industry in Uttara Kannada district in Karnataka observed that cashew processing units at an overall level gained profits to the tune of Rs. 0.01/g that is Rs. 0.02 on every rupee of investment. Large processing units gained higher profits that is Rs. 0.04/g as compared to medium (Rs. 0.008/g) and small processing units (Rs. 0.06/g).

Mittal and Sudhakar (2000) argued that the potential of information technology is yet to be tapped fully in input marketing activity, notwithstanding the need for quality information for decision making. This evaluates the possibilities of improving the efficiency and effectiveness of marketing operations with a well conceived information technology deployment. The paper also outlines the emerging business environment with the passing of Indian Technology Act, 2000 and the consequent prospects for fertilizer marketing operations.

Singh (2000) studied the status of fertilizers marketing system in India and examined its potential improvement. The study focused mainly on sources and location of fertilizers supply; distribution channels; fertilizer use promotion; extent of fertilizer use and output performance; sources of information on fertilizer practices and its purchase behavior of farmers; efficiency of marketing systems; and problems experienced by the farmers in acquiring fertilizers. It discussed important issues about the next stages of development of the fertilizer market. The basic circumstances which affect the growth of fertilizer use have changed and new challenges are emerging. The new developments which are a result of new economic environment require a new orientation of efforts and policies.

Gajanan and Subramanian (2001) studied the marketing and exports of lemongrass oil in Kerala. The processing involves filtration to remove sediments, moisture and blended for standardizing citric content, the processor observed shortage/loss of around one per cent during filtration of oil. The cost of processing of lemon grass oil was observed to be Rs 4.70 per kg.

Kumar *et al.* (2003) examined the Indian research efforts in vegetable crops, new niches for vegetable production, and the impact of pest management research. It was indicated that the ongoing research programmes on vegetables addressing many emerging challenges, there is a wide scope for innovative improvements and a sharper focus on vegetable processing, value addition and quality control.

Chinappa Reddy (2007) in their study conducted in six districts of Karnataka state observed that a majority of vermicompost producers used it only on their farms and just 16 per cent of them sold the compost to other farmers.

2.4 Cost and Returns structure

Singh and George (1970) in their investigation revealed that there were three important channels in the marketing of rice namely.

Channel-I: Producer → rice-miller → retailer → consumer

Channel-II: Producer → rice-miller → fair price shops → consumer

Channel-III: Producer → small huller (processor) → retailer → consumer

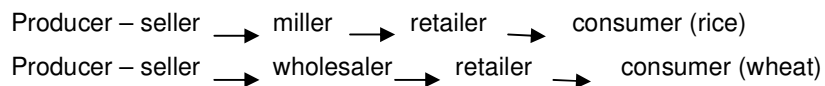
The marketing costs incurred accounted for Rs. 2.11 per quintal of rice. In case of sales through government fair price shops, the net share of the producer was of the order of 90.77, 80.15 and 88.37 per cent of the consumer rupee for the coarse, medium and superior varieties of rice, respectively. The corresponding percentages were lower in case of open market sales being 78.22, 76.12 and 79.84 for the three varieties of rice, respectively. This was due to the higher prices paid by the consumer for the rice in open market. The rice

millers incurred a loss of Rs. 1.35 per quintal on the produce sold to government at procurement prices. However, they did recover their losses of the sales from open market quota. Their profit margin from open market sales came to Rs. 5.89 for the coarse, Rs. 6.12 for the fine and Rs. 6.23 for the superior varieties of rice. The retailer's margins were lower in the case of government fair rice shops as compared to open market sales.

Patel (1971) in his study examined the price spread in marketing groundnut in Gujarat state for the period 1962-68 and revealed that the millers had increased their share in the consumers rupee and the farmers had not improved their share over time.

Neog and Barkatky (1979) analyzed the price spread for rice in Assam and found that the price spread was relatively higher in whole sale market than in retail market, given his costs. During the period, wholesalers could spread the price from 31 to 160 per cent, while retailers could spread if from 0.65 to 28.39 per cent.

Pandey *et al.* (1979) identified the marketing channels and assessed the extent of price spread from various agricultural commodities in Kurukshetra district (Haryana). The channels identified were:



The result indicated that the producers received, on an average, 49 per cent and 80 per cent of the consumer's price in case of paddy and wheat, respectively. The share of the marketing costs ranged between 12 and 15 per cent and marketing margins between 9 and 30 per cent for both crops. The margin for rice was highest for miller. The net price received by farmers was negatively related to the distance and marketing costs and positively related to the marketable surplus. The marketable surplus constituted 76.99 per cent production. The borrowers generally preferred to sell their produce through commission agents due to prior commitments and intimate contacts. The producers were often forced to sell during periods of low prices because of lack of storage facilities.

Muralidharan (1981) compared the processing of sugarcane into sugar, gur and khandsari in Mandya district of Karnataka. It was found that the processing cost per quintal was Rs. 70.51, Rs. 43.05 and Rs. 116.66 for sugar, gur and Khandsari, respectively. Share of fixed cost in the total processing cost was 64.24 per cent in sugar units, 30.78 per cent in gur units and 17.29 per cent in case of khandsari units. Whereas, variable cost formed 35.76, 69.22 and 82.71 per cent for sugar, gur and khandsari, respectively.

Bawa and Kainth (1989) while analyzing the cost and return of rice milling industry in Amritsar district of Punjab found that dehusking of one tonnes of paddy yielded a net profit of Rs 45.67. Expenses on raw material (86 per cent) constituted the major item. Running expenditure on machinery and repairs and maintenance costs constituted 1.96 per cent and 1.10 per cent, respectively. Net returns of the enterprise were 2.31 per cent of gross output.

Singh and Ali (1985) studied economics of mustard and rapeseed marketing in the western region of Uttar Pradesh. They found that the cost of processing was Rs. 20.98 per quintal. They suggested for establishment of expellers in co-operative basis.

Hassan and Raghuram (1987) in their study on cashew processing and marketing in Prakasam district of Andhra Pradesh observed that drying of nuts, roasting of nuts, shelling of nuts, drying of shelled kernels, peeling of kernels, grading of kernels, conditioning of graded kernels and packing of graded kernels were the major stages in processing. The study reported that 80 kg of raw nuts when processed resulted in 22 kg of kernels (28per cent recovery). The processor incurred Rs. 87.06 as processing cost of which labour constituted 56.6 per cent and material cost stood at 42.5 per cent. Within the labour cost shelling accounted for higher proportion followed by peeling.

Hemachand (1989) in his study on economics of processing units of arhar pulse in Narasinghpur district (Madhya Pradesh) revealed that the fixed and variable costs accounted for 45 per cent and 55 per cent, respectively. The costs of processing of arhar dal worked out to Rs 61.62per quintal.

Veena and Tajinder (2000) had studied the performance analysis of Bhagpur and Jargaon sugar mills of Ludhiana district in Punjab. They found that production cost of sugar in

Bhagpur sugar mill was Rs.12.37 per kg and Rs 9.89 per kg in Jargon sugar mill. An expense on raw material was the major item 77.2 per cent and 82.86 per cent of other expenses including manufacturing expenses and maintenance were 22.78 and 17.12 per cent, respectively. Gross profit was Rs 2.67 per kg at Jargaon mill and Rs 0.58 per kg at Bhagpur mill. Lower per unit cost coupled with relatively higher sales increased the profitability of the Jargon sugar mill tremendously; it was Rs.2.69 per kg compared to only 58 paise per kg for the Bhagpur mill.

Mittendorf and Hertag (1982) analyzed the marketing costs and margins for major food items in developing countries and found that marketing costs and margins of rice accounts for about 30-60 per cent of consumer's price while those for wheat were 60-80 per cent and maize 40 per cent. They suggested that marketing costs and margins should be reviewed regularly to assess their effect on producers share in consumer's rupee.

Raju and Kakadia (1980) in their study on marketing of groundnut in Gujarat state observed that the marketing cost for farmers was Rs. 5.07 and Rs. 4.99 per quintal at Gondal and Rajkot markets, respectively. However, in the case of traders, the marketing cost was found to be Rs. 9.49 and Rs. 9.42 per quintal at Gondal and Rajkot markets, respectively.

Veerkar (1988) conducted a study on economics of preservation of mango into different products in Ratnagiri district of Maharashtra. The cost of preservation of one quintal Alphonso mango as pulp worked out to Rs971.26. The cost of preservation of one quintal local types of mango fruits into pickle, chutney and raw slices in brine worked out of Rs 557.48, Rs 861.00 and Rs151.28, respectively. The break even production analysis showed that the actual production handled in all the factories was more than breakeven point production.

Bawa and Kainth (1989) while analyzing the cost and return of rice milling industry in Amritsar district of Punjab found that dehusking of one tones of paddy yielded a net profit of Rs 45.67. Expenses on raw material (86 per cent) constituted the major item. Running expenditure on machinery and repairs and maintenance costs constituted 1.96 per cent and 1.10 per cent, respectively. Net returns of the enterprise were 2.31 per cent of gross output.

Nagesh (1990) in his study on investment in production and marketing of cashew of Karnataka found that the overall cost of processing per quintal of raw nuts worked out to Rs. 553.54, out of which interest on capital itself formed 53.62 per cent of the total cost. This was followed by wages for piece rate workers (20.36per cent). The costs incurred on other items like administrative, overheads, salaries, depreciations, utilities, factory overheads and cost of packing material were found to be the least. The overall cost of production of kernels was found to be Rs. 1976.55 per quintal of raw nuts processed. The cost of raw material (Cashewnut) was the major component in cost of production of kernels accounting 71.99 per cent (Rs. 1423.01) of total cost.

Dalvi *et al.* (1992) studied economics of processing of cashewnut in Sindhudurg district of Maharashtra state and found that the cost of processing per quintal of cashewnut was Rs. 331.35 at an overall level. Out of the total cost, the major cost was the interest on fixed and working capital, accounting Rs. 21.55 (6.51per cent) and Rs. 148.16 (44.72per cent), respectively. The other items of costs were labour (13.74per cent) and tin containers (15.84per cent). The overall gross increase in the value of nuts worked out to Rs. 500.70 (45.96per cent) per tin and net increase was Rs. 174.50. Net added value worked out to 29.64 per cent. This was possible due to processing of raw nuts.

Subramanian and Sudha (1992) worked out the costs and returns associated with processing of one tonne finished product of tomato (ketchup). It was observed that the benefit: cost ratio was around 2.00 showing that processing is profitable. Raw material and packing were the two major items accounting for 67 per cent of the total variable cost of processing.

Venkatasheshaiyah (1992) in his comparative study on groundnut processing units in three different categories *viz*, 3-chamber, 2-chamber and baby-expeller oil mill noted that the per quintal total processing costs amounted to Rs 2696.18, Rs 2606.13 and 2536.126 for baby expeller, 2-chamber and 3-chamber oil mills respectively. The average processing cost for these three categories amounted to Rs 2551.32 per quintal. Further he revealed that of the total processing cost (average) total fixed costs accounted for about 0.53 per cent while the

total variable costs accounted for about 99.47 per cent. The fixed cost was comprised of salaries, depreciation and interest costs while the variable cost was comprised of raw material, labour wages, power and fuel packaging and incidental charges.

Amrutha (1994) studied the economics of processing paddy into rice, murmura, poha and popped rice in chitradurga and dharwad district of Karnataka. wherein the per quintal fixed cost in large and small rice mills were Rs 16.68 and Rs 25.55 respectively. The variable cost per quintal in rice mill was Rs 477.89 and Rs 655.95 in small and large units.

Singh *et al.* (1994) studied the economics of marketing and processing of pulses in Bhundelkhand region (UP) and revealed that the average cost of processing per quintal including the cost of raw material worked out to Rs. 800.61. The processing cost of per quintal arhar, gram and lentil dal came to Rs. 831.67, Rs. 822.47 and Rs. 752.05, respectively.

Sunil Kumar (1994) identified three marketing channels for paddy rice which were in practice.

Channel-I: Farmer → itinerate trader → miller → wholesaler → retailer → consumer

Channel-II: Farmer → miller/small processor → wholesaler → retailer → consumer

Channel-III: Farmer → miller/small processor → wholesaler/commission agents' → retailer → consumer

The share of farmers in consumer's rupee was found to be highest in channel-11.

Kunnal (1995) in his study on performance of the KSSC Ltd. An economic analysis revealed that the capacity utilization of KSSC owned seed processing plant was only 35-45 per cent of its installed capacity, due to low seed production activity undertaken by the corporation.

Further it is indicated that the processing first was 11 to 12 Rs per quintal of seeds of paddy, ragi, jowar, maize and pulses. Similarly it was Rs. 16.50, Rs. 100 and Rs 300 for per quintal of seeds of sunflower, groundnut and cotton respectively.

Maurya *et al.* (1995) in their study on marketing of aonla and its product in Varanasi district, indicated that the per quintal processing cost of morabba, pickle and chutney came to Rs 2198.80, Rs 1750.40 and 3233.80 respectively. The processing cost was highest for aonla chutney and lowest for aonla pickle.

Raut *et al.* (1995) in his study on economic feasibility of straw berry cultivation in Nasik district of Maharashtra observed that, the per hectare total cost of production of straw berry was Rs. 4.27 lakhs. Cost A accounted for 59.57 per cent of the total cost. Cost of runner (39.92 per cent) and rental value of owned land (36 per cent) were the important items of total cost. Per hectare gross income obtained from straw berry was to the tune of Rs. 10.23 lakhs.

Balasubaramanaia *et al.* (1996) in a study on pricing and transaction trend of raw cashew nut in India, observed that the cost of processing of kernel per quintal of cashew nut was maximum on raw cashew nut (70 per cent) followed by labor (10.50 per cent), purchase tax (5 per cent), handling charges (5 per cent), packing material (4.50 per cent). the minor item of cost was transportation cost, fuel, factory overhead, administrative overhead and depreciation (0.10 per cent) each.

Srinivasa *et al.* (1996) in their study on economics of processing of cashewnut in Andhra Pradesh indicated that the processors have to bear the processing cost of Rs. 124.22 per 80 kg of raw nuts, out of this total cost, raw material cost of Rs. 50.77 was incurred which formed 40.89 per cent and labour cost was Rs. 72.81 accounted to 58.61 per cent of total processing cost.

Gurudev Singh and Asokan (1998) in their study on management of seed production activity a case study of Gujarat state seed corporation, where it was worked out per quintal cost of processing different crop seeds. For cotton the per quintal cost of labor, chemicals, packing materials, certification and tags and inward transport cost were Rs. 60, Rs. 30, Rs. 263, Rs. 300 and Rs. 15 respectively. The total per quintal cost of processing of cotton of processing of cotton was Rs. 668.

Joshi *et al.* (1999) revealed that economics of processing of mango pulp in home, cottage small and large units in south region of Maharashtra state. Total processing cost for a single tin (850 g) worked out to be in home, cottage, small and large scale units were Rs. 47.13, Rs. 41.95, Rs. 42.58 and Rs. 33.70. With in different categories the cost of processing was maximum in home scale and minimum in large scale units. The profit per tin remained at Rs. 4.78 in home scale, Rs. 6.89 in cottage, Rs. 5.59 in small and Rs. 13.32 in large scale units with overall net profit of Rs. 12.28. Cost and return indicated that processing of mango pulp was profitable as indicated by input ratio, which was greater than unity.

Jayalakshmy and Abdul (2000) conducted study on cost of establishment and cost of production of cashew apple syrup in Kerala state. On an average, 750 bottles of syrup can be obtained from one tonne of cashew apple. The extracted juice can be preserved for syrup production during the off season as well. The cost involved (the labour and inputs) for processing of one tonne of cashew apple is Rs 1940. A minimum of 750 bottle of cashew apple syrup can be obtained from one tonne of cashew apple. This works out to a cost of Rs 25.80 per bottle. Of the total cost, 85 per cent forms the input cost (Chemical, bottle, sugar etc.) and 15 per cent forms the labor cost. The price of apple and interest towards non-recurring cost is not included. At sale price of Rs 40 per bottle, the net profit per bottle was Rs.14.20.

Veena and Tajinder (2000) had studied the performance analysis of Bhagpur and Jargaon sugar mills of Ludhiana district in Punjab. They found that production cost of sugar in Bhagpur sugar mill was Rs.12.37 per kg and Rs 9.89 per kg in Jargon sugar mill. An expense on raw material was the major item 77.2 per cent and 82.86 per cent of other expenses including manufacturing expenses and maintenance were 22.78 and 17.12 per cent, respectively. Gross profit was Rs 2.67 per kg at Jargaon mill and Rs 0.58 per kg at Bhagpur mill. Lower per unit cost coupled with relatively higher sales increased the profitability of the Jargaon sugar mill tremendously; it was Rs.2.69 per kg compared to only 58 paise per kg for the Bhagpur mill.

2.5 Inventory management

McCool (1996) in his study described the challenges that make inventory management a problematic issue for in-flight caterers' financial management practices. In-flight kitchens are a logistics operation, and effective inventory management and detailed product usage controls were essential for overall cost control. They were most efficiently operated as large production food factories with assembly line production of passenger trays. The different requirements of individual airlines, which may have an account with the caterer, add considerably to the caterer's costs and must be reflected in the pricing offered to the airlines. A pricing system was developed which eliminates product food cost as the basis of pricing and which places new emphasis on actual labour requirements to produce, package, and store and distribute the products and menu items selected by each airline.

Dev (1998) in his study on cashewnut processing units in Uttar Kannada district of Karnataka found storage cost of maintaining the stock and interest for carrying the inventories as the main components of inventory management. He observed that the total per quintal costs of carrying the inventory was about Rs. 536.42, Rs. 558.33 and Rs. 545.60 for small, medium and large units, respectively. In overall inventory carrying cost, about 99.73 per cent was contributed by interest on inventory capital and remaining 0.27 per cent was contributed by storage cost and stock maintenance cost put together.

