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PROBLEMS AND PROSPECTS OF RICE MILL MODERNIZATION A CASE STUDY

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INTRODUCTION

India is the second biggest rice producing country in the world after China. It contributes about 20 percent of the world output of rice. Paddy being the major cereal crop of India covers an area of more than 42.8 million hectares, the largest under any single crop (FAO, 1995). It has been stated by the Department of Agriculture, Government of India that in 1985-86 production of paddy was of the order of 96 million tonnes which was increased to 115 million tonnes in 1995-96 and is expected to increase to 130 million tonnes by year 2000. It is grown in almost all the provinces of the country but more than 86 percent of the total production accounts for the States of Andhra Pradesh, West Bengal, Tamil Nadu, Uttar Pradesh, Bihar, Orissa, Madhya Pradesh, Punjab and Assam. Rice production, processing and marketing constitute the biggest industry in the country. Indian rice milling industry is the oldest and largest agro-based industry. The annual production of paddy was estimated at over 521 million tonnes, mostly in developing countries and the amount is rising at an average rate of 3 percent per annum (FAO, 1995). It was, however, the serious food crisis in the early sixties which highlighted the need for a proper policy towards the industry. This led to joint study of the industry by the Government of India and the Ford Foundation of India. The study pointed out that the overall supply of rice could be augmented substantially with additional yield obtained through modernization of the existing rice processing techniques. A number of studies were also undertaken and came out with the same findings. As a result, the policy of modernization of rice mills in India has since then been pursued by the Government of India and various States within it. Thus, the industry has become fairly modernized and more important in the economy of the country. However, it is still believed that this has not been successfully implemented in most parts of the country. Thus, with higher priority being given to paddy production programmes

and the changing pattern of demand for rice, the milling industry has to adopt itself to the developing nation.

Rice milling in India is carried out in small and medium size rice mills. Most of the small size mills are huller mills. Other various types are Battery of Huller mills, Huller-cum-Sheller mills, Sheller mills and modern mills. The numbers of rice mills of different types existing in country are as follows:

Types of Rice Mills*	Number of Rice Mills
Huller Mills	78,309
Sheller Mills	4586
Huller-cum-Sheller Mills	10,384
Modern Mills	31,068

* For details see Table 1.

Huller mills have the advantage of being cheap and simple to operate but are very inefficient in converting paddy into rice. The rice recovery in huller type will be 60-68 percent with 10-25 percent broken whereas 68-72 percent recovery with 5-7 percent broken in modern type. It is a noticeable fact that the modern mills give the highest yield of rice with least broken and better quality of by-products. Normally the huller mills yield bran having lowest oil content as it contains appreciable amount of husk and broken rice. But the oil content in bran from Sheller and modern mills are far better in this respect.

LEGISLATIVE MEASURES

The Rice Milling Industry (Regulation and Licensing) Act now in force provides that:

a. The new rice mills to be set up will undertake dehusking of paddy separately by rubber roll Sheller or centrifugal dehusker and shall have paddy separators and cleaners in addition to the polisher;
b. All the existing mills excepting single hullers shall be modernized; and

c. Promotional efforts in the form of technical assistance, concessional finance, subsidy for modernization, extension programmes, training, research and development etc.

MAJOR PROBLEMS FACED BY THE INDUSTRY

The major problems faced by the industry are heterogeneity in the composition of rice milling industry. Large variations are found in type, capacity, location, services rendered as well as in ownership of different processing units. Consequently investment requirement, cost and return also vary over a wide range. Heterogeneity in rice milling industry arise mainly from the widely varying economic activities made available to private rice millers in different areas and sectors of the country. Another common feature of rice milling industry is considered that its technical potential capacity is not fully utilized and this is because of the seasonal concentration and spatial spread of paddy production coupled with the existence of a number of diverse processing units competing with one another in supplying facilities. As these small mills generally do not purchase and store paddy on their own, their operations tend to be restricted to the paddy marketing season, and their installed capacity remained unutilized/underutilized during the rest of the period of the year.

PROBLEMS FACED IN GENERAL

It is estimated about 10 percent of paddy/rice is damaged and/or lost in processing, storage and transport with the present methods and machinery. Sixty to eighty percent head yield is obtained with 10-25 broken and admixture of bran and husk whereas with modern techniques, 68-72 percent head rice with 5-7 percent broken and better utilizable by-products. The estimated loss in terms of money due to ill rice recovery and excess broken etc with present methods would run into crore of rupees.

Since paddy is the staple food of practically all paddy growers and also it is seasonal with one harvest per year, there should be some facility in storage which can be protected from various hazards like damage caused due to spontaneous heating, damage by birds, rodents and insects.

PROBLEMS IN PARBOILING AND DRYING

Parboiling of paddy, a process of partial boiling or cooking prior to milling which imparts an extra strength to the rice kernel so that it could withstand the milling stress and result in higher head yield. This significant increase in the hardness of the kernel results due to gelatinization of the starch during parboiling and the disrupted protein which expanded and occupied all the air spaces in the endosperm.

