

A CASE STUDY IN AGRICULTURAL MARKETING

THE MODERN RICE MILL IN INDIA

By

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Preface

This case study is based on my research on agricultural marketing and processing in India which extended over several years. Numerous persons in India have contributed to my understanding of the issues related to agricultural marketing. The findings of this research have been published in several papers and two books.

I am grateful to Mr. V. S. Tyagaraja Mudaliar, chairman of the Thanjavur Co-operative Marketing Federation, for providing additional information on the operations of the modern mill to make this case study up to date, and to Mr. C. Muthiah of the Agricultural Economics Research Centre in Madras for continuing to help in data collection.

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Introduction

This case study is an analysis of the establishment and functioning of the first and the largest modern rice mill in India. It is neither a story of spectacular success, nor of a spectacular failure as case studies usually are. Rather, it is written with a purpose of illustrating the complexity of factors that enter into the establishment and functioning of an enterprise in a low income economy. These factors often distort both the factor and the product prices and make it difficult to measure the efficiency of an enterprise with the usual yardsticks of cost-benefit analysis.

This case study makes the following points:

1. It argues that in a low income country, there exists considerable pressure to develop the co-operative sector. This pressure arises partly from the assumptions of inefficiency and exploitative nature of the private sector and partly on ideological grounds. When the basic assumptions about the functioning of the private sector do not hold, a cooperative enterprise not only finds it difficult to operate at lower costs than its private counterpart, but even incurs additional costs which could be avoided under competition conditions. This is not to suggest that co-operative enterprises should, therefore, not be developed in a low income economy. It is essential, however, that they be established

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This case study was prepared before my joining the World Bank. The views and interpretations expressed in this study are strictly my own.

and operated in an environment that fosters strong competition from within and outside the sector.

2. It illustrates how utilization of capital is adversely affected when public policies encounter a dilemma of whether to subsidize the producer or the consumer and attempt doing both simultaneously.

3. It points out that even within the co-operative sector, as the scale of operation increases, the degree of capitalization may increase more than proportionately with the size of operations. This leads to higher unit fixed costs in larger mills as compared to smaller mills even at full capacity utilization of both size of mills. However, even if the large mills are not relatively more capital intensive, if they are used only partially, unit fixed costs are much higher than when small mills are used at full capacity to mill the same amount of paddy.

4. It emphasizes that the conditions in which the first quasi public modern rice mill has been established and operated, constitute a malady of the modernization program and explain at least partially why more dynamic entrepreneurship in the field of rice milling has not evolved in the smaller scale privately operated mills.

The development of the modern processing industry has thus been treated as subsidiary to the over all growth process and has been affected by policies which often must cater to the broader economic and political goals.

A Brief History of Establishment

India's first modern rice mill was set up in Tiruvarur in Thanjavur district in Tamil Nadu State in 1964-65, under the ownership and management of the Thanjavur Co-operative Marketing Federation (TCMF). In April 1963, nearly two years before the mill went into operation, a Ford Foundation team summarized the problems of the traditional rice milling industry in India.

1. The paddy received from farmers is low in milling quality.
2. Traditional storage in India does not provide adequate protection.
3. Milling machinery manufactured in India was designed 30 to 50 years ago. Most of this machinery consists of hullers which give rice out-turn of 64 percent. The remaining is sheller type, which gives an out-turn of 68 percent.¹

The team, therefore, recommended an overall modernization of the paddy-rice system beginning from improved production practices by

cultivators to establishment of mechanical driers, rubber roll sheller mills and bran extraction plants coupled with improved storage facilities at all levels of handling. The team observed: "For each of the modern storage and milling facilities, the expected increase in out-turn of rice would save 1,600 tons of rice a year. This additional out-turn would have an estimated value of Rs. 11 lakh. The proposed modern storage and rice milling facilities will operate at a lower cost than mills currently in use."² Upon recommendations of the Ford Foundation team, the Food Department made a decision in July 1964 to set up seven imported modern rice mills as the first step toward modernization. Six mills were set up in the co-operative sector, and one in the public sector.

The modern rice mill at Tiruvarur (hereinafter referred to as the TCMF mill) is one of these seven mills. It has a capacity of 4 tons per hour (TPH) or about 24,000 tons of paddy per year. The remaining six rice mills have capacities of 2TPH and 1TPH. The TCMF mill has a parboiling unit, a paddy cleaning unit, silo storage with mechanical handling, a mechanical drying system instead of the traditional sundrying, and a rubber roller milling unit in place of the traditional battery of hullers or cone polishers.

Sources of Finance for Fixed Capital

The factors which determined the sources of financing of the TCMF mill are involved enough to make an interesting case study of the conflict between the different departmental wings of the government. We only summarize the final sources of funds in Table 1 below. The

Table 1. Sources of Initial Capital Funds of the TCMF Rice Mill, Tiruvarur.

Sources	(Million Rs.)	Percent
1. Member Share Capital	0.300	7.89
2. Contribution of the State of Tamil Nadu ¹	0.780	20.53
3. Loan from the National Co-operative Development Corporation (NCDC) ¹	2.345	61.71
4. Subsidy from the State Government ¹	0.375	9.87
Total	3.800	100.00

¹The NCDC provided Rs. 3.023 million to the State government for the mill. The loan carries an interest of 5 percent per year and is repayable in 15 installments beginning March 1968.