Bhattacharjee (1999) in his study on strategies for supply chain management by Hindustan Lever Ltd. (HLL) in India found that on an average about 20 to 24 per cent of turnover was to be located in as inventories annually in the traditional strategy for the supply chain management. Further, she also stated that to overcome this problem, the HLL came out with a net strategy of 'zero' working capital and near zero stock, which ultimately led to reduction in inventories located into a mere 5 to 6 per cent from the earlier 22 to 24 per cent of annual turnover.

Chandrasekhar (1999) in his study on estimation of storage costs for a multirole, multi product and multi vocational firm found that there existed three different systems of storage namely company owned, company leased and dealer owned warehousing facilities. Of these

three different facilities, he found the dealer owned system to be the cheapest and the company owned system to be the costliest facility.

Kamat (1999) in his study on different strategies for inventory management opined that demand forecasting and just-in-time method were helpful in reducing the inventories in store, sales and in process. Further, he also stated that the demand forecasting strategy can be executed within 14 to 21 weeks while the just-in-time strategy can be executed within 5 to 10 weeks. The study also gave a general conclusion that the costs associated with inventory management could be attacked only with the help of proper long-term strategies particularly in the field of supply chain management.

Lichtenberg and Zilberman (2000) developed a model to examine storage technology choices in the inventory management of commodities that are relatively highly perishables, and their impacts on resource allocation, prices, the environment, and the economic welfare of consumers or producers. The model was used to derive the socially optimal level of spoilage reducing input use and to examine the effects of alternative policies for addressing environmental damage on supply, market equilibrium and consumer and producer incomes. It was shown that storage technology choices affect total output as well as the temporal distribution of supply, consumption, and prices.

Vickener *et al.* (2002) found that investment in supply chain management technology in US food industry was extensive, particularly in the restaurant or food-away-from-home (FAFH) sub sector. From 1980 to 1995, inventory turns in the restaurant sub sector have effectively doubled, increasing from 26 to 51 per cent. This means FAFH inventories were entirely replenished once a week, down from the 14 days' supply maintained two decades ago. Over the same period, total market capitalization grew at a compounded annual growth rate of 17 per cent from \$ 5 to \$53 billion. Based on the co-integration model estimated, they found that for every one unit increase in inventory turnover, market capitalization increased by \$479 million in the FAFH industry over the analysis period. Thus, the equity capital market places a premium on the efficient management of inventories in the food system and rewards those firms that develop, adopt and implement supply chain technologies.

2.6 Problems faced by the processing industries

Gupta *et al.* (1974) studied the stages of modernization of paddy milling industry, millers mentioned three major problems in paddy procurement, viz., non availability of paddy in the market at the prices fixed by the government which resulted in loss in surrendering levy rice, there was a keen competition among millers to procure paddy and not enough paddy was available in market due to the drought situation.

Singh *et al* (1981) suggested transport facilities, credit facilities, supply of electricity at cheaper rates to the processing units and storage facilities for increasing the efficiency of arhar dal processing in the unnao district.

Chadha (1989) observed the following constraints in the fruits and vegetable processing industries,

- a) Non- availability of processing varieties of fruits and vegetables.
- b) Short periods of raw material availability
- c) Excessive costs of raw material.

Jain (1989) in his study on economics of arhar pulse in Narasinghpur district (M.P) found that, main problems of arhar processors were inadequate availability of raw material, short supply of power leading to the under utilization of plant, declining output and efficiency of machinery, labour and problems of transportation for disposal of processed material.

Singh and Mann (1989) appraised the problems of important agro-based industries in Punjab. The low outturn in rice milling industry was attributed to lack of modernization. It was found that the capacity of these industries was mostly underutilized. The export of fully processed rice and modernization of rice mills was suggested for speedy development of rice milling industry.

Srivastava (1989) assessed the constraints faced by agro-based industries. The factors such as age old technology, over utilization of energy, lack of economies of scale in

production and increased marketing costs were identified as the major problems faced by agro-processing industries.

Nagesh (1990) found that the major problems faced by the cashew nut processor in Karnataka were existence of large number of processing units, inadequate availability of raw cashew nuts, poor quality of raw cashew nuts, rise in prices of raw cashew nut, non availability of skilled labour, increase in wage rate and high taxes. All these problems ultimately resulted in under utilization of installed capacity.

Singh *et al.* (1991) identified higher fluctuations in prices and absence of proper marketing facilities as the major problems faced by groundnut processors and thus, suggested measures to solve the problems through co-operatives like National Co-operative Development Corporation and National Dairy Development Board.

Venkatashshaiah (1992) in his study on groundnut processing units in Andhra Pradesh, had identified that stiff competition among the processors for getting the required raw material, frequent power shedding, high taxation, low product recovery and non-adoption of efficient technology, at an affordable costs as the major problems associated with the groundnut processing.

Vinay Rao (1992) studied economics of rice milling in Shimoga district of Karnataka and opined that the rice mills faced the problems of inadequate funds for investment and working capital, lack of availability of quality raw material, restrictions in the supply of electricity and mill point levy system. These problems were found to hamper the milling operations, encourage corruption, and contribute to increase in the price of rice and scope for government officials to harass the millers, resulting in closure of many small mills.

Subramanian and Sudha (1993) studied that the main problem faced by the small scale fruit and vegetable processing units was marketing of their produce. Besides the main constraint of low domestic household demand, these units have to face stiff competition for marketing their produce from well established big manufacturers whose brand names are familiar with common household consumers.

Amrutha (1994) found that the lack of sufficient quantity of raw material, inadequate transport facility, higher marketing charges and fees, irregular supply of power, inadequate supply of fuel and competition for custom milling as the major problems of rice mills in Karnataka.

Brahmprakash and Dineshkumar (1997) studied the infrastructural requirements for the development of agro-processing industry in rural India and concluded that lack of market information, rapid and refrigerated transport system, storage facility, banking institutions, packing and post-harvest technology were the major constraints responsible for the slow growth of agro-processing industry.

Roy (1997) concluded that the low level of processing in India was mainly due to inadequate post-harvest technology, lack of transport and marketing infrastructure, absence of linkages between processing industry and the growers and lack of domestic demand for processed products. Majority of the processing units were in cottage and tiny sector, where research and development efforts were also most non-existent and new products were rare. Lack of sophisticated packing technology further added to these problems. Poor infrastructure was the single biggest problem that affected the Indian agricultural processing sector.

3. METHODOLOGY

This chapter is intended to present the climatic and economic feature of the study area, nature and source of data collected, analytical tools and techniques employed to evaluate the objectives of the present study.

The chapter is presented under the following headings.

- 3.1 Description of the study area
- 3.2 Sampling design
- 3.3 Nature and sources of data
- 3.4 Analytical tools and techniques employed
- 3.5 Definition of terms and concepts used in the study

3.1 Description of the study area

Location:

Karnataka state is located in west central part of peninsular India. It consists of a narrow elongated belt between the Arabian Sea and Western Ghats and enhancing coast line of about 400 km.

The state has an area of 119257 sq. km and is situated between 11°5' and 18°45' north latitude and 74°12' and 78°40' East longitude. The state is bounded by Maharashtra on the north and by Goa and Arabian Sea on the west. It has a common border with Andrapradesh on the east and with Tamilnadu and Kerala on the south. The average rainfall of the state is 1139 mm. The state receives rainfall both from Southwest and Northwest monsoons. The climatic endowments are favorable for the adoption of cross red cattle and for the production of crops through the year, if the water is made available. The mean temperature ranges from 21.5°C to 32°C. Figure 2 depicts the Karnataka map showing study area.

Salient features of the district

Davangere district was formed during the year 1997 – 98, from the erstwhile Chitradurga district. It was earlier called Dyavanakere, later named as Davangere. The district has 6 taluks. For administrative purposes district has been made into two sub divisions - Davangere sub division consisting of Davangere, Honnali, Channagiri and Harihar and Harpanhalli sub-division consisting of Harpanhalli and Jigalur taluks. The area of the district is 5975.99 Sq. Kms. From the figure. 2, we can see different taluks of Davangere district.

Davangere district is bounded by Ballery district in the North and East, Shimoga district in the West and Chitradurga district in the South. The district has 24 hoblies, 810 villages, 230 Gram Panchayats, two Town Municipalities. As per the 2001 Census, Davangere District has recorded population of 1,790,952

The district lies between North latitude 75°30' and East longitude 13°45' to 14°50'. The Sulekerehalla is a major stream having its origin in the area of hills to the west of Holalkere taluk. River Tungabhadra flows in Harihar & Harpanhalli taluks. Irrigation facility is available in the district. Davangere was famous for cotton mills and trading activities. Even now Davangere is noted for commercial and trading activities in Karnataka State. Agriculture is the main occupation in the district. The detailed information about the district is given below in the table 1.

SOILS:

The soils of the district are formed of mixture of black soils, brown and red soils.

RIVER:

Tungabhadra river flows in the district. River originates from Shimoga district flows through Davanagere district towards Ballery district.

TEMPERATURE & RAIN FALL:

The temperature is minimum 16°C to 17°C during November & December and 42°C to 43°C during April & May. The average rain fall in the district has been 644 mm. However, during 2005 the rainfall has been less than the average rainfall i.e. 423.4 mm.

The population of the district as per 2001 census is 1790952. The average population density is 333 per sq.km. The literacy rate is 58per cent.

WATER RESOURCES AND IRRIGATION:

A total of 138832 hectares area is irrigated in Davangere district, majorly, 78595 hectares area is irrigate by canals and 44291 hectares area is irrigated by bore wells, 8180 hectares area is irrigated by lift irrigation, 3887 hectares area is irrigated by Village Tanks and 2429 hectares area is irrigated by Wells.

OCCUPATION:

Main occupation in the district is agriculture. Of the 597597 hectares area, 408848 hectares area is cultivated. Maize, Jowar, Paddy, Ragi and Sugar cane are the main crops.

FOREST:

The district possesses forest area of 89918 hectares which is about 15.04per cent of the total geographical area.

INDUSTRIES:

As on March - 2005, in the district, there were 8022 small scale industries providing employment to 27447 persons and the investment made by these units was Rs. 21200.19 lakhs. There are 9 medium and large industries in the district.

FINANCIAL INSTITUTIONS & CREDIT FACILITIES:

There are 85 commercial bank branches and 42 Grameena bank branches in the district. Total advances amount to Rs 102249.00 lakhs and total amount deposited is Rs 87143.00 lakhs.

ROADS AND RAIL:

Railway line of 47 Kms broad gauge runs in the district with 6 railway stations. District has 52 Kms of National Highway and 287.60 Kms of State Highway, 994.12 Kms of major district roads, 1094.90 Kms village roads, 1035.80 Kms TDB roads and 650.5 Kms municipal roads. There are two industrial estates with 122 sheds, 109 sheds have been allotted and 94 units are working.

There is one industrial area on Lokikere road having 93.08 acres. Of 93.98 acres 80.00 acres have been allotted and 52 units are working at present. There is a proposal of developing 102.76 acres of land on Karur industrial area for fabrication units which are existing presently on National Highway (P B Road).

AGRICULTURAL RESOURCES

Agriculture is the main resource of the district. Agriculture has played an important role in the economic development of the district and it is bound to be a prominent sector in the overall development of the district. Kharif, Rabi and summer are the three seasons. During Kharif season, major crops like Paddy, Jowar, and Maize are grown. During Rabi season Ragi, Jowar are grown. In summer season, crops like Groundnut and vegetables are grown with the help of irrigation. Sugarcane and Cotton are the cash crops in the district. The detailed information about the area and production of different crops in the district is provided in the below table 2.

As seen above, out of 243747 farmers, the maximum of them (106864) have land less than 1 ha. There are three main and two sub regulated markets in the district, the turnover from which has been Rs. 217.51 crores during 2006-07

The table 3 provides the land holding pattern in the district.

Table 1: General information about the study area

Sl. No.	Particulars	Davangere District
1	Area (sq kms)	5975.99
2	Population	1790952
	Male	917705
	Female	873247
	Rural	1247954
	Urban	542998
3	Density Person/sq. km	333
4	Sex ratio no. of F/1000M	950
5	Literacy ratio	58%
	Male	66%
	Female	51%
6	Population Main workers	
	Person	631726
	Male	466994
	Female	164732
7	Number of Hoblies	24
8	Number of Grampanchayats	230
9	No. of villages	810
10	No. of towns	4
11	Average Rain fall	644 mm
12	Forest Land	89918
13	Land not available for cultivation (in ha)	38972
14	Barren land	20533
15	Land Utilization (in ha)	
	Fallow land	58805
	Area Sown	408848
16	Number of Farmers	243747

3.2 SAMPLING DESIGN

To fulfill the objectives of the study, 3 taluks namely Davangere, Harihar and Honnali were purposively selected from the district as these taluks had a considerable number of rice mills with varying level of integration of milling operations. However, due to the difficulty in eliciting required information from the integrated rice mills (those units which had integrated bran oil extraction facilities), the present investigation was confined to the conventional and modern rice mills –the sample included three conventional and three modern mills with one conventional and one modern mill selected from each of the above taluks. However, for ascertaining the problems faced by the rice milling units, a larger sample of nine conventional and nine modern units were selected by choosing three conventional and three modern units from each of three taluks. The definition of conventional and modern mills is presented in section 3.5

3.3 NATURE AND SOURCES OF DATA

The data required for accomplishing the objectives of the study were collected both from primary and secondary sources.

The primary data collected from the mill owners related to paddy procurement cost, processing cost, inventory costs, management issues in procurement, processing and marketing returns from the sale of main products and by-products, marketing costs incurred and problems encountered in the rice milling operations.

Secondary data were collected from the records maintained by the mill owners. These data pertained to the details of assets and liabilities, extent of investment made at different points in time, cash inflows and outflows. The data were collected for a period of five years that is from 2005-2006 to 2009-2010.

3.4 ANALYTICAL TECHNIQUES EMPLOYED

In order to analyze the objectives of the study, the data collected subjected to analysis through appropriate techniques as follows:

1. Tabular analysis
2. Financial ratio analysis
3. Financial feasibility analysis
4. Economic order quantity (EOQ) model of inventory management.

3.4.1 Tabular analysis

The data collected were presented in tabular form to facilitate easy comparisons. The investment pattern cost of procurement, inventory costs, value addition, costs and returns in paddy milling and problems faced by the processors were studied using tabular analysis. The data were summarized with the help of statistical tools like averages and percentages to obtain meaningful inferences.

3.4.2 Financial ratios analysis:

The financial ratio analysis technique was considered useful in evaluating the performance of the rice mills. The ratio analysis technique was employed to study the solvency, liquidity, profitability, and sales of the processing units. The ratios used in the analysis are described below.

Test of solvency:

The solvency ratios would indicate the ability of the processing units to meet its medium and long term obligations. They would also provide a basis for measuring the leverage effect on the mills to meet the solvency position of the mills. Ratios such as total liabilities to owned funds and fixed assets to own funds were employed.

(a) Total liabilities to owned funds

The ratio reflects the total commitments which the milling units owed to the creditors in relation to their owned funds. This ratio is computed using the equation given below.

Table 2: Area and production of important crops in Davangere district

Sl. No.	Crop	Area (ha)	Production (tonnes)
1	Cash crop - Sugar cane	19992	1999200
	Cotton	4660	23.68
2	Cereals		
	Paddy	76941	383.46
	Maize	126864	490.40
	Jowar	37482	92.67
	Ragi	27819	98.68
3	Oilseeds	36720	85.05
4	Pulses	25745	250.5

(Source: Joint Director Office, Agriculture Dept. Davangere)

Table 3: Land holding pattern in the district

Sl. No.	Size of land holding (ha)	No. of farmers	% of Land holding
1	Less than 1 ha	106864	43.84%
2	1-2 ha	73211	30.03%
3	2-4 ha	44353	18.19%
4	4-10 ha	17267	7.08%
5	More than 10 ha	2052	0.84%

(Source: district note 2006-07 from Dept of Statistics, Davangere)

$$\text{Total liabilities to owned funds} = \frac{\text{Total liabilities}}{\text{Owned funds}}$$

The total liabilities refer to all the items under the liability column of balance sheet except the net profits, subsidies, and owned funds. The paid-up share capital, depreciation fund, reserve funds and net profits were included under the owned funds of the mills.

(b) Fixed assets to owned funds ratio

This ratio would indicate the extent of owned funds invested in fixed assets obtained using following equation.

$$\text{Fixed assets to owned funds ratio} = \frac{\text{Fixed assets}}{\text{Owned funds}}$$

Fixed assets include the value of sites, buildings, furnitures, fixtures, vehicles etc.

Test of liquidity

These measure the ability of the mills to meet their maturing obligations. These ratios are also called balance sheet ratios. Current ratio and liquid assets to total assets ratio were employed to measure the liquidity position of the mills.

(a) Liquid assets to total assets ratio = $\frac{\text{liquid assets}}{\text{Total assets}}$

Liquid assets included cash in hand, cash at bank, short term deposits, value of closing stock adjusting heads due to, sundry debtors, deposits with banks etc. The total assets included all items under the assets column of the balance sheet, viz, sum of current assets and fixed assets

(b) Current ratio

The ratio would measure the number of units of current assets owned by the mills to meet each of the short term obligations. It is given by the following equation.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

If the ratio was more than one, it is suggested that current assets were adequate to pay off all current liabilities. If it was one, they were just sufficient and if less than one, mills are unable to pay current dues when asked for. Current liability was obtained by deducting long term loans and long term deposits from the total liabilities.

Test of profitability

The profitability ratios would provide a fairly sound method of diagnosis of the financial status of the rice mills and its overall efficiency. These ratios compared the returns over the amount sunk into the business by the mills. Thus, these ratios indicated the profitability of sales and investments made in the business. The ratios employed for the study are discussed below.

