HULLING AND MILLING RATIO IN MAJOR PADDY GROWING STATES: A CASE OF KARNATAKA

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PREFACE

Paddy is the raw output from the field that requires processing. Human beings cannot consume paddy as it is. It has to be suitably processed into rice for human consumption. The need for this process is the basic reason for the existence of the paddy processing industry. As such, the hulling and milling of paddy is the oldest and largest agro-processing industry in our country and Karnataka as well. Almost the entire production (90 per cent) of paddy is converted into rice every year by paddy processing units of varying sizes and capacities spread across the country. The remaining 10 per cent of paddy produced is stored as seed for next season's crop.

The present study is the modest attempt to address the economics of paddy processing industries in Karnataka, which has been one of the leading producers of paddy in the country. The study further attempts to estimate the highly debated '***conversion ratios***' of paddy in the modern rice mills against the tradition huller type of paddy processing units in the state.

The present study entitled as "*Hulling and Milling Ratio in Major Paddy Growing States: A Case of Karnataka*" is an outcome of the study conducted in Karnataka by ADRTC, ISEC (Bangalore), and also a part of the all India coordinated study entitled "*Hulling and Milling Ratio in Major Paddy Growing States: Consolidated Report*" undertaken by the Centre (ADRTC), Bangalore.

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FOREWORD NOTE

Rice is the premier staple food. India accounts for around 28 percent of total rice area and 21 percent of total rice production in the world. Rice milling is a primary processing activity under which hull and bran is removed from the paddy grain to convert it into polished rice. There exists a wide range of technology in rice milling with low productive small mills having simple machinery on the one hand and high productive and highly automatic mills with sophisticated machinery, on the other. The capacity of rice milling in the country varies widely from as low as 0.5 tonnes per hour to as high as 197 tonnes per hour. Conventional rice hullers are very popular for milling of rice in rural areas. The hullers are usually low capacity mills. The conversion ratio of rice in huller mills is about 5 percent less than that obtained in modern mills in the case of raw paddy and 2 percent less in the case of parboiled paddy. In the hullers, both shelling and polishing operations are carried out simultaneously and therefore bran admixed with husk is obtained with a higher breakage of rice grain. The modern rice mills have separate processing mechanism for de-husking and polishing of the paddy. The husk can be utilized for energy and for industrial products like furfural and the bran for extraction of edible and non edible grades oil. These mills also have better recovery and lower energy consumption compared to conventional hullers.

The present study titled "*Hulling and Milling Ratio in Major Paddy Growing States*" was undertaken as coordinated study by Agricultural Development and Rural Transformation Centre, ISEC, Bangalore. This report is our Centre's report on the study carried out in Karnataka.

As many studies in the past have indicated that the overall supply of rice could be augmented substantially with additional conversion of paddy to rice through modernization of the existing paddy processing techniques, the present study tries to arrive at prevailing state of conversion ratio under various forms of hulling and milling using field level data collected from various traditional and modern rice

mills in Karnataka. The study assumes immense relevance considering the fact that half of the paddy produced in the country is still processed by hullers, shellers and huller-cum-shellers that are generally considered inefficient as compared to the modern rice mills having much higher conversion ratio. The present study tries to analyze the trend and pattern of modern rice mills with existing problems and prospects of paddy processing industry. The study enumerates hulling & milling ratios from paddy to rice processed by hullers, shellers and modern rice mills in Karnataka.

I am sure this report will add immense value to the existing literature in the area of paddy processing. The findings of the study would be useful to researchers, academicians, practitioners and policy makers.

The study was initiated by Dr. G.B. Lokesh and carried out by Dr. Komol Singha.

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Project Coordinators

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CHAPTER – I

PADDY AND MILLING PERSPECTIVE IN KARNATAKA

1.1: INTRODUCTION

Rice (*Oryza sativa L.)* has been the staple food for more than half of humanity in the world (Razavi and Farahmandfar, 2008*).* As reported[1] by NABARD, at present 65 per cent of India's population is living on rice. Similarly, in the findings of Joshi (2004), Saunders *et al* (1980) and others, rice is the staple food for more than 50 per cent of India's population. The agricultural population density supported by rice cultivation in Asia is the highest in the world (Joshi, 2004; Boyce, 1988). Historically too, grain or paddy has shaped the culture, diet and economy of the people of Asia. There is a strong positive correlation between population density and rice cultivation. Compared to other cereals, rice is more capable of sustaining land productivity without the use of manure or fertilisers (Boyce, 1988). According to Thiyagarajan and Gujja (2010), India has the largest share of its land area under rice cultivation, and become second largest producer of rice (21 per cent of global rice production) next to China in the world (Joshi, 2004; Nayak, 1996).

The area under rice cultivation in India fluctuates around 43 million hectares. It was a maximum of 45.5 million hectares in 2008-09. The total rice production was 99.2 million tonnes in the same year (Thiyagarajan and Gujja, 2010). Rice productivity was hardly 668 kg/ha in 1950-51 and it increased to a maximum of 2,202 kg/ha in 2007-08 (NABARD, 2010). As per advanced estimates released as on July 19, 2010 (Ministry of Agriculture, 2010) it decreased slightly to 2,178 kg/ha in 2008-09 and 2,130 kg/ha in 2009-10. At present, rice contributes about 43 per cent of total food grain production and 46 per cent of total cereal production in the country. It continues to play a vital role in the national food grain supply chain (Mondal, *et al*. 2011).

[1]Retrieved on 26th August 26, 2011 from NABARD: http://www.nabard.org/modelbankprojects/ricemill.asp

According to Joshi (2004), during the year 2001-02, India accounted for 44,622 thousand hectare area of rice cultivation with production level of 93084.5 thousand tonnes. It has also been observed that West Bengal was the largest rice producer (16.39 per cent) during same period, followed by Uttar Pradesh (13.38 per cent), Andhra Pradesh (12.24 per cent), Punjab (9.47 per cent), Orissa (7.68 per cent) and Tamil Nadu (7.38 per cent). In terms of area, West Bengal ranked first with 13.60 per cent of total area, and it was followed by Uttar Pradesh (13.17 per cent), Orissa (10.08 per cent), Andhra Pradesh (8.57 per cent), Chhattisgarh (8.37 per cent) and Bihar (8.00 per cent). In terms of productivity, Punjab stood first with 3,545 kg/ha followed by Tamil Nadu (3,263 kg/ha) and Andhra Pradesh (2,978 kg/ha) during the same period of time.

Among the states, Karnataka is one of the leading producers of paddy in the country. The state accounted for 3.32 per cent of the total production of rice in the country in 2008-09. The other leading states were West Bengal (15.13 per cent), Andhra Pradesh (9.63 per cent), Uttar Pradesh (13.25 per cent), Punjab (6.01 per cent), Orissa (9.78 per cent) and Bihar (7.68 per cent). In Karnataka, the area under paddy was 1.51 million hectares with the production of 3.80 million tonnes of paddy during 2008-09 (Ministry of Agriculture, 2010).

In the real sense of the term, *rice* is the processed form, which is ready for cooking and *paddy* is the raw output from the field that requires processing. Human beings cannot consume paddy as it is. It has to be suitably processed into rice for human consumption. The need for this process is the basic reason for the existence of the paddy processing industry. As such, the hulling and milling of paddy is the oldest and largest agro-processing industry in our country. Almost the entire production (90 per cent) of paddy is converted into rice every year by paddy processing units of varying sizes and capacities spread across the country. The remaining 10 per cent of paddy produced is stored as seed for next season’s crop.

Paddy processing, thus, is the primary processing activity by which husk and bran are removed from paddy to transform it into *polished rice*. Hence, rice forms the basic

primary processed product obtained from paddy, which may further be processed for obtaining various secondary and tertiary products. This provides ample opportunities for the development of rice-based value-added products. Apart from rice milling, processing of rice bran for oil extraction, energy generation from husk etc., are important agro-processing activities for value-addition, income and employment generation. According to Razavi and Farahmandfar (2008), no rice variety can be commercially successful unless it possesses high whole kernel (head) and total milled rice yield. Whole kernel (head) yield is the quantity of well-milled intact whole kernels (including broken kernels three-quarters or more in length) obtainable from given quantities of rough rice (paddy).

The major problem in the rice processing industry in India is that about half of the entire paddy production is processed by modern mills and the remaining by inefficient traditional hullers leading to considerable post-harvest loss. Therefore, there is reasonable scope for augmenting the growth of the rice processing industry and reducing post-harvest losses with suitable interventions and modernisation. The basic objective of modern rice milling is to remove the hull, bran and germ with minimum breakage of endosperms.

The present study tries to address the problems of paddy processing in Karnataka, which has been one of the leading producers of paddy in the country. In fact, the present study attempts to estimate the highly debated conversion ratios of paddy in the modern rice mills against the tradition huller type of paddy processing units in the state. Further, the study is a modest attempt to provide the economics of the traditional vis-à-vis modern rice mills to discuss the problems and prospects of paddy processing in the state.

1.2: USES OF RICE[2]

Rice is not only the staple food of the majority of the population in the world but is also used for different purposes in our day-to-day life. Some uses of paddy in different stages are given below:

[2] This portion is excerpted from Joshi (2004)

- **Staple food**: Rice is used as a staple food by more than 60 per cent of World population. The most popular way of eating rice is to cook it first. There are many ways of cooking it like khichadi, pulav, kheer, zeera-rice, iddli, dosa, etc.
- **Starch**: Rice starch is used to make ice-cream, custard powder, puddings, gel, distilled to make potable alcohol etc.
- **Rice bran**: It is used in confectionery products like bread, snacks, cookies and biscuits. The defatted bran is also used as cattle feed, organic fertiliser (compost), medicinal purposes and in making wax.
- **Rice bran oil**: Rice bran oil is used as edible oil and in manufacturing soap and fatty acids. It is also used in cosmetics, synthetic fibres, plasticisers, detergents and emulsifiers. At present, about 6 lakh tonnes of rice bran oil is produced from 35 lakh tonnes of rice bran per annum in the country. It is nutritionally superior and provides better protection to the human heart.
- **Flaked rice**: It is made from parboiled rice and used in many dishes.
- **Puffed rice**: It is made from paddy and is eaten as such.
- **Parched rice**: It is made from parboiled rice and is easily digestible. In India, about 4-5 per cent of total supply of rice is used as parched rice.
- **Rice husk**: It is used as a fuel, in board and paper manufacturing, packing and building materials and as an insulator. It is also used to make compost and chemical derivatives.
- **Rice broken**: It is used for making breakfast cereals, baby foods, rice flour, noodles, rice cakes, iddli, dosa, poultry feed etc.
- **Rice straw**: It is mainly used as animal feed, fuel, mushroom bed, for mulching in horticultural crops and in preparation of paper and compost.
- **Paddy as a seed**: Paddy is used as seed. The proportion utilised for seed varies from 2 to 6 per cent of total production.

1.3: AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN THE STATE

Rice is the staple food of the people of Karnataka. The state contributed 3.32 per cent of the total production of rice in India and had 1.51 per cent of country's area under rice

during 2008-09 (Ministry of Agriculture, 2010). The productivity of paddy in Karnataka has always been higher than the all India average but much below the productivity of states like Punjab, Andhra Pradesh and Haryana. The productivity Karnataka increased from 2,069 kg/ha in 1990-91 to 2593 kg/ha in 2000-01 and increased to 2,644 kg/ha in 2008-09. The increase rate was at an annual compound growth of 1.87 per cent (during 1990-91 to1999-2000) and 0.77 per cent (during 2000-01 to 2009-10).

Table 1.3:
Area, Production and Productivity of Paddy in Karnataka
(1990-91 to 2009-10)

Year (20 Years)	**Area** ('000 Ha)	**Production** ('000 Tons)	**Productivity** (Kg/Ha)
1990-91	1173.2	2427.8	2069.4
1991-92	1269.0	2819.8	2222.1
1992-93	1316.6	3068.7	2330.9
1993-94	1373.8	3182.9	2316.8
1994-95	1295.5	3167.5	2444.9
1995-96	1265.2	3023.9	2390.1
1996-97	1358.5	3211.5	2363.9
1997-98	1353.5	3212.6	2373.6
1998-99	1426.8	3656.8	2562.9
1999-00	1449.8	3716.7	2563.6
2000-01	1483.4	3846.7	2593.1
2001-02	1417.7	3234.0	2281.2
2002-03	1154.8	2390.1	2069.7
2003-04	1073.9	2550.4	2374.9
2004-05	1308.2	3706.2	2833.1
2005-06	1485.2	3999.2	2692.8
2006-07	1395.7	3645.5	2612.0
2007-08	1416.0	3176.0	2360.0
2008-09	1514.0	3802.0	2644.0
2009-10	1430.0	3273.0	2409.0
Mean	1348.0	3255.6	2425.4
CV (%)	**8.5**	**14.0**	**8.1**
Exp. Gr. rate Per Annum (%) (1990-91 to 1999-00)	1.72	3.62	1.87
Exp. Gr. rate Per Annum (%) (2000-01 to 2009-10)	1.26	1.37	0.77
Exp. Gr. rate Per Annum (%) (1990-91 to 2009-10)	0.56	1.06	0.69

Source: Directorate of Economics and Statistics, Government of Karnataka (2010)

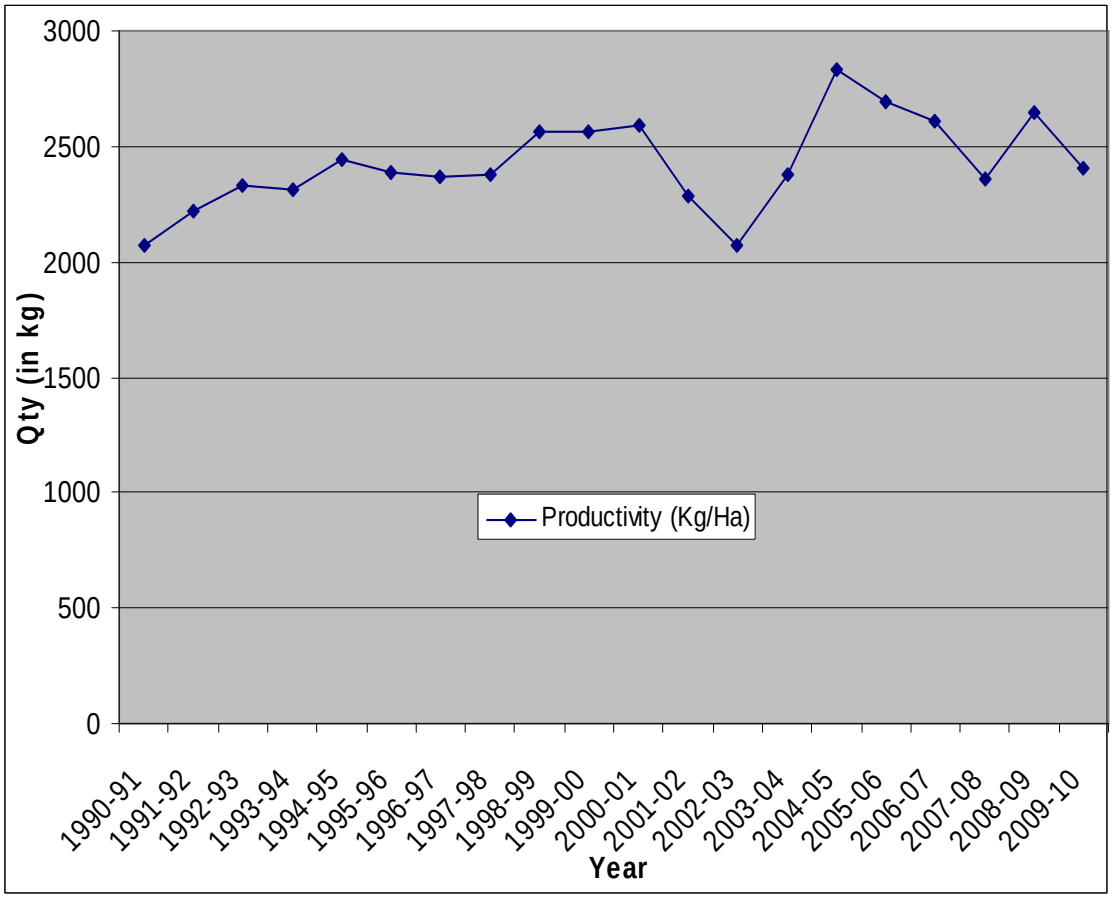
As indicated in the **Table 1.3**, over the years the area under paddy production in Karnataka has been increasing at 0.56 per cent over 20 years from 1990-91 to 2009-10. If we break it into two periods, it was 1.72 per cent growth from 1990-91 to 1999-00 and 1.26 per cent from 2000-01 to 2009-10. Similarly, production and productivity of paddy also increased between 1990 and 2010 (though the growth was slower at the later stage) by 1.06 per cent and 0.69 per cent respectively. The productivity (kg/ha) of paddy in the state was at an annual compound growth of 1.87 per cent during 1990-91 to 1999-00 and slightly decreased to 0.77 per cent during 2000-01 to 2009-10. In the case of production, the annual compound growth rate was 1.06 for 1990-91 to 2009-10. To split the whole period into two, it was 3.62 per cent during 1990-91 to 1999-00 and slightly lower at 1.36 per cent during 2000-01 to 2009-10.

However, for the 10 years from 2000-01 to 2009-10, the annual exponential growth of area under paddy cultivation was 1.26 per cent, production was 1.37 per cent, and productivity was slightly lower at 0.77 per cent. This was considerably lower compared to the previous 10 years from 1990-91 to 1999-00, as the growth of area per annum under paddy cultivation was 1.72 per cent, production was 3.62 per cent and productivity was1.87 per cent. This was mainly due to erratic rainfall during the period and the farmer's preference for the cultivation of other commercial crops that were economically more profitable than paddy. However, in absolute terms, the area under paddy cultivation increased by 22 per cent in 20 years — from 11.73 lakh hectares in 1990-91 to 14.30 lakh hectares in 2009-10. Similarly, production also increased considerably by 35 per cent — from 24.27 lakh tons in 1990-91 to 32.73 lakh tons in 2009-10. Hence, productivity has also shown considerable improvement from approximately 14.28 per cent during the same period of time, i.e. from 2100 kg/ha in 1990-91 to more than 2400 kg/ha in 2009-10. It was much higher than the national level[3] (Fig: 1.3). The Coefficient of Variation (CV) of area and productivity was 8.5 and 8.1 per cent respectively over 20 years in the state and the variation in productivity can be seen in Figure 1.3.

[3] The productivity of all India level for 2009-10 was 2130 kg/ha (Ministry of Agriculture 2010).

Fig: 1.3:

Rice Productivity (kg/ha)

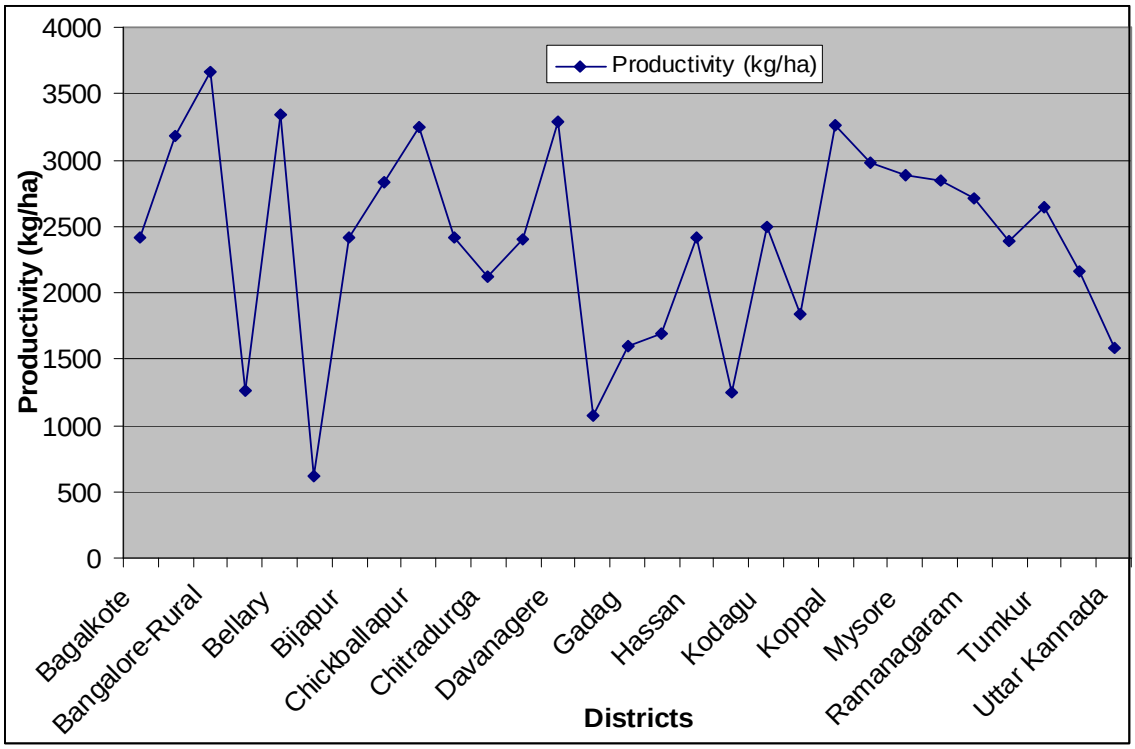


1.4: DISTRICT-WISE AREA, PRODUCTION AND YIELD IN KARNATAKA

Table 1.4 shows the latest information (2008-09) of district-wise area, production and productivity of paddy in Karnataka. Table 1.4 sh6ws that there were wide variations in area, production and productivity of paddy among the districts in 2008-09. The Coefficient of Variation of area, production and productivity across the districts was much higher than the state level shown in Table 1.3. For example, CV of area of production was 92.5 per cent and productivity was 32 per cent across the districts.