Source: The Thanjavur Co-operative Marketing Federation, Tiruvarur.

planned expenditure was Rs. 2.7 million. It will be noted from Table 1 that the actual expenditure on capital account was anticipated to be greater than the planned expenditure by Rs. 1.1 million.

After much debate and a series of discussions between the different departments of the government, the NCDC increased its loan component to meet the gap of Rs. 1.1 million. Table 2 shows the actual and some alternative estimates of the capital costs of the TCMF mill. The actual capital costs of the TCMF mill are presented along

Table 2. A Comparison of the Actual and Hypothetical Estimates of Capital Costs of Two Modern Mills in India.

	Rs. 1000	
	Memari West Bengal	(TCMF) Tamil Nadu
Capacity	2TPH	4TPH
<u>Actual Capital Costs</u>		
1. Land	195.00)	
2. Buildings	39.33)	
3. Mill Warehouses	1.81)	410.00 ²
4. Permanent Warehouses	180.00 ¹	2,200.00 ²
		600.00 ³
5. Mill Equipment and Machinery	323.48	1,300.00
6. Total capital costs (1+2+3+4+5)	739.62	4,540.00
7. Proposed silo	900.00	-----
8. Revised estimate of existing silos ⁴	-----	1,656.00
9. Revised total capital costs (6-4-5+7+8)	1,639.62	3,396.00

¹ Flat warehouses

² Silos

³ Silo accessories

⁴ Based on interviews of G.V.K. Moorthy and James E. Wimberly.

Source: West Bengal Apex Co-operative Agricultural Marketing Society and Thanjavur Co-operative Marketing Federation.

with those of a smaller modern mill of 2TPH. This mill was set up in Memari in Burdwan district in West Bengal a little after the establishment of the TCMF. The figures in Table 2 show the very substantial difference in their degree of capitalization.

The significantly high costs of construction of silos in Tamil Nadu were due to two main reasons. A certain degree of over-cautiousness in the construction of the first set of silos resulted in higher costs of construction. Second, considerable research in the construction of silos has provided possibilities of several alternative types of silo constructions which have further reduced costs. We have, therefore, provided an alternative estimate of the capital costs of silos in Tamil Nadu. This estimate is much closer to the estimated costs of silos in various other modern rice mills, established in the public and the co-operative sectors subsequent to the TCMF mill.

Management

Rapid increases in paddy production were planned in Thajavur district in the late sixties through introduction of high yielding varieties of paddy. Considerable new acreage was being brought under high yielding varieties not only in the main growing season July-January, but also in the second crop season that is harvested in September-October, i.e. during monsoons. Thus area double cropped in the district was to increase from 17 percent to 33 percent with nearly a 50 percent increase in the paddy production. Most of this would be harvested in the rainy season when the moisture content of the paddy is very high and when paddy sprouts rapidly due to high humidity. It therefore has to be exported to other districts for processing.

The chairman of the TCMF was convinced of a significant contribution that modern dryers and mills would make in parboiling and processing large quantities of paddy all through the year, particularly when the traditional sundrying method failed to be operable. He played a key role in obtaining the modern rice mill for the TCMF. The Chairman is himself one of the most successful private sugar millers of the Tamil Nadu State and has considerable expertise in the management of a business enterprise similar to the rice mill in the private sector. Thus among all the modern rice mills in India, the TCMF has provided exceptionally good leadership in the establishment of the mill. It also has a potential to provide a highly efficient day to day operation of the rice mill.

It is noteworthy that despite this dynamic leadership, a phenomenon by no means representative of the co-operative enterprise in the LDCs, the rice mill's administration is mainly manned by government officers, on deputation to the TCMF. The secretary of the TCMF, the chief administrator, is deputed to the TCMF by the state government and holds a rank of the joint registrar in the co-operative department of the

Tamil Nadu state government. He is assisted in administration and accounts by the chief accounts officer who is a chartered accountant. There are three assistant secretaries also in charge of the administration. Of the three, two are deputed by the government. They are of the rank of subregistrar of the co-operatives.

There is a chief engineer and eight shift engineers. The chief chemist is in charge of the soil extraction plant while the R. and D. section is manned by two qualified scientists.

When compared to the traditional mills, the TCMF's administrative superstructure of 326 employees does not seem disproportionately larger than its milling capacity (see Tables 3 and 4). However, it adds significantly to the fixed costs and is a major factor affecting the mill's competitive position.

Table 3. Effective Milling Capacity and Number of Employees, in Traditional Mills and the TCMF Rice Mill, Tamil Nadu State.

Serial No. of the Mill	Milling Capacity (tons of paddy per day)	No. of Employees
1	5 ¹	n.a.
2	10 ¹	50
3	12 ¹	40
4	517 ¹	20
5	5 ¹	18
6	10 ¹	43
7	16 ¹	65
8 (TCMF)	88 ²	326

n.a.: Not available.

¹A single shift of 8 hours per day.

²22 hours of capacity utilization per day.

First, the mill's staff is highly trained, therefore, highly paid and of permanent nature. Second, as will be shown later, since the actual capacity utilization is very low, the staff adds significantly to the fixed costs per unit of output. Third, because of the mammoth capital expenditure of the modern mill as compared to the traditional mills, the high fixed costs of labor when combined with capital costs together affect the mill's competitive position.