(a) Ratio of net profit to fixed assets

This ratio would indicate the earning capacity of the fixed assets of the rice mills. It was computed as follows.

$$\text{Net profits to fixed assets} = \frac{\text{Net profits}}{\text{Fixed assets}}$$

An increase in the ratio over the years would show improved overall efficiency of the mills. Net profits included the amount of income by the mills after meeting all its expenses at the end of the year.

(b) Net profits to owned funds ratio

This ratio indicates the profit earned by the processing unit on the owned funds invested in the business. Higher ratio would indicate higher percentage of income generated on the equity

$$\text{Net profit to owned funds ratio} = \frac{\text{Net profits}}{\text{Owned funds}}$$

A higher ratio indicates the higher overall efficiency of business of the rice mills and fuller utilization of its total resources and vice versa.

3.4.3 Financial feasibility analysis

Investment analysis techniques were carried out to evaluate the feasibility of investment in rice mills. The discounted cash flow technique which has an advantage of reducing the cash flows to a single point of time was used to facilitate the comparison.

Financial feasibility analysis was conducted for representative conventional and modern rice milling units. These representative units- one conventional and one modern- were created based on the information collected by the three conventional units and three modern units selected for the present research work. The feasibility analysis conducted for the representative units were based on certain assumptions mentioned hereunder,

Conventional rice mills:

The life of the representative conventional rice mill was assumed to be 15 years. In respect of this unit, it was assumed that the milling capacity of five quintals per hour and the mill would have two shifts per day of six hours each. Further, it was assumed that the mill would run for 240 days per annum. The capacity utilization rate was set at 55 per cent with five per cent increase every five years. Further, the representative conventional unit was assumed to process 70 per cent of the total paddy handled into rice and remaining quantity into poha. The prices of rice and poha and all inputs including that of paddy were assumed to be increasing by 2 per cent per annum during the life of the project. It was further assumed that the plant, machinery, building etc would depreciate at 2 per cent per annum. The appropriate discount rate was considered to be 16 per cent.

Modern rice mills:

The life of the representative modern rice milling unit was assumed to be 20 years. The capacity of the modern unit was assumed to be 30 quintals per hour, and the mill would have 2 shifts of 8 hours each, running for a total of 250 days in a year. In respect of modern units, the rate of capacity utilization was assumed to be higher at 70 per cent with an increase of 5 per cent for every five years. The proportion of paddy converted into rice and poha would be 55 per cent while, the remaining 45 per cent of paddy would be processed into poha. Regarding the prices of the end products, i.e. rice and poha and the prices of inputs, the same assumption was made for conventional unit (2% increase per annum) would hold for the modern unit also. It was further assumed that the plant, machinery, building etc would depreciate by 2 per cent in the value per year. The appropriate discount rate was considered to be 16 per cent.

Four conventionally used project evaluation techniques were adopted in the study to evaluate the feasibility of the investment in paddy processing units. They are as follows.

- a) Net present value (NPV)
- b) Benefit cost ratio (BCR)
- c) Payback period (PBP)
- d) Internal rate of return (IRR)

(a) NET PRESENT VALUE (NPV)

This indicates the present value of expected or realized net cash flows or returns of the project over its life time when discounted at the opportunity cost of capital. The opportunity cost of capital considered in this study was 16 per cent per annum.

The NPV was worked out as follows:

$$NPV = \sum \frac{Y_t}{(1+r)^t} - I$$

Y= net returns in period t

t = 1.....20

r = discount rate

I= Initial investment

(b) BENEFIT COST RATIO (BCR)

The benefit cost ratio was worked out by discounting the net returns during the life period of the paddy processing unit at a discount rate of 16 per cent per annum. The formula used was:

$$B-C \text{ ratio} = \frac{\text{Discounted net return}}{\text{Initial investment}}$$

(c) INTERNAL RATE OF RETURN (IRR)

It is the discount rate which makes the net present value of the project benefits equal to zero. It is usually determined by trial and error method. In this study also IRR was computed by trial and error method. For this, the discount rate was too low and which the NPV positive and another discount rate which was too high and which made the NPV negative were ascertained. Then the IRR was estimated as follows:

$$IRR = \text{Lower discount rate} + \frac{\text{Present worth of cash flows at lower discount rate}}{\text{Sum of the two NPVs ignoring the negative sign}} \times \left[\frac{\text{difference between worth of cash flows stream at 2 rates}}{\text{Sum of the two NPVs ignoring the negative sign}} \right]$$

The project is considered to be feasible if the IRR is higher than the prevailing interest rate.

(d) PAYBACK PERIOD (PBP)

It indicates the number of years required to recover the initial investment made in rice mills. The method followed is to successively add the net returns from each production year until the investments are completely recovered. Since, the cash flows from rice mills were not uniform; the payback period was calculated by successively reducing the net cash flows from outstanding investments.

4 Economic order quantity (EOQ) model.

The present study used the classical economic ordering quantity model to determine the optimum ordering quantity and optimum frequency of ordering.

EOQ model of inventory management is also known as the Wilson formulation is most popularly used basic model know the quantity to be ordered of a commodity each time the order is placed, and to examine the number of times the order needs to be placed in a year. So that, the total cost of inventory which consists of ordering cost and holding cost is minimized. This model is based on the following assumptions:

- The demand for the item is certain, continuous and constant over time.
- The lead time, that is time between placing an order and its delivery, is known and fixed. Thus, when the lead time is zero, the delivery of item is instantaneous.
- Within the range of the quantities to be ordered, per unit holding cost and the ordering cost are constant and thus independent of the quantity ordered.
- The purchase price of the item is constant, that is to say, no discount is available on purchase of large lots.

- The inventory is replenished immediately as the stock level reaches exactly equal to zero.

Some important concepts used in the model and procedure for determination of optimum ordering quantity are briefly described hereunder.

- 1) **Ordering Cost/ Set-Up Cost:** Ordering cost is incurred whenever the inventory is replenished. It includes costs associated with the processing and chasing of the purchasing order, transportation, inspection for quality, expediting overdue orders and so on. It is also known as procurement cost.

Total annual ordering cost:

This is given by number of times an order is placed, N, multiplied by the ordering cost per order, A. thus

$$O(Q) = N \times A$$

The Value of N itself is dependent on the order quantity Q, and the annual demand, D. Here N would be equal to D/Q. Accordingly,

$$O(Q) = \frac{D}{Q} \times A$$

- 2) **Carrying cost/holding cost:** It is also known as the holding cost or the storage cost, carrying cost represents the cost that is associated with storing an item in inventory. It is proportional to the amount of inventory and the time over which it is held.

Total annual holding cost;

The total annual cost is obtained by multiplying the unit holding cost, h, by the average no of units held in the inventory.

$$H(Q) = \frac{Q}{2} \times h$$

Total (variable) annual inventory cost: $T(Q) = O(Q) + H(Q)$

Determination of EOQ (Q*) for the classical EOQ model:

Economic order quantity is the quantity of a commodity to be ordered, which minimizes the total cost of inventory, is given by

$$T(Q) = \frac{D}{Q} A + \frac{Q}{2} h$$

By taking the first derivative of the above solution w.r.t. Q, setting it equal to 0 and solving for Q provides the quantity of commodity to be ordered, such that the inventory costs are minimized. Thus,

$$\frac{dT(Q)}{d(Q)} = -\left(\frac{AD}{Q^2}\right) + \frac{h}{2} = 0$$

Or
$$\frac{AD}{Q^2} = \frac{h}{2}$$

Or
$$Q^2 = \frac{2AD}{h}$$

Therefore,
$$Q=Q^*=\sqrt{\frac{2AD}{h}}$$

It provides the optimum solution for the quantity to be ordered. Since, the second derivative of $T(Q)$ happens to be $2AD/Q^3$ which is a positive number, the above solution actually happens to be the inventory cost minimizing solution.

To apply the above model in the present study, each of the three conventional units and three modern units was considered. For each unit, the average demand for the paddy over the past five years was calculated and used as the annual demand for the purpose of the application of EOQ model. As per one of the standard assumption of the model, constant holding cost (h) of Rs 1.2 per quintal of paddy was assumed in respect of conventional units and Re 0.3 per quintal in respect of modern units. Further, in consultation with the rice milling units an ordering cost of Rs 200 per order was assumed for each unit. The application of economic ordering quantity model provided a total of six solutions – one optimum solution for each of the six selected units.

3.5 Definition of Terms and Concepts Used in the Study

Conventional rice mills: Conventional rice mills are the units, in which the paddy processing is carried out by using steel hullers, an age old technology which is inefficient. Different activities like cleaning, drying, grading, polishing etc are carried out manually.

Modern rice mills: Modern rice mills are the units, in which the paddy processing is carried out by using rubber roll shellers, a modern technology which is more efficient. Majority of the activities are carried out using machineries like driers, aspirators, graders, polishers etc.

Procurement cost of products: cost is computed as the summation of expenses incurred as labour charge, transportation and handling costs, loading and unloading charge and packaging costs.

Transportation and handling costs: This cost incurred on hiring the transport facilities and loading and unloading of raw materials.

Packaging cost: It was the expenses incurred on packing materials like gunny bags, sutli or any such materials.

Inventory: It is defined as usable but idle resource at different stages.

Raw material: It means that the products brought by the retailers that were processed but not packed.

Cost of carrying inventory: This is expressed in rupees per item held in stock per unit time. It was worked out by adding the items of packaging material cost, labour charge and cost of wastage.

Fixed capital: The items included under the fixed capital are the cost of land, building, machinery and equipments and other fixtures.

Working capital: The working capital includes cost of raw materials, utilities (like power, oil and water charges), processing material (cloth bags, tags, labels) cost, wages, salaries, company overheads (repair and maintenance cost) and administrative overheads (stationeries expenses, office communication), interest on working capital, chemical cost, license fee, cost of processing and advertisement expenses.

Investment on building: This included investment on building for processing/value addition, storage, office and drying yard.

Investment on machinery and equipments: Investment made on display cases, floral cases, display walk-in-freezers, hot-food display cases, ice machines, packing machine, weighing machines etc.

Investment on other fixtures: Included investment on fan, tube lights, furniture and computers in the retail outlets.

Investment on infrastructure: Included investment on power generator, trolleys and transport vehicles.

Pre cleaning: It referred to the removal of particles such as pieces of trash, stones, clods, removal of foreign materials, other products etc, larger in size than desirable products from threshed products lot. In the case of fruits and vegetables, it was the washing of fruits and vegetables to remove dusts, removal of decayed material etc.

Grading: It referred to the actual cleaning and grading of products based on the quality preferences.

Treating: It referred to the application of fungicide, insecticide or combination of both, to products so as to disinfect them from seed borne or soil borne pathogenic organisms and storage insects.

Bagging and weighing: It referred to filling of products in bags/ polythene bags to an exact weight.

Labeling and stitching: It referred to attaching labels, certificates, tags on the products bags and sewing the seed bags.

Cost and returns: The total marketing cost incurred by the rice millers were calculated by adding rent, transportation cost, packaging cost, labour charge, loading and unloading charge and miscellaneous charges like repair and maintenance and electricity charge. The percentage share of the value of the total value has been worked out.

Gross return: Gross returns was worked out by deducting the total purchase value from total sale value

$$\text{Gross returns} = \text{Total Sale Value} - \text{Total Purchase Value}$$

Net returns: Net returns was arrived at by deducting the total marketing costs from gross returns

$$\text{Net returns} = \text{Gross returns} - \text{Total Cost of a Retailers}$$

4. RESULTS

The results of the study are presented under the following heads.

- 4.1 Investment pattern and financial feasibility of rice milling units
- 4.2 Processing and marketing management
- 4.3 Paddy Inventory management
- 4.4 Costs and returns structure
- 4.5 Problems faced by the processors of rice milling units

4.1 INVESTMENT PATTERN AND FINANCIAL FEASIBILITY OF RICE MILLING UNITS

4.1.1 Investment pattern in rice milling units

The capital investment of conventional and modern rice mills with an annual average installed capacity of 14400 quintals and 120000 quintals, respectively, is presented in table 4.1.

From the table, it can be seen that the total fixed capital investment was Rs 36.97 lakhs for conventional unit and Rs 379.25 lakhs for modern processing unit.

The investment on machinery and equipments was the highest followed by buildings, land, infrastructures and other fixtures. The proportion of investment on land in the total investment was higher in conventional unit (6.76 %) than in modern unit (2.01 %). Similarly the proportion of fixed capital invested on building was higher in conventional unit (34.14 %) and lower in modern unit (25.08 %). The proportion of investment on machinery and equipment was higher in modern unit (71.10 %) compared to conventional unit (54.10 %). In respect of infrastructures, investment was more in conventional unit (1.47 %) than in modern unit (1.00 %).

The comparison of investment between the conventional and modern processing units revealed that the fixed capital requirement in the case of modern mills was 9-10 times bigger than in conventional units

4.1.2 Staffing pattern in rice mills

Table 4.2.presents staffing pattern in rice mills. From the table, we can see that in the case of conventional units, staff persons like manager, technician and supervisors are not appointed as in the case of modern units, and we can also see that unlike in modern units, conventional mills do not have purchaser/ helper to assist in procurement and other milling activities. Since the size of the modern mills is six times larger than conventional mills, the modern mills had maintained two security guards as it was one in conventional units. It is evident from the table that the total manpower requirement in modern rice mills (23) is higher as compared to conventional mills (17).This increase in manpower is attributed to the increased size of the modern mills and the higher output. The results pointed out that the employment generation is higher in modern mills in comparison with conventional mills.

4.1.3 Financial feasibility of rice mills

Tables 4.3 and 4.4 presents the cash flows in representative conventional and modern paddy processing units, respectively. As can be seen from the tables, cash inflows and cash outflows varied widely over years during the life of the project. The Net Present Value of the representative conventional unit worked out to be Rs 27.55 lakhs. Similarly, the net present value for modern unit was Rs 408.36 lakhs.

Table 4.5 shows three discounting measures of financial feasibility, namely, Net Present Value, Benefit Cost ratio and Internal Rate of Return for both conventional and modern units in addition Payback period for both types of mills is also presented in the table. The Net Present Value of all the cash flows during the life of the mills was Rs 27.55 lakhs for conventional unit and Rs 408.35 lakhs for modern unit, respectively. This showed that the paddy milling units, whether conventional or modern unit, would be highly feasible. The

Table 4.1 : Investment pattern in rice mills

(Rs in lakhs)

Particulars	Conventional unit (Installed capacity of 14400 quintals/annum)	Modern unit (Installed capacity of 120000 quintals/annum
	Amount	Amount
Land	2.50 (6.76)	7.50 (2.01)
Building	12.62 (34.14)	95.00 (25.08)
Machinery & Equipments	20.00 (54.10)	269.50 (71.10)
Infrastructures	1.30 (1.47)	3.80 (1.00)
Other Fixtures*	0.55 (0.62)	3.25 (0.85)
Total	36.97	379.25

*Other fixtures include almeras, lockers, electrical installations etc.
Figures in the parentheses indicate percentages of the total.

Table 4.2: Staffing pattern in rice mills

Sl. No	Staff particulars	Conventional unit	Modern unit
1	Manager	-	1
2	Technician	-	2
3	Supervisor	-	1
4	Accountant	1	1
5	Purchaser/helper	-	1
6	Clerk	1	1
7	Security guard	1	2
8	Skilled labour	4	6
9	Unskilled labour	10	8
	Total	17	23

Table 4.3: Cash flows in representative conventional unit

(Rs in lakhs)

Years	Cash outflows (Rs)	Cash inflows (Rs)	Net cash flows (Rs)	Net discounted cash flows (Rs)
0	36.970	-	- 36.970	-36.970
1	55.230	58.000	2.770	2.388
2	56.145	60.400	4.255	3.175
3	58.320	66.000	7.680	4.923
4	61.565	69.000	7.435	4.131
5	63.000	71.780	8.780	4.221
6	63.900	72.998	9.098	3.760
7	65.990	72.220	6.230	2.225
8	67.850	77.980	10.130	3.117
9	70.450	84.300	13.850	3.664
10	74.000	87.982	13.982	3.192
11	78.120	99.000	20.880	4.767
12	83.880	108.000	24.120	4.748
13	85.000	118.900	33.900	5.746
14	89.000	135.000	46.000	6.725
15	95.000	156.450	61.450	7.739
				Total =64.52

Table 4.4: Cash flows in representative modern unit

(Rs in lakhs)

Years	Cash outflows (Rs)	Cash inflows (Rs)	Net cash flows (Rs)	Net discounted cash flows (Rs)
0	379.25	-	-379.25	-379.25
1	385.98	460.87	74.89	64.56
2	386.25	462.22	75.97	56.69
3	386.99	464.55	77.56	49.71
4	387.10	478.10	91.00	50.55
5	375.00	499.00	124.00	59.61
6	410.00	510.00	100.00	41.322
7	412.36	500.01	87.65	31.30
8	414.93	525.55	110.62	34.03
9	417.00	543.33	126.33	33.42
10	420.80	572.00	151.20	34.52
11	436.00	593.00	157.00	35.84
12	449.90	600.00	150.10	29.54
13	512.30	720.00	207.70	35.20
14	600.90	745.00	144.10	21.06
15	698.00	890.00	192.00	24.18
16	725.00	959.90	234.90	25.50
17	755.00	1090.00	335.00	31.36
18	785.00	1225.00	440.00	35.513
19	890.00	1550.00	660.00	45.89
20	1050.00	1860.00	810.00	48.60
				Total = 786.00

Table 4.5: Evaluation of investment in paddy processing units

Sl. No.	Particulars	Conventional unit	Modern unit
1	Net present value (lakh rupees)	27.55	408.35
2	Benefit cost ratio	2.00	2.08
3	Internal rate of return (%)	23.11	26.60
4	Payback period (years)	2.05	1.75

Benefit Cost ratio worked out to be 2.00 for conventional unit and 2.08 for modern unit. This implied that, for every one rupee invested in conventional rice mill, there would be net returns of Rs 2.00 in present value terms. In respect of modern units, the net returns for one rupee investment would be Rs 2.08. The Internal Rate of Return for both conventional and modern units happened to be very high at 23.11 per cent and 26.60 per cent, respectively. Since these values of Internal Rate of Return are considerably higher than the prevailing rate of interest, 16 per cent both units would be highly financially feasible.