Fig: 1.4:

Productivity of Paddy in the Districts in 2008-09



Raichur district stood first in terms of area of cultivation and productivity of paddy with 1, 64,925 hectares and 4, 68,464 tonnes respectively. The lowest area of paddy cultivation and productivity was registered by Bijapur district with 12 hectares and 29 tonnes of respectively during the same period. However, the highest productivity of paddy was registered by Bangalore (Rural) district with 3,665 kg/ha. It was much higher than the state average of 2380 kg/ha in 2008-09. In the second position, Bellary district registered 3,345 kg/ha. Davanagere was third with 3288 kg/ha.

The least productivity was registered in Bidar district with 624 kg/ha and this was much lower than the state average (2380 kg/ha). The volatility of productivity of paddy among the district during 2008-09 can also be seen clearly in Figure 1.4:

Table 1.4:

District-wise Area, Production and Productivity of Paddy in Karnataka (2008-09)

Districts	Area (ha)	Production (tons)	Productivity (kg/ha)
Bagalkote	87	210	2414
Bangalore-Urban	2119	6738	3180
Bangalore-Rural	2233	8183	3665
Belgaum	71239	89459	1256
Bellary	122721	410503	3345
Bidar	5503	3435	624
Bijapur	12	29	2417
Chamarajanagar	19294	54673	2834
Chickballapur	8122	26356	3245
Chikmagalur	43789	106000	2421
Chitradurga	8658	18410	2126
Dakshin Kannada	55372	132894	2400
Davanagere	130208	428172	3288
Dharawad	32834	35398	1078
Gadag	1905	3055	1604
Gulbarga	92740	157008	1693
Hassan	53146	128074	2410
Haveri	51669	64709	1252
Kodagu	35362	88096	2491
Kolar	4157	7621	1833
Koppal	75223	245003	3257
Mandya	89357	266775	2985
Mysore	123803	356604	2880
Raichur	164925	468464	2840
Ramanagaram	6612	17968	2717
Shimoga	131070	313243	2390
Tumkur	39816	105308	2645
Udupi	61512	132678	2157
Uttar Kannada	80490	127083	1579
Total	**1513978**	**3802149**	**2380**
Mean	52206.1	131108.6	2380.2
CV (%)	**92.5**	**108.8**	**32.0**

Source: Directorate of Economics and Statistics, Govt. of Karnataka (2010)

Technology and topographical conditions played crucial roles in ensuring the highest productivity, production and area of paddy cultivation in Karnataka. Ideal climatic conditions for the cultivation of paddy coupled with recent developments in the irrigation infrastructure in Raichur district resulted in the expansion of the area under paddy

cultivation and production. However, Raichur could not retain it top place in productivity compared to the other districts like Bangalore Rural, Bangalore Urban, Bellary, Chickballapur, Davanagere, Koppal, etc[4]. It was also certified that inter-district variation of productivity was much higher (CV 32%) than the state's productivity (8.1%) from 1990-91 to 2009-10 (Tables 1.3 and 1.4).

1.5: HISTORICAL PERSPECTIVE OF MODERN RICE MILLING

Paddy cannot be consumed in its raw form and needs to be suitably processed into rice for human consumption. Rice milling is a primary processing activity under which the hull and bran are removed from the paddy grain to convert it into polished rice. Rice forms the basic primary processed product obtained from paddy that may further be processed into various secondary and tertiary products. Paddy hulling and milling is the oldest and the largest agro-processing industry in the country.

According to Joshi (2004), it is estimated that about 10 per cent of the food grains produced in India are lost in processing and storage. Further, he estimated that about 9 per cent of paddy is lost due to use of old and out-dated methods of drying and milling, improper and unscientific methods of storage, transport and handling. He recommended installation of sophisticated mills and proper care to minimise post-harvest loss of paddy in the country.

In the early 1960s, the Government of India (GOI) implemented a major food production drive, primarily through an intensive agricultural development programme. The GOI and Ford Foundation (FF) scientists worked on the agricultural development programme, concentrated on paddy production and post-production efforts. As a result, in 1963 a GOI-FF team began a one-year study of the post-production industry. Their report in 1964 described the industry as follows[5]:

[4] Detail factors responsible for the volatility of productivity in different districts of Karnataka is not done scientifically as the present study is primarily on the *Hulling and Milling Ratio of Paddy* in the state.
[5] This section is retrieved from Saunders, *et al.* (1980)

1. The present practices and equipments used in paddy cleaning, drying, storage, and processing are obsolete and cause substantial loss of food grains.
2. With modern technology the present systems used in the post-production could be up-graded (or "modernised") to reduce losses, supply better quality of rice to the consumer, reduce operation cost and, thus, supply more food grains to the nation from the present production.
3. In order to adapt new technology to conditions in India and to evaluate its results, a pilot project comprising of seven new storages and processing units was proposed.

Before the advent of mechanical milling, the traditional method of rice milling known as hand-pounding was in practice. In fact, after hand-pounding the nutritive value of rice increased when compared to machine milled rice[6]. In hand-pounding, a variety of implements is used such as: (i) mortor and pestle (ii) dhenki (iii) hand stone (chakki). At present with the availability of modern milling techniques, all these traditional methods have become obsolete.

The conventional mechanised mills can be categorised into four main types: (1) hullers (2) shellers (3) huller-cum-shellers (4) modern rice mills. As per the finding of Bhalla (1965), with the improvement of technology, hand-pounding techniques were discarded as inferior compared to huller. The hand-pounding techniques yield a much lower output and incur a much higher cost of production.

In the beginning, conventional rice hullers were very popular for milling of rice in rural areas. The hullers were usually low capacity mills. The conversion ratio of rice in huller mills was about 5 per cent less than that obtained in modern mills in the case of non-parboiled and 2 per cent less in the case of parboiled paddy (Lele, 1970). Both shelling and polishing operations were carried out simultaneously in the processing mechanism of the huller mills. Hence, there was no control over the polishing of rice. Bran mixed with husk was obtained with a higher breakage of rice grains.

[6] Retrieved [10th October 2011 from: http://drdpat.bih.nic.in/Status%20Paper%20-%2005.htm]

However, the modern rice mills have separate processing mechanisms for de-husking and polishing of the paddy. The husk can be utilised for energy and for industrial products like furfural and the bran for extraction of edible and non-edible oil. These mills also have better recovery and lower energy consumption compared to the conventional hullers. According to Nayak (1996), huller mills had the advantage of being cheap and simple to operate but were very inefficient in converting paddy into rice. The rice recovery in hullers was 60-68 per cent with 10-25 per cent of broken grains. The modern mills can recover 68-72 per cent of rice with hardly 5-7 per cent broken grains.

1.6: STATUS OF RICE MILLING INDUSTRY IN THE STATE

Rice is subjected to more processing as it is converted from the paddy to rice fit for human consumption and other products in developing countries (Saunders, *et al*. 1980). Broadly, in this present study, two processing techniques — traditional (Huller) and mechanical methods (Modern) — will be studied in detail.

Milling of paddy is an improvement of technology in the sector. During the milling of rice, husk and bran are obtained as by-products. The quality of husk produced depends upon the type of rice mill. In the single huller and the battery of hullers, the husk is obtained in a fine broken state and is always mixed with bran and broken rice. This husk-bran mix is used as a boiler feed[7].

Paddy husk is mainly used as fuel in most parts of Karnataka. In some places, it is left in the fields to decompose and enrich the soil. Karnataka, being one of the leading paddy producers in the country, has quite a large concentration of rice mills — about 1,755 modern rice mills as on 20008-09 (Govt. of Karnataka, 2010). The data on the number of rice mills (modern rice mills) in each district is presented in **Table 1.6.** Since the rice

[7] As quoted by Madhulika Sinha and Malati Hegde (1987) and Vimal and Tyagi (1984), accessed on 29th August 2011 and available at http://www.ces.iisc.ernet.in/energy/paper/TR109/tr109_std2.htm

milling industry was is in the unorganised sector, proper and accurate information on traditional rice mills (hullers) was not available with the Government of Karnataka.

Table 1.6:
Number of Paddy Processing Units (Modern/Traditional) in Karnataka
(in 2008-09)

Sl. No	District Name	Hullers	Sheller	Hullers cum Sheller	Modern Rice Mills	Total	% of State total
1	Bangalore (Rural)	-	-	-	5	5	0.28
2	Bellary	-	-	-	121	121	6.89
3	Belgaum	-	-	-	36	36	2.05
4	Bidar	-	-	-	5	5	0.28
5	Chamarajanagar	-	-	-	10	10	0.57
6	Chikamangalur	-	-	-	74	74	4.22
7	Chikaballapura	-	-	-	29	29	1.65
8	Chitradurga	-	-	-	15	15	0.85
9	Davangere	-	-	-	136	136	7.75
10	Dharwad	-	-	-	9	9	0.51
11	Dakishna Kannada	-	-	-	9	9	0.51
12	Gulbarga	-	-	-	27	27	1.54
13	Hassan	-	-	-	133	133	7.58
14	Haveri	-	-	-	43	43	2.55
15	Kolar	-	-	-	22	22	1.25
16	Kodagu	-	-	-	32	32	1.82
17	Mandya	-	-	-	283	283	16.13
18	Mysore	-	-	-	165	165	9.40
19	Raichur	-	-	-	90	90	5.13
20	Ramanagar	-	-	-	35	35	1.99
21	Shimoga	-	-	-	73	73	4.16
22	Tumkur	-	-	-	144	144	8.21
23	Uttar Kannada	-	-	-	117	117	6.67
24	Udupi	-	-	-	34	34	1.94
25	Bangalore (urban)	-	-	-	2	2	0.11
26	Koppal	-	-	-	106	106	6.04
27	**Total**	-	-	-	**1755**	**1755**	**100**

Source: Department of Food and Civil Supplies, Govt. of Karnataka (2010)

From the data available with the Department of Food and Civil Supplies, Government of Karnataka (2010), it can be seen that the district of Mandya has the largest concentration of modern rice mills. Mandya is historically a rice-growing district and has 283 rice mills (16.13 per cent of the mills in the state) followed by Mysore district with 165 (9.40 per cent) and Tumkur district with 144 (8.21 per cent). Though Raichur district registered highest in the area and production of paddy in the state, only 90 (5.13 per cent) paddy mills are operating in the district. It is comparatively lower than that of other major rice producing districts. The rice produced by these mills caters to both domestic and export markets or other states. The major product of these mills is raw rice (non-parboiled), although some rice mills produce parboiled rice as their principal product to supply to the neighbouring states.

1.7: OBJECTIVES

The paddy processing activity in Karnataka can be broadly classified into two categories, viz. traditional method and modern method. However, the paddy processing units of the traditional huller type are often considered inefficient when compared to the modern mills. Now, the major problem of this study is that, in Karnataka about 75 per cent of total rice produced is processed by the modern rice mills, whereas the remaining 25 per cent is processed by hullers, which are considered to be inefficient with lower conversion ratio, and thereby lower value addition (Govt. of Karnataka, 2010). In this regard, a number of studies in the past have indicated that the overall supply of rice could be augmented substantially through modernisation of existing traditional rice processing techniques.

The present study is a modest attempt to analyse the hulling and milling ratios[8] of paddy through different processing methods and suggest appropriate policy measures to overcome the problems/constraints faced by the paddy processing sector in the state. However, the specific objectives of the study are given below:

[8] Hulling ratio is defined as the ratio of brown rice to total paddy processed and the milling ratio is considered as the ratio of processed rice (polished/fine rice) to total paddy. Details of it can also be found in the Methodology section (section 1.8).

1 To analyse the trends and patterns in the growth of modern rice mills.
2 To estimate conversion ratios of paddy to rice by different mills (modern and traditional) without parboiling in various paddy processing units.
3 To estimate the relative shares of different milling techniques in paddy processing units with various type of processing technologies.
4 To identify probable constraints and solutions of the paddy processing industry in the state.

1.8: METHODOLOGY AND CHAPTERISATION

The present study is based on both primary and secondary data. While evaluating the hulling and milling ratios of paddy, more emphasis is given to primary data, and 2009-10 is considered as the year of reference. However, data pertaining to 2007-08 and 2008-09 have also been collected to validate yearly growth trends and fluctuations of paddy conversion ratios in the state.

The secondary data were collected mainly from the Ministry of Food Processing Industries, Government of India, and the Departments of Agriculture, Agricultural Marketing and Food and Civil Supplies, Government of Karnataka. Information on applied aspects of rice processing and by-product utilisation, like drying, storage, parboiling, milling, bran stabilisation, etc., were collected from official publications and research articles.

Primary data from ninety-two (92) rice mills (25 traditional mills and 67 modern mills) were collected from the three districts of Karnataka — Mandya, Davanagere and Tumkur. These districts were selected based on the concentration of rice mills and area under paddy cultivation. Mandya and Davanagere have relatively more number of modern rice mills as well as area of paddy production in the state. It was also found that these districts do not have hullers. In order to make a comparison between traditional and modern paddy conversion ratio, we chose Tumkur district where a large number of hullers (traditional) mills are being operated (based on informal sources) as well as area of paddy cultivation in the district is high.

From the selected districts 67 modern mills were randomly selected — Mandya (38 mills) and Davanagere (29 mills) and Tumkur (25 traditional hullers). For the present study, among the traditional rice mills only the huller units were surveyed because the sheller and huller-cum-sheller units are limited in number in Tumkur district and the state. A primary survey revealed that the traditional mills (hullers) were the hiring units and processed only non-parboiled rice. In the case of modern mills, all the units operated under the owner-cum-trader category and produced non-parboiled rice. The modern mills were of three types: Phase I with 7 units, Phase II with 24 units, and Phase III with 36 units. In short, all the sampled units (both modern and traditional) produced non-parboiled rice only. Modern mills (67 units) operated under the *owner-cum-trader*, and 25 traditional mills (huller mill) under *custom hiring* basis (refer to Chapter II, Table 2.5a).

From each selected mill or unit, detailed information was obtained through primary survey with pre-tested questionnaire. A questionnaire was prepared specifically indicating the quantity of paddy processed, hulled or milled in the mills. For further analysis, hulling ratio was considered as the ratio of ***brown rice*** to the total paddy processed, and milling ratio as the ratio of processed ***rice to paddy***. Certain mills follow two stages of processing — the first step involves hulling of paddy to get brown rice, and the second process includes polishing the brown rice to the fine white rice (polished rice). In order to analyse the trend and growth of rice mills, secondary information was obtained from the Government Departments, traders' associations, etc, and analysed using suitable statistical techniques, like percentage, co-efficient of variation, exponential growth rate, etc.

For the convenience of the readers, the whole study report is divided into 5 chapters. The first chapter focuses on the introduction of the report under which the basic perspective of hulling and milling in Karnataka and genesis of paddy cultivation and milling processes are included. In this chapter, area of paddy cultivation, production and productivity of paddy in the state as well as district-wise analysis of the same are also included. The objectives and methodology of the study are also discussed in this chapter.

In the Chapter II, the important part of study like hulling and milling ratios with respect to different types of mills and different stages of rice production along with the status, trends in the milling industry and growth of rice milling industry in Karnataka state are discussed. In the Chapter III, economic aspects of the milling industry in the state like, cost of processing of rice, market incidentals occurred in the rice processing, marketing of processed rice and standards maintained in the processed rice with respect to different types of mills are presented. This chapter contains the core issue of the report including the net return of the different mills.

In the Chapter IV, along with the constraints like under-utilisation of the mills, subsidy aspects and remedies for those constraints are included. Finally, Chapter V wraps up with some policy implications and recommendations.

CHAPTER – II

HULLING AND MILLING RATIO OF PADDY

2.1: INTRODUCTION

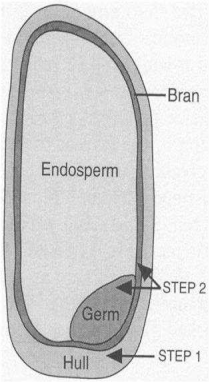
Paddy is the major food grain produced in India. It goes through several stages of processing before it can be consumed as food. The milling primarily transforms paddy into consumable form of rice and the milling ratio is the ratio of paddy to the rice in consumable form. In this section, an attempt has been made to determine how much rice is produced by processing of raw paddy, which gives milling ratio. Based on the data collected on total quantity of paddy processed and total quantity of rice produced, the milling ratio has been calculated and presented in this section. The efficiency of rice milling can be measured by three factors: technology, degree of competition, and capacity of utilisation. Technology has a more significant impact on the cost of conversion, quality and quantity of rice and by-products (Lele, 1970). Therefore, the study of technology embedded in the rice processing industry is very important.

Besides technological impact on crop production, post-harvest management has also become very important to meet the ever-increasing demand for food. According to Saunders, *et al*. (1980) the post-harvest loss of food grains occurring during harvesting, threshing, drying, processing, storage, transportation, etc., has been estimated to be about 30 to 40 per cent for all food crops in developing countries. However, according to an estimate of Joshi (2004), a total post-harvest loss of paddy at the producers' level was about 2.71 per cent of total production. It was also estimated that about 10 per cent of food grains produced in India was lost in processing and storage and about 9 per cent of paddy was lost due to use of old and outdated methods of drying and milling, improper and unscientific methods of storage, transport and handling, etc. According to Mejía (2006), it has been estimated that post-harvest losses of rice might be as high as 16 per cent of the total produced. A study carried out in China revealed that total post-harvest

losses ranged from 8 to 26 per cent, with storage and drying being the most critical operations[9]. In Philippines too, lack of adequate processing equipment contributes significantly to post-harvest loss of rice, which has been estimated to be as high as 40 per cent of total production (Saunders *et al*., 1980). Though there were some differences in figures in this context, it was certain that the post-harvest loss of paddy was quite significant. However, the post-harvest loss of *pulses* was 9.5 per cent in Uttarakhand state of India (Kumar *et al*., 2011), much lower than that of paddy. Therefore, with the ever-increasing demand of paddy, post-harvest management of paddy is an important issue, especially in India.

Fig: 2.1:

Rice Processing and the Structure of Grain



Source: Carney (1996)

Three main operations are involved in rice milling: 1) *threshing*, 2) *winnowing* and 3) *pounding*. Threshing involves separating the grains from the stalks after a short period of drying. This can be done by using a hand-held flailing-stick, animals for trampling, or machinery, etc. Winnowing, which alternates with pounding, removes the husks and chaff. Traditionally, it is carried out by placing the rice in a flat basket and rotating the grains so that the lighter materials move to the edge, where they are jettisoned. The third operation of rice processing, *pounding*, is really misnamed, since the need to obtain whole grains, rather than broken, requires a tapping and rolling motion, in which

[9] As quoted by Mejía (2006)

loosening the grip on the pestle at the right moment before striking the rice minimises grain breakage. *Pounding* actually involves two distinct stages: first, removing the grain's hard outer coat or hull (de-husking) and secondly, polishing or whitening the rice by separating the bran and the nutrient-bearing germ from the softer endosperm. The structure of processed paddy and the detail parts of rice can be seen from the Figure 2.1[10].

2.2: OUTLINE OF MODERNISATION OF MILLS IN INDIA

With the emergence of modernisation and development of technology, the traditional hand pounding or foot pounding (Dhenki) of rice has now become obsolete. The rice hullers, shellers and modern rice mills have become popular. Traditional mills included two types of conventional milling systems defined as sheller mills and huller mills. Sheller mills consist of an under-runner disc huller followed by and Engelberg type huller. Huller mills consist only of Engelberg-type hullers, presumably in series so that the first de-husked and the second polished the grain (probably the same huller used twice).

With the emergence of efficient modern mills, the importance of traditional hullers and shellers became redundant. According to Joshi (2004), the hullers seldom give about 65 per cent of yield with 20-30 per cent broken rice. Besides, it did not give completely cleaned rice. The modern rice mills (single pass) have the capacity to process 2-4 tons per hour with yield recovery of 70 per cent and grain breakage of 10 per cent only. According to Lele (1970), modern rice mills have out-turned advantage of 1.6 per cent of parboiled rice over the traditional hullers. However, in case of non-parboiled rice, the out-turn ratio of modern mills was 2.5 per cent higher than the shellers and 6.6 per cent higher than hullers (Saunders, *et al*. 1980; Lele 1970).

In the case of modern rice mills, many adjustments (e.g. rubber roll clearance, separator bed inclination, feed rates) are automated for maximum efficiency and ease of operation. The whitener-polishers are provided with gauges that sense the current load on the motor

[10] This portion is excerpted from Carney (1996).

drives, which indicates the pressure on the grain. Modern rice milling consists of the stages given in Table 2.2 and Figure 2.2 [11].