Table 4. The Tanjore Co-operative Marketing Federation Limited, Tiruvarur. Categorywise and Departmentwise List of Staff as on 31-7-'71.

Department	Officers	Superintendents Accountants	Clerks	Typists	Telephone Operators	Peons & Watchmen	Drivers and Cleaners	Attendants	Shift Engineers	Scien- tific Assists.	Shift Chemi- sts	Tech- nical Worke_s	Total
Establishment	--	1	3	1	--	2	--	--	--	--	--	--	7
Accounts	1	7	13	--	--	5	--	--	--	--	--	--	26
Fertilizers	--	2	12	--	--	2	--	--	--	--	--	1	17
Paddy & Rice	--	4	22	--	--	7	--	1	--	--	--	2	36
General (Including P.A. to Pdt. & Govt. Staff)	4	--	6	6	2	6	--	2	--	--	--	--	26
Research & Development	1	--	1	--	--	--	--	--	--	4	--	4	10
Transport	--	2	7	--	--	1	51	--	--	--	--	7	68
Manufacturing	1	--	1	--	--	1	--	--	1	--	--	--	4
Security	1	--	2	--	--	20	--	--	--	--	--	--	23
Solvent Extraction Plant	1	1	4	--	--	1	--	1	--	--	2	19	29
M.R. Mill	--	--	--	--	--	--	--	--	6	--	--	69	75
Civil	--	--	--	--	--	--	--	--	--	--	--	1	1
Stores	--	--	2	--	--	1	--	--	1	--	--	--	4
Total	9	17	73	7	2	46	51	4	8	4	2	103	326

Source: The Tanjore Co-operative Marketing Federation, Tiruvar.

Finance for Working Capital

When the TCMF commenced procurement of paddy in 1967-68, it was to receive working capital from the Food Corporation of India (FCI) with which it was to work in co-operation. However, due to the differences between the FCI and the TCMF as to the control on procurement operations, the TCMF decided to work independently. It, therefore, had to secure loans for procurement operations from the Central Co-operative Bank, and the State Government. During the peak years of its operation the working capital requirements amounted to nearly Rs. 1.5 to Rs. 2.00 billion in the Kurwai season alone.

One of the major problems of the TCMF has, therefore, been availability of adequate working capital. On the basis of their daily operations the village level co-operative societies have to provide an estimate of their financial needs to the primary co-operative societies. This need is scrutinized by the TCMF officials before an advance is made to the societies. The TCMF must then recover its funds tied in stocks so as to maintain adequate liquidity. In the past, the TCMF's only customers have been other district co-operatives or the FCI. Due to the considerable paper work involved in the transactions, it has not always been possible to recover cash quickly.

The Financial Position

As of 30th June 1970, the TCMF owed Rs. 1,995,411 to the co-operative central bank, Rs. 10,451,021 to the government and Rs. 33,658,523 to the State Bank of India i.e. a total of Rs. 46 million.

The cumulative loss for the period 1963 to 1965 was Rs. 841,742. This was reduced to Rs. 575,720 in 1966 because of the profit of Rs. 266,022.

From 1967 up to June 1970, the mill incurred an additional loss of Rs. 15.66 million.

Some Factors Explaining the Losses

1. The TCMF is required to purchase paddy through primary co-operative societies at prices fixed by the government for dry fair average quality paddy. The primary societies, however, often procure wet paddy with heavy admixtures but do not cut the price paid to the cultivator. The TCMF thus incurs loss in quantity since it must dry and clean paddy before it is stored in silos. However, all the paddy procured does not always get dried quickly. It then deteriorates in quality. The TCMF incurs a loss due to the quality cuts enforced at the time of purchase by the Department of Civil Supplies of the government of Tamil Nadu.

2. The TCMF parboils a major portion of the paddy that it processes. (see Table 5 below). It is noteworthy that when the mill was established, there was a general agreement that the capacity of the parboiling unit should match that of the milling unit, so as to avail of the benefits of parboiled rice, namely higher extraction and better nutritive quality.

The TCMF has, however, consistently encountered a problem with its parboiled rice. The degree of polish of the rice it produces has been a serious problem. The capacity of the shellers and the polishing cones of the mill are balanced at 4 percent polish, a level much below that demanded by the consumers. The State Government through the FCI has demanded a 6 percent degree of polish and enforced cuts in prices paid to the TCMF for lower degree of polish. If the mill raises its degree of polish, it has to cut down on the throughput of the polishing cones. This raises operational problems for the mill. Working polishers excessively increases their wear and tear. On the other hand reducing throughput cuts down the capacity utilization.

Because the Schule equipment is mainly geared to the production of raw rice, the TCMF has also encountered a number of difficulties in parboiling paddy. One of the crucial problems faced by the TCMF is the heating of the soaked kernel uniformly to achieve an even temperature of 85°C in the boiling tank. This is very difficult since the tank can hold 4 to 5 tons of paddy. Due to poor distribution of heat, paddy at the top is heated more than that at the bottom. The scientists at the TCMF have devised a system of passing heat from below the tank. However, there is still a problem while cooling paddy. The other problem is to make paddy absorb only about 15 percent moisture at the soaking stage as against the 33 percent moisture that it normally does. Even the mechanical dryers reduce moisture only to 22 percent. The TCMF has been using a process of washing paddy with a brine solution. It, however, affects the appearance of the final product. The TCMF's boiled rice is often yellowish in color.