Research on food value of rice has shown that parboiled rice has more nutritive value than the raw rice because of the migration of vitamins from outer layers of the rice kernel into the inner starchy endosperm due to moisture heat treatment. Moreover, due to better milling quality, the losses of broken and fines into the bran are reduced considerably in the milling process of parboiled rice, and hence, total rice outturn of 72-73 percent (2-8 percent more than the raw rice) and whole rice outturn of 60-65 percent (20-30 percent more than raw rice) are obtained. This is perhaps the easiest and cheapest method of attaining the self-sufficiency in meeting the growing demand for rice.

Loss of rice due to inefficient drying method is also not insignificant. Sun drying is the most popular and traditional method of drying. This method is completely dependent upon weather and it needs specially constructed large floor area that restricts the capacity of a mill to a certain extent. Excessive losses will occur due to scattering, birds, rodents etc. This can be improved by drying paddy in a mechanical dryer using husk as burning fuel.

PROBLEMS IN BY-PRODUCTS

Bran obtained in milling is a part of the rice kernel and as such is quite rich in fat. Polished rice contains 0.3 percent fat whereas brown rice contains about 2.2 percent fat on a moisture free basis. Rice bran contains 20 percent extractible but the bran produced in commercial mills usually contains 13-18 percent extractible. The quantity of bran if totally extracted for the oil in it, is capable of producing 7.17 lakh tonnes of edible rice bran oil. Thus, if this total potential is exploited, enough oil would be available to curtail a major portion of the import of edible oils required to fill up the ever widening gap between the demand and supply of edible oils in the country.

Rice husk is the largest by-product of rice milling industry which amounts to 22-24 percent of the total paddy. The heating value of husk has been reported to be 3000-3500 Kcal/kg. Thus, husk can be used for generating steam for parboiling paddy and as

heat source mechanical dryers. Twenty kg of husk can generate 60,000-70,000 Kcal which would be enough to reduce the moisture content of one tonne of paddy from 20 to 14 percent. It can be used as fuel in domestic stoves and as a soil conditioner or a diluents component in commercial mixed fertilizers. It can also be used as an abrasive material because of its high silica content. Husk ash is used in glass industry for polishing. Rice husk can be directly used as a loose insulating material in building and cold storage facilities. Success has been achieved in the use of husk ash for manufacturing cement. Pure silicon which is used for making semiconductors is a very costly material that can be obtained from rice husk. Boards and briquettes can also be produced from rice husk.

Therefore, there is an urgent need of modernizing the methods and machinery by new innovations and popularizing the new innovations and the new techniques of paddy processing such as parboiling, drying, milling, handling, storage, transport and by-product utilization to reduce the substantial losses. In order to substantiate the argument a case study was undertaken in the Midnapur district of West Bengal by IIT Kharagpur (RESC, 1982-83). On the basis of survey data collected, the past population of rice mills in the district was found to be 110 out of which only 29 were in position to function. The number of solvent extraction units was three whose capacities ranged from 4 to 6 tonnes of bran oil per day. Out of an estimated annual average amount of 9 million tonnes of paddy produced in West Bengal, Midnapur alone had a big share of 2 million tonnes. The amount of paddy kept for seeds was 10 percent, 11.1 percent was milled by modern mills, 2.9 percent by huller mills and the rest 76 percent of paddy was husked by either licensed or unlicensed husking mills (under runner disc Sheller). In other words, amount of paddy milled by modern mills, huller mills and husking mills were 0.222, 0.058 and 1.520 million tonnes respectively. Amount of paddy kept for seeds was 0.20 million tonne out of a total production of 2 million tonnes in the district.

Under the above mentioned conditions, rice produced by modern mills was 0.161 million tonne and that produced by huller and husking mills collectively was 1.0257 million tonnes per year. Had the total paddy produced in the district been milled by only modern mills, then rice production would have been 1.303 million tonnes instead of the present 1.187 million tonnes. Thus the district is losing 0.118 million tonne of rice worth 24.25 crore of rupees per year at Government fixed rates of rice. If the total bran

available in the district could be utilized for edible oil production, it would have produced 23,760 tonnes of bran oil worth 22.57 crore of rupees every year. Similarly, if the total amount of husk and paddy straw were put to heat energy generation, it could have produced an estimated amount of 4.752×10^{12} Kcal per year. Thus, it can be said that modern rice mills are more productive than the single huller mills. However, some people are of the opinion that since modern mills are capital intensive in nature, it cannot be a good solution for a country where there exists both unemployment and underemployment. In order to break this myth and to establish on the contrary that modernization of rice mills increases the employment potential per unit of paddy milled through direct employment and employment generated in subsidiary industries, a detailed estimate of the comparison of modern mills with that of huller mills for the whole West Bengal State has been presented in Table 2 on the basis of the case study conducted in the Midnapur district.