Table 2.2:
Modern Milling Process

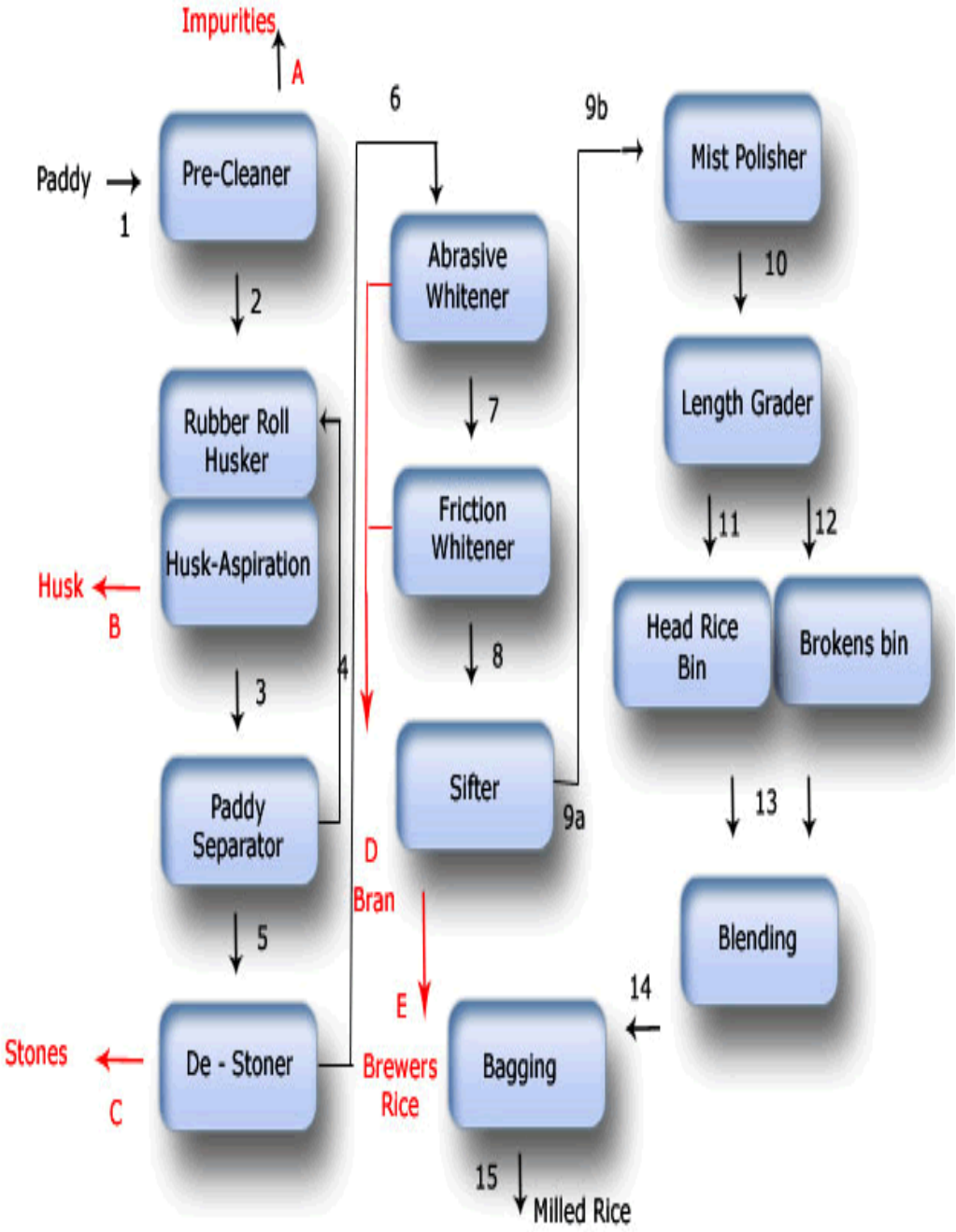
Stage	Function
Pre-cleaning	Removing all impurities and unfilled grains from the paddy.
Husking	Removing the husk from the paddy.
Husk aspiration	Separating the husk from the brown rice/un-husked paddy.
Paddy separation	Separating the un-husked paddy from the brown rice.
De-stoning	Separating small stones from the brown rice.
Polishing	Improving the appearance of milled rice by removing remaining particles and polishing the exterior of the milled kernel.
Sifting	Separating small impurities or chips from the milled rice.
Length grading	Separating small and large broken rice from the head rice.
Blending	Mix head rice with predetermined amount of broken rice, as required by the customer.
Weighing and bagging	Preparing milled rice for transport to the customer

The new India Licensing Rules has made modernisation of rice mills compulsory. In October 1977, of the 10,000 sheller-cum-huller rice mills operating in India, only about 1,600 units had been modernised by installing rubber roll shellers, paddy cleaners, and paddy separators. The government initiated three schemes for three types of plants: (a) Scheme I, Modernisation of existing shellers for 1 tph (Ton per Hour) mills (b) Scheme II, Same for ½ tph mills, and (c) Scheme III, Installation of Parboiling and Mechanical Drying Plant in Modern Rice Mills[12].

[11] Retrieved [Sept. 13, 2011: http://www.knowledgebank.irri.org/rkb/index.php/rice-milling/commercial-rice-milling-systems]
[12] This section is retrieved from Saunders, *et al*. (1980)

Fig. 2.2:

Flow Diagram of Modern Rice Mill



The enforcement of 'Rice Milling Industry (Regulation and Licensing) Act' provides the following measures (Nayak, 1996) to develop rice mills in India.

- The new rice mills will undertake de-husking of paddy separately by rubber roll sheller or centrifugal de-husker and shall have paddy separators and cleaners in addition to polisher
- All the existing mills excepting single hullers shall be modernised
- Promotional efforts in the form of technical assistance, concessional finance, subsidy for modernisation, extension programmes, training, research, development etc.

2.3: GROWTH OF RICE MILLING IN KARNATAKA

The rice milling industry in Karnataka is one of the oldest and biggest agro-based industries in the state. The rice milling industry was developed because it had become necessary to convert the harvested paddy into rice for domestic consumption. As the population grew rapidly, demand for rice also increased in the state, especially with the growth of urban migrants. Since then, the need for efficient post-harvesting management of paddy was acknowledged by the policy makers and government. This is how the process of conversion from traditional rice milling to modern industrial milling to increase yield and reduce processing losses, was initiated. However, many rice mills are still operating with the traditional technology. The green revolution period saw an increase in production of paddy and necessitated the modernisation of the rice milling industry. It was also required to increase efficiency and meet the global quality standards apart from the changing needs of consumers. The traditional rice mills like hullers produced rice at the lesser cost and not very efficient in the production and maintenance of quality. Despite the disadvantages, a number (not estimated accurately) of traditional rice mills are still functioning in the state, especially in Tumkur district.

The modernisation of the rice milling industry in Karnataka started in the 1970s with the main objective of producing good quality rice coupled with efficient utilisation of the different by-products obtained during the processing of paddy such as bran and husk for edible and/or industrial purposes. During 2001-02, there were more than 14,370 rice mills including hullers, shellers, huller-cum-shellers and modern rice mills. Given the extant food habits of the people (rice as staple cereal), a large number of mills are in the command areas of the state. There are around 1,755 modern rice mills operating in the state at present (Government of Karnataka, 2010).

2.4: TRENDS AND TYPES OF RICE MILLS

While trying to analyse the trends and types of rice mills in Karnataka it was found that a complete list of rice mills and type of rice mills was not available with any organisation in the state. As per the information provided by the Department of Food and Civil Supplies, Government of Karnataka, we came to know that the state has 1,755 modern rice mills. However, no information was available on the exact number of hullers (traditional mills) in the state.

It was also learnt that in the last two decades, the hullers, huller-cum-shellers and sheller mills have lost their importance in the paddy processing industry not only in the state but also in the country. Presently, though the huller mills have the advantage of being cheap and simple to operate, the major players in the rice processing industry are the modern rice mills. It is probably because the hullers are very inefficient in converting paddy to rice. On the other hand, the modern mills give the highest yield of rice with least quantity of broken grains and better quality by-products like, bran, husk, etc. Normally the huller mills yield bran with the lowest oil content because it contains an appreciable amount of husk and broken rice. The oil content in the bran from the modern mills is far superior in this respect. As per the Karnataka Food and Civil Supplies Corporation Ltd., the overall out-turn ratio of modern rice mills in Karnataka in 2004 was 67 per cent of fine and super fine varieties of rice (FCI, 2004).

2.5: BASIC CHARACTERISTICS OF THE SELECTED SAMPLE UNITS

The sample paddy processing units were situated in Mandya, Davanagere and Tumkur districts. The total sample, comprising 92 rice mills (both modern and traditional), produced only non-parboiled rice. As many as 67 of the sample were modern mills, operating as *owner-cum-trader* units and 25 were huller mills (traditional) operating as *custom hiring* units (Methodology in Chapter I). The distribution of sample units was based on the type of mill, type of service and type of rice produced and presented in Table 2.5a.

Table 2.5a:

Description of Sample paddy Processing Units in Karnataka

Type of Unit	Total Sample Units (No.)				
	Owner Cum Trader		Custom Hiring		All
	Non-parboiled	Parboiled	Non-parboiled	Parboiled	
Modern Rice Mill (Phase I)	7	-	-	-	**7**
Modern Rice Mill (Phase II)	24	-	-	-	**24**
Modern Rice Mill (Phase III)	36	-	-	-	**36**
Huller (Traditional)	-	-	25	-	**25**
Total	**67**	**-**	**25**	**-**	**92**

Source: Survey

From Table 2.5a, it is clear that there are three stages for modern mills — phase I, phase II and phase III, operating as owner-cum-trader units and producing non-parboiled rice (for the purpose of present study only). Similarly, 25 units were hullers (traditional) operating as *custom hiring units* (produced non-parboiled rice).

From the primary sample, it was found that the rice mills were fairly distributed among the districts (Chapter I Section 1.8). They were established in the 1960s and 1970s, and upgraded from time to time over the decades. The modern rice mills were also updated to

become fully automated paddy-processing units using agro-engineering technology and imported colour-sorter machines. In this context, we can compare the sample units with respect to the size, average investment and number of employees engaged, etc. As mentioned earlier, the huller units were much cheaper than the modern rice mills that require much larger investment. The average investment on rice mills varies with the type of the rice mills, type of service and type of the rice processed. The basic comparison of the present text will be made on the basis of conversion ratio of rice from paddy in modern and traditional mills.

In this context, a comparison has been made between the modern and traditional rice mills with respect to the size of sample units, average investment and the number of employees. It has been clearly reflected in Table 2.5b that the average investment for the sample huller units was Rs 0.76 lakh. However, the average investment for the modern rice mills was Rs 93.23 lakh. The average capacity of the modern rice mills was 6.8 tons per hour (TPH), and for the traditional huller it was 1.2 tph. It was much lower than the modern one. In the case of labour involvement per day, the requirement was relatively higher for modern of rice mills at an average of 6.06 persons. However, for the traditional mills, it was 0.90 employee/persons per day.

Table 2.5b:

Investment and Employment in Paddy Processing Units in Karnataka

Type of Unit	**Avg. Investment** (Rs. in lakhs)	**Avg. Capacity of Units (TPH)**	**Avg. No. of Employees/day**	**Avg. Daily Wage Labour**
Modern Rice Mills (Phase I,II and III)	93.23	6.8	6.06	6.15
Traditional Mills (Hullers)	0.76	1.2	0.90	0.08

Source: Survey

An average of 6.15 and 0.08 daily wage labourers were engaged in the modern mills and traditional huller mills respectively. The traditional mills being small and run primarily on custom hiring basis[13] required fewer number of labourers. Some of the traditional

[13] Custom Hiring mill refers to the entire by-product obtained in the production process belongs to the farmers, while the owners of the hullers get a fixed custom charge for every unit of paddy processed through the huller unit.

hullers were being run by daily wage labourers and self labour. Often, these mills could not even engage one full-time labourer because almost all the units were run on custom hiring basis where machines are operates when customers comes for processing/hulling paddy and pay custom charges. It thus turned out that the modern rice mills create better employment opportunities in the agro-processing industry than the traditional ones. Nevertheless, as was observed during the study, with the advancement of milling technology fully automated milling machines have replaced human labour to some extent.

2.6: HULLING AND MILLING RATIOS IN MODERN/TRADITIONAL MILLS

In the analysis, the milled rice has been categorised into two kinds: ***raw rice*** (processed as raw i.e. without boiling/heating treatment of paddy) called *non-parboiled*, and ***rice*** (processed after boiling/water heating treatment to the paddy) called *parboiled rice*. In terms of grade, the polished rice is categorised as: 1) ***Grade A*** (Basmati Rice and superfine quality), 2) ***Common rice*** (Non-Basmati Rice, Grade B) by the purchasing agencies and both can either be raw (non-parboiled) or parboiled (Kapur, 2003). However, in our present study, the classification of Common and Grade A rice is not made on the basis of Basmati and Non-Basmati quality, it is categorised by the millers for their convenience on the basis of the overall quality of the rice produced.

The hulling and milling ratio of different types of mills with respect to the types of rice produced are presented in Tables 2.6a to 2.6d. In general, it was observed that there were considerable differences in the milling ratio among the different types of mills and different grades of rice produced. It was obvious that the milling ratio observed in the modern type of rice mills was considerably higher than that of traditional rice mills.

Table 2.6a shows that the out-turn ratio (paddy to rice conversion ratio) of non-parboiled rice by Phase I modern mills (7 number of units) was at the constant rate of 61.2 per cent from 2007-08 to 2009-10. If we break the out-turn ratio in terms of grade of rice (as per the survey result provided), Grade A rice has the advantage of 2 per cent over Common

rice. The total paddy processed (both Common and Grade A together) under Phase I mills was 5, 49,733 quintals in 2007-08, 5, 57,899 quintals in 2008-09 and 5, 74,715 quintals in 2009-10. On an average, 5, 60,782 quintals of paddy was processed in three years' time. The total quantity of rice (output) produced was 3, 36,494 quintals; 3, 41,287 quintals; and 3, 51,569 quintals in 2007-08; 2008-09 and 2009-10, respectively. On an average, a total of 3, 43,117 quintal of rice was produced in the three years' time. The conversion ratios were constant at 62 per cent for Grade A and 60 per cent for Common rice for the same period, and the overall conversion ratio (irrespective of grades) was 61.2 per cent for the same period.

Table 2.6a:
Hulling and Milling Ratio of Modern Mills in Phase I

Type of Service		**Owner cum Trader**			
Type of Rice Produced		**Non-Parboiled (N= 7)**			
Year		**2007-08**	**2008-09**	**2009-10**	**Average**
Paddy Processed (Qty. in Quintal)	Grade A	332733	327366	336982	332360
	Common	217000	230533	237733	228422
	Total	**549733**	**557899**	**574715**	**560782**
Rice Produced (Qty. in Quintal)	Grade A	206294	202967	208929	206063
	Common	130200	138320	142640	137053
	Total	**336494**	**341287**	**351569**	**343117**
Conversion Ratio (%)	Grade A	62.0	62.0	62.0	62.0
	Common	60.0	60.0	60.0	60.0
	Average (%)	**61.2**	**61.2**	**61.2**	**61.2**

Source: Survey

Table 2.6b shows that the conversion ratio of Phase II type of mills was higher than Phase I. On an average, this phase had better conversion ratio (paddy to rice) in Karnataka with 63.4 per cent over Phase I from 2007-08 to 2009-10. In 2007-08, altogether, 8, 89,563 quintals of paddy were processed and 564743 quintals rice produced. In terms of conversion ratio, it was 63.5 per cent, and if we break the conversion ratio into, Grade A and Common rice, the former performed well with 63.8 per cent and for the latter it was 61.6 per cent. In 2008-09, the performance was slightly lower and the conversion ratio was 63 per cent. However, in 2009-10, the conversion

ratio rose to 63.7 per cent. On an average, the conversion ratio of Grade A rice was 63.6 per cent, an increase of 2 per cent over Common rice (61.7%), in the three years' time (2007-08 to 2009-10).

Table 2.6b:
Hulling and Milling Ratio of Modern Rice mills in Phase II

Type of Service		**Owner cum Trader**			
Type of Rice Produced		**Non-Parboiled (N=24)**			
Year		**2007-08**	**2008-09**	**2009-10**	**Average**
Paddy Processed (Qty. in Quintal)	Grade A	762363	798857	824571	795264
	Common	127200	96600	120000	114600
	Total	889563	895457	944571	909864
Rice Produced (Qty. in Quintal)	Grade A	486388	503280	528550	506073
	Common	78355	60472	73200	70676
	Total	564743	563752	601750	576748
Conversion Ratio (%)	Grade A	63.8	63.0	64.1	63.6
	Common	61.6	62.6	61.0	61.7
	Average (%)	**63.5**	**63.0**	**63.7**	**63.4**

Source: Survey

In the case of Phase III of modern rice mills, it was observed that the performance in terms of conversion ratio from paddy to rice was better than other previous two phases. On an average, the conversion ratio was 63.5 per cent over the three years study period. From Table 2.6c, it is evident that the conversion ratio increased constantly at a very slow pace from 2007-08 to 2009-10. For instance, the conversion ratio increased from 63.4 per cent in 2007-08 to 63.5 per cent in 2008-09, and further increased to 64.6 per cent in 2009-10. Like other two phases, the performance of Grade A rice was slightly better than the Common rice, e.g. 63.6 per cent for Grade A rice and 63.4 per cent for Common rice.

Of all the phases of modern mills, Phase III became the most efficient one. It is also clear that the performance levels improved as the machines were upgraded in the respective phases. The highest conversion ratio in the last three years (2007-08 to 2009-10), irrespective of phases, was 63.7 per cent in 2009-10 by the Phase II type of mills and the lowest was 61.2 per cent by Phase I.

Table 2.6c:
Hulling and Milling Ratio of Modern Rice mills in Phase III

Type of Service		Owner cum Trader			
Type of Rice Produced		Non-Parboiled (N=36)			
Year		2007-08	2008-09	2009-10	Average
Paddy Processed (Qty. in Quintal)	Grade A	760436	854202	913879	842839
	Common	844200	868500	904500	872400
	Total	**1604636**	**1722702**	**1818379**	1715239
Rice Produced (Qty. in Quintal)	Grade A	484398	546690	575744	535611
	Common	532690	546287	579785	552920
	Total	**1017088**	**1092976**	**1155529**	1088531
Conversion Ratio (%)	Grade A	63.7	64.0	63.0	63.6
	Common	63.1	62.9	64.1	63.4
	Average (%)	63.4	63.5	63.6	63.5

Source: Survey

Under the traditional type of rice mills, only huller mills are included in the study. In Table 2.6d, it can be seen that the sample traditional huller mills operated under the custom hiring basis and produced only non-parboiled rice. The conversion ratio was far behind that of the modern mills in all the three phases. It was 58.6 per cent; 58.9 and 58.5 per cent for 2007-08; 2008-09 and 2009-10 respectively. The overall conversion ratio turned out to be 58.7 per cent for the same period. Similar to modern mills, the huller's conversion ratio of Grade A rice was slightly better than Common rice. It was 59.5 per cent and 57.9 per cent respectively for three years.

Table 2.6d:
Hulling and Milling Ratio of Traditional Rice Mills

Type of Service		Custom Hiring			
Type of Rice Produced		Non-Parboiled (N=25)			
Year		2007-08	2008-09	2009-10	Average
Paddy Processed (Qty. in Quintal)	Grade A	90395	228974	87105	135491
	Common	137895	146316	151513	145241
	Total	228289	375289	238618	280732
Rice Produced (Qty. in Quintal)	Grade A	53803	136285	51845	80644
	Common	79896	84775	87787	84153
	Total	133699	221061	139632	164797
Conversion Ratio (%)	Grade A	59.5	59.5	59.5	59.5
	Common	57.9	57.9	57.9	57.9
	Average (%)	58.6	58.9	58.5	58.7

Source: Survey

2.7: DIFFERENCES IN MILLING RATIOS AMONG DIFFERENT MILLS

It is obvious that there are considerable differences in the milling ratios with respect to the different phases. The milling ratio of modern type of mills especially in Phase III was comparatively higher than other types of mills. It has certain advantages over the other mills because primarily it involves many more stages in paddy processing. To compare the mills in terms of milling ratios, we clubbed all the four tables.

In Table 2.7, we can see considerable differences in the milling ratios of the different modern mills. Phase III mills were superior to the Phase II mills. Similarly, Phase II was superior to Phase I. This was primarily due to the different milling techniques and stages used in different mills. Traditional rice mills (hullers) used only single steel hullers. While modern rice mills used some specialised machineries like pre-cleaners, de-stoners, rubber roll sheller, paddy separators, rice polishers and graders (Table and Figure 2.2).