Table 6 below shows the income that the TCMF would have earned if it had obtained a price for parboiled rice, at least on par with the raw rice.

It is noteworthy that the loss in income from sale of boiled rice shown in Table 6 alone is equal to the total loss incurred by the mill during 1963 to 1965.

3. The TCMF had to accept price cuts due to the poor appearance of its parboiled paddy. However, in the controlled market, the TCMF has not received a premium in price for its lower refraction rate and lower rate of broken, which it would in the open market. It must, however, be pointed out that this premium is often exaggerated in justifying investments in modern rice mills in LDCs. In most rice consuming countries, broken rice is always put to use by consumers and, therefore, is not

Table 5. Capacity Utilization and Costs of Processing Rice in the TCMF, Tiruvarur, March 1970 - June 1971.

Month & Year	Quantity of Paddy Processed (tons)		Percent Capacity Utilization $4=2/2200^1$	Cost of Processing (Rs. Per ton)			Cost of Storing Paddy
	Hulled	Parboiled		Parboiling ²	Hulling ³	Total	
1	2	3		5	6	7=5+6	8
March 1970	1,392.10	1,175.25	63.3	n.a.	n.a.	n.a.	n.a.
April 1970	572.15	548.80	26.0	n.a.	n.a.	n.a.	n.a.
May 1970	107.30	37.75	4.8	n.a.	n.a.	n.a.	n.a.
June 1970	838.90	22.60	38.1	n.a.	n.a.	n.a.	n.a.
July 1970	1,488.85	1,480.95	67.6	22.73	20.02	42.75	22.00
August 1970	1,019.00	1,019.00	46.4	28.92	24.19	53.11	27.52
September 1970	1,100.00	1,190.00	50.3	27.57	28.65	56.22	28.63
October 1970	259.40	259.40	11.8	93.66	70.66	166.32	109.13
November 1970	228.50	228.50	10.4	87.85	86.81	172.66	127.27
December 1970	84.00	84.00	3.8	320.80	180.42	501.22	152.89
January 1971	1,199.45	1,199.45	54.9	25.58	23.88	49.46	24.06
February 1971	735.00	735.00	36.6	40.70	30.18	70.88	37.26
March 1971	772.40	772.40	35.6	38.95	32.45	71.40	35.79
April 1971	657.50	657.50	30.1	42.24	26.50	68.78	37.62
May 1971	562.90	562.90	25.7	35.03	39.06	74.09	47.59
June 1971	845.95	845.95	38.7	37.01	33.76	70.77	20.21

¹ 4 TPH at 22 hours per day and 250 days a year of operation.

² Costs of parboiling include furnace oil, stores and spares, salt, electricity, wages, pension fund, bonus, machinery repairs, depreciation, salaries, and cost of steam in the boilers. Parboiling costs thus only exclude interest on fixed capital.

³ Hulling costs include wages, electricity, rubber rollers, stores and spares, repairs to machinery and building, salaries, pension fund, bonus, miscellaneous expenses, taxes and depreciation of machinery and buildings at 10 and 5 percent of the capital value respectively. The hulling costs thus only exclude interest on fixed capital.

⁴ Storage costs include salaries of silo workers, pension fund and bonus, wages, stores and spares, electricity, repairs to machinery and buildings, taxes, insurance, interest on loan, and depreciation of silos and conveyors at 5 and 10 percent of capital cost respectively.

Source: The Thanjavur Co-operative Marketing Federation, Tiruvarur.

Table 6. Loss in Earnings Incurred by the TCMF from Sale of Boiled Rice to the State Government, 1970.

Grade of rice	Quantity of rice	Price received for boiled rice	Price received for raw rice	Difference between the two prices	Difference in value of boiled & raw rice
1	2 (Quintals)	3	4 Rs. per Quintal	5	6=2x5 Rs.
I	21,243	80.00	87.40	7.40	157,199
II	97,506	75.60	82.55	6.95	677,671
III	1,329	72.65	79.30	6.95	8,840
Total	120,078	-----	-----	----	843,711

Source: The Thanjavur Co-operative Marketing Federation, Tiruvarur.

discounted as much as in the international market. The price premium would certainly not be so high as to compensate for the losses resulting from the various other factors.³

4. The open market prices of rice both in Tamil Nadu State as well as in the neighboring state of Kerala are higher than the price at which the Civil Supplies Department purchases rice from the TCMF. The management of the mill claims that if it could sell rice in the open market rather than selling it to the government, it would make good substantial amount of losses. Tables 7 and 8 show the difference in the government procurement prices and the open market prices of rice and paddy and the income that would have been earned by the TCMF had it sold rice and paddy in the open market. It is noteworthy that the total loss in income as estimated in Tables 7 and 8 is equal to a third of the losses of the mill during 1967-70, i.e. may be equal to the loss for the year 1970.

It is not only the open market prices but even the margins fixed between the prices of rice and paddy by the state governments that have varied substantially from one state to another as is evident from Table 9.