Table 2 reveals that the modern rice milling system in addition to being self-sufficient in energy, employs additional 4.0179 labours per tonne of paddy processed, yields 3.5 lakh tonnes of additional rice worth 10.5 million rupees and produces 4.2 lakh tonnes of pure rice bran which can partially yield 84,000 tonnes of bran oil in West Bengal. Additional products of modern rice mill which are of considerable economic value are cement and silicon from paddy husk, animal feed and chemicals like sodium silicate, furfural etc. All these products can be economically manufactured from by-products of milling industry providing additional income, employment and overall prosperity to the State economy.

PRESENT STATUS OF RICE MILLING INDUSTRY IN MIDNAPUR DISTRICT

In order to know the present status of rice milling industry in Midnapur district a case study was undertaken in the year 1986-87 by the RESC, PHTC, IIT Kharagpur on the basis of questionnaire supplied by the Department of Food, Ministry of Food and Civil Supplies, Govt. of India. It was found that there were 21 licensed mills which were functioning. Out of these 21 mills 18 were surveyed by personal interview method by the

author and the data were analyzed. The result showed that all the rice mills were running their mills for trading purposes only. Modernization of rice mills started in the district in 1970; so far only four those were fully modernized and the rest were in the process of modernization. Seventy eight percent of the rice mills surveyed were found to be having rubber-roll-Sheller, 6 percent discs Sheller, 10 percent battery of hullers and the rest 6 percent double hullers. About 89 percent of the rice mills had adopted local/traditional method of parboiling paddy and the rest by CFTRI parboiling method and pressure parboiling. Only three rice mills were having mechanical dryers for drying their parboiled paddy whereas all others were using the conventional method of drying paddy, i.e., sun drying. The bran produced from different mills having rubber-roll-Sheller was sold to the solvent extraction plants in the district which were four in numbers. Almost all the rice millers were aware of the modern equipments used in rice mills. Even though they believed that modernization was economical, they had not been able to procure and use all the modern equipments due to financial constraint. Only in case of few rice mills non-availability of power supply was found to be the stumbling block for modernization. The millers were quite confident of modernizing their mills if they were provided with financial assistance, technical advice, electricity, concessions in the present levy system and marketing facilities for products and by-products.

Table 1

NUMBER OF RICE MILLS IN INDIA
(As on 1.1.1987)

Sl. No.	State/ U.T.	Huller	Sheller	Huller-cum-Sheller	Modern	Total
1	Andhra Pradesh	5386	1387	3999	7763	18535
2	Assam	931	1	2350	1363	4645
3	Bihar	4749	63	9	51	4872

4	Gujarat	2105	132	260	1095	3592
5	Haryana	1175	234	-	990	2399
6	Himachal Pradesh	1175	2	-	40	1217
7	Karnataka	8670	973	1697	10186	21526
8	Kerala	11872	4	12	1286	13174
9	Madhya Pradesh	3114	239	227	94	3674
10	Maharashtra	6133	389	897	2091	9510
11	Manipur	71	-	97	1	169
12	Meghalaya	85	-	8	-	93
13	Orissa	3050	34	220	674	3978
14	Punjab	4374	304	15	1988	6681
15	Rajasthan	236	108	6	-	350
16	Tamil Nadu	16690	74	311	1959	19034
17	Tripura	689	5	8	1	703
18	Uttar Pradesh	5707	562	150	1215	7634
19	West Bengal	1151	55	110	161	1477
20	Chandigarh	18	11	-	27	56
21	Dadra & N. Haveli	11	1	-	25	37
22	Delhi	48	-	-	40	88
23	Goa, Daman & Diu	666	-	8	9	683
24	Pondicherry	203	8	-	9	220
ALL INDIA TOTAL		78309	4586	10384	31068	124347

Note: The States/Union Territories not mentioned are not having rice mils.

Table 2

COMPARISON OF SINGLE HULLER MILL AND MODERN RICE MILL IN WEST BENGAL

Sl. No.	Item	Single Huller Mill	Modern Mill
1	Capacity (tonnes per hour)	0.70	2.00
2	Units Required for West Bengal (Nos.)	6250	2188

3	a) Power Requirement (Horse power per huller/mill)	17	85
	b) Power Requirement for West Bengal	106250*	185980**
4	a) Labour Requirement (no. of labourers per huller/mill)	2	70
	b) No. of Labourers Required for West Bengal	12500	153160
	c) Rate of Employment (man days/tonne of paddy)		
5	a) Rice Production (million tonnes)	4.55	4.90
	b) Value of Rice (rupees in crore)	1365	14700
	c) Husk-Bran Mixture Production (million tonnes)	2.55	Nil
	d) Value of Husk-Bran Mixture (rupees in crore)	98	Nil
	e) Pure Bran Production (million tonnes)	Nil	0.42
	f) Value of Pure Bran (rupees in crore)	Nil	84
	g) Husk Production (million tonnes)	Nil	1.54
	h) Value of Husk (rupees in crore)	Nil	35.9
	i) Broken and Fines Production (million tonnes)	Nil	0.14
	j) Value of Broken and Fines (rupees in crore)	Nil	8.4
TOTAL INCOME GENERATION (rupees in crore)		**1463**	**1598.3**

* Mostly provided by electric or diesel engines.
** Mostly by steam engines from the husk produced in rice mills.

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