Table 2.7

Hulling Milling Ratios of Modern and Traditional Rice Mills

Type of Unit	**Particulars** (Qty. in Qtl)	**2007-08**	**2008-09**	**2009-10**	**Average**
Phase I	Paddy Processed	549733	557899	574715	560782
	Fine Rice	336494	341287	351569	343117
	Out-Turn Ratio (%)	61.2	61.2	61.2	61.2
Phase II	Paddy Processed	889563	895457	944571	909864
	Fine Rice	564743	563752	601750	576748
	Out-Turn Ratio (%)	63.5	63.0	63.7	63.4
Phase III	Paddy Processed	1604636	1722702	1818379	1715239
	Fine Rice	1017088	1092976	1155529	1088531
	Out-Turn Ratio (%)	63.4	63.4	63.5	63.5
All Modern	Paddy Processed	3043932	3176058	3337665	3185885
	Fine Rice	1918325	1998015	2108848	2008396
	Out-Turn Ratio (%)	63.0	62.9	63.2	63.0
Hullers	Paddy Processed	228289	375289	238618	280732
	Fine Rice	133699	221061	139632	164797
	Out Turn Ratio	58.6	58.9	58.5	58.7
All (Modern and Huller)	**Paddy Processed**	3272221	3551347	3576283	3466617
	Fine Rice	2052024	2219076	2248480	2173193
	Out-Turn Ratio (%)	62.7	62.5	62.9	62.7

Source: Field Survey

Similarly, the milling ratio of parboiled rice was better than non-parboiled rice (Nayak, 1996; Lele, 1970). As we do not incorporate parboiled rice in this present study, the performance level of non-parboiled rice will be analysed for traditional and modern rice mills from 2007-08 to 2009-10. Parboiled rice is processed in the modern rice mills to get more milling ratio and nutritious properties. In short, rice undergoes partial boiling or cooking prior to milling which imparts extra strength to the rice *kernel* to withstand the milling stress and result in higher head yield (Nayak, 1996).

2.8: MILLING RATIO BETWEEN OWNER-CUM-TRADER AND CUSTOM HIRING CATEGORY

The mills operating under owner-cum-trader basis have shown a considerably higher milling ratio compared to the mills running on custom hiring bases. The main reason behind this considerable difference is primarily due to the type mills in operation. It was also noticed that, generally, the mills running on custom hiring bases are hullers and mills running on owner-cum-trader basis are modern rice mills. Since modern rice mills have adopted advanced technologies for the processing rice they show higher milling ratio compared to the hullers that follow the traditional processing methods (Single step processing).

Table 2.8:

Differences between Owner-cum-Trader and Custom Hiring

Mill Category	**Activity** (qty. in qtl)	**2007-08**	**2008-09**	**2009-10**	**Average**
Modern Mills (Owner-cum-Trader)	Paddy Processed	3043932	3176058	3337665	3185885
	Fine Rice	1918325	1998015	2108848	2008396
	Out-Turn Ratio (%)	63.0	62.9	63.2	63.0
Hullers (Custom Hiring)	Paddy Processed	228289	375289	238618	280732
	Fine Rice	133699	221061	139632	164797
	Out-Turn Ratio (%)	58.6	58.9	58.5	58.7

Source: Survey

From the Table 2.8 it is clearly seen that the overall out-turn ratio of owner-cum-trader category of mills is better (63 per cent) than the custom hiring category of mills (58.7 per

cent). In the three years, the mills under owner-cum-trader category reached the highest out-turn ratio ever at 63.2 per cent in 2009-10. However, mills under the custom hiring category touched 58.9 per cent in 2008-09, which was the best performing year.

2.9: CONCLUSION

As portrayed above, the milling ratio of rice was quite consistent in all the three phases for modern mills, ranging from 61.2 per cent to 63.5 per cent for three years from 2007-8-2009-10. The performance of the mills also increased across the phases as technology was upgraded from phase I to III. Similarly, the traditional mills were more consistent in their performance in the state with around 59 per cent for the three-year study period.

Maintaining a good milling ratio in processing of rice not only gives good yield but also good quality of rice and higher net returns on investment. Adoption of advanced techniques in the milling operation and production of parboiled rice was lacking in the study area. Upgrading the existing hullers or traditional rice mills with advanced techniques into modern rice mills can improve the milling ratio as discussed in the previous sections. In this regard, appropriate steps may be initiated by the Department of Agriculture, agricultural universities and other extension agencies to help the traditional millers in upgrading mills with advanced machineries. This will ultimately help in improving the milling ratio in the study area in Karnataka.

Government and financial institutions may also be extended subsidies and loans at the low interest rates to upgrade the present hullers or traditional type rice mills into the modern rice mills. The traditional millers are advised to upgrade their rice mills to the modern standards to achieve the higher milling ratio. Even though, there will be additional costs to upgrade the rice mills and produce the parboiled type of rice, millers can get the higher profits with higher milling ratio. This is the wish of the government as well.

CHAPTER – III

ECONOMICS OF PADDY PROCESSING

3.1: INTRODUCTION

The basic economics of paddy processing remains with out-turn ratios and quality of output of the mills. In this modern age, modern technology has shaped the fortunes of many rice-growing countries in the world. The rapid changes in the cultivation, marketing and consumption of rice require improved productivity of rice. This improvement of technology saves post-harvesting losses to some extent. The rice milling industry is improving the socio-economic standards of many entrepreneurs in India, particularly in Karnataka. The study of the economic aspects of the rice milling industry may help in understanding the economic viability and profitability of this industry in the state. This is the core chapter of this study and gives a broad idea of economic aspects of the rice milling industry including market incidentals, cost of processing rice in the different types of mills and the different types of the rice produced. By treating the paddy processing units as strict business units, we will arrive at a conclusion on the economics of paddy processing in the huller units and in the modern rice mills in the different phases of development.

3.2: MARKET INCIDENTALS OF MODERN AND TRADITIONAL MILLS

The market incidentals of processing rice are presented in the Tables (3.2a to 3.2d) below. It is obvious that the market incidentals in the modern rice mills under the owner-cum-trader category were considerably higher than that of traditional rice mills. However, in case of custom hiring category of huller units, there was no market incidental because, the farmers hulled their paddy by paying custom charges and the mill owners got only custom charges. Even the customers of the huller units, viz. the farmers who bring the paddy to convert it into rice, often help in the tasks of loading/unloading and feeding of paddy/rice in huller machines. Hence, costs like transportation, handling, storage, drying

costs, packing, weight-loss, etc., do not arise for huller units. Therefore, we do not compare traditional and modern mill in this regard. However, a comparison is made between the different phases (phase I; Phase II and phase III) of modern mills.

The three years' average market incidentals of modern mills was Rs 8.75 per quintal of paddy processed (Table 3.2a). In 2009-10 the highest market incidentals of Rs 9.58 per quintal paddy processed were incurred and the lowest at Rs 7.78 per quintal was recorded in 2007-08. Of the different components of market incidentals, transport charges were highest at Rs 2.08 per quintal of paddy processed. At the bottom, average storage charge incurred in the three years average was Rs 0.78 per quintal of paddy processed. However, the drying cost was not recorded as the present study concentrates only with the non-parboiled rice. The detailed market incidental for three years from 2007-08 to 2009-10 is given in Table 3.2a.

Table 3.2a:
Market Incidentals Incurred by Modern Rice Mills (All)

Year	**2007-08**	**2008-09**	**2009-10**	**Average**
Handling/Cleaning/ Packing (Rs./Qtl)	1.07	1.77	1.77	1.53
Packing Material (Rs./Qtl)	1.67	1.98	2.09	1.91
Drying Labour/Material Charges (Rs./Qtl)	0.00	0.00	0.00	0.00
Weight loss (Rs/Qtl)	1.69	1.65	1.67	1.67
Transportation (Rs./Qtl)	1.85	2.08	2.31	2.08
Storages Charges (Rs./Qtl)	0.70	0.73	0.90	0.78
Other Specify (Rs./Qtl)	0.81	0.67	0.87	0.78
Total (Rs/Qtl)	**7.78**	**8.88**	**9.59**	**8.75**

Source: Survey

For the present study, the varietals comparison of market incidental of different quality of rice, like Grade A and Common, was not made, as the processing activities and charges of these categories remain more or less the same. Intuitively, over the years, the cost of market incidentals has been increasing and differed for the different phases.

From the Table 3.2b, it is clear that the three years average market incidentals of phase I was Rs 8.76 per quintal of paddy processed, which was lower than that of Phase II and

Phase III of modern mills given in the following tables. Under this phase, the weight loss during milling Rs 2.57 per quintal and it was the costliest component of market incidentals. It is followed very closely by transportation charges at Rs 2.07 per quintal of paddy processed. At the bottom, storage charges remained at the Rs 0.10 per quintal of the paddy processed. Intuitively, the market incidentals increased year after year. It was Rs 6.34 per quintal of paddy processed in 2007-08, and increased to Rs 9.27 per quintal and Rs 9.68 per quintal in 2009-10.

Table 3.2b:
Market Incidentals Incurred by Modern Rice Mills – Phase I

Year	**2007-08**	**2008-09**	**2009-10**	**Average**
Handling/Cleaning/ Packing (Rs/Qtl)	1.10	2.10	2.10	1.77
Packing Material (Rs/Qtl)	1.30	1.92	1.66	1.63
Drying Labour/Material Charge (Rs/Qtl)	0.00	0.00	0.00	0.00
Weight loss (Rs/Qtl)	1.60	2.30	2.50	2.57
Transportation (Rs/Qtl)	1.74	2.15	2.32	2.07
Storages Charges (Rs/Qtl)	0.10	0.10	0.10	0.10
Other Specify (Rs/Qtl)	0.50	0.70	1.00	0.73
Total (Rs/Qtl)	**6.34**	**9.27**	**9.68**	**8.76**

Source: Field Survey

In Phase II of modern rice mills, the three years' average market incidental was Rs 8.96 per quintal of paddy processed. Transportation charge was the highest market incidental under this phase at Rs 1.83 and storage chare was the lowest at Rs 1.10 per quintal of paddy processed. Handling charges were also comparatively high and were in second position in market incidentals at Rs 1.77 per quintal of paddy processed. Interestingly, under this phase of modern rice mills, market incidentals were less volatile in the three years, ranging from more than Rs 1 to lower than Rs 2. Like Phase I type of mills, the total market incidental charges of Phase II rice mills increased year after year from Rs 7.54 per quintal of paddy processed in 2007-08 to Rs 9.45 per quintal in 2008-09 and Rs 9.90 per quintal in 2009-10.

Table 3.2c:
Market Incidentals Incurred by Modern Rice Mills – Phase II

Year	2007-08	2008-09	2009-10	Average
Handling/Cleaning/ Packing (Rs/Qtl)	1.10	2.10	2.10	1.77
Packing Material (Rs/Qtl)	1.36	1.53	1.80	1.56
Drying Labour/Material Charge (Rs/Qtl)	0.00	0.00	0.00	0.00
Weight loss (Rs/Qtl)	1.58	1.52	1.50	1.53
Transportation (Rs/Qtl)	1.40	2.00	2.10	1.83
Storages Charges (Rs/Qtl)	1.10	1.10	1.10	1.10
Other Specify (Rs/Qtl)	1.00	1.20	1.30	1.17
Total (Rs/Qtl)	**7.54**	**9.45**	**9.90**	**8.96**

Source: Field Survey

The market incidentals of phase III of modern rice mill is depicted in the Table 3.2d. As mentioned above, the average three years overall market incidental charges were found to be higher than the other previous two phases. On an average, the market incidentals of Phase III stood at Rs 9.06 per quintal of paddy processed. The packaging material charges became the highest market incidental under this phase at Rs 2.55 per quintal of paddy processed, and it was followed closely by the transportation charges at Rs 2.33 per quintal of paddy processed.

Table 3.2d:
Market Incidentals Incurred by Modern Rice Mills – Phase III

Year	2007-08	2008-09	2009-10	Average
Handling/Cleaning/ Packing (Rs/Qtl)	1.00	1.10	1.10	1.07
Packing Material (Rs/Qtl)	2.36	2.50	2.80	2.55
Drying Labour/Material Charges (Rs/Qtl)	0.00	0.00	0.00	0.00
Weight loss (Rs/Qtl)	1.58	1.52	1.50	1.53
Transportation (Rs/Qtl)	2.50	2.10	2.50	2.33
Storages Charges (Rs/Qtl)	0.90	1.00	1.50	1.13
Other Specify (Rs/Qtl)	0.92	0.10	0.30	0.44
Total (Rs/Qtl)	**9.16**	**8.32**	**9.70**	**9.06**

Source: Field Survey

Mention may be made here again that the drying charges of parboiled paddy have been excluded because the present study concentrates on non-parboiled paddy only. Otherwise,

the total charges of market incidents per unit (quintal) of paddy processed could have been much higher (at least Rs 1- 2 more) than the present market incidental charges.

3.3: PROCESSING COST OF MODERN AND TRADITIONAL RICE MILLS

The processing cost of rice in modern rice mills is presented in the **Table 3.3a**. The processing cost of milling consists of fixed and variable/direct costs. According to Shwetha, *et al*. (2011), the total processing cost per quintal of paddy amounted to Rs 127.00 per quintal for traditional mills and Rs 196.40 for modern units in the five years from 2005-06 to 2009-10 in Davangere district of Karnataka. In this study, under the fixed cost, major components like, insurance, depreciation charges and administrative charges are included. Depreciation charges may vary considerably according to the age of machine used, even the two mills using same technology. In addition, this component is more significant for the modern mills than the traditional ones because the modern mills use advanced technology involving huge investment ((Lele, 1970). Fixed cost estimation excludes investment on machines (seed cost) for the present study. This type of cost (seed cost) was studied in the previous chapter (Table 2.4b).

However, the variable cost consists of labour cost, electricity (especially for modern mills), packaging charges, maintenance and storage charges, etc. This cost varies as production changes (increase or decrease). As mentioned above, the study concentrated on non-parboiled rice so fuel charges of modern mills for parboiling of paddy were not included. However, the same (fuel charges) was included in the case of traditional mills, and clubbed with electricity charges because sometimes they run on diesel as well.

The present study found out that the three years' average cost (2007-08 to 2009-10) of paddy processing by modern mills (phase I, II and II) was Rs 68.49 per quintal (excluding seed capital). Of which, Rs 45.09 was attributed to variable costs and the remaining Rs 23.41 for fixed cost. The average total cost of paddy processed (combine three phases) was Rs 65.05 per quintal in 2007-08 and rose to Rs 67. 66 in 2008-09, and further increased to Rs 72.76 per quintal of paddy processed in 2009-10. The detail cost structure of modern rice mills is given in Table 3.3a.

Table 3.3a:

Average Cost of Paddy Processing by Modern Rice Mills (Owner cum trader)

Type of Rice Produced	**Non-Parboiled**			
Year	**2007-08**	**2008-09**	**2009-10**	**Average**
Variable Cost (A)				
Labour Cost (Rs/Qtl)	17.07	18.76	20.66	18.83
Electricity charges (Rs/Qtl)	14.49	14.37	15.07	14.64
Fuel Charge/Parboiling (Rs/Qtl)	0.00	0.00	0.00	0.00
a. Petrol/Diesel (Rs/Qtl)	0.00	0.00	0.00	0.00
b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
c. Bio Mass (Rs/Qtl)	0.00	0.00	0.00	0.00
Packing Material Cost (Rs/Qtl)	0.86	1.12	1.27	1.08
Maintenance/Repair Cost (Rs/Qtl)	4.15	4.46	5.05	4.55
Storage Cost Specify (Rs/Qtl.)	0.86	0.88	0.98	0.91
Other Cost Specify (Rs/Qtl)	4.92	4.93	5.34	5.07
Sub-total	**42.37**	**44.53**	**48.37**	**45.09**
Fixed Cost (B)				
Insurance (Rs/Qtl)	1.31	1.40	1.49	1.40
Depreciation (Rs/Qtl)	16.01	15.45	16.18	15.88
Adm. Expense (Rs/Qtl)	2.74	3.43	3.71	3.30
Other Specify (Rs/Qtl)	2.63	2.84	3.01	2.83
Sub-total	**22.69**	**23.13**	**24.39**	**23.41**
Total (A+B)	**65.05**	**67.66**	**72.76**	**68.49**

Source: Survey

The fixed cost was slightly increasing from Rs 22.69 per quintal of paddy processed in 2007-08 to Rs 23.13 in 2008-09 and Rs. 24.39 per quintal in 2009-10. Finally, three years' average of this cost was Rs 23.41 per quintal of paddy processed. However, the variable cost was increasing more rapidly than the fixed cost like the increase in price of materials and labour charges. The variable cost per quintal of paddy processed was found to be Rs 42.37 in 2007-08. It went up to Rs 44.53 in 2008-09 and even further to Rs 48.37 per quintal of paddy processed, and ultimately, the three years' average variable cost was found to be Rs 45.09 per quintal of paddy processed for the modern rice mills (phase I, II and III).

Table 3.3b
Cost of Paddy Processing by Modern Rice Mills – Phase I

Costs	Year	2007-08	2008-09	2009-10	Average
Variable Cost	Labour Cost (Rs/Qtl)	22.10	23.20	25.49	23.60
	Electricity charges (Rs/Qtl)	7.39	7.57	7.18	7.38
	Fuel Charges for Parboiling (Rs/Qtl)	0.00	0.00	0.00	0.00
	a. Petrol/Diesel (Rs/Qtl)	0.00	0.00	0.00	0.00
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.00	0.00	0.00	0.00
	Packing Material Cost (Rs/Qtl)	1.27	1.89	2.1`	1.58
	Maintenance/Repair Cost (Rs/Qtl)	3.56	3.66	4.10	3.77
	Storage Cost Specify (Rs/Qtl.)	1.00	0.99	1.10	1.03
	Other Cost Specify (Rs/Qtl)	6.98	6.67	6.55	6.74
	Sub-total	**42.30**	**43.98**	**44.42**	**43.57**
Fixed Cost	Insurance (Rs/Qtl)	0.90	0.76	0.78	0.81
	Depreciation (Rs/Qtl)	6.16	6.12	6.01	6.09
	Administrative Expenses (Rs/Qtl)	1.21	2.52	2.57	2.10
	Other Specify (Rs/Qtl)	2.69	2.67	2.62	2.66
	Sub-total	**10.95**	**12.07**	**11.98**	11.67
Total	**Variable + Fixed Costs**	**53.25**	**56.05**	**56.41**	**55.24**

Source: Survey

Even though the operations like parboiling and drying in rice-processing costs more than the production of non-parboiled rice, the costs can be compensated by the sale of additional by-products like rice bran/germs that are not generally produced when processing non-parboiled rice. However, the related information and analysis are given in the subsequent sections of this study. To identify the technological advancement of different modern mills, phase-wise description and the costs (excluding seed cost) incurred during the process are given in the Tables 3.3b to 3.3e.

From the Table 3.3b, we can see that the total cost incurred by phase I mills was Rs 55.24 per quintal of paddy processed in the three years from 2007-08 to 2009-10. If it is divided into two parts as fixed and variable cost, a greater share is attributed to variable cost with Rs 43.57 per quintal of paddy processed and Rs 11.67 to fixed cost. Of the total, labour cost was the highest with Rs 23.60 per quintal of paddy processed under the sub-category

of variable cost, and storage charge was at the bottom with Rs 1.03 per quintal of paddy. However, depreciation charges were the highest cost component under the fixed cost of phase I type of mills and insurance the least. In 2007-08 Phase I mills incurred the least processing cost at Rs 53.25 per quintal and it rose to Rs 56.05 per quintal in 2008-09. However, the growth rate of cost incurred in Phase I from 2008-09 to 2009-10 was very minimal at 0.64 per cent (Rs 56.05 in 2008-09 to Rs 56.41 in 2009-10) per quintal of paddy processed.

Table 3.3c
Cost of Paddy Processing by Modern Rice Mills – Phase II

Costs	Year	2007-08	2008-09	2009-10	Average
Variable Cost	Labour Cost (Rs/Qtl)	18.14	20.33	20.86	19.78
	Electricity charges (Rs/Qtl)	11.33	12.68	14.34	12.78
	Fuel Charges for Parboiling (Rs/Qtl)	0.00	0.00	0.00	0.00
	a. Petrol/Diesel (Rs/Qtl)	0.00	0.00	0.00	0.00
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.00	0.00	0.00	0.00
	Packing Material Cost (Rs/Qtl)	0.62	0.66	0.70	0.66
	Maintenance/Repair Cost (Rs/Qtl)	4.13	4.44	4.44	4.34
	Storage Cost Specify (Rs/Qtl.)	0.74	0.81	0.87	0.81
	Other Cost Specify (Rs/Qtl)	4.65	4.73	5.10	4.83
	Sub-total	**39.62**	**43.66**	**46.31**	**43.19**
Fixed Cost	Insurance (Rs/Qtl)	0.79	0.66	0.97	0.81
	Depreciation (Rs/Qtl)	3.64	3.45	3.78	3.62
	Administrative Expenses (Rs/Qtl)	3.53	3.75	3.75	3.67
	Other Specify (Rs/Qtl)	2.70	3.05	3.31	3.02
	Sub-total	**10.66**	**10.90**	**11.81**	**11.12**
Total	**Variable + Fixed Costs**	**50.28**	**54.56**	**58.11**	**54.32**

Source: Field Survey

For the analysis of cost of paddy processed by Phase II type of mills, Table 3.3c presents the costs of paddy processing that is slightly lesser than Phase I. However, the three years average labour cost had decreased and electricity cost was almost 73 per cent higher than Phase I. It is because of the improvement of the technology. The average total cost incurred by the Phase II type of mill was Rs 54.32 per quintal of paddy processed in the three years from 2007-08 to 2009-10. If it is divided into two parts as fixed and variable

cost, the greater share was attributed to variable cost with Rs 43.19 per quintal of paddy processed and Rs 11.12 to fixed cost. Of the total cost, the labour cost was the highest with Rs 19.78 per quintal of paddy processed under the sub-category of variable cost, and packing material charge at the bottom with Rs 0.66 per quintal of paddy. However, administrative charges were the highest cost under fixed cost of Phase II type of mills at Rs 3.67 per quintal and insurance the least under the same category at Rs 0.81 per quintal of paddy processed. Yearly cost comparison of the Phase II mills shows that processing cost was lowest in 2007-08 at Rs 50.28 per quintal and it rose to Rs 54.56 per quintal in 2008-09 with a growth of 8.5 per cent per annum. However, the growth rate of cost incurred from 2008-09 to 2009-10 was slightly lower than the previous year at 6.5 per cent (Rs 54.56 in 2008-09 to Rs 58.11 in 2009-10) per quintal of paddy processed.