The substantial differences in the margins make it difficult to evaluate cost benefit ratios of investments in modern rice mills, since they vary from one state to another and from one time to another depending on governmental policies.⁴

Table 7. Earnings that Could have Accrued to the TCMF from Sale of Paddy in the Open Market, 1970.

Grade of Paddy	Government Account Sale			Open Mar-	Open Mar-	Difference in the Open Market & Government Value of Paddy
	Quantity Sold in Tons	Price per Ton (Rs.)	Total Value	ket price of Paddy Rs. per t	ket Value of Paddy (Rs.)	
1	2	3	4=2x3	5	6=5x2	7
II	1194.879	470	561,593.13	701.75	838,506.34	276,913.21
III	284.519	450	132,533.55	666.66	196,344.04	63,810.49
	1489.398	---	694,126.68	-----	1,034,850.38	340,723.70

Source: The Thanjavur Co-operative Marketing Federation, Tiruvarur.

Table 8. Earnings that Could have Accrued to the TCMF from Sale of Rice in the Open Market, 1970.

Grade	Government Account Sales		Open Market Sales		Difference between the open market & govt. value
	Quantity sold	Value of rice	Open Market price of rice	Open Market value of rice	
1	2	3	4	5=4x2	6=5-3
	(tons)	(Rs.)	(Rs. per ton)	(Rs.)	(Rs.)
I raw rice	2307.953	2,015,980.02	1206.40	2,783,711.30	767,731.28
II raw rice	123.388	107,174.84	1139.40	140,588.29	33,413.45
III raw rice	44.984	35,533.51	871.30	39,194.56	3,661.05
I boiled rice	2124.310	1,757,836.06	1085.80	2,306,575.80	548,739.14
II boiled rice	9750.668	7,388,736.06	1032.20	10,064,639.51	2,675,875.75
III boiled rice	132.937	97,846.31	871.30	115,828.01	17,981.70
Total	14,483.740	11,403,134.50	-----	15,450,537.47	4,047,402.97

Source: The Thanjavur Co-operative Marketing Federation, Tiruvarur.

Table 9. Procurement Prices of Paddy and Rice Fixed by State Governments in 1967-68.

State	Paddy price	Rice Price	Value of rice equivalent of 1 quintal of paddy	Margin between price of 1 quintal of paddy and its rice equivalent
	1 (Rs./per -quintal)	2	3 (.67 x 2)	4
Andhra Pradesh	46.00	72.69	48.70	2.70
Assam	56.25	107.77	72.20	15.95
Bihar	56.25	95.25	63.81	7.56
Gujarat	55.00	N.A.	N.A.	N.A.
Maryana	52.50	86.00	57.60	5.10
Kerala	56.00	90.14	60.39	4.14
Madhya Pradesh	56.00	85.00	59.95	0.95
Tamil Nadu	45.00	72.80	48.77	3.77
Maharashtra	56.00	76.15	51.10	4.90
Mysore	45.00	70.00	46.90	1.90
Orissa	48.00	N.A.	N.A.	N.A.
Punjab	52.50	85.00	56.95	4.45
Uttar Pradesh	56.25	90.00	60.30	4.05
West Bengal	56.25	93.75	62.81	6.56

Source: - Reports of the Agricultural Prices Commission, Ministry of Food and Agriculture, Government of India.

5. The heavy losses of the TCMF are also due to the high costs of operation of the rice mill in relation to the milling margin allowed by the Tamil Nadu government. The state government at present allows Rs. 2.00 per quintal of paddy milled or Rs. 3.00 per quintal of rice as a milling charge. The milling charges fixed by the various state governments vary substantially although the milling costs between different states are not significantly different.⁵ e.g. The West Bengal government allowed a milling charge of Rs. 5.36 per quintal of rice as compared to Rs. 2.25 allowed by the Tamil Nadu, Maharashtra and Andhra Pradesh governments in 1967.

The variable milling costs in most traditional huller mills are close to the milling charge allowed by the Tamil Nadu State government.⁶ The fixed costs in traditional mills are insignificant for two reasons. (1) The traditional mills consist of a battery of hullers and steaming tanks for parboiling paddy requiring little fixed capital. (2) Most traditional mills are quite old and, with inflation, have already recovered the fixed capital costs of their mills, which in the organized sector mostly consist of land value. Since the introduction of controls,

there has been little change in the ownership of mills, a phenomenon widely observed in the times of an open market in paddy.

The costs of milling in the TCMF rice mill are high for numerous reasons. Table 5 above showed the total per ton costs of parboiling and milling paddy as estimated by the TCMF for various months. The costs include everything other than interest on fixed and working capital. It should be noted that the interest costs are particularly high in the TCMF because of the high degree of capitalization of the mill. The milling costs estimated by the TCMF and presented in Table 5 show an extremely wide variation from one month to another. Because of the way the costs are estimated, there is no relationship between the unit costs of operation and capacity utilization. We, therefore, present below a systematic comparative analysis of the milling costs of the two different modern rice mills to show the implications of capacity utilization for unit costs of operation.

Variable and Fixed Costs of Milling: A Comparative Analysis of
Two Modern Mills

Table 10 shows the actual variable costs of milling in the West Bengal and the TCMF rice mills.

Table 10. Actual Per Ton Variable Costs of Processing Paddy in Modern Mills.