The results pertaining to Payback Period were in line with the estimated values of NPV, B-C ratio and IRR. While the Payback Period happened to be 2.05 years for conventional units and 1.75 years for modern units. This implied that the initial investment made in conventional unit would be completely paid off in around two years. In respect of modern mill, the period required for the capital recovery would be one year and nine months.

4.2 PROCESSING AND MARKETING MANAGEMENT

4.2.1 Capacity utilization

Table 4.6 represents the capacity utilization in the rice mills. It can be seen that the installed processing capacity per day was six times higher in the case of modern units than in the conventional units. With a marginal increase in the number of working days and duration of each shift, the quantity processed per day and annual quantity processed was around 13 times higher in the modern units as compared to the conventional units. The capacity utilization of conventional unit was as such, around 44 per cent only as compared to 69 per cent capacity utilization in modern units. The lower capacity utilization of conventional mills could be attributed to the use of conventional technology coupled with lack of capacity to procure inputs in time and market their end products.

4.2.2 Extent of conversion of paddy into rice and poha

Table 4.7 depicts the extent of total quantity of paddy handled, which was converted into rice and poha in conventional and modern rice mills. The table reveals that of the total quantity of paddy processed by conventional units, 70 per cent was converted into rice and the remaining 30 per cent into poha. However, the proportion of total quantity of paddy converted into rice by modern units was higher at 55 per cent. As such, modern units processed only 45 per cent of procured paddy into poha.

4.2.3 Product recovery in rice mills

Table 4.8 depicts the product recovery in both types of rice mills. The head rice recovery from processing paddy is higher in modern unit (73.5 %) compared to conventional unit (66 %). The recovery of broken rice was 3 times higher in conventional units (10.5 %) than in modern unit (3.5 %). With regard to recovery of by-products, bran accounted for 7 per cent in conventional units and 8 per cent in modern units; Husk recovery varies marginally that is 16.5 per cent and 15 per cent in conventional and modern respectively. In respect of poha making, the quantity of poha (70 %) and brokens (9 %) recovered from a kg of paddy was almost the same in conventional and modern units.

Table 4.6: Capacity utilization in rice mills

Sl. No.	Particulars	Conventional unit	Modern unit
1	Installed capacity per hour (qtls)	5	30
2	Number of working days/annum	240	250
3	Number of shifts/day	2	2
4	Duration of each shift (hours)	6	8
5	Number of working hours/ annum	2880	4000
6	Annual installed capacity (qtls)	14400	120000
7	Quantity processed/day (qtls)	26.45	330.60
8	Annual Quantity processed (qtls)	6343	82640
9	Capacity utilization (percentage)	44.05	68.90

Table 4.7: Extent of conversion of paddy into rice and poha

Particulars	(Per cent)	
	Conventional unit	Modern unit
Paddy processed into rice	70	55
Paddy processed into poha	30	45

4.3 PADDY INVENTORY MANAGEMENT IN RICE MILLING UNITS

4.3.1 Paddy storage and inventory costs

Table 4.9 presents quantity of paddy stored in a year by conventional and modern units along with the details of the inventory costs. As revealed by the table, conventional units stored 6343 quintals of paddy per annum in comparison with 82640 quintals stored by modern units. The average period of storage per year was 98 days in respect of conventional units and 60 days in modern units. While conventional units incurred a storage cost of Rs 1.20 per quintal, it was only Re 0.30 for modern units. Further, maintenance cost was also higher in the case of conventional units (Rs3 per quintal) as compared to modern units (Rs 2.55 per quintal). Overall, the storage costs were Rs 3.20 and Rs 2.85 per quintal in respect of conventional and modern units, respectively.

4.3.2 Economic ordering quantity (EOQ) model of paddy inventory management

Table 4.10 presents the results of economic ordering quantity model of paddy inventory management. As the table reveals the analysis was conducted for 3 conventional and 3 modern units. The total annual demand for paddy for conventional units one, two and three was 5420 quintals, 6061 quintals and 4895 quintals respectively. In respect of modern rice milling units, the annual paddy requirement was much higher at 31680 quintals, 3300 quintals and 85785 quintals per annum respectively for mill one, two and three. The application of EOQ model of inventory management revealed that the optimum quantity of paddy to be ordered each time was 1320 quintals for mill one, 1395 quintals for mill two and 1275 quintals for mill three under conventional units. This kind of strategy for conventional units would require mill one to place the order of 1320 quintals four times once in a year when doing so, mill one would be incurring an optimum minimum cost of Rs 1614 per annum for meeting its paddy requirements. In respect of mill two, the optimum solution required mill two

Table 4.8: Product recovery in rice mills

(Per cent of paddy processed)			
Sl no	Product particulars	Conventional unit	Modern unit
1	<u>Rice milling process:</u>		
	Head rice	66.00	73.5
	Broken rice	10.50	3.50
	Bran	7.00	8.00
	Husk	16.50	15.00
2	<u>Poha making process:</u>		
	Poha	71.00	72.00
	Broken rice	8.50	9.00
	Husk	20.50	20.50

Table 4.9: Paddy storage costs

Sl. No.	Particulars	Conventional unit	Modern unit
1	Quantity of paddy stored (qtls/annum)	6343	82640
2	Period of storage (days)	98	60
3	Storage cost (Rs/ctl)	1.20	0.30
4	Cost of maintenance of stock (Rs/ctl)	3.00	2.55
6	Total cost (Rs/ ctl)	3.20	2.85

* Storage cost refers to rental value of the storage structures.

* Maintenance costs include costs of protection measures, labour etc

Table 4.10: Economic order quantity model (EOQ model)

Particulars of rice mill	Annual demand for paddy (qtls)	Economic ordering quantity (qtls)	Optimum frequency of ordering per annum	Optimum cost (Rs)
Conventional unit				
Mill 1	5420	1320	4.10	1614.00
Mill 2	6061	1395	4.35	1700.00
Mill 3	4895	1275	3.83	1540.00
Modern unit				
Mill 1	31680	6910	4.50	2054.00
Mill 2	39300	7200	5.45	2215.50
Mill 3	85785	10980	7.80	2210.00

to place a full order of 1395 quintals four times and 465 quintals of paddy one time in a year, minimizing the total cost of ordering and storage at Rs 1700 per annum. The conventional mill number three would do well by placing an order of 1275 quintals of paddy 3 times and 1020 quintals one time in a year.

With regard to modern units, optimum solution required (i) mill one to place an order of 6910 quintals of paddy four times and 3455 quintals one time in a year. (ii) mill two, to place an order of 7200 five times and 3240 quintal one time in a year and (iii) mill three, to place an order for 10980 quintals paddy seven times in a year. By doing so, modern mills one, two and three would minimize the total ordering and total holding costs at Rs. 6910, Rs. 7200 and Rs. 10980 per annum.

Fig 3, 4, 5, 6, 7 and 8 provides diagrammatical representation of determination of economic order quantity and optimum cost for 3 conventional and 3 modern mills. It may be noted that, the point of economic order quantity, total ordering costs would equal total holding costs and that the total costs would be at its minimum on the total cost curve.

4.4 COSTS AND RETURNS STRUCTURE IN RICE MILLS

4.4.1. Costs incurred by conventional and modern units in paddy procurement.

Table 4.11 presents the costs incurred by conventional and modern rice mills in procurement of paddy for rice milling by two separate channels, namely, purchase directly from the farmers (channel-1) and purchases from commission agents (channel-2). As the table reveals, the purchase price of paddy varied across types of rice mills and channels. It was Rs 1320 per quintal in channel 1 and Rs 1380 per quintal in channel 2 for conventional units. The purchase price, however, was bit higher for both the channels in respect of modern units, that is, Rs 1400 quintal in channel 1 and Rs 1450 in channel 2. The costs incurred on account of purchase tax, commission and market fee was of fixed proportion of the paddy purchase price. It was 2 per cent of purchase price each in respect of tax and commission and 1.5 per cent in respect of market fee. It may be noted that the mills didn't have to pay any commission for paddy purchased directly from farmers (channel- 1). In respect of transport and handling, the cost incurred by both conventional and modern units was the same at Rs 5 per quintal, when purchasing from the commission agents (channel- 2). However, the purchase from farmers (channel- 1) led to differential transportation and handling cost of Rs 9 per quintal in channel 1 and Rs 12 per quintal in channel- 2. The cleaning and weighing charges incurred by the paddy mills differed considerably between the channels. While, the conventional mills incurred Rs 2 per quintal for cleaning and weighing, the amount spent was much higher at Rs 5 per quintal in respect of channel -1. Similar was the case for modern units also. While, cleaning and weighing charges were 2.50 per quintal in channel 2, they amounted to Rs 7 per quintal in channel-1. Overall, the total procurement costs were higher in respect of channel- 2 compared to channel -1 for both conventional and modern units. Specifically, the costs were Rs 99 per quintal and Rs 75.80 per quintal respectively for channel 2 and channel-1 for conventional units. The corresponding numbers for modern units were Rs 107.25 per quintal and Rs 86 per quintal.

4.4.2 Cost of processing paddy into rice and poha.

Table 4.13 presents the cost of processing of paddy into rice and poha incurred by the conventional and modern rice milling units. In respect of paddy conversion into rice, as revealed by the table, the two most significant components of total processing cost were interest on working capital and expenditure on power, fuel and water. While these two accounted for 43.4 per cent and 42.6 per cent respectively. In the case of conventional units, their share was 53.45 per cent and 31.94 per cent in the case of modern units. Another component of rice milling cost which was the third largest one was interest on fixed capital, the share of which was 8.7 per cent for conventional units and 7.63 per cent for modern units. The another component of processing costs like administrative costs, depreciation on