Table 3.3d
Cost of Paddy Processing by Modern Rice Mills – Phase III

Costs	Year	2007-08	2008-09	2009-10	Average
Variable Cost	Labour Cost (Rs/Qtl)	10.98	12.75	15.64	13.12
	Electricity charges (Rs/Qtl)	24.76	22.87	23.68	23.77
	Fuel Charges for Parboiling (Rs/Qtl)	0.00	0.00	0.00	0.00
	a. Petrol/Diesel (Rs/Qtl)	0.00	0.00	0.00	0.00
	b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
	c. Bio Mass (Rs/Qtl)	0.00	0.00	0.00	0.00
	Packing Material Cost (Rs/Qtl)	0.69	0.81	1.00	0.83
	Maintenance/Repair Cost (Rs/Qtl)	4.77	5.27	6.62	5.55
	Storage Cost Specify (Rs/Qtl.)	0.84	0.85	0.98	0.89
	Other Cost Specify (Rs/Qtl)	3.13	3.40	4.36	3.63
	Sub-total	**45.18**	**45.95**	**52.28**	47.80
Fixed Cost	Insurance (Rs/Qtl)	2.23	2.79	2.73	2.58
	Depreciation (Rs/Qtl)	6.21	5.89	6.39	6.17
	Administrative Expenses (Rs/Qtl)	3.48	4.04	4.81	4.11
	Other Specify (Rs/Qtl)	2.50	2.80	3.10	2.80
	Sub-total	**14.43**	**15.52**	**17.03**	15.66
Total	**Variable + Fixed Costs**	**59.61**	**61.46**	**69.31**	**63.46**

Source: Field Survey

Phase III type of modern rice mills were still efficient and technologically more advanced compared to the earlier Phase I and Phase II type of mills. A number of interesting and

significant observations of Phase III type of mills can be seen in Table 3.3d. The costs of paddy processing by the modern rice mills in Phase III was significantly higher compared to the modern rice mills in Phase I and Phase II of modernisation. In particular, on an average, the cost of processing a quintal of paddy by the modern rice mills in Phase III remained about 15 and 17 per cent higher than those in Phase I and II respectively. Basically, the economies of scale were high when smaller quantity of paddy was processed because technology had improved.

From Table 3.3d above we can see that the electricity charges for processing of paddy in the modern rice mills of Phase III remained significantly higher than those in Phase I and Phase II type of mills. It was more than three times higher than Phase I and almost two times higher than Phase II. In addition, the depreciation charges had gone up compared to the former two phases of modern mills. However, the labour cost had also gone down drastically to Rs 13.12 per quintal of paddy processed. It was 44.4 per cent lesser than Phase I and 33.7 per cent lower than Phase II type of modern mills.

As mentioned above, the maintenance cost for the modern rice mills in Phase III also remained much higher than those in Phases I and II. It was because of the fixed cost for the modern rice mills belonging to Phase III remained much higher than those belonging to Phases I and II. This had been reflected especially in depreciation charges, followed by administrative expenses and insurance costs. The total three years average paddy processing cost in Phase III type of mills turned out to be Rs 63.46 per quintal. It had increased from Rs 59.61 per quintal of paddy processed in 2007-08 to Rs 61.46 per quintal in 2008-09, and further increased to Rs 69.31 per quintal in 2009-10. Similarly, the share of fixed cost of the total processing cost of Phase III type of mills was 4-5 per cent higher than the earlier two phases of modern mills.

From the above analysis, we can observe that there exist some significant differences among the various components of costs for the modern rice mills belonging to different phases of modernisation. While the modern rice mills of Phase I have comparative cost advantage in terms of total costs of processing per unit of paddy, those belonging to

Phase III have the least advantage in terms total unit costs of paddy processing. In fact, it remained evident that the modern rice mills belonging to Phase III of modernisation were less labour-intensive. Again, as they are heavily capital intensive and extremely mechanised, the costs of electricity, maintenance, depreciation etc., remained much higher than those in Phases I and II.

Now, in contrast to the modern rice mills, it was necessary to consider the processing costs borne by the traditional rice mills, viz. the huller units. The detail cost of paddy processing in traditional mills can be seen in Table 3.3e below. As mentioned above, the present study of traditional mills also concentrates on the non-parboiled rice and the custom hiring basis traditional rice mills have also been included.

Table 3.3e

Cost of Paddy Processing by Traditional Mills (Hullers) on Custom Hiring basis

Year (Non-parboiled)	**2007-08**	**2008-09**	**2009-10**	**Average**
Variable Cost (A)				
Labour Cost (Rs/Qtl)	3.28	4.02	4.76	4.02
Electricity/fuel charges (Rs/Qtl)	4.32	5.71	6.41	5.48
Fuel Charges for Parboiling (Rs/Qtl)	0.00	0.00	0.00	0.00
a. Petrol/Diesel (Rs/Qtl)	0.00	0.00	0.00	0.00
b. Firewood (Rs/Qtl)	0.00	0.00	0.00	0.00
c. Bio Mass (Rs/Qtl)	0.00	0.00	0.00	0.00
Packing Material Cost (Rs/Qtl)	0.62	0.79	0.57	0.66
Maintenance/Repair Cost (Rs/Qtl)	1.63	1.61	2.08	1.78
Storage Cost Specify (Rs/Qtl.)	0.50	0.53	0.67	0.57
Other Cost Specify (Rs/Qtl)	0.00	0.00	0.40	0.40
Sub-total	**10.36**	**12.67**	**14.88**	**12.64**
Fixed Cost (B)				
Insurance (Rs/Qtl)	0.33	0.60	0.83	0.59
Depreciation (Rs/Qtl)	0.15	0.15	0.15	0.15
Adm. Expenses (Rs/Qtl)	1.83	1.65	1.75	1.74
Other Specify (Rs/Qtl)	0.00	0.00	0.00	0.00
Sub-total	**2.31**	**2.51**	**2.73**	**2.58**
Total (A+B)	**12.66**	**15.08**	**17.61**	**15.12**

Source: Survey

From Table 3.3e, it is clear that the cost of paddy processing in traditional mills was lesser than in modern mills. The cost of machines was also much lesser compared to the modern mills. As a result, the depreciation charges and insurance cost reduced drastically compared to modern mills. The three years average cost turned out to be Rs 15.12 per quintal of paddy processed. We also witnessed that the cost of paddy processing in this mills was increasing year after year from Rs 12.66 per quintal in 2007-08 to Rs 15.08 per quintal in 2008-09, and further rose to Rs 17.61 per quintal. As these mills were run under the custom hiring basis and mostly run by self-labour, the labour cost dramatically dropped to Rs 4.02 per quintal of paddy processed, and the electricity charge became the highest cost component in this mill type at Rs 5.48 per quintal. When we break the total cost of paddy processed into two parts, only Rs 2.58 per quintal was attributed to fixed cost and Rs 12.64 to variable cost. Similarly, these two sub-costs (fixed and variable) were also increasing year after year from 2007-08 to 2009-10.

Compared to the modern rice mills, the cost of paddy processing in the traditional mills (hullers) was almost five times less. Similarly, the labour cost was also five times lesser than the modern mills because the traditional mills were run on custom hiring basis and labour involvement was not much significant. Besides, the machine was of low cost and the cost of insurance cost was also dramatically low.

3.4: ECONOMICS OF MODERN MILLS RUNNING UNDER OWNER-CUM-TRADER

The basic tenet of the economics of rice mills centres on the benefits or profit on the investment made by the mills. For the purpose, prior understanding of the detail cost, investment and valuation of the output and by-products in both modern and traditional mills is required. The gross investments made by modern and traditional mills in the three years from 207-08 to 2009-10 are given in Table 3.4a.

Table 3.4a:

Total Investment made by Rice Mills (Rs in Lakh)

Type of Mills	No. of Units	2007-08	2008-09	2009-10	Average*
1. All Modern Mills	67	24516 (365.9)	25673 (383.1)	27119 (404.8)	25769 (384.6)
Phase I	7	4377 (625.3)	4509 (644.1)	4665 (666.4)	4517 (645.3)
Phase II	24	7284 (303.5)	7379 (307.5)	7821 (325.9)	7495 (312.3)
Phase III	36	12855 (357.1)	13785 (382.9)	14633 (406.5)	13758 (382.2)
2. Traditional Mills	25	21 (0.8)	41 (1.6)	30 (1.2)	31 (1.2)
All (Modern and Traditional) (1+2)	**92**	**24537** (266.7)	**25714** (279.5)	**27149** (295.1)	**25800** (280.4)

Source: Survey

* Three years Average; Figures in parenthesis are average investment per unit

The gross investment in this section is excluding the seed cost or initial machine cost (given in the Chapter II, Table 2.4b). It consists of two components: a) sum total of total market incidentals; electricity cost; labour cost and depreciation charges, b) total value of paddy purchased for processing. However, the second component (total value of paddy purchased for processing) was not included in the case of traditional mills of the present study because they run on the custom hiring basis. The three years average gross investment of modern rice mill was Rs 25,769 lakh and Rs 384.6 lakh was the three years average gross investment. The average gross investment was increasing year after year from Rs 365.9 lakh per mill in 2007-08 to Rs 383.1 lakh in 2008-09 and then rose to Rs 404.8 per modern rice mill in 2009-10. Interestingly, the average gross investment in Phase I was quite higher than other two phases. The average (three years) gross investment in Phase I was Rs 645.3 lakh per mill and for Phase II it was Rs 312.3 lakh per unit — just a half of Phase I. However, in Phase III, the gross investment rose to Rs 382.2 lakh per mill in three years. In the case of traditional mills, three years average gross investment was Rs 1.2 lakh per unit. It was Rs 0.8 lakh per unit in 2007-08 and rose to Rs 1.6 in 2008-09, and slightly fell to Rs 1.2 lakh per unit in 2009-10.

Compared to the modern mills, the gross investment in traditional mills was much less. It was primarily due to the absent of value of paddy purchased for processing in the traditional mills as they were running under the custom hiring basis, besides low cost machines,. The overall (both modern and traditional) average gross investment was Rs 280.4 lakh per unit of the 92 sample units in three years. It was Rs 266.7 lakh per unit in 2007-08, and gradually rose to 279.5 lakh per unit in 2008-08, and Rs 295.1 lakh per unit in 2009-10.

Table 3.4b:

Economics of Modern Rice Mills– Running on Owner-cum-Trader Basis

No.	Components	2007-08	2008-09	2009-10	Average
1	Paddy Processed	3043932	3176058	3337665	3185885
2	Value of Paddy Processed	22902	23937	25185	24008
3	Conversion Ratio of Fine Rice	62.7	62.6	62.8	62.7
4	Quantity of Fine Rice Produced	1918706	1999341	2107861	2008636
5	Value of Fine Rice Produced	23663	24789	26159	24870
6	Conversion Ratio Broken Rice	2.2	2.2	2.2	2.2
7	Quantity of Broken Rice Produced	66757	71106	72350	70071
8	Value of Broken Rice Produced	383	412	422	406
9	Conversion Ratio of Bran	4.3	4.4	4.5	4.4
10	Bran Produced	132441	141249	148928	140873
11	Value of Bran Produced	855	922	975	917
12	Conversion Ratio of Husk	20.5	19.8	20.2	20.2
13	Husk Produced	636431	646519	689000	657317
14	Value of Husk Produced	110	121	130	120
15	Total Value of By-Product **(8+11+14)**	1349	1454	1528	1444
16	**Gross Returns (5+15)**	25011	26244	27687	26314
17	Total Market Incidentals	249	284	323	285
18	Total Electricity Cost	539	565	612	572
19	Total Bio-fuel Cost	NA	NA	NA	NA
20	Total Labour Cost	475	531	615	541
21	Total Depreciation & Other Costs	351	356	383	363
22	**Total Cost (17+18+19+20+21)**	**1613**	**1737**	**1933**	**1761**
23	Net Returns **(16-22-2)**	495	570	568	545
24	**Net Return (23/1) (Rs/Qtl)**	**16.3**	**17.9**	**17.0**	**17.1**

Source: Survey

Note: N= 92; Quantity in Quintal, Value in Rs Lakh; NA=Not Available

Coming to the economics of modern rice mills, it is expected to result higher yield of rice as well make the by-products like broken-rice, bran, husk, etc., available separately and in smaller quantities. It is mandatory for the rice mills irrespective of the quantity of paddy milled because the economics of modernisation is essentially based on better rate of recovery and not on the quantum of production. Table 3.4b portrays the overall picture of the economics of modern rice mills. The sample mills were running under the owner-cum-trader and produced only non-parboiled rice in this study. For the entire sample modern rice mills (92 units of three phases), the net return per quintal of paddy processed turned out to be Rs 17.1 on an average from 2007-08 to 2009-10. The share of by-products (broken-rice, bran and husk) in value terms was 5.5 per cent of gross returns from milling operations and for the main product, viz. fine rice, it was 94.5 per cent of gross returns. The share of total costs (including market incidentals, processing costs) stood at 6.8 per cent of gross investment (i.e., total costs and value of paddy purchased for processing, given in Table 3.4a:), while the net return was only 2.1 per cent of the gross investment.

Our interest is in the net return per quintal of paddy processed. The overall net return per quintal of paddy processed was Rs 16.3 in 2007-08 and rose to Rs 17.9 in 2008-09. However, there was slight downfall in 2009-10 as the net return of the modern mills turned out to be Rs 17.0 per quintal of paddy processed in the study period.

To identify the technological development of the mills, we are analysing the improvement in the different phases from the tables given below (Table 3.4c to 3.4e). Now, as was done earlier, we can sub-divide the modern rice mills under the present survey further into three distinct sub-groups, viz., modern rice mills belonging to Phase I, II and III and examine the major economic variables separately too. As such, the major observations for the modern rice mills of Phase I (Table 3.4c) are that they run under the owner-cum-trader basis and produce non-parboiled type of rice only.

Table 3.4c:

Economics of Modern Rice Mills– Phase I Running on Owner-cum-Trader Basis

No.	Components	2007-08	2008-09	2009-10	Average
1	Paddy Processed	549733	557899	574715	560782
2	Value of Paddy Processed	4123	4229	4368	4240
3	Conversion Ratio of Fine Rice	61.2	61.2	61.2	61.2
4	Quantity of Fine Rice Produced	336494	341287	351569	343117
5	Value of Fine Rice Produced	4188	4310	4443	4313
6	Conversion Ratio Broken Rice	2.0	2.1	2.0	2.0
7	Quantity of Broken Rice Produced	10995	11716	11494	11402
8	Value of Broken Rice Produced	82	88	89	86
9	Conversion Ratio of Bran	4.0	4.2	4.4	4.2
10	Bran Produced	21989	23432	25287	23570
11	Value of Bran Produced	163	176	190	176
12	Conversion Ratio of Husk	20.0	19.0	20.0	19.7
13	Husk Produced	109947	106001	114943	110297
14	Value of Husk Produced	15	19	21	18
15	Total Value of By-Product **(8+11+14)**	260	283	299	281
16	**Gross Returns (5+15)**	**4448**	**4593**	**4742**	4594
17	Total Market Incidentals	35	52	56	47
18	Total Electricity Cost	41	41	41	41
19	Total Bio-fuel Cost	NA	NA	NA	NA
20	Total Labour Cost	121	129	134	128
21	Total Depreciation & Other Cost	57	58	67	61
22	**Total Cost (17+18+19+20+21)**	**254**	**280**	**297**	**277**
23	Net Returns **(16-22-2)**	71	84	77	77
24	**Net Return (23/1) (Rs/Qtl)**	**13**	**15**	**13**	**14**

Source: Field Survey

Note: N=7; Quantity in Quintal; Value in Rs Lakh; NA=Not Available

For all the sample units of Phase I modern rice mills (7 units), the net return per quintal of paddy processed turned out to be Rs 14.0 on an average over the three years from 2007-08 to 2009-10. The share of by-products (broken-rice, bran and husk) in value terms stood at 6.1 per cent of gross return while that of the main product, viz., fine rice, stood at 93.9 per cent of gross return. The share of total costs (including market incidentals, processing costs) stood at 6.1 per cent of gross investment (i.e., total costs and value of paddy purchased for processing, given in Table 3.4a), while net return stood at only 1.7 per cent of the gross investment. When we look at the year-wise performance, the average net return in 2007-08 was Rs 13 per quintal of paddy processed, and rose to

Rs 15 per quintal of paddy processed in 2008-09. Again, in 2009-10, the net return decreased to Rs 13 per quintal of paddy processed.

Table 3.4d:

Economics of Modern Rice Mills – Phase II Running on Owner-cum-Trader Basis

No.	Components	2007-08	2008-09	2009-10	Average
1	Paddy Processed	889563	895457	944571	909864
2	Value of Paddy Processed	6761	6805	7198	6921
3	Conversion Ratio of Fine Rice	63.5	63.0	63.5	63
4	Quantity of Fine Rice Produced	564873	564138	599803	576271
5	Value of Fine Rice Produced	6982	7046	7492	7173
6	Conversion Ratio Broken Rice	2.3	2.5	2.5	2
7	Quantity of Broken Rice Produced	20460	21491	22670	21540
8	Value of Broken Rice Produced	151	161	169	160
9	Conversion Ratio of Bran	4.5	4.5	4.6	5
10	Bran Produced	39848	40296	43632	41258
11	Value of Bran Produced	251	260	281	264
12	Conversion Ratio of Husk	19.5	19.0	19.0	19
13	Husk Produced	173465	170137	179468	174357
14	Value of Husk Produced	31	34	36	34
15	Total Value of By-Product **(8+11+14)**	434	455	486	458
16	**Gross Returns (5+15)**	**7415**	**7501**	**7978**	**7631**
17	Total Market Incidentals	67	84	91	80
18	Total Electricity Cost	101	114	135	117
19	Total Bio-fuel Cost	NA	NA	NA	NA
20	Total Labour Cost	161	182	197	180
21	Total Depreciation & Other Costs	194	195	200	196
22	**Total Cost (17+18+19+20+21)**	**523**	**574**	**623**	**573**
23	Net Returns **(16-22-2)**	132	122	157	137
24	**Net Return (23/1) (Rs/Qtl)**	**15**	**14**	**17**	**15**

Source: Field Survey
Note: N= 24; NA= Not Available

In the case of Phase II modern rice mills, the overall performance was better than the Phase I type of mills, and the details are given in Table 3.4d below. For all the Phase II modern rice mills (24 units) sampled, on an average over the three years from 2007-08 to 2009-10, the net return per quintal of paddy processed turned out to be Rs 15.0. The share of by-products (broken-rice, bran and husk) in value terms stood at 6.0 per cent of gross return, while the main product, viz., fine rice was 94.0 per cent of gross return. The share of total costs (including market incidentals, processing costs) stood at 7.6 per cent of gross investment (i.e., total costs and value of paddy purchased for processing, given in

Table 3.4a), while net return stood at only 1.8 per cent of the gross investment. When we look at the year-wise performance, the average net return in 2007-08 was Rs 15 per quintal of paddy processed and it slightly dropped to Rs 14 per quintal of paddy processed in 2008-09. Again, in year 2009-10, the net return shot up to Rs 17 per quintal of paddy processed.