	Memari, West Bengal ¹	TCMF, Tamil Nadu ²
Capacity	2TPH	4TPH
Variable Milling Costs		
Average for 1968	Rs. 12.68	
	July 1969	9.45
	August 1969	15.35
	September 1969	23.09
	October 1969	24.95
	November 1969	13.79
	December 1969	<u>22.34</u>
	Weighted ³	
	average 1969	16.65

¹Costs for West Bengal include factory maintenance, electricity, oil, fuel and all wages. No breakdown was available according to salaries and wages.

²Costs for the TCMF include factory maintenance, electricity, steam unit expense and wages. They do not include salaries, which are considered to be fixed costs. The estimate for West Bengal thus somewhat overstates the variable costs due to inclusion of salary component in them.

³Weighted by the quantities of paddy milled.

Source: West Bengal Apex Co-operative Marketing Society and the Thanjavur Co-operative Marketing Federation.

Data for West Bengal are for the calendar year 1968. Those for Tamil Nadu are on a monthly basis for 1969. Table 11 shows the alternate estimates of unit fixed costs at different levels of capacity utilization in the two rice mills.

It must be noted that these costs do not include either the purchasing costs of paddy or the interest costs on working capital. It is generally recognized that since milling involves storage of paddy, for a considerable period of time, interest costs on working capital are quite substantial. V. K. Gupta, in his analysis of rice mills contends that interest costs on working capital are so high that it is, therefore, perhaps more profitable to have large capacity mills and to operate them only during the season rather than having small mills with plants and facilities to store paddy for lean season operations.⁷

Our data suggest that fixed costs may vary significantly for different sized rice mills for the same quantities of paddy milled, i.e., at different levels of capacity utilization (Table 11), the data for the two rice mills show considerably higher per unit fixed costs in the TCMF rice mill as compared to the West Bengal mill. This is obviously due to the higher degree of capitalization of the TCMF rice mill. We show below two different patterns of milling that could be followed to mill 12,000 tons of paddy. Under Plan 1, milling is undertaken in a 2 TPH rice mill all through the year.

Under Plan 2, milling is confined only to the first five months. The two plans show a significant difference in the interest costs incurred on working capital. From Table 11, however, it is clear that the per unit fixed costs of the two rice mills at 12,000 ton per year capacity are substantially different. The figures presented below show that the savings in interest charges brought about by utilizing the larger rice mill at only 50 percent capacity are not compensated by the higher per unit fixed costs in a larger rice mill.

Savings in interest in milling 12,000 tons of paddy in a 4 TPH rice mill = Rs. 153,853.8 - Rs. 27,340.00 = 126,513.8 (from Tables 12 and 13).

Additional fixed costs of milling 12,000 tons of paddy (from Table 11) = (Rs. 53.2 - Rs. 22.4) = Rs. 30.8 x 12,000
= Rs. 369,600.00

It is noteworthy that these results are based, for Tamil Nadu, on the fixed costs which use the lower costs of silos rather than the actual which are much higher, and for West Bengal on fixed costs which include costs of the proposed silo construction. We, however, used market rate of interest rather than the actual interest costs incurred by the two rice mills to emphasize the real social cost of capital.

Table 11. Alternate Estimates of Unit Fixed Costs at Different Levels of Capacity Utilization, West Bengal and Tamil Nadu.

Level of capacity utilization (tons)	Tamil Nadu			West Bengal	
	1	2	3	1	2
1,000	169.6	794.6	638.8	127.9	268.8
2,000	84.8	397.3	319.4	63.9	134.4
3,000	56.5	264.9	212.9	42.6	89.6
4,000	42.4	198.6	159.7	32.0	67.2
5,000	33.9	158.9	127.8	25.5	53.8
6,000	28.3	132.4	106.5	21.3	44.8
7,000	24.2	113.5	91.3	18.3	38.1
8,000	21.2	99.5	79.8	16.0	33.6
9,000	18.8	88.3	71.0	14.2	29.9
10,000	17.0	79.5	63.9	12.8	26.9
11,000	15.4	72.2	58.1	11.6	24.4
12,000	14.1	66.2	53.2	10.1	22.4
13,000	13.0	61.1	49.1		
14,000	12.1	56.7	45.6		
15,000	11.3	53.0	42.6		
16,000	10.6	49.7	39.9		
17,000	10.0	46.7	37.6		
18,000	9.4	44.1	35.5		
19,000	8.9	41.8	33.6		
20,000	8.5	39.7	31.9		
21,000	8.0	37.8	30.4		
22,000	7.7	36.1	29.0		
23,000	7.4	34.5	27.8		
24,000	7.1	33.1	36.6		

Footnotes to Table 11:

Tamil Nadu: Estimate 1 is based on the data supplied by the TCMF modern rice mill on depreciation of machinery and buildings, taxes, insurance and TCMF salaries. Estimate 2 includes TCMF data on taxes, insurance and salaries. Depreciation of buildings and machinery are, however, obtained independently as 5 percent of the capital costs respectively. Interest on fixed costs. It should be emphasized that estimate 1 does not include any interest charges. The third estimate is very similar to the second, except that it uses the revised capital costs of silos for depreciation and interest.