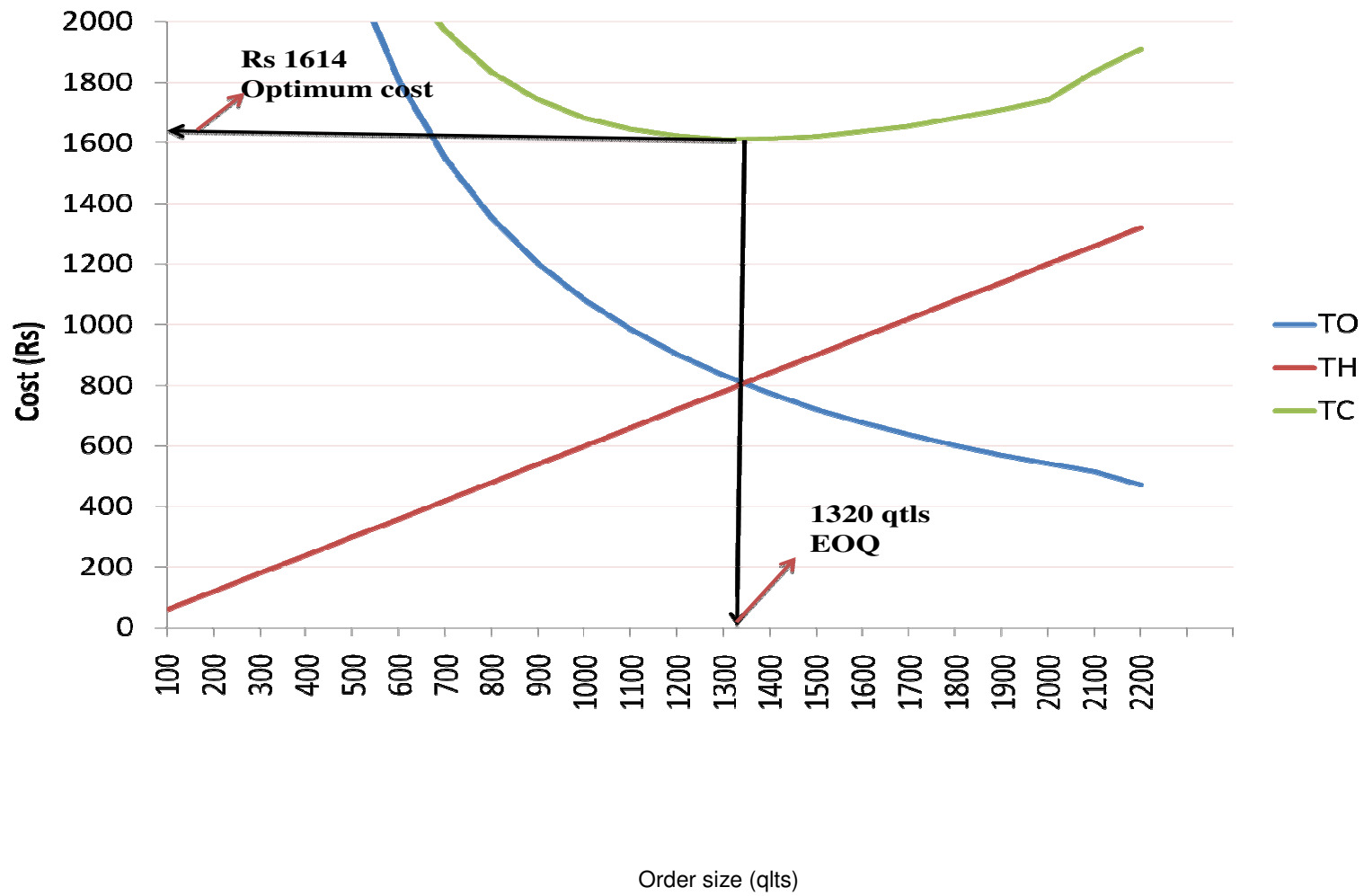


Fig.3. Economic order quantity model for conventional unit 1

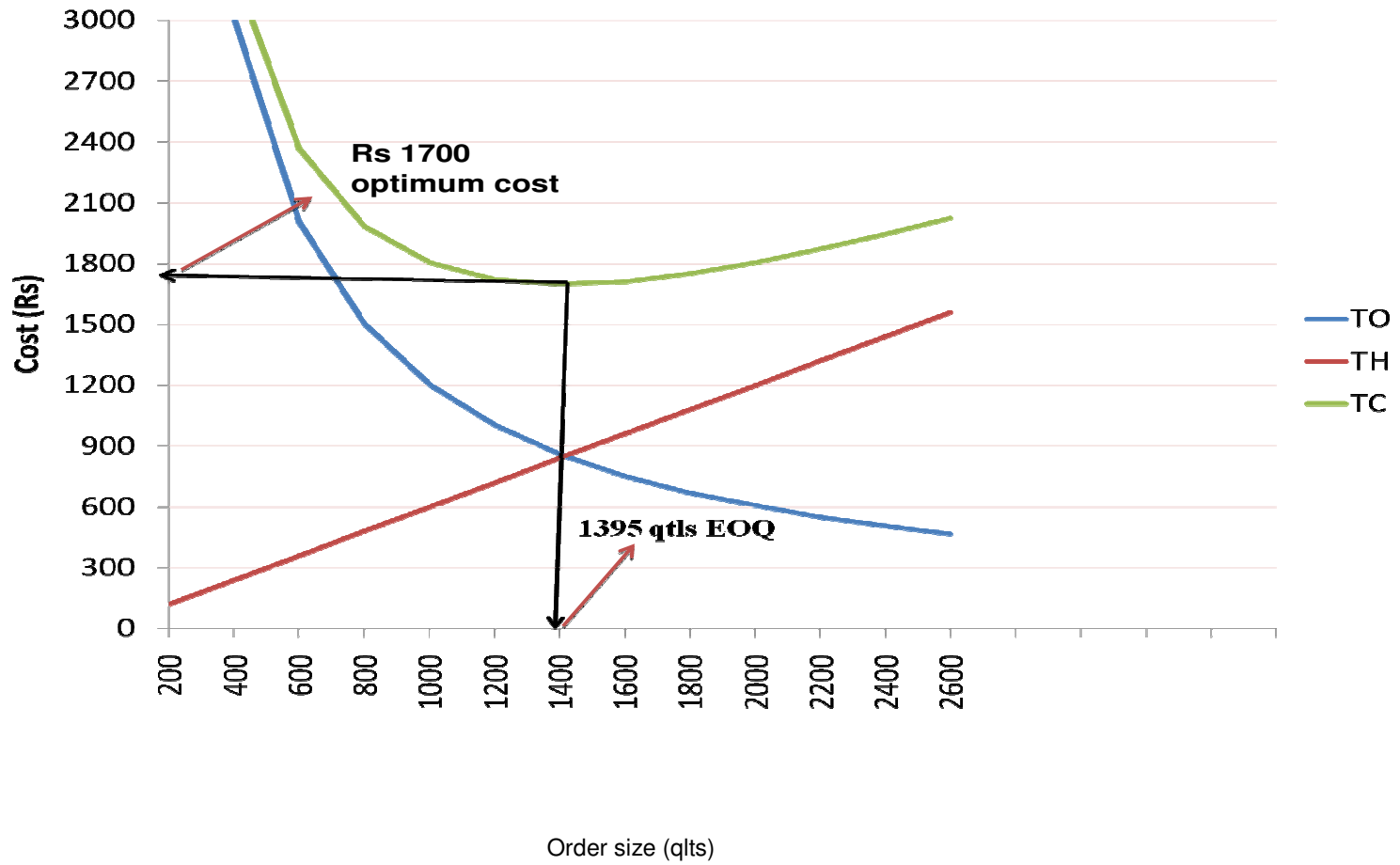


Fig.4. Economic order quantity model for convective unit 2

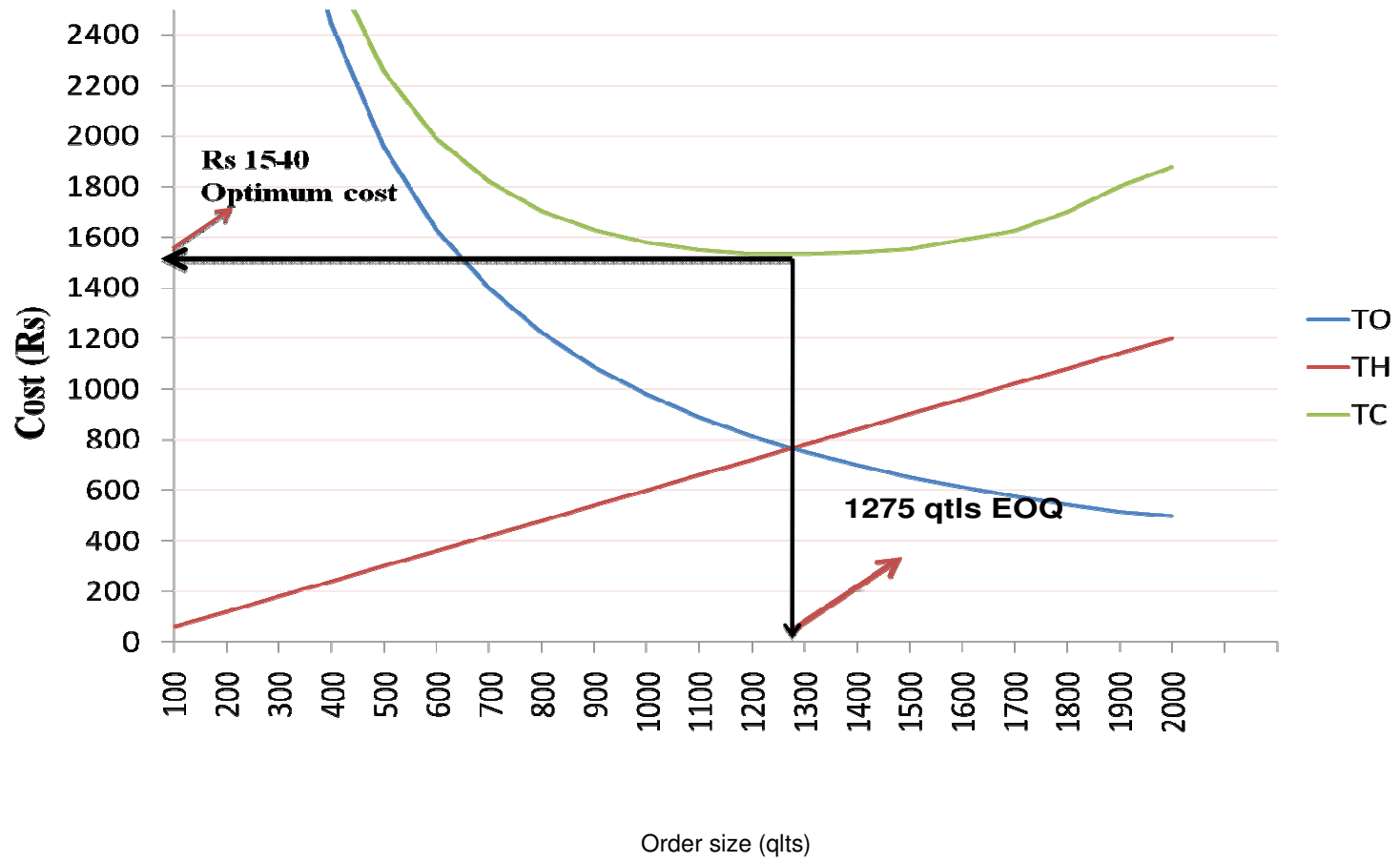


Fig.5. Economic order quantity model for convectional unit 3

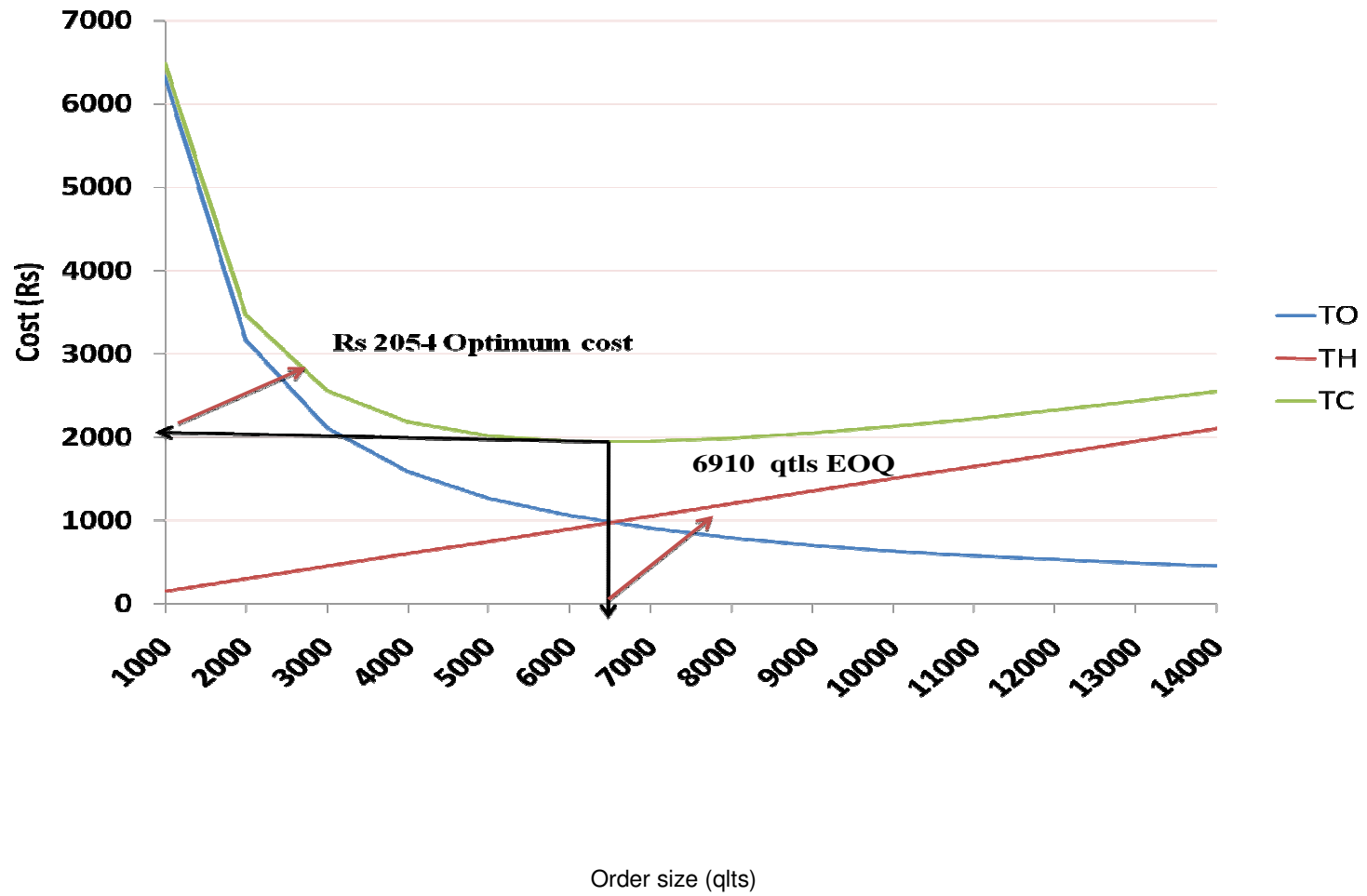


Fig.6. Economic order quantity model for modern unit 1

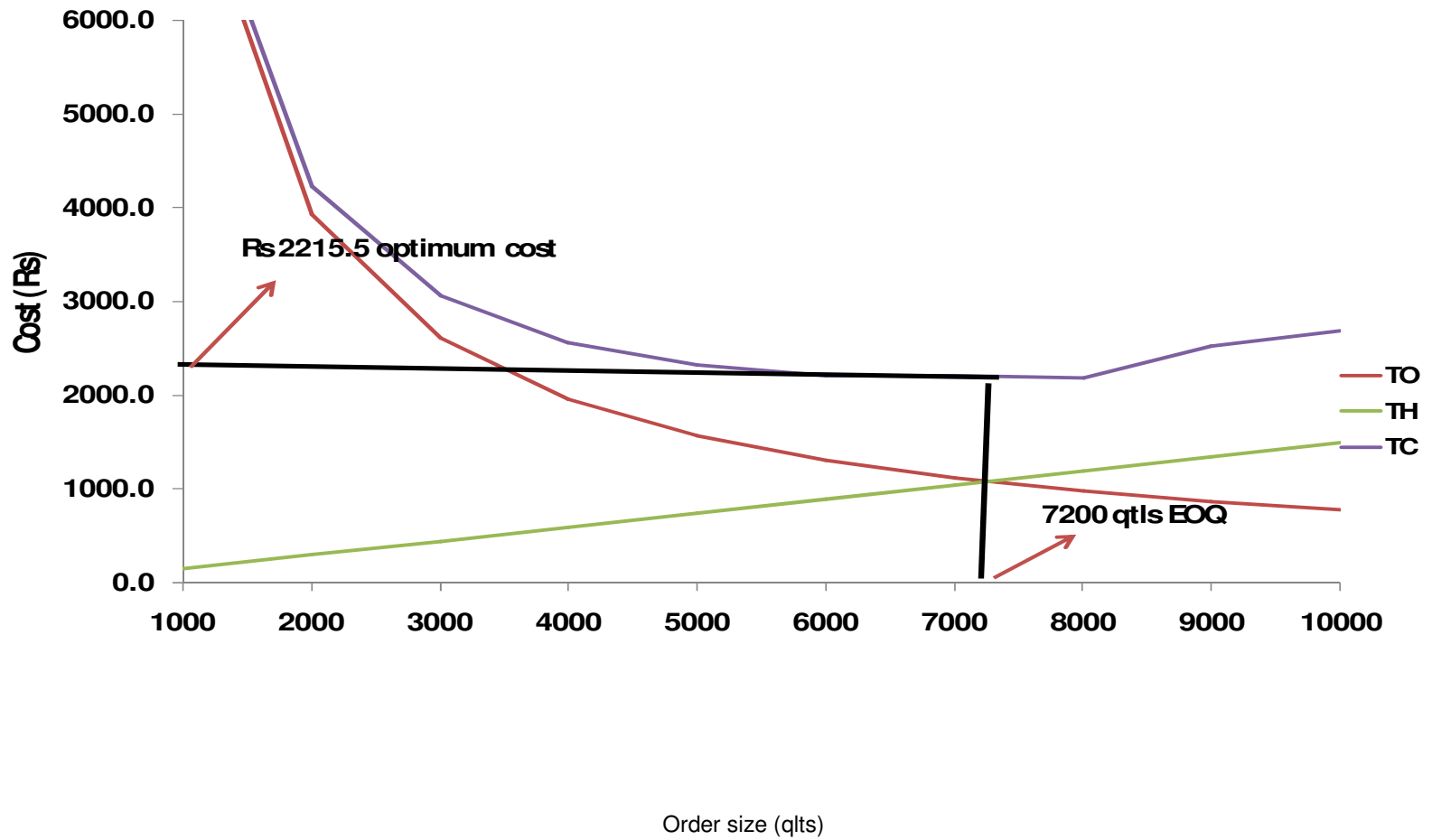


Fig.7. Economic order quantity model for modern unit 2

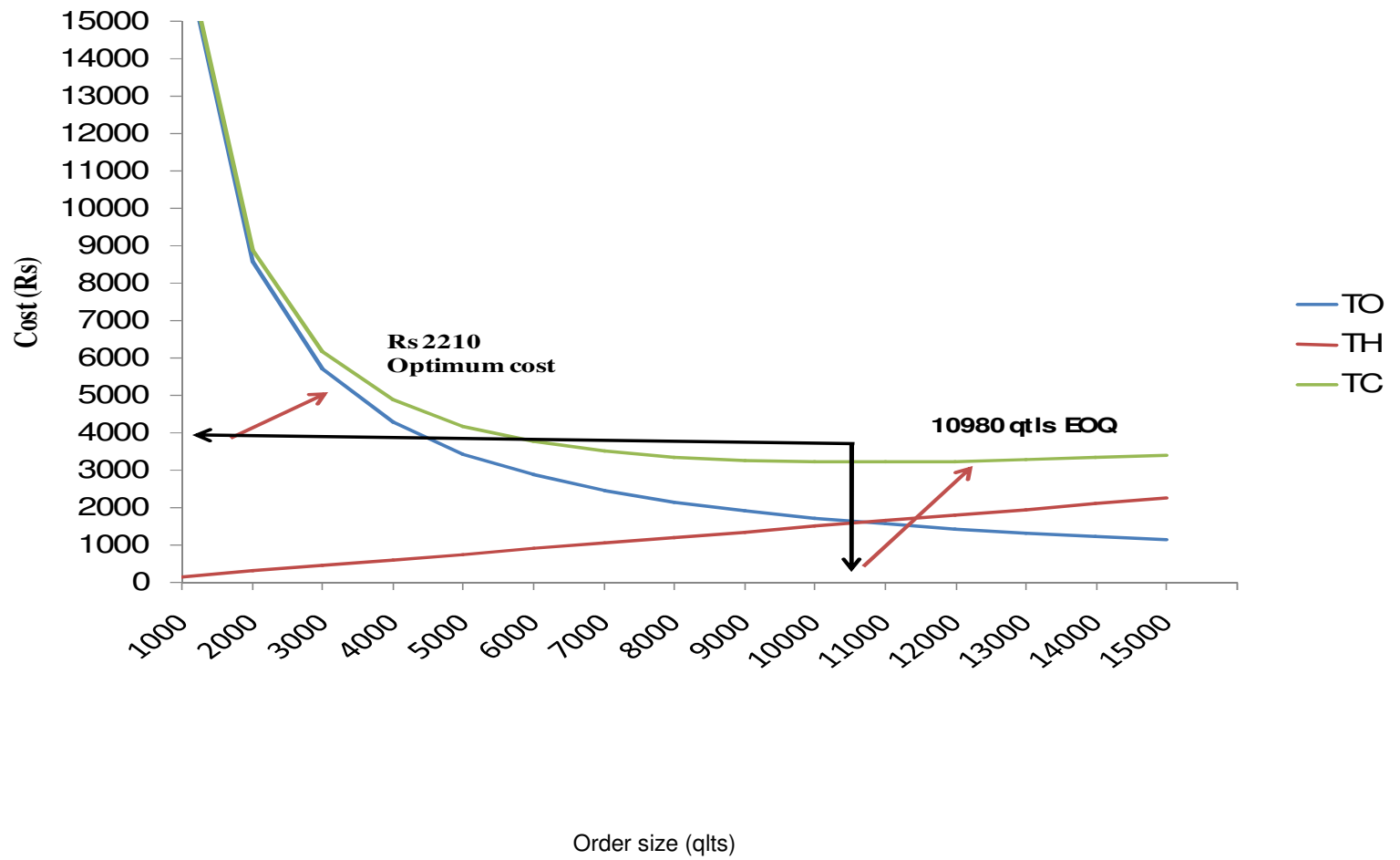


Fig.8. Economic order quantity model for modern unit 3

Table 4.11: Costs incurred in procurement of paddy for rice milling

(Rs per quintal)

Sl. No.	Particulars	Conventional unit				Modern unit			
		Channel 2	% of total	Channel 2	% of total	Channel 1	% of total	Channel 2	% of total
	Purchase price	1320.00		1380.00		1400.00		1450.00	
1	Purchase tax	2640	34.82	27.60	27.89	28.00	32.55	29.00	27.05
2	Commission	-	-	27.60	27.89	-	-	29.00	27.05
3	Market fee	19.80	26.13	20.70	20.90	21.00	24.42	21.75	20.29
4	Transport and handling	09.00	11.90	05.00	05.10	12.00	13.96	05.00	04.67
5	Packing material	15.00	19.80	16.00	16.16	18.00	20.95	20.00	18.65
6	Cleaning and weighing	05.50	07.30	02.00	02.02	07.00	08.15	02.50	02.34
	Total	75.80	100	99.00	100	86.00	100	107.25	100

Note: Channel 1: Farmers → millers.

Channel 2: Commission agents → millers.

Table 4.12. Costs incurred in procurement of paddy for poha making

(Rs per quintal)

Sl. No.	Particulars	Conventional unit				Modern unit			
		Channel 1	% of total	Channel 2	% of total	Channel 1	% of total	Channel 2	% of total
1	Purchase price	950.00	-	1000.00	-	1000.00	-	1045.00	-
2	Purchase tax	19.00	33.78	20.00	26.32	20.00	31.75	20.90	25.82
3	Commission	-	-	20.00	26.32	-	-	20.90	25.82
4	Market fee	14.25	25.33	15.00	19.74	15.00	23.80	15.66	19.34
5	Transport and handling	08.00	14.23	05.00	06.6	12.00	19.05	06.50	08.02
6	Packing material	15.00	26.66	16.00	21.05	15.00	23.80	16.00	19.76
	Cleaning and weighing	-		-		01.00	00.01	01.00	01.23
	Total	56.25	100	76.00	100	63.00	100	80.95	100

Note: Channel 1: Farmers → millers.

Channel 2: Commission agents → millers.