Table 3.4e:

Economics of Modern Rice Mills – Phase III Running on Owner-cum-Trader Basis

No.	Components	2007-08	2008-09	2009-10	Average
1	Paddy Processed	1604636	1722702	1818379	1715239
2	Value of Paddy Processed	12019	12903	13620	12847
3	Conversion Ratio of Fine Rice	63.4	63.5	63.6	64
4	Quantity of Fine Rice Produced	1017339	1093916	1156489	1089248
5	Value of Fine Rice Produced	12493	13433	14225	13384
6	Conversion Ratio Broken Rice	2.2	2.2	2.1	2
7	Quantity of Broken Rice Produced	35302	37899	38186	37129
8	Value of Broken Rice Produced	150	163	164	159
9	Conversion Ratio of Bran	4.4	4.5	4.4	4
10	Bran Produced	70604	77522	80009	76045
11	Value of Bran Produced	441	486	504	477
12	Conversion Ratio of Husk	22.0	21.5	21.7	22
13	Husk Produced	353020	370381	394588	372663
14	Value of Husk Produced	64	67	74	68
15	**Total Value of By-Product (8+11+14)**	**655**	**716**	**742**	**704**
16	**Gross Returns (5+15)**	**13148**	**14149**	**14967**	**14088**
17	Total Market Incidentals	147	148	176	157
18	Total Electricity Cost	397	411	436	415
19	Total Bio-fuel Cost	NA	NA	NA	NA
20	Total Labour Cost	192	220	284	232
21	Total Depreciation & Other Cost	100	103	116	106
22	**Total Cost (17+18+19+20+21)**	**836**	**882**	**1013**	**911**
23	Net Returns **(16-22-2)**	293	364	334	330
24	**Net Return (23/1) (Rs/Qtl)**	**18**	**21**	**18**	**19**

Source: Field Survey
Note: N = 36; NA= Not Available

In Phase III of modern rice mills, the overall performance was much better than the Phase I and II type of mills, and the details are given in Table 3.4e below. For all the sample units of phase III modern rice mills (36 units), on an average over the three years from 2007-08 to 2009-10, the net return per quintal of paddy processed turned out to be Rs 19.0. The share of by-products (broken-rice, bran and husk) in value terms stood at 5.0

per cent of gross return, while that for the main product, viz. fine rice, stood at 95.0 per cent of gross return. The share of total costs (including market incidentals, processing costs) stood at 6.6 per cent of gross investment (i.e., total costs and value of paddy purchased for processing, given in Table 3.4a), while net return stood at only 2.3 per cent of the gross investment. When we look at the year-wise performance, the average net return in 2007-08 was Rs 18 per quintal of paddy processed and it increased to Rs 21.0 per quintal of paddy processed in 2008-09. Again, in 2009-10, the net return decreased to Rs 18.0 per quintal of paddy processed.

3.5: ECONOMICS OF TRADITIONAL (HULLERS) MILLS RUNNING UNDER CUSTOM HIRING BASIS

The economic aspects of traditional mills running on custom hiring basis and producing non-parboiled rice are presented in the Table 3.5. The milling ratio was 58.7 kg per quintal of paddy processed. As mentioned above, the value of rice was not given for these mills as they are run on the custom hiring bases. The net return was realised at Rs 25.0 per quintal of paddy processed.

Unlike modern mills, the share of by-products (broken-rice, bran and husk) of gross return does not arise in case of traditional mills because the by-products were being taken away by the customers and the same applies to the main product, viz., fine rice, as well. When we look at the year-wise performance, the average net return in 2007-08 was Rs 26 per quintal of paddy processed, and slightly fell down to Rs 24 per quintal of paddy processed in both 2008-09 and 2009-10. The yearly average total cost of traditional mills (25 units) was Rs 31 lakh in three years, and in terms of per unit, it was Rs 124 lakh per mill in three years. However, though it is low technologically compared to the modern mills, the conversion ratio was not that much lower as we expected, and stood at 58.7 per cent per quintal of paddy processed. However, the conversion ratio of broken rice was quite high at 10.2 per cent per quintal of paddy processed when compared to 2.2 per cent per quintal of paddy processed in modern mills. The traditional mills had lesser capital investment compared to the modern mills and their annual paddy processing capacity was much lower than the modern mills. For instances, the annual paddy processing capacity

of traditional mills in the last three years (2007-08 to 2009-10), was hardly 14 per cent for Phase I modern mills, 29.6 per cent for Phase II and 23.5 per cent for Phase III types of modern rice mills.

Table 3.5:

Economics of Traditional Rice Mills Running on Custom Hiring Basis

	Year	**2007-08**	**2008-09**	**2009-10**	**Average**
1	Quantity of Paddy Processed (qtl)	228289	375289	238618	280732
2	Quantity of Fine Rice Produced (qtl)	133699	221061	139632	164797
3	Broken Rice Produced (qtl)	13241	19140	11931	14770
4	Conversion Ratio of rice (kg/qtl)	58.6	58.9	58.5	58.7
5	Conversion Ratio Broken Rice (kg/qtl)	10.2	10.2	10.2	10.2
6	By-product obtained (kg/qtl)	23.6	23.6	23.6	23.6
7	Customs Charges (Rs/qtl)	35.1	35.1	36.1	35.5
8	Value of Custom Charges (Rs Lakh)	80	132	86	99
9	By-products if Sold	NA	NA	NA	NA
10	Value of By-Product	NA	NA	NA	NA
11	Total Electricity cost (Rs in lakh)	10	21	15	16
12	Total Labour Cost (Rs in lakh)	7	15	11	11
13	Depreciation & Other Costs (in lakh)	3	5	3	4
14	**Gross Returns (8+10) (Rs in lakh)**	**80**	**132**	**86**	**99**
15	Total Cost (11+12+13) (Rs in lakh)	21	41	30	31
16	Net Returns (14-15) (Rs in lakh)	60	91	56	69
17	**Net Returns (Rs./Qt) (16/1)**	**26**	**24**	**24**	**25**

Source: Survey
Note: N= 25; NA= Not Available

3.6: MARKETING OF PROCESSED RICE BY MODERN AND TRADITIONAL MILLERS

As has been mentioned earlier, the traditional rice milling units under the purview of the present study turned out to be traditional hullers running on a custom hiring basis and producing non-parboiled rice. These huller units only process paddy for a fixed charge per quintal and do not have to market the final product. Hence, for traditional huller units running on a custom hiring basis, issues relating to marketing of rice do not arise at all.

However, for the modern rice mills, marketing of products and by-products is one of the major business activities. In fact, the simple rule of business for the modern rice mill was to buy paddy at cheap rate from the farmers and sell the polished fine rice at high price in

a cost-effective manner. Their main customers can be classified into three groups: a) Wholesalers (buying in bulk); Levy to the government; and c) Retailers in the market. Generally, rice is sold to wholesalers at slightly cheaper rates than that of retailers. The retailers buy rice (fine/polished) as individual traders openly from the mills at the prevailing market price. However, the third category, levy to government, is somewhat different. By law, all the licensed modern rice mills have to sell a certain percentage of processed rice to the government at the minimum price set by the government (administered price). It should be noted here that the amount of levy rice was to be calculated based on the installed capacity of the modern rice mills.

Secondly, it should be noted here that there was very little waste items in processing paddy to rice because the by-products generated at every stage of processing the paddy to rice have a definite demand in the market. Starting from the main product viz., the fine rice, by-products like, broken rice, bran and husk were obtained separately and sold by the modern rice mills. However, these by-products were not found separately. Thus, the option of marketing was present at every stage of production in the modern rice mills.

Table 3.6a:

Marketing of Rice by Modern Rice Mills

Year	Unit	Wholesaler	Retailer	Levy to Govt.	Total
2007-08	**Quantity (Qt)**	1158357	437049	536539	2131945
	% of Total	*54.3*	*20.5*	*25.2*	*100.0*
2008-09	**Quantity (Qt)**	1205478	416599	593875	2215953
	% of Total	*54.4*	*18.8*	*26.8*	*100.0*
2009-10	**Quantity (Qt)**	522923	1139862	668222	2331007
	% of Total	*22.5*	*48.9*	*28.7*	*100.0*
Average	**Quantity (Qt)**	2920166	1963598	1795141	6678905
	% of Total	***43.7***	***29.4***	***26.9***	***100.0***

Source: Survey

In this section, however, we are concerned only with the marketing of fine rice by the sample modern rice mill units (67 mills) and the details of marketing have been described in Table 3.6a, which combines the overall state of marketing for all the sample rice mills

taken together. The phase-wise analysis of marketing of rice by the modern mills can be seen in Tables 3.6b to 3.6d.

Table 3.6a makes it evident that on an average, only 27 per cent of the fine rice produced by the modern rice mills (Phase I, II and III together) served as levy to the government and 29.4 per cent of the total processed rice was sold to retailers in the open market. However, 44 per cent of fine rice produced was sold to the wholesalers. It is also interesting to note that the 49 per cent of the total rice was sold to retailers in 2009-10 and hardly 22.5 per cent of rice was sold to wholesalers. In 2007-08 and 2008-09, the major share, 54 per cent, of rice was sold to wholesalers. The levy to government was increasing uniformly year after year, from 25 per cent in 2007-08 to 27 per cent in 2008-09, and reached to 29 per cent in 2009-10.

Table 3.6b:

Marketing of Rice by Modern Rice Mills (Phase I)

Year	Unit	Wholesaler	Retailer	Levy to Govt.	Total
2007-08	**Quantity (Qt)**	267720	148978	133035	549733
	% of Total	48.7	27.1	24.2	100.0
2008-09	**Quantity (Qt)**	279507	135569	142822	557899
	% of Total	50.1	24.3	25.6	100.0
2009-10	**Quantity (Qt)**	286208	138506	150001	574715
	% of Total	49.8	24.1	26.1	100.0
Average	**Quantity (Qt)**	277774	141130	141878	560782
	% of Total	49.5	25.2	25.3	100.0

Source: Survey

On an average in the three years of the study, Phase I type of mills sold 25 per cent of the total rice produced to retailers and the government. The remaining 50 per cent of the rice was sold to wholesalers. The levy to the government was increasing at a slow pace from 24 per cent in 2007-08 to 26 per cent in 2009-10. The share of rice sold to wholesalers was more or less same throughout the study period. However, the share of rice sold to retailers declined slowly from 27 per cent in 2007-08 to 24 per cent in 2009-10 (refer to Table 3.6b).

In the case of Phase II type of mills (Table 3.6c), on an average 54 per cent of the total rice produced was sold to wholesalers in three years study period, levy to the government was 28.4 per cent and 17.7 per cent was sold to the retailers. The share of rice sold to the wholesalers remained more or less same in the three years of study period. However, the growth in rice marketing between the retailers and levy to the government was opposite. The share of rice produced by Phase II type of mills sold to the retailers declined from 20 per cent in 2007-08 to 19 per cent in 2008-09, and dropped further to 13.7 per cent in 2009-10. Meanwhile, the rice sold to the government increased from 25 per cent to 28 per cent in 2008-09 and touched to 32 per cent in 2009-10.

The average quantity of rice produced by these mills was highest in 2009-10 with a total of 5, 99,803 qtls of rice. It was approximately 24,993 qtls per mill (5, 99,803 qtls produced by 24 mills). However, in 2007-08 and 2008-09, the total quantity of rice produced was 5, 64,873 qtls and 5, 64,138 qtls respectively — slightly lower than 2009-10. However, the share of rice sold to the wholesalers was approximately 9 per cent more than the Phase I. However, the share of rice sold to the retailer was almost 30 per cent lesser than the Phase I and levy to the government. It was 12 per cent more than Phase I type of mill.

Table 3.6c:

Marketing of Rice by Modern Rice Mills (Phase II)

Year	Unit	Wholesaler	Retailer	Levy to Govt.	Total
2007-08	**Quantity (Qt)**	308421	114104	142348	564873
	% of Total	54.6	20.2	25.2	100.0
2008-09	**Quantity (Qt)**	299557	107750	156830	564138
	% of Total	53.1	19.1	27.8	100.0
2009-10	**Quantity (Qt)**	325093	82173	192537	599803
	% of Total	54.2	13.7	32.1	100.0
Average	**Quantity (Qt)**	310994	101808	163469	576271
	% of Total	54.0	17.7	28.4	100.0

Source: Survey

Finally, in Phase III type of mills (Table 3.6d), 60 per cent of the total rice produced was sold to wholesalers in three years study period, 27 per cent as levy to the government and

13 per cent to the retailers. The rice sold to the wholesalers increased slightly from 59.7 per cent of the total rice produced in 2007-08 to 60 per cent in 2008-09, and 61 per cent in 2009-10.

It should also be noted that, in three years' time, the share of rice sold to wholesalers was increasing as the technology improved, from 49.5 per cent in Phase I type of mills to 54 per cent in Phase II and 60.3 per cent in Phase III. However, the case is quite opposite in the case of retailers. In the three years study period, the share of rice sold to the retailers declined from 25.2 per cent of the total produced in Phase I to 17.7 per cent in Phase II and fell down to 12.8 per cent in Phase III type of mills. It is probably the mill owners who preferred to sell more to the wholesalers rather than the retailers in the open market, as the volume of rice produced increased due to the improvement in technology.

Table 3.6d:

Marketing of Rice by Modern Rice Mills (Phase III)

Year	Unit	Wholesaler	Retailer	Levy to Govt.	Total
2007-08	**Quantity (Qt)**	607351	144462	265525	1017339
	% of Total	59.7	14.2	26.1	100.0
2008-09	**Quantity (Qt)**	656350	142209	295357	1093916
	% of Total	60.0	13.0	27.0	100.0
2009-10	**Quantity (Qt)**	706615	128370	321504	1156489
	% of Total	61.1	11.1	27.8	100.0
Average	**Quantity (Qt)**	656453	139061	293734	1089248
	% of Total	60.3	12.8	27.0	100.0

Source: Survey

3.7: STANDARD OF MOISTURE MAINTAINED IN PROCESSING OF PADDY

To ensure good quality end-product (polished/find rice) in modern rice mills, certain standards have to be maintained especially in the moisture/temperature of raw paddy. There is no doubt that the moisture content in raw paddy significantly affects the quality of the fine rice produced. It is also understood that the quality standards maintained for the processing of rice is different for different varieties of rice. Our study concentrated only non-parboiled rice that was produced so there is no division of common and Grad A rice and the observed average moisture content is presented in the Table 3.7 for the

different phases of the mills. It is also understood that the issue does not arise for the traditional mills because they are run under the custom hiring basis only.

From the Table 3.7, it is understood that the average moisture content in raw paddy was 16.64 per cent on an average for the sample modern rice mills. Again, in the case of paddy for final processing, the average moisture content was, on an average, 11.43 per cent for all the sample rice mills taken together. On an average, the loss in moisture for all the modern mills taken together was 5.2 per cent. It should also be noted here that the maximum loss of moisture was 6 per cent for the modern rice mills in Phase II, which was more than 1 per cent higher than mills of Phase I and II type of mills.

Table 3.7:

Standards Maintained in Processing of Paddy

Description	Phase I	Phase II	Phase III	All
Average Moisture Content of Raw Paddy (%)	16.78	17.06	16.10	16.64
Average Moisture Content for Final Processing (%)	12.00	11.06	11.24	11.43
Foreign Material Refraction removed (%)	9.89	9.22	10.56	9.89

Source: Survey

Along with the loss in moisture, the refraction content or the presence of foreign materials in raw paddy served to be one of the most important yardsticks for gauging the quality of the raw material. It is highly significant to note here that this survey found the average refraction ratio in raw paddy for the sample modern rice mills was an average of 9.89 per cent. Even after cross-verifying ransom samples of raw paddy drawn repeatedly from stocks with the mills, the study found that the refraction ratio of raw paddy was around 9 to 11 per cent for the sample modern rice mills.

It is here that the higher refraction content in raw paddy can be an explanatory factor for the low out-turn ratio for the modern rice mills under the purview of the study, though further focused research on the subject is required. For example, a refraction ratio of 10 per cent means that only 90 kg of paddy was actually processed for every 100 kg of raw

un-cleaned paddy. Hence, 63 kg of rice output (refer to Table 2.6 of Chapter II) means that it was actually obtained from 90 kg of cleaned raw paddy, which in turn means a 70 per cent conversion ratio. There is an indication that the proportion of refraction content in raw paddy may act as an important determinant of the out-turn ratio of modern mills.

3.8: PROCESSING OF PADDY AND ITS BY-PRODUCTS IN MODERN AND TRADITIONAL RICE MILLS

It is intuitive to note that the share of by-product decreases as technology of mills is upgraded through the different phases. Conversely, the out-turn ratio of rice increases as the technology improves. Unlike traditional mills, apart from the main product, fine rice or polished rice, the by-products like, broken rice, bran and husk is produced separately in the modern mills. Also, the quality of the by products produced by improved mills were of better quality and in great demand in the fodder or cattle feed markets and for extraction of oil while the husk was used as fuel by the rice mills to generate steam for parboiling rice or sold as fuel to other industrial units.

The distribution of the main product and the by-products produced by all the modern rice mills processing raw paddy can be seen in Table 3.8a and Figure 3.8a. It was observed that the ratio of paddy to fine rice (i.e. the milling ratio) was 62.73 per cent on an average, while the ratio for broken rice stood at 2.00 per cent. The proportion of husk per quintal of paddy turned out to be about 20.23 per cent while the ratio of bran was 4.40 percent on an average. This table reiterates that the milling ratio or out-turn ratio increased as the technology improved from Phase I to Phase II to Phase III type of mills. The out-turn ratio was 61 kg of rice per quintal in 2007-08, it increased to 63 kg of rice per quintal in 2008-09, and then rose to 64 kg of rice per quintal of paddy processed in 2009-10. However, the share of husk produced was same for all the phases.

Table 3.8a:

Average Quantity of Paddy Processed and By-Products of Modern Rice Mills

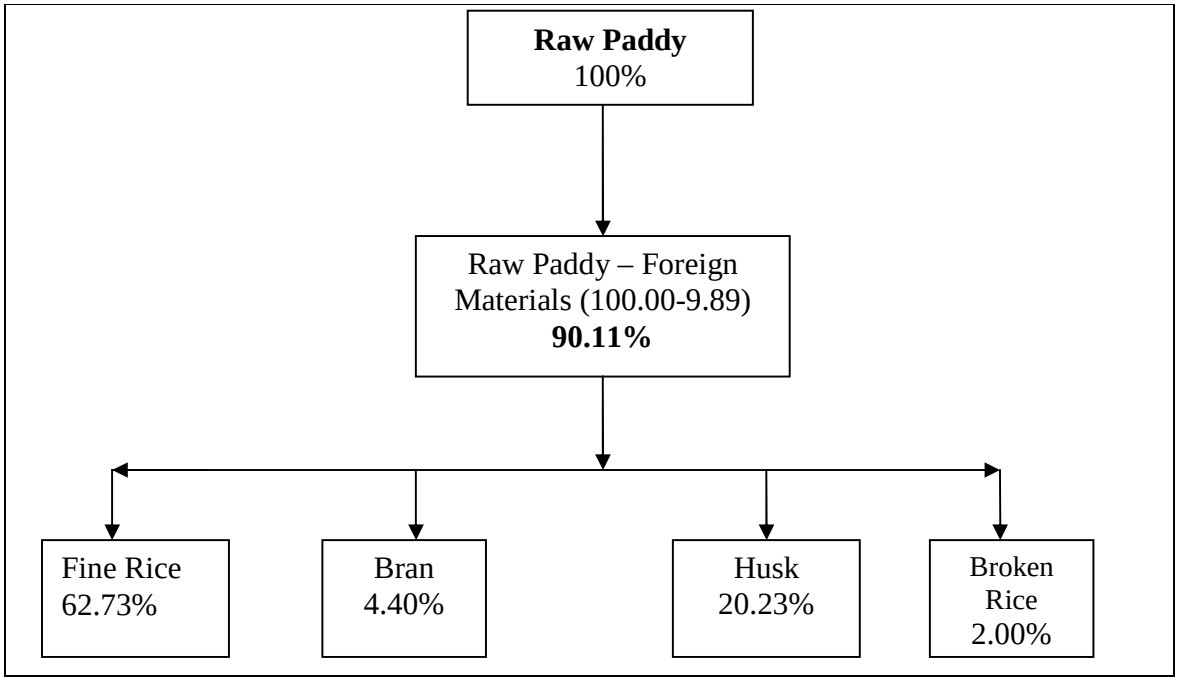
Types of Unit	Fine Rice	Broken Rice	Husk	Bran
Modern Rice Mills (All)	62.73	2.00	20.23	4.40
Modern Rice Mills belonging to Phase I	61.20	2.00	19.70	4.20
Modern Rice Mills belonging to Phase II	63.00	2.00	19.00	5.00
Modern Rice Mills belonging to Phase III	64.00	2.00	22.00	4.00

Source: Survey
Note: Figures are in percentage form

The flow chart below (Figure 3.8a) will ensure a better understanding of the paddy processing in the modern mills by depicting the process and the outputs. It is also clear that unlike traditional mills, foreign materials were removed from the raw paddy to get good quality rice. As mentioned above, in reality the out-turn ratio can be read as 69.6 per cent as the total quantity of paddy processed was 90.11 kg after removing 9.89 kg of foreign materials from the raw paddy.

Figure 3.8a:

Flow Chart of Paddy Processed and it's By-Products of Modern Rice Mills



In the case of traditional mills, the out-turn ratio was much lower than modern mills. The technology of traditional mills was inferior to the modern ones. A detailed presentation of paddy processing and its outputs is made in Table 3.8b and Figure 3.8b. As has been shown earlier, the rate of recovery of fine rice (or the out-turn ratio) in the traditional rice mills, viz., the huller units, turned out to be 58.70 per cent – which is about 11 per cent less than that of modern rice mills. It should also be noted here that in traditional huller units, the recovery of broken-rice was much higher than the modern rice mills.