West Bengal: Estimate 1 for West Bengal includes depreciation of machinery and buildings at 5 percent and 10 percent of their capital value respectively plus interest on fixed capital at 9 percent per annum, and insurance. It does not include salaries of the permanent staff. However, since the total wage bill for 1968 was only Rs. 11,000 exclusion of salaries does not significantly understate the unit fixed costs, particularly at high levels of capacity utilization.

Estimate 2 includes all the components in estimate 1 plus depreciation and interest on the proposed silos. The estimated costs of the proposed silos as provided by the marketing society were divided according to costs of buildings and accessories to arrive at separate estimates of depreciation of buildings and equipment. Interest rate is assumed to be 9 percent per annum.

Table 12. A Milling Pattern of a 2 TPH Rice Mill for Milling 12,000 Tons of Paddy Per Annum--Plan I.

Month	Quantity of paddy purchased (tons)	Quantity of paddy milled (tons)	Carry over Stocks (tons)	Value of carry over stocks ¹ (Rs.)	Monthly interest costs of carry over stocks ² (Rs.)
December	3,000	1,200	1,800	111,600	8,370.0
January	3,000	1,200	3,600	223,200	17,677.3
February	3,000	1,200	5,400	334,800	21,092.4
March	3,000	1,200	7,200	446,400	28,123.2
April		1,200	6,000	372,000	23,436.0
May	1,200	1,200	4,800	297,000	18,748.8
June		1,200	3,600	223,200	17,667.3
July		1,200	2,400	148,800	9,374.4
August		1,200	1,200	74,400	4,687.2
September		1,200	1,200	74,400	4,687.2
October	--	--	--	--	--
November	--	--	--	--	--
Total	12,000	12,000	372,000	2,305,800	153,853.8

¹At Rs. 620 per ton of paddy.

²At 9 percent per annum.

Data on variable costs of processing presented in Table 10 show a significant variation in direct processing costs from one month to another in case of the TCMF rice mill, and show almost invariably higher per unit direct processing costs (i.e., variable costs) than those derived for the West Bengal rice mill from the data for 1968. It is noteworthy that the variable costs in West Bengal are lower than those in Tamil Nadu despite the fact that wages and salaries are included as variable costs in West Bengal whereas only wages are included as variable costs in the case of the TCMF mill. The higher unit variable costs of the TCMF mill seem particularly curious as almost all of the rice produced in the TCMF mill in 1969 was raw, whereas in 1968 at Memari in West Bengal only boiled rice was produced.

To recapitulate, some interesting features of the nature of the costs are noted from the statistics presented above. First, the data show that within a single firm considerable variation in average fixed costs occurs according to variation in capacity utilization. Second, they show that

Table 13: A Milling Pattern of a 4 TPH Rice Mill for Milling 12,000 Tons of Paddy Per Annum--Plan II.

Month	Quantity of paddy purchased (tons)	Quantity of paddy milled (tons)	Carry over stocks (tons)	Value of carry over stocks ¹ (Rs.)	Monthly interest costs of carry over stocks ² (Rs.)
December	3,000	2,400	600	372,000	2,343.00
January	3,000	2,400	1,200	744,000	4,687.00
February	4,000	2,400	2,800	1,736,000	10,936.00
March	2,000	2,400	2,400	1,488,000	9,374.00
April	--	2,400	--	--	--
May	--	--	--	--	--
June	--	--	--	--	--
July	--	--	--	--	--
August	--	--	--	--	--
September	--	--	--	--	--
October	--	--	--	--	--
November	--	--	--	--	--
Total	12,000	12,000	7,000	4,340,000	27,340.00

¹At Rs. 620 per ton of paddy.

²At 9 percent interest per annum.

considerable variation exists in average fixed costs between the two modern mills for milling the same quantities of paddy, even when lower capital costs of silos are used for the TCMF rice mill.

The evidence further suggest that, if anything, per unit direct processing costs are higher in a larger rice mill than in a smaller one. Thus given the larger capital costs of modern rice mills as compared to those of the traditional mills on which Gupta's analysis is based, the saving in interest on working capital derived from a partial utilization of a large rice mill may not necessarily compensate for the larger unit fixed costs. This is likely to be even more significant due to the differing levels of capitalization possible in different sized rice mills.

An additional aspect which is often overlooked in cost accounting of different sized mills is the natural inclination for vertical integration in a larger sized mill due to the availability of by-products as raw materials. An excellent example is the setting up of the oil extraction unit in the TCMF rice mill with a capacity of 45 tons of rice bran extraction a day at the cost of Rs. 1.8 million. It was hoped that the mill would produce enough rice bran to keep the plant running more or less at full capacity. However, due to the problems of procurement and disposal encountered by the rice mill itself, plus the problems of procuring bran from other mills, the oil extraction plant has been operating at less than 50 percent capacity, thus further adding to the heavy overheads, which we have excluded from our cost estimates.

However, even if it is assumed that both small and large mills operate at full capacity the costs of operation of the larger mills are likely to be higher at least for two reasons. First, since a large rice mill has to build considerably larger stocks it may have much less flexibility in purchasing paddy as well as in disposing of rice. It may purchase considerable quantities of paddy later in the season at higher costs. V. K. Gupta's evidence clearly shows a rather high positive correlation between quantities of paddy purchased and unit costs of paddy procured. The procurement costs may also be higher as the mill has to procure supplies from a much larger geographical area involving not only higher transportation costs but also problems of coordination and supervision of procurement. The losses both in milling and storage are also higher due to improper handling resulting from heavier accumulation of paddy and rice stocks.