Table 4.13: Cost of processing paddy into rice and poha

(Rs per quintal of paddy processed)

Sl no	Particulars	Conversion into rice				Conversion into poha			
		Conventional unit		Modern unit		Conventional unit		Modern unit	
		Amount	% of total	Amount	% of total	Amount	% of total	Amount	% of total
1	Power, fuel and water	54.00	42.60	62.75	31.95	05.00	14.16	06.00	14.64
2	Salaries	02.00	01.58	03.95	02.01	03.25	09.21	03.50	08.53
3	Administrative costs	01.25	00.99	02.75	01.40	00.80	02.26	01.10	02.68
4	Interest on a)working capital	55.00	43.40	105.00	53.45	15.00	43.00	18.00	43.90
	b)fixed capital	11.00	08.70	15.00	07.63	08.00	22.66	08.50	22.93
5	Depreciation on a)Buildings at 5%	01.50	01.20	02.00	01.01	02.50	07.08	03.00	07.32
	b)Machinery and equipments at 10%	02.00	02.00	04.95	02.52	00.75	02.13	0.90	02.20
	Total cost	126.75	100	196.40	100	35.30	100	41.00	100

buildings and depreciation on machinery ranged between 1 to 2.5 per cent for the two types of mills

With regard to cost of converting paddy into poha, the interest on working capital and fixed capital had major share in both the conventional and modern units. While, the interest on working capital accounted for around 43 per cent of total poha making costs in conventional units, its share was 44 per cent in modern units. As regards interest on fixed capital, the shares were 22.6 per cent and 22.95 per cent in the total processing costs, respectively, for conventional and modern units. It was the cost of power, fuel and water which occupied the third position in the total cost of poha making in rice milling units. It accounted for around 14.16 per cent in the processing cost in conventional units and 14.64 per cent in respect of modern units. Another cost component which accounted for considered share in poha making costs was the depreciation for buildings (around 7.5 per cent). With regard to salaries, it can be seen from the table that its proportion in the total processing cost varied considerably from 8.5 per cent in modern to 9 per cent in Conventional units.

4.4.3 Returns from paddy processing

Table 4.14 presents returns from paddy processing. The table presents the returns separately for rice making and poha making in respect of both conventional and modern. The products from rice making process were head rice, broken rice, bran and husk. In poha making process, the products obtained included poha, broken and husk. The table reveals that the conventional units enjoyed a total return of Rs 1850 by processing one quintal of paddy into rice. This total returns consisted of Rs. 1617 from the sale of head rice, Rs 131.25 from sale of broken rice, Rs 91 from sale of bran and Rs 10 from sale of husk. These components of the total returns were the result of realization of 66 kgs of head rice, 10.5 kgs of broken rice, 7 kgs of bran and 16.5 kgs of husk from processing of one quintal of paddy. It is also clear from table that the products sold at Rs 24.5 per kg, Rs 12.5 per kg, Rs 13 per kg and Re 0.6 per kg respectively. The results pertaining to returns from rice making differed considerably in respect of modern units. The total returns from converting one quintal of paddy into rice were Rs 2105 in modern units, which was larger by Rs 255 when compared to conventional units. This differential result was on account of variation in the returns realized across different products. For example, while the sale of head rice fetched the modern units Rs1948 (an increase of Rs.33 when compared to conventional units). The sale of bran fetched Rs104 (an increase of Rs 13). However, it may be noted that returns for the modern units from the sale of broken rice were much less at Rs 43.75 compared to Rs131. 25 in respect of conventional units .These varying results in respective modern units were given rise to (i).increase in the yield of head rice as well as its price . (ii) increase in the yield of bran and (iii).fall in yield of broken rice. The returns from husk in respect of modern units were marginally less by just Re 1.

With regard to poha making process, the returns from the processing one quintal of paddy were again higher in modern units (Rs.1477) compared to conventional units. (Rs.1382). The higher returns from poha making in modern units arose mainly from marginally higher poha yield of 72 kgs as compared to 71 kgs of conventional units and marginal higher price Rs.19 per kg compared to Rs.10 per kg in conventional units. While the returns from the sale of broken were slightly higher in modern units by Rs 5.5, the returns from the sale of husk in modern units were marginally lower by Re 0.75.

4.4.4 Marketing costs of rice and poha incurred by rice mills

Table 4.15 presents cost incurred in marketing of rice by conventional units and modern units. The marketing costs are presented separately for 2 channels, namely, channel - 1(sale of rice at mill gate) and channel- 2 (sale of price in open markets). It can be seen from table that, the total cost of marketing per quintal of rice was higher for modern units than for conventional units. While, the marketing costs amounted to Rs 114.75 per quintal and Rs 164.75 per quintal of rice for modern units, the corresponding numbers for channel-1 and channel- 2 for conventional units were Rs 105.75 and Rs 120.75 per quintal. An examination of the components of marketing costs reveals that, sales tax formed the major proportion in the total marketing cost. It was Rs 49 per quintal of rice sold by conventional units and Rs 53 per quintal in modern units. The next largest component of marketing costs at Rs 1.5 per cent of sales price was market price, which amounted to Rs 36.75 per quintal in conventional and Rs 39.75 per quintal in modern units. Next in the order of magnitude was the cost incurred in

Table 4.14: Returns from paddy processing

(Rs per quintal of paddy processed)

Sl. No.	Particulars	Conventional unit			Modern unit		
		Quantity * produced (kgs)	Price (Rs/ kg)	Value (Rs)	Quantity * produced (kgs)	Price (Rs/ kg)	Value (Rs)
Rice making process							
1	Head rice	66.00	24.50	1617.00	73.50	26.50	1947.80
2	Broken rice	10.50	12.50	131.25	03.50	12.50	43.75
3	Bran	07.00	13.00	91.00	08.00	13.00	104.00
4	Husk	16.50	00.60	10.00	15.00	00.60	09.00
	Total **			1849.50			2104.55
Poha making process							
1	Poha	71.00	18.00	1278.00	72.00	19.00	1368.00
2	Brokens	08.50	11.00	93.50	09.00	11.00	99.00
3	Husk	20.50	00.50	10.25	19.00	00.50	09.50
	Total**			1381.75			1476.75

*Quantity produced by processing one quintal of paddy

** Total returns from processing a quintal of paddy.

Table 4.15: Marketing costs of rice and poha incurred by rice mills

(Rs per quintal of rice/poha)

Sl no	Particulars	Rice milling process				Poha making *	
		Conventional unit		Modern unit		Conventional unit	Modern unit
		Channel 1	Channel 2	Channel 1	Channel 2		
1	Sales tax and turnover tax @ 2% of sale price.	49.00	49.00	53.00	53.00	36.00	38.00
2	Market fee @ 1.5% of sale price.	36.75	36.50	39.75	39.75	27.00	28.50
3	Transportation	-	15.00	-	50.00	-	-
4	Packing material	20.00	20.00	22.00	22.00	17.00	17.50
5	Total	105.75	120.75	113.25	114.75	80.00	84.00

Note: Channel 1: Millers → traders at mill gate

Channel 2: Millers → open markets

*Poha was sold only at mill gate.

packing material. It was found to be uniform at Rs 20 per quintal across the channels under conventional and modern units. Another component of marketing costs shown by the table is transportation. However, this cost was pertinent only for channel -2 and not for channel -1, since the latter involved sale of rice at the mill gate itself. The transportation cost in channel- 2 was much higher for modern units at

Rs 50 per quintal compared to Rs 15 per quintal in respect of conventional units.

4.4.5 Marketing costs of by products

Table 4.16 presents marketing costs of byproducts of rice milling units, namely, bran, brokens and husk. The only two components of marketing costs for the above products were sales tax at 2 per cent of sale price and cost on packing material. However, it was only bran in respect of which sales tax was paid by the rice mills at Rs 26 per quintal with regard to packing material, the total cost incurred in respect of bran, brokens and husk was Rs 51, Rs 20 and Rs 25 per quintal, respectively.

Table 4.17 presents the net returns realized by the conventional and modern rice mills from rice milling and poha making. As for rice milling process, the rice mills had two channels to dispose of rice, namely, disposal at the mill gate and disposal in the open market. It may, however, be noted that the sale of byproducts like bran, husk etc took place only at the mill gates. The results revealed that the gross returns (from the sale of products obtained by processing one quintal of paddy were to the tune of Rs 1850 in both the channels for conventional units and Rs 2104.55 in both the channels for modern units. Cost of paddy consists of paddy purchase price, paddy procurement cost and paddy inventory cost varied across the channels and units. For conventional units, cost of paddy per quintal was Rs 1399 in channel-1 and Rs 1482 in channel-2. In respect of modern units, paddy cost was Rs 1489 in channel-1 and Rs 1560 in channel-2. The total marketing costs, which constituted of cost of selling rice, bran, husk and brokens, happen to be Rs 81.30 in channel-1 and Rs 91.20 in channel-2 for conventional units. However, the total marketing costs were much higher for modern units at Rs 103.80 for channel-1 and Rs 140.60 for channel-2. The net returns varied considerably across units and channels. It can be seen from the table that, the net returns from the sale of the products obtained by processing one quintal of paddy were of the order of Rs 242.5 in channel-1 and Rs 149.50 in channel-2 of conventional units. These numbers were Rs 315.5 and Rs 205.60 for channel-1 and channel-2 respectively of modern units.

In respect of poha making, the gross returns from the sale of poha, obtained by processing one quintal of paddy varied from Rs 1381.75 in respect of conventional units to Rs 1476.75 in respect of modern units. The cost of paddy was Rs 1084.32 and Rs 1123.40 in conventional and modern units. The total costs of processing one quintal of paddy, which comprised cost of paddy, processing cost and marketing cost happen to be Rs 1183.24 in conventional poha making process and Rs 1231.35 in modern poha making process. The net returns were Rs 198.50 for conventional units and Rs 245 for modern units from processing one quintal of paddy into poha.

4.18 Financial ratios of rice milling units

Table 4.18 presents the financial ratios computed in respect of conventional and modern units for three years. The solvency ratios analyzed included total liabilities to owned funds ratio and fixed assets to owned funds ratio. Total liabilities to owned funds ratio showed increasing trend in respect of both conventional and modern units.

Solvency ratios included total liabilities to owned funds ratio and total assets to owned funds ratio, the values of these ratios were 1.39, 1.43 and 1.48 for conventional units during the year 2005-06, through 2007-08. The average ratio for the three years was 1.43. The corresponding numbers for the modern units were 0.67, 0.79 and 0.81 with an average of 0.75. The other solvency ratio, namely, fixed assets to owned funds ratio turned out to be 1.00 for 2005-06, 1.06 for 2006-07 and 0.80 for 2007-08, with an average for the three years of 0.95. These numbers in respect of modern units were at 1.08, 0.99 and 1.13 for the corresponding years. The computed liquidity ratios included liquid assets to total assets ratio and current assets to current liabilities ratio. The former was 0.35, 0.37 and 0.34 for 2005-06, 06-07 and 07-08, respectively. While they were of the order of 0.57, 0.63 and 0.64 for modern units. The current assets to current liabilities ratio was found to be 2.12, 1.25 and 1.31 for the above years, the average ratio was 1.56. This ratio took the higher value in the case of

Table 4.16: Marketing costs of by products

(Rs per quintal)

Sl. No.	Particulars	By products		
		Bran	Brokens	Husk
1	Sales tax and turnover tax	26.00	-	-
2	Packing material	25.00	20.00	25.00
3	Total	51.00	20.00	25.00

Table 4.17: Net returns realized by rice mills

(Rs per quintal of paddy processed)

Sl. No.	Particulars	Rice milling process				Poha making process	
		Conventional unit		Modern unit		Conventional unit	Modern unit
		Channel 1 ¹	Channel 2	Channel 1	Channel 2		
1	Gross returns ²	1849.50	1849.50	2104.55	2104.55	1381.75	1476.75
2	Cost of paddy ³	1399.00	1482.20	1488.85	1560.00	1084.32	1123.40
3	Processing cost	126.75	126.75	196.40	196.40	35.30	41.00
4	Marketing cost ⁴						
	a) Rice/poha	69.80	79.70	84.33	121.08	56.80	60.40
	b) Husk	04.95	04.95	10.50	10.50	05.12	4.75
	c) Bran	03.92	03.92	04.48	04.48	-	-
	d) Brokens	02.62	02.62	04.50	04.50	01.70	01.80
	e) Total	81.29	91.19	103.81	140.56	63.62	66.95
5	Total cost	1607.04	1700.15	1789.06	1896.96	1183.24	1231.35
6	Net returns	242.46	149.35	315.50	207.60	198.50	245.00

NA: Not applicable.

1. Channel 1: sale of rice at mill gate

Channel 2: sale of rice in open markets

2. Overall gross returns from main products and by products (refer table 4.14)

3. Cost of paddy includes paddy purchase price, cost of procurement and inventory cost. Paddy purchase price and procurement price used above are the average for two channels. (Refer table 4.11 and 4.12).

4. Table 4.15 and 4.16 provide per quintal marketing costs of rice, poha and its by products. Using this information, marketing costs in the above table were computed for the product quantities obtained by processing one quintal of paddy.

Table 4.18: Financial ratios in respect of conventional and modern rice mills

Ratios	Conventional unit			Average	Modern units			Average
	2005-06	2006-07	2007-08		2005-06	2006-07	2007-08	
Solvency ratios								
Total liabilities to owned funds	1.39	1.43	1.48	1.43	0.67	0.79	0.81	0.75
Fixed assets to owned funds	1.00	1.06	0.80	0.95	1.08	0.99	1.13	1.06
Liquidity ratios								
Liquid assets to total assets	0.35	0.37	0.34	0.35	0.57	0.63	0.64	0.61
Current assets to current liabilities	2.12	1.25	1.31	1.56	3.74	3.81	4.23	3.92
Profitability ratios								
Net profits to fixed assets	0.14	0.19	0.22	0.18	0.41	0.49	0.57	0.51
Net profits to owned funds	0.19	0.17	0.33	0.23	0.43	0.52	0.61	0.52

modern units with an average of 3.92 for three years. Under profitability ratios, net profits to fixed assets and net profits to owned funds ratio were calculated. The first ratio ranged from 0.14 in 2005-06 to 0.22 in 2007-08 in respect of conventional mill and from 0.41 in 2005-06 to 0.57 in 07-08 in respect of modern units. The net profits to owned funds ratio was considerably higher in 2007-08 (0.33) when compared to 2005-06 in the case of conventional units. The similar pattern was observed in the case of modern units also, where the value in 2007-08 was much higher at 0.61 compared to 0.43 in 2005-06.

4.5 Problems faced by the processors of paddy processing units.

Opinion of sample processors regarding problems associated with processing of paddy was presented in table 4.19.

Taxation was the major problem faced by the processors in paddy processing units. All the processors (100 %) expressed that the existing market fee, commission charges and taxation were high and need to be rationalized. Procurement of raw material formed another problem as more than 72 per cent of the paddy mill owners viewed it as a problem followed by difficulties in the availability of labor. The lack of suitable system to get the required capital for the paddy processing unit coupled with high cost of working capital was also continued as a problem by more than 66.66 per cent of the paddy processing units. Inadequate supply of power is one of the major problem faced by the paddy processors. Majority of the processors (66.66 %) including both conventional and modern units have complained about the poor supply of power. This has resulted in under utilization of the capacity in the paddy processing units.

Table 4.19: Problems faced by the rice milling units

Sl. No.	Particulars	Conventional units (n=9)	Modern units (n=9)	Total units (n=18)
1	Problems regarding taxation	9 (100)	9 (100)	18 (100)
2	Interruption in power supply	7 (78.00)	5 (54.95)	12 (66.66)
3	Difficulties in labour availability	8 (89.00)	5 (56.00)	13 (72.22)
4	High costs of paddy procurement	7 (78.00)	6 (66.66)	13 (72.22)
5	Transportation problems	6 (66.65)	3 (33.33)	9 (50.00)
6	High cost of working capital	7 (77.77)	5 (56.00)	12 (66.66)
7	High processing cost	7 (77.77)	4 (44.50)	11 (61.11)
8	Problems regarding repairs and maintenance	6 (66.66)	3 (33.34)	9 (50.00)

The problems regarding high processing cost were reported by 61.11 per cent. This was followed by problems regarding the repairs and maintenance. The respondents felt that the problem of repairs and maintenance was very high (66.66 %) in conventional units in comparison with the modern processors.(34.34 %).

5. DISCUSSION

5.1 Investment pattern and financial feasibility in rice mills

5.1.1 Investment pattern in rice milling units

Table 4.1 indicated that there was a direct relationship between the total capital investment and size/capacity of the processing units. The total capital investment was higher in modern units than in the conventional units. The requirement of capital investment increased with the increase in size of the units because of the increased requirement of land, building, machinery and other fixtures on the one hand and the increased requirement of working capital on the other. This was also observed by Singh and Sindhu (1974) in the case of groundnut processing. It can be seen that the fixed capital investment on the rice milling units was higher on machinery and equipments (54.10 %) followed by buildings (34.14 %), land (6.76 %), infrastructures (1.47 %) and other fixtures (0.62 %). This is with regard to conventional units. The capital investment in the case of modern units was much higher on machinery and equipments to the tune of (71.10 %) followed by buildings (25.08 %), land (2.01 %), infrastructures (1.00 %) and other fixtures (0.85 %). The higher capital investment of Rs.379.25 lakhs in the case of modern units which was ten times higher than in conventional units (Rs.36.97 lakhs) was due to larger number of machineries installed, different types of machines like aspirators, separators, driers, graders, etc, high- tech machineries and larger quantity of raw materials handled. This is in accordance with the findings of Bawa and Kainth (1989) and Kalse *et al.* (1996).

Higher investment on land and buildings in the case of modern units when compared to conventional units was due to more working space required for processing units. Since the size of the modern units is very large i.e. 6 times larger than that of conventional units i.e. 30 quintal per hour capacity, more working space is required for machineries installation and storage structures to store raw materials.

Since the size of the conventional rice mills is very small (5 quintals per hour) and they follow the traditional methods of processing without any separators, driers, aspirators etc, the investment on machineries and land was found to be less compared to modern rice mills. The fixed capital investment was lowest on other fixtures like almeras, lockers and electrical installations in the case of conventional units (Rs.0.55 thousand) due to less administrative staff required in these units as compared to modern units (Rs.1.25 lakhs).