Table 3.8b:

Average Quantity of Paddy Processed and By-Products of Traditional Mills

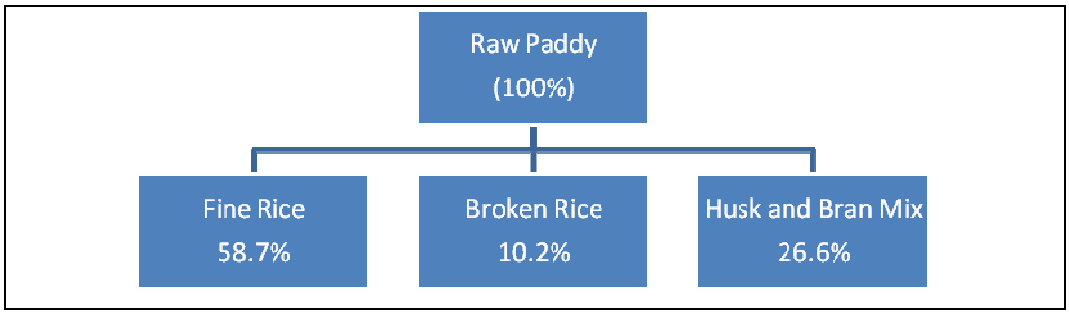
Types of Unit	Fine Rice	Broken Rice	Husk and Bran Mixture
Traditional Mills	58.7	10.2	26.6

Source: Survey
Note: Figures are in Percent

In particular, on an average, the ratio of broken-rice turned out to be as much as 10.2 kg for every quintal of cleaned paddy processed. Unlike modern mills that recover bran, husk and broken rice separately, the huller units (traditional mills) recover a mixture of bran, husk (and fragments of broken-rice also), which made up 26.6 percent per quintal of paddy processed. This mixture has a lower oil-content with high level of impurities and does not command a great demand from the solvent extraction industry when compared to pure bran produced by modern mills.

Figure 3.8b:

Flow Chart of Paddy Processed and it's By-Products of Traditional Mills



Based on the above analysis, we can easily infer that modernisation results in higher yield in fine-rice as well good quality by-products like broken-rice, bran and husk. Irrespective of the quantity of paddy milled, the economics of modern rice mills is essentially based on the rate of recovery. The average quantity of paddy processed by modern mills, outputs including by-products and values are given in the Tables 3.8c to 3.8f.

Table 3.8c:

Average Quantity of Paddy Processed and Its By-Products in Modern Mills

Year	2007-08		2008-09		2009-10		Average	
Products	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**
Paddy	53390	401.52	54954	415.37	57323	434.08	54982	416.99
Fine Rice	33289	412.08	34216	427.48	35780	447.34	34265	428.97
Broken Rice	1135	7.39	1207	7.94	1216	8.10	1178	7.81
Paddy Husk	10914	1.74	10840	2.00	11620	2.19	11089	1.97
Rice Bran	2254	15.33	2393	16.49	2551	17.62	2383	16.48

Source: Survey
Note: Quantity in Quintals; Value in Rs lakh

From the Table 3.8c, it is clear that on an average, 54,982 qtls of paddy were processed in the three years study period by the modern mills. Not repeating the conversion ratios, on an average, 34,265 qtls of rice were produced by the modern mills from 2007-08 to 2009-10. Similarly, on an average, 1,178 qtls of broken rice, 11,089 qtls of husk and 2,383 qtls of bran were produced in three years by the modern mills. It is also clear that the annual average of paddy processed increased gradually from 53,390 qtls in 2007-08 to 54,954 qtls in 2008-09 and further reached to 57,323 qtls in 2009-10.

Table 3.8d:

Average Quantity of Paddy Processed and Its By-Products in Phase I

Year	2007-08		2008-09		2009-10		Average	
Products	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**
Paddy	78,533	589.00	79,700	604.14	82,102	624.00	80,112	605.71
Fine Rice	48,071	598.29	48,755	615.71	50,224	634.71	49,017	616.24
Broken Rice	1,571	11.71	1,674	12.57	1,642	12.71	1,629	12.33
Paddy Husk	15,707	2.14	15,143	2.71	16,420	3.00	15,757	2.62
Rice Bran	3,141	23.29	3,347	25.14	3,612	27.14	3,367	25.19

Source: Survey
Note: Quantity in Quintals; Value in Rs lakh

The phase-wise assessment of modern mills is shown in Table 3.8d. On an average, 80,112 qtls of paddy were processed by phase I type of modern mills in three years study period (2007-08 to 2009-10). It is also clear that the average quantity of paddy processed by modern mills in the three year increased from 78,533 qtls in 2007-08 to 79,700 qtls in 2008-09 and to 82,102 qtls in 2009-10. On an average, the Phase I type of mills processed larger quantities of paddy and recovered more by-products than the overall average of the modern mills together.

Table 3.8e:

Average Quantity of Paddy Processed and Its By-Products in Phase II

Year	2007-08		2008-09		2009-10		Average	
Products	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**
Paddy	37065	281.71	37311	283.54	39357	299.92	37188	288.39
Fine Rice	23536	290.92	23506	293.58	24992	312.17	23521	298.89
Broken Rice	853	6.29	895	6.71	945	7.04	874	6.68
Paddy Husk	7228	1.29	7089	1.42	7478	1.50	7158	1.40
Rice Bran	1660	10.46	1679	10.83	1818	11.71	1670	11.00

Source: Survey

Note: Quantity in Quintals; Value in Rs lakh

In the case of Phase II type of mills depicted in Table 3.8e, on an average 37,188 qtls of paddy were processed in the three years study period from 2007-08 to 2009-10. Compared to Phase I, it is slightly less in terms of paddy processed and by-products recovered. For instance, the average paddy processed in Phase II is 53.5 per cent lower than the Phase I and the bran produced is 50.4 per cent lesser than the Phase I. Like Phase I, this type of mill also increased the quantity of paddy processed moderately at 6 per cent in three years from 2007-08 to 2009-10.

Finally, Table 3.8f shows the average quantity of paddy processed and by-products recovered in Phase III type of mills. It is clear that the average paddy processed by these mills in the three years of study period was 47,646 qtls and it increased year after year. It is also clear that the average quantity of paddy processed and its by-products recovered are slightly higher than the Phase II type of mills.

Table 3.8f:

Average Quantity of Paddy Processed and Its By-Products in Phase III

Year	2007-08		2008-09		2009-10		Average	
Products	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**	**Qty**	**Value**
Paddy	44573	333.86	47853	358.42	50511	378.33	47646	356.87
Fine Rice	28259	347.03	30387	373.14	32125	395.14	30257	371.77
Broken Rice	981	4.17	1053	4.53	1061	4.56	1031	4.42
Paddy Husk	9806	1.78	10288	1.86	10961	2.06	10352	1.90
Rice Bran	1961	12.25	2153	13.50	2222	14.00	2112	13.25

Source: Survey

Note: Quantity in Quintals; Value in Rs lakh

3.9: RELATIVE SHARES OF DIFFERENT MILLING TECHNIQUES

Based on the total quantity of rice produced, an attempt has been made here to explore the type of mill that is dominating the rice processing industry in the study area. Table 3.9 portrays the relative shares of paddy processed by different mills. From the Table, it is clear a comparison of the relative shares of paddy processed cannot be made between modern and traditional mills because the traditional mills became obsolete in the competitive market economy and their share during the study period was 8 per cent only. In this context, comparison is made among the modern mills. As mentioned above, modern mills dominate 92 percent of the total paddy processed by the industry in the study area in the three years from 2007-08 to 2009-10.

Table 3.9:

Relative Shares of different Milling Techniques in Total Paddy Processed

Year	2007-08		2008-09		2009-10		Average	
Type of Unit	**Processed**	**%**	**Processed**	**%**	**Processed**	**%**	**Processed**	**%**
A. Modern Mills	**3044**	**93**	**3176**	**89**	**3338**	**93**	**3186**	**92**
Phase I	550	17	558	16	575	16	561	16
Phase II	890	27	895	25	945	26	910	26
Phase III	1605	49	1723	49	1818	51	1715	49
B. Traditional Mills	**228**	**7**	**375**	**11**	**239**	**7**	**281**	**8**
Huller	228	7	375	11	239	7	281	8
All (A+B)	**3272**	**100**	**3551**	**100**	**3576**	**100**	**3467**	**100**

Source: Survey

Notes: Quantity in `000 Quintal

Among all phases of modern mills, almost 49 per cent of the paddy was processed by the modern rice mills belonging to Phase III. The share increases as technology was upgraded. For instance, Phase I type of mills could process hardly 16 per cent of the total paddy processed. However, Phases II could process 26 percent of the total paddy processed.

It should also be noted that the volume of paddy processed by Phase III type of mills increased slightly from 49 per cent in 2007-08 to 51 per cent in 2009-10. However, the condition reversed during the other two phases and for the traditional mills. As a result, the overall share of paddy processed by the modern mills decreased from 93 per cent in 2007-08 to 89 per cent in 2008-09, and again rose to 93 per cent in 2009-10. Though there was an inequality in sample units of the different phases of modern mills in the present study, we can infer that the share of paddy processed by modern mills was much larger than the traditional mills. Secondly, a larger share of paddy was processed by the higher phase of mills or better technology mills over the inferior technology mills.

3.10: BRIEF ANALYSIS OF ECONOMICS OF PADDY

The costs incurred during the processing of paddy by the modern rice mills remains central to the analysis of the economics of modern rice milling. It is here we find significant differences among the various components of costs for the modern rice mills in the different phases of modernisation. The modern rice mills of Phase II have comparative cost advantage in processing paddy over the phase I, while those of Phase III were the most cost-inefficient (Tables 3.3a to 3.3e). In particular, Phase III modern rice mills were heavily capital intensive and extremely mechanised, which in turn increased expenditure on electricity, maintenance, etc. In contrast to the modern rice mills, the processing costs per quintal of paddy in the traditional rice mills (hullers) run on custom hiring basis remained much lower. It was in case of small scale production only. However, in the large scale operation, the situation is in favour of modern rice mills, especially with the most sophisticated one (Phase III) and economies of scale prevail in the long run.

The modern rice mills function as individual commercial business units that purchase paddy from the farmers, traders, local stockists, etc., and convert it into fine rice. The fine rice is then sold to the whole-sellers, retailers and even to the government as levy. In the process, profit is accrued for the value added in processing raw paddy into fine rice. 'Modern' rice mills were expected to give higher yields of rice and by-products like, broken-rice, bran, husk etc., separately. The economics of modernisation is essentially based on better rate of recovery and not on the quantum of production. It is here that the net return per quintal of paddy processed turns out be Rs 17.01 on an average, varying from a low of Rs 14.00 for the modern rice mills belonging to Phase I to as much as Rs.15.00 for Phase II and Rs 19.00 for Phase III. The share of by-products in value terms stood at 5.04 per cent of gross return, while that for the main product, viz. fine rice, stood at 94.05 per cent of gross return. The share of total costs (including market incidentals, processing costs) stood at 6.8 per cent of gross investment (i.e. total costs and value of paddy purchased for processing, given in Table 3.4a:), while the net return stood at only 2.1 per cent of the gross investment.

On the other hand, the traditional huller units do not produce fine rice, broken rice and other by-products separately. A mixture of broken-bran-husk is produced. Therefore, a perfect comparison between modern and traditional mills cannot be made. For analysis of profit of the traditional huller units, the costs of running the huller unit should be deducted from the custom charges. Unlike modern mills, some benefits from the by-products did not arise because the mills were run under the custom hiring basis. As such, the basic economic principle of the huller units running on a custom hiring basis thrived solely on the profit accrued to the huller units out of the difference between the custom charges earned by processing paddy brought by the farmer clients and the cost of running the huller units. Therefore, the efficiency and quantum of paddy processed or capacity of paddy processed by the traditional mills cannot be compared with the advanced modern mills. However, the huller units remain very important for the poor farmers in the rural area because it is much cheaper than the modern rice mills. Thus, it appeared the huller units running on a custom hiring basis perform similar tasks as the modern rice mills at much greater convenience and for the commercial purposes in the urban areas.

For traditional huller units run on a custom hiring basis, the issues relating to the marketing of rice did not arise at all. However, for the modern rice mills, marketing of products and by-products was one of their major business activities. We found that only 26.9 per cent of the fine rice produced by the modern rice mills served as levy to the government, while 73.1 per cent of fine rice was sold in the market.

While studying the standards maintained in processing and the quality of the end product, it was observed that the average moisture content in raw paddy was found out to be 16.64 per cent on an average, which fell down 5.21 per cent further to about 11.43 per cent for final processing. Again, it was highly significant to find that the average refraction ratio in raw paddy stood at 9.89 per cent for the sample modern rice mills in the survey, revealing the availability of an extremely poor quality of paddy to the rice mills. Similarly, this issue did not arise in traditional mills run under the custom hiring basis.

In case of availability of fine rice and by-products, it was observed that on an average, out-turn ratio of paddy to fine rice of modern rice mills was 62.70 per cent, while the ratio for broken rice, husk and bran stood at 2.20 per cent, 20.20, and 4.40 per cent, respectively. The rest of the raw material, viz., un-cleaned raw paddy accounted for the refraction/foreign materials and loss of moisture in processing. On the other hand, the rate of recovery of fine rice in case of traditional rice mills turned out to be 58.70 per cent. It is exactly 6 per cent lower than the modern rice mills. The recovery of broken-rice come was 10.20 per cent in traditional hullers while 23.60 per cent was a mixture of bran and husk.

In case of the relative share of modern and traditional paddy processing units in the paddy processing industry, it was observed that 92 per cent of paddy was processed by the modern rice mill as against 8 per cent by the traditional rice mills, viz., the hullers. Again, among all types of paddy processing units, almost half (49%) of the paddy was processed by the modern rice mills belonging to Phase III.

3.11: CONCLUSION

The above discussion on the economic aspects of the rice milling industry reveals many things such as variation in the market incidentals, different costs driving the industry, profitability of the custom hiring mills and the domination of the different mill types operating in the study area. The study on market incidentals showed a sharp increase in cost over the three years in rice procurement. This was mainly because of the increase in prices of raw materials in the market.

It was a good sign that the major share of paddy was processed by modern type of rice mills in Phase III. However, there is still a lot of scope to upgrade the existing hullers into modern rice mills and it is also suggested that the mill owners and farmers be made aware of the benefits of producing parboiled rice because it generates greater out-turn ratio compared to non-parboiled rice (Lele, 1970). It is slightly inconvenient for the individual farmers to go for parboiling before processing because small quantities or subsistence level paddy is processed in the rural areas.

CHAPTER – IV

CONSTRAINTS FACED BY RICE MILLS

4.1: INTRODUCTION

Understanding and resolving the basic constraints and difficulties of any industry will ensure sustainable development. This will help in building a better future for that industry through increased growth in output and profit. Paddy processing technology has been perfected over time by centuries of trial and error, which ultimately has resulted in the establishment of the highly sophisticated and technologically advanced modern rice mills we know today. In the present study, especially in this section, an attempt has been made in to explore the problems/constraints of the rice milling industry in the study area based on the results of the sample respondents. Suggestions to overcome those specific constraints have been collected from the respondent millers and presented in this section.

4.2: CAPACITY UTILISATION OF MODERN VERSUS TRADITIONAL RICE MILLS

The profitability of the rice processing units is mainly based on capacity utilisation. More the capacity utilisation more will be the returns. In the findings of Shwetha, *et al* (2011) in Karnataka, the annual installed capacity was 14,400 quintals in the case of traditional mills and 1, 20,000 quintals for modern mills while capacity utilisation was 44.05 per cent and 68.90 per cent in traditional and modern units respectively. When we convert it to tonnes per hour (TPH), it is hardly 0.5 TPH for traditional mills working 240 days and 3.0 TPH for modern mills working 250 days per year (12 to 16 hours per day).

It was observed that capacity utilisation was less in the mills in the study area due to many reasons. There was a remarkable difference in the capacity utilisation between modern and traditional rice mills. Traditional mills were much lower than the modern

mills in terms of their installed capacity as well as utilisation capacity. Detail analysis of the study can be seen in Tables 4.2a to 4.e below.

From the Table 4.2a it is obvious that the average installed capacity of modern mills was 6.8 TPH in the three years study period while the capacity utilisation of modern rice mills was 3.8 TPH. However, it was less for the traditional mills (Table 4.2e). The three years average capacity utilisation was 54.9 per cent. It fell from 55.5 per cent in 2007-08 to 54.3 per cent of the total installed capacity in 2008-09 and again rose to 55 per cent in 2009-10. It was also observed that the modern mills could run at the most 16 hours per day (24 hr – 8hr =16 hr) and for 71 days there was no work (365 days – 294 days = 71 days) due to one reason or the other. Therefore, on an average, 294 days in a year were found to be operative and worked 4704 hours (16 x 294 hours) in a year.

Table 4.2a:

Capacity of Utilisation of Modern Rice Mills

Year	**2007-08**	**2008-09**	**2009-10**	**Average**
Actual Capacity (Tonnes/Hour)	6.6	6.8	7.1	6.8
Capacity Used (Tonnes/Hour)	3.7	3.7	3.9	3.8
% of Capacity Utilisation	**55.5**	**54.3**	**55.0**	**54.9**
Mill Closed (Days/Year)	70	72	72	71
Milling Hour Capacity (Max. Hr/Day)	16	16	16	16
Mill Run (Days/Year)	295	293	293	294

Source: Survey

Coming to the phase-wise analysis, Table 4.2b portrays the installed capacity and utilisation capacity of Phase I type of modern mills. On an average, 5.1 TPH was the actual maximum capacity and capacity used was 2.6 TPH for the Phase I type of mills in the three years study period. It was also noticed that there was a marginal increment in the actual installed capacity from 4.9 TPH in 2007-07 to 5.2 TPH in 2008-09 and to 5.3 TPH in 2009-10. This was calculated on the basis of maximum milling hours per day and the number of days the mills worked in a year. Under Phase I, at the most, the mills worked for 16 hours per day as indicated by the respondents. On an average, mills remained off for 70 days in a year due to different reasons and operated for 295 days in a

year (365-70 = 295 days). It is also clear that the average capacity of utilisation was 51.3 per cent of the total installed capacity under the Phase I type of mills.

Table 4.2b:

Capacity of Utilisation of Modern Rice Mills Phase I

Year	2007-08	2008-09	2009-10	Average
Actual Capacity (Tonnes/Hour)	4.9	5.2	5.3	5.1
Capacity Used (Tonnes/Hour)	2.5	2.7	2.7	2.6
% of Capacity Utilisation	51.0	51.9	50.9	51.3
Mill Closed (Days/Year)	69	72	70	70
Milling Hour Capacity (Max. Hr/Day)	16	16	16	16
Mill Run (Days/Year)	296	293	295	295

Source: Survey

In the case of Phase II types of mills as portrayed in Table 4.2c, on an average, 7.1 TPH was the actual installed capacity and there was a marginal increment in the actual installed capacity from 6.9 TPH in 2007-07 to 7.0 TPH in 2008-09 and to 7.4 TPH in 2009-10. This was calculated on the basis of maximum milling hour per day and the days of mills run in a year. Phase II mills worked at the most for 16 hours per day as indicated by the respondents. On an average, mills were remained shut for 68 days in a year due to different reasons and were operative for 297 days. It is also clear that the average capacity used was 3.8 TPH and capacity utilisation was 53 per cent of the total installed capacity under the Phase II type of mills.

Table 4.2c:

Capacity of Utilization of Modern Rice Mills Phase II

Year	2007-08	2008-09	2009-10	Average
Actual Capacity (Tonnes/Hour)	6.9	7.0	7.4	7.1
Capacity Used (Tonnes/Hour)	3.8	3.5	4.0	3.8
% of Capacity Utilisation	55.1	50.0	54.1	53.0
Mill Closed (Days/Year)	68	66	70	68
Milling Hour Capacity (Max. Hr/Day)	16	16	16	16
Mill Run (Days/Year)	297	299	295	297

Source: Survey

For Phase III type of mills, as given in the Table 4.2d, the capacity of paddy processing was much higher than the previous two phases. On an average, the actual installed capacity was 8.3 TPH — almost 63 per cent and 17 per cent higher than the Phase I and Phase II type of mills respectively. Similarly, the capacity utilisation was 5 TPH, which was 92.3 per cent and 31.5 per cent higher than the Phase I and Phase II type of mills respectively.

Table 4.2d:

Capacity of Utilisation of Modern Rice Mills Phase III

Year	2007-08	2008-09	2009-10	Average
Actual Capacity (Tonnes/Hour)	8.1	8.2	8.5	8.3
Capacity Used (Tonnes/Hour)	4.9	5.0	5.1	5.0
% of Capacity Utilisation	60.5	61.0	60.0	60.5
Mill Closed (Days/Year)	72	78	75	75
Milling Hour Capacity (Max. Hr/Day)	17	17	17	17
Mill Run (Days/Year)	293	287	290	290

Source: Survey

It was also noticed that there was a marginal increment in the actual installed capacity from 8.1 TPH in 2007-07 to 8.2 TPH in 2008-09 and to 8.5 TPH in 2009-10. This was calculated on the basis of maximum milling hours per day and the number of days the mills worked in a year. Phase III mills worked for a maximum of 17 hours in a day. On an average, mills did not work for 75 days in a year due to different reasons and operated for 290 days in a year. It is also clear that the average capacity of utilisation was 60.5 per cent of the total installed capacity for Phase III type of mills.

Table 4.2e:

Capacity of Utilisation of Traditional Rice Mills

Year	2007-08	2008-09	2009-10	Average
Actual Capacity (Tonnes/Hour)	1.5	1.0	1.0	1.2
Capacity Used (Tonnes/Hour)	0.6	0.5	0.5	0.5
% of Capacity Utilisation	40	50	50	47
Mill Closed (Days/Year)	42	41	45	43
Milling Hour Capacity (Max. Hr/Day)	6	7	7	7
Mill Run (Days/Year)	323	324	320	322

Source: Survey

In the case of traditional mills, on an average in the three years, the actual installed capacity was 1.2 TPH. It was almost 82 per cent less than the modern mills together. Similarly, the capacity of utilisation by the traditional mills was 47 per cent of the total installed capacity and it was 14.3 per cent lower than the modern mills together. From the Table 4.2e, one can see that the capacity used was 0.5 TPH against the 1.2 installed capacity of TPH. Unlike modern mills, the traditional mills could run at the most 7 hours per day and did not work for 43 days in a year — much less compared to modern mills. This is because the mills were run on the custom hiring basis and the farmers needed regular processing (though it is small quantity) of their paddy for their own consumption. Hence, based on the above observations, it turns out that the modern mills outweigh the traditional rice mills both in terms of capacity installed and capacity utilised to a great extent.

4.3: REASONS FOR UNDER UTILISATION OF CAPACITY

As discussed above there was much lower capacity utilisation under both the types of rice mills (modern and traditional). There are several reasons for this lower capacity utilisation of rice mills in the study area. The study by Lele (1970) cited the decline in the raw paddy production and government levy as the major factor for under-utilisation of installed capacity of mill.

In the present study, lack of trained labour, unavailability of labour, irregular power supply, technical problems including breakdown of machines, etc have been recorded as some of the major factors responsible for under-utilisation of installed capacity in both traditional and modern mills. Particularly, for the modern mills, availability of paddy for processing (raw materials) and market fluctuations were additional problems resulting in under-utilisation of the installed capacity of the mills. Detail percentage of factors responsible for under-utilisation of installed capacity of modern and traditional mills can be seen in Tables 4.3a and 4.3b respectively.

Table 4.3a:

Reasons for Under-utilisation of Installed Capacity of Modern Mills

Reasons	**No. of Respondent**	**Per cent**
Labour Problem	28	42
Power-interruption	11	17
Raw Material	13	20
Technical Problem	7	11
Market fluctuation & others	7	10
Total	**67**	**100**

Source: Survey

From the Table 4.3a, it is clear that the labour problem became one of the most important issues for modern rice mills, which were under-run or could not be run to the extent of installed capacity. This factor accounted for 42 per cent of the total factors responsible for the under-utilisation of the modern mills. It was followed by shortage of raw paddy with 20 per cent of the total. Similarly, electricity problem was not an exception, and this factor accounted for 17 per cent. At the bottom, but not the least, technical problems like, break down of the machines, minor repairs and marketing problems also increased under-utilisation of the modern mills during the study period.

In the case of traditional mills as well, the problem of labour became an important factor for the under-utilisation of the mills. As portrayed in the Table 4.3b, we can see that 40 per cent of the respondent said that the labour problem was responsible for under-utilisation of the mills, followed by technical problems (31 per cent) and irregular power supply (29 per cent). Unlike modern mills, the issue of raw materials and market fluctuation did not arise in the traditional mills because this type of mills was running on the custom hiring basis.

Table 4.3b:

Reasons for Under-utilisation of Installed Capacity of Traditional Mills

Reasons	**No. of Respondents**	**Per cent**
Labour Problem	10	40
Power-interruption	7	29
Technical Problem	8	31
Total	**25**	**100**

Source: Survey

4.4: SUBSIDY/ASSISTANCE OBTAINED (IF ANY) BY RICE MILLS

The details of subsidy/assistance obtained from different sources by the respondents with respect to different types of mills are presented in the Tables 4.4a and 4.4b. The comparison made between modern rice mills and traditional rice mills in the context of subsidy revealed that modern rice mills enjoyed larger subsidy or assistance from different sources because they are quite expensive and require huge seed capital.

Coming to the modern mills, there was lot of variation in the number of beneficiaries and the amount of subsidy during the three years study period among the different phases of rice mills. However, for the present study, all the modern mills have been clubbed. From the Table 4.4a, it is clear that the state government became the main source of loans or subsidy in this context. Out of 67 sample modern mills, 30 received loan or subsidy from different sources during the three years study period. It is not that the other 37 units did not receive subsidy, they might have repaid or had their loans waived during the survey.

Table 4.4a:

Assistance/Subsidy Obtained by the Modern Rice Mills

Year	**2007-08**		**2008-09**		**2009-10**	
Source	No. of Beneficiaries	Amt (in Lakh)	No. of Beneficiaries	Amt (in Lakh)	No. of Beneficiaries	Amt (in Lakh)
Central Government	0	0.0	1	1.0	0	0.0
State Government	6	208.2	4	147.0	1	50.0
Small Scale Industry Corporation	1	3.0	1	0.0	0	0.0
APEDA	0	0.0	1	0.0	3	15.0
RBI/Commercial Bank	2	60.0	3	10.1	4	305.5
Other sources	1	50.0	2	36.0	0	0.0
Total	**10**	**321.2**	**12**	**194.1**	**8**	**370.5**

Source: Survey

In 2007-08, the total number of beneficiaries was 10 with the total subsidy of Rs 321.2 lakh. On an average, it was Rs 32.1 lakh per unit and the major source was the state government with 6 beneficiaries and a total subsidy of Rs 208.2 lakh. It was followed by

commercial banks, which extended loan of Rs 60.0 lakh in the same period to 2 beneficiaries. The Small Scale Industry Corporation (SSIC) and other sources (unspecified) with Rs 3.0 and Rs 50.0 lakh respectively, had one beneficiary each. In 2008-09, the number of beneficiaries increased by 20 per cent to 12 beneficiaries. However, the number of beneficiaries increased to 12, the total amount came down to Rs 194.1 lakh only. The average share was Rs 16.1 lakh per unit. However, in 2009-10, the number of beneficiaries decreased to 8 but the total amount of subsidy/assistance received by the 8 beneficiaries was very huge at Rs 370.5 lakh. In the same year, commercial banks extended loans/subsidies to 4 beneficiaries and became the largest benefactor in this context with total share of Rs 305.5 lakh and average share of Rs 76.3 lakh per unit. It was followed by Agricultural and Processed Food Products Export Development Authority (APEDA), which extended assistance to 3 beneficiaries amounting to Rs 15 lakh only, and at the bottom, was the state government which extended Rs 50 lakh to one beneficiary.

Table 4.4b:

Assistance/Subsidy Obtained by the Traditional Mills

Year	**2007-08**		**2008-09**		**2009-10**	
Source	No. of Beneficiaries	Amt (in Lakh)	No. of Beneficiaries	Amt (in Lakh)	No. of Beneficiaries	Amt (in Lakh)
Central Government	2	1.25	0	0.00	1	0.75
State Government	1	0.90	2	1.70	0	0.00
Small Scale Industry Corporation	0	0.00	0	0.00	0	0.00
APEDA	0	0.00	0	0.00	0	0.00
RBI/Commercial Bank	1	0.78	2	1.20	5	4.10
Other sources	0	0.00	0	0.00	0	0.00
Total	**4**	**2.93**	**4**	**2.90**	**6**	**4.85**

Source: Survey

In case of traditional mills depicted in Table 4.4b, altogether 14 mills received financial assistance (Rs 10.68 lakh) from different sources. The amount was very low but it was 56 per cent of the amount that the sample mills received as assistance when compared to 44 per cent received by the modern mills in the present study. It is obvious that the traditional mills received smaller sums than modern mills as subsidy/assistance because of their lower capacity and smaller seed capital.

From the Table 4.4b, it is seen that 4 mills were given assistance by different agencies amounting to Rs 2.93 lakh. The central government contributed the highest share of Rs 1.25 lakh to 2 beneficiaries at Rs 0.62 lakh per unit. In the same year, one each mill was given Rs 0.90 lakh and Rs 0.78 lakh by the state government and commercial banks respectively. Similarly, in 2008-09, 4 mills were given loan/assistance of Rs 2.90 lakh by different agencies. The state government and commercial bank gave Rs 1.70 lakh and 2.20 lakh respectively to two mills. However, in 2009-10, a slight improvement was made in terms of the number of beneficiaries. With commendable service, altogether 5 mills benefited from commercial banks by Rs 4.10 lakh — almost Rs 0.82 lakh per mill. Only one unit was extended financial assistance of Rs 0.75 lakh by the central government that year.

4.5: CONSTRAINTS IN PROCESSING OF PADDY

The study of the constraints faced by the millers helps in determining the industry's lacunae, which in turn will help to improve the business or conditions of the industry in the long run. The present section comprises the opinions shared by the respondents/millers on the constraints in the processing of rice during the three years study period. The important constraints (not all) are listed in percentage form in Tables 4.5a and 4.5b for modern and traditional mills, respectively, below.

In the case of modern mills (Table 4.5a), trained and sufficient supply of labour became most important problem for rice millers in Karnataka. Altogether, 27 per cent of the respondents said that the labour problem was the major constraint in Karnataka's rice

milling industry. It was followed by electricity problem (22%) which includes low power supply, irregularity in supply and high tariff, etc. Insufficient supply of raw paddy (18 per cent) and financial assistance (16 per cent) are also responsible at a great extent. Other factors like weak rural infrastructure, limited quality/advanced machines and parts in the market, uncertainty of rice market, etc., can also be mentioned as constraints faced by the modern rice milling industry. Very often, weak road infrastructure was added as a problem (if not major) in the transportation of raw paddy by heavy trucks especially in the rainy season. Mention may be made of the factors like mandi fee, toll tax and delays in clearance of loaded trucks with the raw materials at the state boundaries as constraints faced by the milling industry.

4.5a:

Constraints in Processing of Paddy in Modern Mills

Constraints	**No. of Respondent**	**%**
Electricity Problem (low voltage, irregular)	15	22.5
Shortage and irregular supply of raw Paddy	12	17.9
Lack of adequate finances	11	16.4
Lack of international standard machinery and technical know-how	2	3.0
Lack of good quality roads for transportation in the rainy season	4	6.0
Lack of trained labour supply	18	26.9
Fluctuation of market	4	6.0
Mandi fee, toll tax and delays in clearance of loaded trucks with the raw materials at the state boundaries	1	1.5
Total	**67**	**100.0**

Source: Survey

In the case of traditional mills, the issue of raw material supply and market do not arise, as they run under the custom hiring basis. Still, some major problems like labour, finance and electricity are more or less same with the modern mills. Details of the constraints faced by traditional rice millers can in Table 4.5b. Shortage of paddy for processing was ranked top as constraint by 36 per cent of the traditional huller mills. The labour problem was ranked in the second position with 24 per cent. At the bottom, power and inadequate finance were identified as major problem by 20 per cent of the respondents.

4.5b:

Constraints in Processing of Paddy in Traditional Mills

Constraints	No. of Respondent	%
Electricity Problem (low voltage, irregular)	5	20.0
Shortage and irregular supply of raw Paddy	9	36.0
Lack of adequate finances	5	20.0
Lack of trained labour supply	6	24.0
Total	**25**	**100.0**

Source: Survey

4.6: STEPS TO OVERCOME THE CONSTRAINTS

In the previous section, we discussed the constraints confronted by rice processing industries in Karnataka. In this section the suggestions to overcome those constraints are listed as expressed by the respondent millers in Tables 4.6a and 4.6b. Among the various suggestions, a few important ones made the millers are included in this section. Sufficient and uninterrupted power supply and financial assistance were the top priority concerns shared by both traditional and modern mills.

Table 4.6a:

Suggestions to Improve Modern Mills

Suggestions	No. of Respondent	%
Government should provide sufficient and uninterrupted electricity at reasonable rate	26	38.8
Adequate and sufficient financial facilities should be extended	19	28.4
Loans should be provided at lower interest rates	9	13.4
Government should make efforts to decrease the market fluctuation	5	7.5
Levy may be reduced or exempted	5	7.5
Government should intervene in supplying uninterrupted raw paddy supply	2	3.0
Provide good quality of seeds for better yields to farmers	1	1.5
Total	**67**	**100.0**

Source: Survey

Table 4.6a portrays the 7 most significant suggestions made by the modern rice millers. Of the total, 39 per cent of respondent felt that the sufficient and uninterrupted power supply might help in developing this industry. Supply of adequate financial assistance was the second most important suggestion (28 per cent) made by the millers in the study area. The need for providing financial assistance at the lower interest rate was felt by 13 per cent of the respondents. The fourth important suggestion as shared by the respondents was to reduce government levy and stabilise the rice market (8 per cent each of the total respondent). Last, but not the least, to improve supply of raw paddy by increasing production and providing advanced seeds to the farmers.

Table 4.6b:

Suggestions to Improve Traditional Mills

Suggestions	**No. of Respondent**	**%**
Government should provide sufficient and uninterrupted electricity at reasonable rate	8	32.0
Adequate financial facilities should be extended	6	24.0
Loans should be provided at lower interest rates	5	20.0
Government should help in paddy production	3	12.0
Provide good quality of seeds for better yields to farmers	3	12.0
Total	**25**	**100.0**

Source: Survey

In the case of traditional mills (Table 4.6b) almost the same suggestions were given, except for marketing, government levy and supply of raw materials. Uninterruptedly power supply to the mills at the subsidised rate (32 per cent) was the most preferred suggestion made by the traditional millers followed by adequate and low interest rate of finance and increase in paddy production because it is the bread and butter of millers.

4.7: CONCLUSION

It is noteworthy to mention that the under-utilisation of the installed capacity of paddy processing under mills affects rice production and the economic status of the millers adversely. To overcome this situation and to improve the conditions, the reasons for

under-utilisation of mills like electricity problem and labour problems should be addressed properly. To improve the capacity utilisation of mills, sufficient and un-interrupted supply of electricity in the peak season should be ensured, proper finance at the reasonable interest rate should be made available with the government's support. In recent years, it was felt necessary to give special better subsidy and financial assistance to the rice milling industry. There is need to revamp the subsidy policy because the sector needs structural changes in the form of mill types. The government and financial institutions should take steps to encourage the millers by extending more subsidies and finance to the millers who are ready to upgrade their mills with advanced technology, improve milling ratio and produce parboiled rice, which in turn may earn more profits for the millers.

As discussed above, there are several constraints in the way of better milling in the study area. These constraints need to be addressed properly by the government and responsible authorities especially the problems like unavailability of sufficient electricity, problem of labour supply and government's levy policy, etc.

CHAPTER V

CONCLUSION AND POLICY RECOMMENDATIONS

5.1: CONCLUDING NOTE

The production and consumption of rice in the present era are very closely connected to the issue of poverty alleviation especially in the developing nations. They are becoming key factors for the economic development of several countries including India. The Asian region is a major consumer and producer of rice. There are several ways to improve production with respect to the growing economies and feed their rapidly growing population. The rice-milling industry not only processes rice for consumption but also ensures development of entrepreneurship and generates employment at the grass root level especially at the village level economy in India and particularly in Karnataka.

It is the responsibility of the government to regulate this industry to ensure better milling practices to increase the rice production to the maximum level. Based on the above results and discussions, the following few important findings have been made.

1. In Karnataka, though traditional rice mills became obsolete due to the advancement of technology, a number of traditional rice mills still dominate the rice milling industry in the rural areas. Out of the traditional rice mills in Karnataka, like huller, sheller and huller-cum-sheller, hullers out-number the other two. At present, the shellers and huller-cum-shellers mills can hardly be seen in the rural areas, not only in Karnataka but also in other parts of the country.

2. Though the traditional mills are widely used, the out-turn ratio for the hullers (traditional) was an average of 58.7 per cent as compared to the modern rice mills with an average of 63.0 percent during the three years study period. It was 4.3 per cent lower than that in the modern rice mills on an average. We can conclude

from the finding of the present study and that of other studies in the past that the traditional mills are quite inefficient in terms of out-turn ratio and capacity of processing TPH when compared to modern rice mills. In the modern rice mills the out-turn ratio increases by about 3.7 per cent points as we move from Phase I to II to III with improvement in milling techniques.

3. While considering the economics of paddy processing by the traditional rice mills (hullers) and the modern rice mills, it was found that market incidental cost for the hullers was non-existent because it was run on a custom-hiring basis, while that of the modern rice mills was Rs. 8.75 per quintal of paddy processed.

4. In case of processing costs of paddy, the modern rice mills belonging to Phase III were the most cost-inefficient when it processes in large scale. Otherwise, it is capital intensive and extremely mechanized mills, which in turn made the costs of electricity, maintenance, depreciation, etc., much higher to the tune of Rs 68.49 per quintal of paddy processed. In contrast, the processing costs of paddy in the traditional rice mills (hullers) running on a custom hiring basis was Rs 15.12 per quintal. These processing costs are excluding the seed cost.

5. The net returns per quintal of paddy processed by the modern rice mills turned out to be Rs 17.1 per quintal on an average, varying from a low of Rs 14.0 for Phase I to as much as Rs 15.0 for Phase II and Rs 19.0 for Phase III. In sharp contrast to this, the net return per quintal of paddy processed by the tradition rice mills (hullers) was Rs 25.0 per quintal on an average, much higher than that of the modern rice mills. However, the net return of modern mills was lower than the traditional ones and higher cost of processing per unit, modern mills are superior to the traditional mills when it processes in a large scale.

6. The average investment for the sample huller units stood at Rs 0.76 lakhs. However, the average investment for the modern rice mills stood at Rs 93.23 lakhs. The average paddy processing capacity of modern rice mills stood at the

most 6.8 tons per hour (TPH), and in case of traditional huller, the average capacity was 1.2 tons per hour — much lower than the modern one. The labour involvement per day was also relatively higher in modern rice mills and was an average of 6.06 persons. However, for the traditional mills, it is 0.90 employee/persons per day.

7. Of the constraints faced by the mills, labour shortage was one of the most important factors for under-utilisation of installed capacity of modern mills — 42 per cent. It was followed by shortage of raw paddy — 20 per cent. Similarly, the electricity problem was not an exception, and it accounted for 17 per cent of the total. At the bottom but not the least, technical problems like, break down of the machines, minor repairs and marketing problems also led to under-utilisation of capacity in modern mills during the study period. In the case of traditional mills, like modern mills, the labour problem became an important factor for the under-utilisation of the mills — 40 per cent. It was followed by technical problem with 31 per cent and irregularity of power supply accounted for 29 per cent. Unlike modern mills, the issue of raw materials and market fluctuation did not arise in the traditional mills because they were run on custom hiring basis.

8. The share of by-products in modern rice mills like broken-rice, bran and husk in value terms was 6.1 percent and the main product, viz. fine rice, was 93.9 per cent of gross return. Again, while the share of total costs was 6.1 percent and the net return was only 1.7 per cent of gross investment. In sharp contrast to this, the huller units did not have the by-products because it was taken away by the farmers/customers.

9. Similarly, for the traditional huller units, the issues relating to the marketing of rice did not arise. However, for the modern rice mills, 26.9 per cent of the fine rice produced served as levy to the government and 29.4 per cent of the total processed rice was sold to retailers in the open market. However, 43.7 per cent of fine rice produced was sold to the wholesalers.

10. In case of the relative share of paddy processed in modern and traditional units, the share of traditional mills during the study period to total paddy processed turned out to be 8 per cent only. Modern mills dominated with 92 per cent of the total paddy processing industry in the study area. Among all phases of modern units, almost about half (49 per cent) of the paddy was processed by the modern rice mills in Phase III. The share of paddy processed increased as technology improved from Phases I to II to III.

5.2: POLICY RECOMMENDATIONS

The policy recommendations suggested to achieve better status in the milling industry in the study area are as follows:

1. A strong extension service has to be developed to increase the area under paddy cultivation by creating awareness among the different group of farmers regarding the importance of rice in the country's economy with respect to employment, consumption habits, export value and other benefits at the grass root level. More importantly, this could eliminate the shortage of raw paddy for processing in the mills.

2. While discussing the various studies we observed that the milling ratio was higher for producing parboiled rice compared to that of non-parboiled rice. To convert all the mills into producers of parboiled rice, the extension agencies and agricultural universities should take steps to ensure appropriate technology transfer to produce parboiled rice and financial institutions and government should extend financial support to the poor/needy millers to produce parboiled rice. This may ultimately help in achieving better milling ratio and further increase the profits of millers.

3. It has been proved by the present study that the milling ratio is higher in modern rice mills as compared to hullers. Hence, it is suggested that millers who are still

operating hullers to process paddy adopt modern technology. The required technical expertise should be provided to the millers by the extension agencies like food processing industries and agricultural Universities.

4. As discussed in the previous chapters, the observed capacity utilisation in traditional and modern rice mills was a very low. Maximum utilisation of the capacity of mill will ensure more rice production. Hence, permanent solutions must be put in place to tackle problems like poor power supply. As stated above, there is need to increase paddy production because inadequate supply of paddy was one of the reasons for under utilisation of the mill capacity.

5. Since the millers are not happy with the present levy policy of the government, it may be revamped in accordance with the interest of the millers.

6. A single window system may be created to give licenses to start new rice mills by liberalising the requirements. This can help in expanding the rice milling industry on a large scale in the state.

7. Last but not the least the labour problem should be solved by introducing proper training programmes to select unemployed youth, especially in the rural areas of the state. We should not look for labour from outside the state because they are not stable in their profession.

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