5.1.2 Staffing pattern in rice mills

As observed from the table 4.2, there were 17 staff persons in the case of conventional units as compared to 23 in the case of modern units. This indicated that the manpower requirement was higher in modern rice mills as compared to conventional mills. We can see from the table that manager, technician and supervisor were appointed by the modern units and not by the conventional units. This was because of huge size of the modern mills, range of activities involved in the milling process, larger quantity of input and output, involvement of different types of machineries etc. We can also see that in modern mills, helper/purchaser was appointed additionally, to assist the procurement of large quantity of raw materials and other milling activities.

Since the size of the conventional rice milling units was very small compared to modern units, the owner of the mill himself performed the activities of manager, supervisor and helpers/purchaser along with his family members. Further, the number of skilled laborer was six in modern units as compared to four in conventional units this was because of involvement of hi-tech machineries and their handling in the former.

Since the conventional units were operated manually i.e. the activities like drying, cleaning, separating etc. were done manually, the unskilled labour requirement was more in the case of conventional units (10) as compared to modern units. Thus, the results pointed out that the overall employment generation was higher in modern mills in comparison with the conventional mills.

5.1.3 Financial feasibility of rice milling units

The results depicted in the tables 4.3 and 4.4 showed that the initial investment in conventional rice milling units would amount to Rs 36.47 lakhs, and it would be Rs 379.25 in the case of modern units. In both the cases, it was found that cash outflows would increase over the years during the life of the project; this is mainly due to the expected increase in the costs associated with huge raw materials like paddy, labor, power charges etc. In a similar way, there would also an increase in cash inflows over the life of the project. This is due to the fact that the capacity of the processing plants would be used to the larger extent with the passage of time and that there would be continuous increase in the demand as well as prices of the rice and its by products. The net cash flows would be lowest in the first and second year; it was mainly due to the non availability of adequate quantity of raw materials like paddy and labour. The reason for increasing net cash flows over the years as predicted by most of the processors was high demand for rice, bran and husk in the market. Since bran is an important raw material for edible bran oil and husk is used as fuel, there is a greater demand for these products in the international markets.

Table 4.5 presents the financial feasibility analysis for rice milling units. This analysis was carried out using analytical techniques viz., the Net Present Value, Benefit Cost Ratio, Internal Rate of Return and Payback Period.

Net present value

The net present value in modern units was higher than in the conventional units. It was Rs 27.55 lakhs for conventional unit and Rs 408.35 lakhs for modern unit. It was mainly due to two important factors in modern unit viz., relatively lower maintenance costs and higher returns.

Benefit cost ratio

The benefit cost ratios were 2.00 for conventional unit and 2.08 for modern unit. This implied that for every one rupee invested in conventional rice mill, there would be net returns of Rs 2.00 in present value terms. In respect of modern units, the net returns for one rupee investment would be Rs 2.08. The magnitude of the ratio also indicated the priority to be assigned for investment in modern units. However, since the ratios were greater than unity for both the types of mills, the investment in rice milling units, irrespective of the type, was financially sound and economically feasible.

Internal rate of return

The internal rate of returns indicates the rate of returns that accrues to the investment. It is the rate at which the net present worth of the project is zero. The formal selection criterion with IRR is that it should exceed opportunity cost of capital for the project to be accepted. The internal rate of return for both conventional and modern units happened to be very high at 23.11 per cent and 26.60 per cent, respectively. Since, these values are considerably higher than the cost of capital (16 per cent), both units would be highly financially feasible.

Payback period

The payback period refers to the time required to recover the initial investment in the rice milling units. The results pertaining to payback period were in line with the estimated values of NPV, B-C ratio and IRR. While the payback period happened to be 2.05 years for conventional units, it was 1.75 years for modern units.

Thus, all the criteria of financial feasibility of the project indicated that, irrespective of the type of mills, investment in rice milling units was economically feasible and financial sound in Davangere district of Karnataka. The general inference of the findings was that, investment in modern mills was economically more profitable than that in conventional mills. This is obvious due to the adoption of advanced technology and the economy in scale of processing.

5.2 Processing and marketing management

5.2.1 Capacity utilization

As indicated in table 4.6, the annual installed capacity was 14,400 quintals in the case of conventional units as compared to 1, 20,000 quintals in modern units, but the capacity utilization was 44.05 per cent and 68.90 per cent in conventional and modern units, respectively. Thus, it clearly indicates that the capacity utilization was higher in the case of modern units in comparison with conventional units. The installed processing capacity per day was six times higher of modern units than in conventional units with a marginal increase in the number of working days and the duration of each shift. The quantity processed per day and annual quantity processed was around 13 times higher in the modern units as compared to the conventional.

Kalse *et al.* (1996) also observed higher installed capacity and capacity utilization in respect of modern units compared to conventional units.

The lower capacity utilization of conventional mills compared to modern mills could be attributed to the use of conventional technology i.e. manual method of processing like cleaning, parboiling, drying, grading, packing etc. coupled with unavailability of required inputs like finance, paddy, labour, power etc in time.

5.2.2 Extent of conversion of paddy into rice and poha

Table 4.7 showed the extent of total quantity of paddy handled and its conversion into rice and poha in conventional and modern rice mills.

It can be inferred from the table that out of total quantity of paddy processed by conventional units, nearly 70 per cent was converted into rice and the remaining 30 per cent into poha. However, the proportion of total quantity of paddy converted into rice by modern units was higher at 55 per cent as such; modern units processed only 45 per cent of procured paddy into poha.

5.2.3 Product recovery in rice mills

Table 4.8 showed different by products recovered along with main product in both the conventional and modern rice mills in the process of rice milling and poha making. Because of the hi-tech machinery in the case of modern units, the recovery percentage of main product i.e. head rice was higher (73.5 %), compared to conventional units (66 %). Owing to conventional method of milling and poor quality of paddy procured, the recovery percentage of broken rice was higher (10.5 %) in conventional units, in comparison with the recovery percentage in modern mills (3.5 %). Thus, the modern mills are efficient in recovering the head rice and reduce the percentage of brokens. With regard to bran and husk, a larger difference between two types of mills was marginal. The recovery of bran was 7 per cent in conventional units and 8 per cent in modern units. The difference in the recovery of bran was due to hi-tech machineries, which are more efficient in removing the bran content from the rice. In the case of conventional method, the bran is not removed to that extent. We can see from the table that husk recovery was marginal in both types of mills and this marginal difference in the recovery of husk between mill types was due to technology involved in the modern units and also dependent on the quality of the paddy. The husk percentage is generally less in superfine quality paddy which is procured by the modern units, and more in the case of paddy which is procured by the conventional units.

Similarly in respect of poha making process, the recovery of poha, brokens and husk was almost the same in conventional units and modern units. This similarity in the yield of poha between mills is mainly on account of similar technology used in poha making. The age old method of boiling, pounding and drying was followed in both the conventional and modern units.

5.3 Paddy inventory management in rice milling units

5.3.1 Paddy storage and inventory costs

Table 4.9 showed that the conventional units on an average stored 6343 quintal of paddy per annum in comparison with 82640 quintals by modern units. This was because of

direct relationship between the capacity/size of the mill and raw material requirement. Since the quantity processed per day was more in modern units (330.60 quintals) as compared to conventional units (26.45 quintals), the velocity of processing paddy was higher in the case of modern units and as a result, the storage days were less in modern units (60 days) as compared to conventional units (98 days).

Coming to the inventory costs, the average annual storage cost of paddy was four times higher (Rs.1.20) in the case of conventional units as compared to modern units (Re.0.30). The reason attributed for this difference in the storage cost is the lack of storage structures and storage facilities with the conventional millers; hence, these units go in for hiring the godowns, which costs around Rs.1.20 for one quintal of paddy stored.

The situation was different in the case of modern units. They had their own storage structures. Because of handling a large quantity of raw material which was 13 times higher (82640 quintals) than in the conventional units (6343 quintals) and the resultant economies of scale, the storage cost per quintal (Re 0.30) was found to be less in modern units in comparison with the conventional units (Rs.1.20). Similar observation was made by Amrutha (1994).

5.3.2 Economic order quantity (EOQ) model of paddy inventory management

Table 4.10 presented the results of economic order quantity (EOQ) model which was used to examine the quantity of paddy to be ordered and the frequency of ordering that would result in minimization of the total cost of ordering. The results pertaining to conventional units indicated that the annual demand of paddy hovered around 5000 quintals to 6000 quintals per annum. As per the analysis of EOQ model, the results revealed that the maximum frequency of ordering was 4.35 times in the case of mill two and minimum frequency was 3.83 times in the case of mill three. The cost minimizing ordering quantity revealed by the analysis was 980 quintals, 995 quintals and 1275 quintals in respect of mill one, two and three, which were associated with the optimum ordering cost that ranged from Rs 1540 (mill 3) to Rs 1700 (mill 2).

The EOQ model results naturally revealed larger economic order quantity and larger optimum costs, when compared to the conventional mills. These differences arose on account of larger demand for paddy and larger costs involved in holding the procured raw material. As such mill three which had the largest demand of 86000 quintals for paddy was prescribed seven times ordering in a year so as to keep its ordering cost at minimum that is Rs 10980 similarly, mill one requiring least quantity of paddy per year (around 32000 quintals) among the modern mills was suggested to place an order of 6910 quintals each time and keep its cost minimum at Rs 2054 per order. Another modern unit that is mill two which had intermediate demand for paddy at 39300 quintals per annum was advised to order raw material around six times a year at 7200 quintals per order and keeping its inventory cost minimum at Rs 3215.5 per order.

5.4 Costs and returns structure in rice mills

5.4.1 Costs incurred by conventional and modern units in paddy procurement

Tables 4.11 and 4.12 presents costs incurred by rice mills in paddy procurement for rice milling process and poha making process. The results are available in the tables for both conventional unit and modern unit with respect to two identified channels that is channel-1 and channel-2. While channel-1 pertained to procurement directly from farmers, channel-2 involved purchase by the mills from commission agents. The three components of the cost, namely, purchase tax, commission and market fee were computed as a fixed percentage of the cost of one quintal of paddy. These percentages were 2 per cent, 2 per cent and 1.5 per cent in respect of purchase tax, commission and market fee respectively. It may be noted from the table that in channel-1 the mills do not have to pay any commission since the purchase was directly from farmers. Another noteworthy thing observable from the table is considerable difference in cleaning and weighing charges between channel-1 and channel-2 in respect of both conventional and modern units. These charges were higher in respect of channel-1 compared to channel-2. For example, while the conventional mills have to spend Rs 5.5 per quintal for cleaning and weighing the produce purchased from the farmers they

have to spend only Rs 2 per quintal when purchased from commission agents. Similarly, the modern mills spent Rs 7 per quintal when purchasing from farmers and only Rs 2.50 when purchasing from commission agents. This clearly indicated that the produce supplied by the farmers to the mills was probably not well cleaned, which require the millers to spend good sum of money to make the produce fit for milling. Both conventional and modern mills have to spend less money on transportation and handling. When purchasing from the commission agents compared to the expenditure on these accounts when purchasing from farmers. This observation highlights the fact that the mills had to get the produce from the paddy producers scattered at different places away from the mill. However, on the whole, the mills had to spend more towards paddy procurement when relying on channel-2 instead of channel-1 mainly on account of the additional cost component pertaining to the commission charges. The total procurement cost amounted to around Rs 76 per quintal in channel-1 and Rs 99 per quintal in channel-2 in respect of conventional units and Rs 86 per quintal in channel-1 and Rs 107 per quintal in channel-2 in respect of modern units.

5.4.2 Cost of processing paddy into rice and poha.

Table 4.13 presents costs incurred on various components in processing of one quintal of paddy into rice and poha. The results are presented separately for conventional and modern units. The table revealed that the three major components of processing costs comprised of interest on working capital, interest on fixed capital and power, fuel and water charges. In rice milling as well as poha making process, by both conventional and modern units, interest on working capital was the largest cost component accounting for more than 43 per cent of the total processing costs of both conventional and modern units. Power, fuel and water charges occupied the second largest place among the costs in the case of rice milling by conventional and modern units. However, it was the interest on working capital which occupied the second position in respect of poha making (more than 22 %). While interest on fixed capital was the third most significant processing cost for conventional and modern units in the process of rice milling (around 8 % of the total processing costs), it was power, fuel and water charges which were third in order for the process of converting paddy into poha (around 14 % of the total cost). This particular observation pointed out to the fact that requirement of power and fuel was not as significant for poha making as for rice milling. While the costs associated with salaries and depreciation on buildings ranged between 1 to 2 per cent of the total processing cost of milling rice by both conventional and modern rice mills. These costs were much higher when converting paddy into poha and ranged between 7 to 9 per cent of the total processing costs. Overall, the total processing cost per quintal of paddy amounted to Rs 127 per quintal for conventional unit and Rs 196.40 per quintal for modern unit by processing rice from paddy and Rs 35.30 for conventional unit and Rs 41 for modern unit while processing paddy into poha.

5.4.3 Returns from paddy processing

Table 4.14 depicts returns from paddy processing. The table shows the quantities of head rice, broken rice, bran and husk produced by processing one quintal of paddy into rice and quantity of poha, brokens and husk produced by processing one quintal of paddy along with their sale prices and returns. Because of the difference in the technology, while one quintal of paddy yielded 66 kgs of head rice in conventional units, it yielded around 74 kgs of head rice in modern units. This difference in head rice naturally resulted in the output of larger quantity of broken rice (10.50 kgs) per quintal of paddy processed in respect of conventional unit and only 3.50 kgs in modern units. The yield of bran and husk are marginally different between conventional and modern units in rice making process. It is clear from the table that the modern units could also realize higher price per kg of head rice (Rs 26.50) than the conventional units (Rs 24.50). This difference between the price of head rice occurred on account of difference in the rice quality. The prices of brokens, bran and husk did not differ between the two types of mills. Overall, the modern mills realized a return of Rs 2105 from the products obtained by processing one quintal of paddy as against Rs 1815 obtained by conventional units.

In respect of poha making, the products obtained were poha, brokens and husk. The yield of poha obtained by processing one quintal of paddy was only marginally higher at 72 kgs in modern units as against 71 kgs in conventional units. While the brokens were almost all the same between the units, husk quantity realized was 1.5 kg more per quintal of paddy

processed in conventional units than in modern units. While the prices of bran and husk remained the same for two types of mills, poha fetched slightly higher price per kg (Rs 19) in modern units compared to conventional units (Rs 18). In poha making also the modern units realized higher returns per quintal of paddy processed (Rs 1477) than conventional units (Rs 1382).

5.4.4 Marketing costs of rice and poha incurred by rice mills.

Table 4.15 presented the costs incurred in marketing of rice by conventional and modern units. The rice is marketed through two different channels, channel-1 (sale of rice at mill gate) and channel-2 (sale of rice in open markets). It can be seen from the table that, the total cost of marketing per quintal of rice was higher for modern units than for conventional units. The marketing costs amounted to Rs 114.75 per quintal and Rs 164.75 per quintal of rice for modern units, and the corresponding numbers for channel-1 and channel-2 were Rs 105.75 and 120.75 for conventional units. Among the different items of cost, sales tax and turnover tax (2 per cent) and commission (2 per cent) were the major cost items constituted more than 50 per cent each of the total cost of marketing, because of high rate of taxation and commission. Hence, there is a need to reduce the tax rate and commission charge in order to encourage the increase in marketing of products.

The cost of marketing per quintal of rice was found to be higher through channel-2 (sale in open markets), that is Rs 120.75 in the case of conventional units and Rs 164.75 in modern units. The reason for the higher cost in marketing of rice through channel-2 was higher transportation costs, incurred by the mills. Similar observations were made by Mahesh.V.Chidri (1999). As a result of more value for the products of modern mills, tax and commission would be higher along with high transportation cost. Thus, the cost of marketing per quintal of rice was high in modern mills than conventional units.

With respect to marketing of poha, it was sold at the mill gate itself. The marketing cost incurred in marketing poha was amounted to Rs 80 in the case of conventional units and it was Rs 84 in modern units, which was higher compared to conventional units. There was no commission but the tax and market fee were paid, which resulted in high marketing costs.

With respect to marketing of by products like bran, husk and brokens, sales tax and cost of packing material are the only two components of marketing costs. The total costs incurred in marketing the byproducts were amounted to Rs 51, Rs 20 and Rs 25 for bran, brokens and husk respectively, however, the marketing cost of bran was found to be higher compared to husk and brokens, because of sales tax (2 per cent) on the value of bran.

5.4.5 Net returns realized by rice mills

Table 4.17 presents the results pertaining to net returns realized by rice mills from processing one quintal of paddy. As such gross returns in the table pertained to the returns obtained from the sale of main products as well as by products obtained by processing one quintal of paddy by both conventional and modern units in rice milling as well as poha making. Cost of paddy in the table refers to the sum of the paddy purchase price, procurement price and inventory costs. Similarly, marketing costs in table refers to the costs associated with the sale of main products (rice/ poha) and by products like husk, bran and brokens. The total costs stand for the sum total of cost of paddy, processing cost and marketing cost. With regard to rice milling process, the table reveals that the returns from the sale of all the products obtained from processing one quintal of paddy fetched Rs 1849.50 in respect of conventional units (same for channel-1 and channel-2) and Rs 2105.55 in modern units. This difference in gross returns between two types of mills could be attributed to higher yield of head rice and better price enjoyed by the modern mills. The cost of paddy was higher for the channel-2 compared to channel-1 for both conventional and modern units. The higher cost of paddy in respect of channel-2 was on account of commission charges paid by the mills. The processing cost per quintal of paddy was Rs 126.75 for conventional units and Rs 196.40 for modern units. The higher costs associated with power, fuel and water charges were mainly responsible for higher processing costs in respect of modern mills. The total marketing costs were higher in channel-2 as compared to channel-1 in respect of both conventional and modern units (Rs 91.91 as against Rs 81.29) and modern units (Rs 140.56 as against Rs 103.81). The differential marketing costs between channel-1 and channel-2 were mainly on account of the costs associated with transporting rice to the markets. The implications of all

these in rice milling was that the conventional units could get the net returns of Rs 242 in channel-1 and Rs 149 in channel-2 by converting one quintal of paddy into rice. The corresponding numbers were Rs 316 and Rs 208 for modern units.

With respect to poha making process, the table revealed that the gross returns from the sale of poha and by products obtained from processing of one quintal of paddy varied from Rs 1382 in conventional units to Rs 1477 in modern units, while the cost of paddy varied from Rs 1084 in conventional unit to Rs 1123 in modern unit. The processing cost varied from Rs 35.30 to Rs 41. Further, there was variation in the total marketing costs of main products and by products between the two types of units. While the marketing costs amounted to Rs 63.60 for disposing the products obtained by processing one quintal of paddy in conventional units, they stood at Rs 67 in modern units. Overall, the net returns realized by processing one quintal of paddy into poha stood at higher level (Rs 245) for modern units for conventional units (Rs198.5).

5.4.6 Business performance of the rice mills

Various financial ratios were worked out to assess the financial performance and are presented in table 4.19. These ratios are solvency ratios, liquidity ratio, profitability ratio and turnover ratios.

Solvency ratios

To determine the solvency position of the rice milling units, two ratios namely, total liabilities to owned funds and fixed assets to owned funds were worked out. The ratio of total liabilities to owned funds reflected the amount of money rice mills owe to its creditors as against the money invested by the owners of the millers that is the extent of debits per rupee of owned funds. Solvency ratios included total liabilities to owned funds ratio and total assets to owned funds ratio. The values of total liabilities to owned funds ratio were 1.39, 1.43 and 1.48 for conventional units during the year 2005-06, through 2007-08. The average ratio for the three years was 1.43. The corresponding numbers for the modern units were 0.67, 0.79 and 0.81 with an average of 0.75. These ratios were found to be higher in the case of conventional units compared to modern units, this indicated that large amount of external funds were borrowed and used by the conventional units. This may be due to low financial base of these units to carry out the various operations in the unit. To know the extent of owned funds tied up in fixed assets, the ratio of fixed assets to owned funds was worked out, which was found within the acceptable limits of 1:1. The ratio turned out to be 1.00 for 2005-06, 1.06 for 2006-07 and 0.80 for 2007-08, with an average for the three years of 0.95. These numbers in respect of modern units were at 1.08, 0.99 and 1.13 for the corresponding years. The values of the ratio here meant that the claims of the creditors on the fixed assets of the conventional units were greater than in the modern units. Thus it can also be said that both type of units have maintained the ratio below the 3, indicating that the units external liabilities are almost in accordance with the better business norms of 3:1, of total liabilities to owned funds. Hence these units have maintained good financial structure.

Reddy Indrasena (1994) has indicated that, a higher value of this ratio was associated with problems of liquidation, because the claims of the creditor have to be met by sale of fixed assets, which are in non-liquid form. Hence the small units make concentrated efforts to increase their owned funds.

Liquidity ratios

Liquidity ratios were worked out to test the ability of the rice milling units to meet the financial obligations. Liquidity plays a prominent role in any business enterprise for meeting immediate financial demands. Two ratios viz., liquid assets to total assets and current assets to current liabilities were worked.

The liquid assets to total assets ratios worked out to be 0.35, 0.37 and 0.34 for the years 2005-06, 06-07 and 07-08 respectively with an average of 0.353 in the case of conventional units. And it was 0.57, 0.63 and 0.645 for the corresponding years with an average of 0.615 in the case of modern units. Generally the ratio of 0.60 to 0.66 is acceptable for a processing industry, in order to meet immediate financial requirement, for purpose of procuring raw material, payment of wages and other expenses. Conventional units had maintained somewhat less of their total assets in the form of liquid assets as

compared to modern units. Hence, the performance of conventional units with respect to liquidity is found to be not satisfactory. Hence, these units should increase liquid assets to meet the immediate financial requirement to achieve higher level of production.

The current condition of the business is indicated by the current ratio i.e. the ratio between current assets and current liabilities. The ratio worked out to be 2.12, 1.25 and 1.31 for the years 05-06, 06-07 and 07-08 with an average of 1.56 in conventional units which indicated that for every rupee of current liability, the amount of current assets available was Rs 2.12, Rs 1.25 and Rs 1.31 in conventional units. In the case of modern units, these ratios were worked out to be 3.73, 3.81 and 4.23 for 2005-06, 06-07 and 07-08, respectively. This showed that the modern units are not much dependent on short term borrowings and hence possessed a good liquidity position when compared to conventional units. Page *et al.* (1970) considered that a current ratio was ideal (3).

Profitability ratios

The liquidity analysis of the rice milling units reveals the ability to meet its financial obligation and as such do not reflect the profitability aspects. Hence, the profitability ratios were used to analyze the overall profitability or efficiency of the business organizations. Two different ratios namely, net profit to fixed assets and net profits to total assets were worked out and compared with selected units.

To determine the income yielding capacity of the fixed assets, the ratio of net profit to fixed assets were worked out to be 0.14, 0.19 and 0.22 for the years 2005-06, 06-07 and 07-08, with an average of 0.183. This indicated that these units were able to generate an income of 18.3 per cent on fixed assets. As in the case of modern units, the ratios were 0.41, 0.49 and 0.57 for the corresponding years, with an average of 0.51 indicating the capacity to generate the income of 51.0 per cent on fixed assets. Thus, the modern units were in a better position to meet the long-term obligations compared to the conventional units.

Net profit to owned funds ratio was used to examine the extent of net profit gain for each rupee of investment. The ratios were found to be 0.19, 0.17 and 0.33 with an average of 0.23 in the case of conventional units as compared to modern units i.e. 0.43, 0.52 and 0.61 with an average of 0.52. This indicates that the modern units were in a position to protect their equity and they had generated the income on the equity when compared to modern units.

5.5 Problems faced by the processors of rice milling units

The prevalence of problems of rice milling units is quite common and the units are no exception. The opinion of sample processors on different problems is discussed in table 4.19.

Majority of the processors viewed that the taxation was the major problem faced by them in paddy processing. All the processors (100 per cent) expressed that the existing market fee, commission charges and taxation were high and need to be rationalized. Procurement of raw material formed another problem as more than 78 per cent of the conventional paddy mill owners viewed it as a problem where as only 66 per cent of the modern millers found it as difficult. The reason attributed for this was the modern millers had a contract with the paddy growers in different places to meet their requirement. Another serious problem was difficulties in the availability of labor, as it was viewed by 72.22 per cent of the millers. The lack of suitable system to get the required capital for the paddy processing unit coupled with high cost of working capital was also continued as a problem by more than 66.66 per cent of the paddy processing units. Inadequate supply of power is one of the major problem faced by the paddy processors. Majority of the processors (66.66 per cent) including both conventional and modern units had complained about the irregular supply of power. This has resulted in under utilization of the capacity in the paddy processing units.

The problems regarding high processing cost were reported by 61.11 per cent. This was followed by problems regarding the repairs and maintenance. The machinery and equipment loses its efficiency over a period of time, hence, repairs and maintenance costs come into picture. Similar were the observations of Jain Hemchand (1989) and Amrutha (1994). The conventional processors felt that the problem of repairs and maintenance was very high (66.66 per cent) in their units as compared to the modern processors.(34.34 per cent), this was due to the additional facility of having their separate organization to overcome this repairs and maintenance problems in the case of modern mills.

6. SUMMARY AND POLICY IMPLICATIONS

Rice is the most important crop of India and second most important one in the world. It is the staple food for more than 3 billion people in Asia, the world's most densely populated region and for hundreds of millions in Africa and Latin America. World area under rice cultivation is around 152 million hectares. With an average per hectare productivity of 3.88 metric tons, the global rice production is 628 million metric tons. India and China are the biggest rice producers in the world with a share of 32.12 per cent and 22.68 per cent of world production in 2006 respectively.

The byproducts which we get from paddy milling are rice bran and husk. The amount of rice bran is approximately five per cent of paddy processed. The rice bran is a pericarp or outer cuticle layer that remains beneath the hull. It gets removed during the milling process. About two decades back, rice bran was considered almost a waste and hence most of it was burnt. It is now viewed to have high nutritive value. Being rich in protein and natural B-Vitamin, rice bran is used as a cattle feed. The rice bran processing has now gained momentum, with increasing consumer demand for bran oil, extracted from bran.

The main purpose of mechanization in the processing is to save labour, precision in processing operations, save time and expenditure on renewable sources of energy and make use of labour optimally, hence, processor must plan the right combination men and machines to perform the task and achieve the cost minimization and maximization of output to compete in international markets.

The sustained growth of any processing industry depends on the viability which is largely determined by the cost of production and management efficiency in processing. The cost of production is one of the important variables influencing the profits which are also an indicator of management efficiency. Rice milling is not an exception to this. Over years, many rice processing units have been closed down in the state, while many other units are performing well. This difference in position clearly points out in-effective management as an important reason among several other reasons. In this context, a comparative analysis of conventional and modern rice mills in Karnataka assumes importance. Such an analysis sheds light on differences that exist in various dimensions of management between two types of mills. Further, such a comparative study reveals the problems faced by milling units in the successful performance of their operations. At present, the studies that address these issues of rice milling in the state are inadequate. The present study is an attempt in this direction. The study addresses the above issues with respect to Davangere district of the state.

Davangere is one of the major paddy growing area, and it has the largest number of rice mills in the state. The district nearly consists of around 110 traditional, 125 modern rice mills. Besides, there is a vast scope for upgradation and modernization of traditional mills for the efficient use of the resources and to increase the efficiency of milling in rice mills in the district. The study was undertaken with the following objectives;

1. To analyze the Investment pattern and financial feasibility of conventional and modern rice milling units.
2. To analyze the processing and marketing management in the selected units.
3. To analyze the paddy inventory management in the selected units.
4. To analyze the costs and returns structure in selected units.
5. To analyze the problems faced by rice mills in processing and marketing operations.

Methodology

To fulfill the objectives of the study, three taluks namely Davangere, Harihar and Honnali were purposively selected from the district as these taluks had a considerable number of rice mills with varying level of integration of milling operations. However, due to the difficulty in eliciting required information from the Integrated rice mills (those units which had integrated bran oil extraction facilities), the present investigation was confined to the conventional and modern rice mills – one each from the selected taluks were selected. Similar selection procedure was followed in respect of modern mills also. Thus, the study, in total, considered six rice mills – three Conventional and three Modern.

The primary data collected from the mill owners related to paddy procurement cost, processing cost, inventory costs, management issues in procurement, processing and marketing returns from the sale of main products and by-products, marketing costs incurred and problems encountered in the rice milling operations.

Secondary data were collected from the records maintained by the mill owners. These data pertained to the details of assets and liabilities, extent of investment made at different points in time, cash inflows and outflows. The data were collected for a period of five years that is from 2005-2006 to 2009-2010.

The data collected were presented in tabular form to facilitate easy comparisons. The investment pattern, cost of procurement, inventory costs, value addition, costs and returns in paddy milling and problems faced by the processors were studied using tabular analysis.

The financial ratio analysis technique was considered useful in evaluating the performance of the rice mills. The ratio analysis technique employed to study the solvency, liquidity, profitability, turnover and sales of the processing units.

Findings of the study

The investment pattern on rice milling units revealed that there was a direct relationship between the total capital investment and size of the processing units. The total capital invested in the case of conventional unit was Rs 36.97 lakhs and Rs 379.25 for modern unit. However, the proportion of fixed capital was more in conventional units as compare to modern units because of higher proportion of investment on buildings, infrastructures and other fixtures. The investment on machinery and equipment constituted a major part of the fixed capital.

A discount factor 16 per cent was employed in the financial feasibility analysis. It was found that, net present value of the investment of representative conventional and modern units was Rs 27.55 lakhs and Rs 408.35 Lakhs respectively. The benefit cost ratio worked out to 2.00 and 2.08 in conventional and modern units, respectively. The internal rate of return was higher in the case of modern unit (23.11 per cent) as compared to conventional unit (26.60 per cent). The payback period was found to be 2.05 in conventional units and 1.75 in respect of modern units. Hence, it was found that the investment proposal in rice milling units was financially feasible, and the investment in modern rice milling units was more profitable compared to conventional units.

The capacity utilization was six times higher in the case of modern units than in the conventional units. With a marginal increase in the number of working days and duration of each shift, the quantity processed per day and annual quantity processed was around 13 times higher in the modern units as compared to the conventional units. The capacity utilization of conventional unit was as such, around 44 per cent only as compared to 69 per cent capacity utilization in modern units. The lower capacity utilization of conventional mills could be attributed to the use of conventional technology coupled with lack of capacity to procure inputs in time and market their end products. The efficiency of rice milling units in terms of capacity utilization, the lower per cent of capacity utilization in conventional units was due to scarcity of inputs. Modern units have higher capacity utilization as compared to conventional units; it was due to higher proportion of working capital invested by the former.

In respect of rice milling process, One quintal of paddy when processed result in 66 kilogram of head rice, 10.50 kilogram of broken rice, 7 kilogram of bran and 16.5 kilogram of husk in the case of conventional units and the corresponding numbers was 73.50, 3.50, 8 and 15 kilograms, respectively in the case of modern units. With regard to poha making process, the recovery per cent of the products like poha, brokens and husk remains the same in both types of mills. The out turn of the head rice depends on the quality of the paddy and the intensive care taken during the processing operations.

Totally, two channels of marketing were identified in both the conventional and modern units. It can be seen from table that, the total cost of marketing per quintal of rice was higher for modern units than for conventional units. While, the marketing costs amounted to Rs 114.75 per quintal and Rs 164.75 per quintal of rice for modern units, the corresponding numbers for channel-1 and channel- 2 for conventional units were Rs 105.75 and Rs 120.75

per quintal. An examination of the components of marketing costs revealed that, sales tax formed the major proportion in the total marketing cost. It was Rs 49 per quintal of rice sold by conventional units and Rs 53 per quintal in modern units. The next largest component of marketing costs at Rs 1.5 per cent of sales price was market price, which amounted to Rs 36.75 per quintal in conventional and Rs 39.75 per quintal in modern units. Next in the order of magnitude was the cost incurred in packing material. It was found to be uniform at Rs 20 per quintal across the channels under conventional and modern units. Another component of marketing costs shown by the table is transportation. However, this cost was pertinent only for channel -2 and not for channel -1, since the latter involved sale of rice at the mill gate itself. The transportation cost in channel- 2 was much higher for modern units at Rs 50 per quintal compared to Rs 15 per quintal in respect of conventional units.

Sales realized from one quintal of paddy processed was more in modern rice mills compared to conventional units, due to higher recovery per cent of head rice and higher prices per unit realized. The higher net returns in modern rice milling units were due to higher efficiency achieved in processing and marketing of their products.

The business performance of the rice milling units as observed through the financial ratios such as solvency, liquidity and profitability ratio, showed that the modern processing units are performing more efficient than the conventional units, because of larger economies of scale in operation and management. We can see that though the solvency positions of both traditional and modern units were within the acceptable norm, that is 1:1, the solvency ratios were high in conventional units as compared to modern units. This is because of poor financial strength of conventional units. Thus, in general these ratios revealed that the modern units were financially sound as compared to the conventional units.

The major problems faced by the rice milling units are heavy taxation, commission, inadequate power supply, labour problem, high procurement cost, lack of availability of finance, repairs and maintenance and marketing. Therefore there is a need to reduce the taxation rate, commission rate and market fee rate. The processors were not getting adequate finance for procurement of paddy.

POLICY IMPLICATIONS:

1. The ratio analysis and financial feasibility analysis revealed better financial performance in respect of modern units compared to conventional units. This finding suggests that the conventional unit owners could modernize their units and enjoy larger profits.
2. Procurement costs were lower when paddy was purchased directly from farmers instead of purchasing commission agents. Thus, mills would benefit from strong contractual arrangements with paddy growers.
3. Invariably all the rice mill owners opined that the tax rates were high both while purchasing paddy and selling rice. High taxes generally get manifested in high prices. Since rice is an important staple crop of the state, it would be advisable to the government to lower the tax rates and help to reduce the prices, which would help consumers especially in the present days of rising food prices.

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BUSINESS EFFICIENCY IN RICE MILLS – A COMPARATIVE ANALYSIS OF CONVENTIONAL AND MODERN RICE MILLS IN DAVANGERE DISTRICT

SHWETHA M. K.

2010

Dr.S.B.MAHAJANASHETTI
MAJOR ADVISOR

ABSTRACT

India ranks second in production of rice next only to China. Rice milling is the oldest and the largest agro-processing industry of the country. The present study had made an attempt to document investment pattern and financial feasibility, inventory management, processing and marketing management, cost and returns in both conventional and modern rice mills. Primary and secondary data were collected to evaluate the objectives of the study. Ineffective management on the part of the processors has led to the failure or poor performance of many rice milling units. Therefore the study focuses on the management aspects and its managerial lapses in order to evolve appropriate policies for improving the efficiency of the rice mills. Totally six rice mills in were selected in Davanagere district of Karnataka. Further, they were categorized into conventional rice milling units and modern rice milling units based on the technology adopted

The results showed that the total investment on modern rice mills was ten times higher (Rs.379.25 lakhs) as compared to conventional rice mills (Rs.36.97 lakhs). The Net Present Value for modern unit and conventional unit was Rs.408.35 and Rs.27.55, respectively. The capacity utilization was higher (68%) in modern units in comparison with conventional units (44%). The total returns obtained from both rice milling and poha making process were higher in modern rice units (Rs.1478) as compared to conventional units (Rs.1381). This showed that the modern rice mills were more efficient than the conventional rice mills. Procurement costs were lower when paddy was purchased directly from farmers instead of purchasing commission agents. Thus, mills would benefit from strong contractual arrangements with paddy growers.