Lessons from the TCMF

The performance of the TCMF therefore has significant implications for development of modern entrepreneurship in the rice milling industry.

The lessons to be drawn from the TCMF are mostly negative but nonetheless important, both for public policy as well as for development of a modern entrepreneur in the LDC's.

The TCMF has been incurring heavy losses since its inception. These are by no means due to the inherent technological or economic inferiority of the modern milling process. To some extent the losses are a result of the teething problems that any new enterprise and the very first one of its kind would encounter in an LDC. They are thus unavoidable. However a major portion of the losses are attributable to the government policies. These policies have distorted both the factor prices and the product prices. The price distortions have caused overcapitalization of the mill and underutilization of the capacity, leading to high per unit costs of operation. They have imposed price cuts for poor quality on the one hand without providing price incentives for the improvement in quality on the other. They have fixed milling margins that can be borne only by the low cost traditional mills, and certainly not by the overcapitalized and underutilized TCMF. The procurement, sale and pricing policies of the government have penalized the mill in more than one way. They have also forced an inefficient co-operative procurement system on the mill which is over-bureaucratized and wasteful.

Apart from the direct bookkeeping losses incurred by the TCMF, the governmental policies have wider implications for the development of modern entrepreneurship in the rice milling industry. Because the governmental policies have prohibited open market operation of the mill, it is not yet known how well the TCMF will survive the forces of competition. This is one reason why the TCMF has so far failed to lead in the modernization of the rice milling industry in the state. A number of other modern mills are being established in the public and the co-operative sector, some also under the management of the TCMF. However the TCMF has failed to provide an example of economic viability which the private sector mills would emulate. In fact, the private millers in Tamil Nadu indicate that despite the technological superiority of the modern mills, until these modern rice mills prove to be economically viable under free market conditions, the private sector will not be enthused about modernization.

This response of the private entrepreneur to modernization is partly a result of the TCMF's accounting losses. However, it is also a result of the TCMF's scale of operations, the degree of its automation, the easy terms on which it has been able to raise its capital and the technical know-how that it has had at its disposal, all of which are at present not as easily available to the small individual traditional private miller.

The response of the private millers in Tamil Nadu is also different from that in several other states, where private rice millers have shown keen interest in modernization. Some have provided leadership in

setting up modern units, while encouraging other millers to follow suit. Either through their trade associations or individually, they have demanded financial and technical assistance from the government and from institutions working on the problems of modernization. They have urged the policy makers to introduce a price policy which would provide stability to the market system and encourage modernization of the processing industry in a more positive way.

The evidence on the performance of the traditional market system in India is overwhelming in the consistency with which it shows a highly competitive system of grain marketing in India.⁹ The efficiency of this system must be enhanced by introducing better technology and more facilitative regulation of the system, without, at the same time, eliminating its competitive and highly flexible nature.

A more pragmatic, a more workable and a more ambitious programme of rice milling modernization will be highly consistent with this goal. Such a program must involve a greater emphasis on a critical evaluation of the factors that come in the way of modernization. It must also be less concerned with the pattern of ownership. It should be at least such as to provide financial assistance and technical know-how to all those millers who wish to modernize. On a more active note, it could provide better incentives through a less interventionist but a more regulated price policy and through research and training program on a wide variety of problems related to modernization. The Indian government has already taken positive steps to initiate research and training programmes related to modernization. It is gradually, although slowly, moving toward incorporating private millers in financial and technical assistance. Agricultural Price Policy, which is a crucial variable in modernization, is however necessarily determined by much broader economic, political and administrative considerations and often hampers the progress of modernization.

Footnotes

- ¹Report to the Government of India on Increasing Milling Outturns of Rice from Paddy in India, M.D. Faulkner, George W. Reed and D. D. Brown, September 1963 as quoted by James E. Wimberly, Evaluation of Modern Rice Milling Program in India, The Ford Foundation, New Delhi, October 1969. p. 1.
- ²Ibid.
- ³An interesting study made of the domestic rice market in the Philippines indicates that price differences due to quality are much smaller in the domestic market in the Philippines as compared to those in the international market. Roger A. Aspires, The Relationship Between Quality and Price in Philippine Wholesale Rice, International Rice Research Institute, Los Bonos, Philippines, Unpublished Mimeograph.
- ⁴For a detailed analysis of implications of governmental policies for the working of the market systems, see Uma J. Lele, Food Grain Marketing in India, Private Performance and Public Policy, Cornell University Press, Ithaca, N.Y., Aug. 1971.
- ⁵See Uma J. Lele, An Analysis of the Modernization of the Rice Milling Industry, Occasional Paper No. 37, Department of Agricultural Economics, Cornell University, Ithaca, N.Y., June 1970, pp. 10-12.
- ⁶Uma Lele, An Analysis of Modernization of the Rice Milling Industry In India, op. cit.
- ⁷V. K. Gupta, T. P. Gopalswamy and D. P. Mathur, Studies on Modernization in Rice Paddy System, the Indian Institute of Management, Ahmadabad, 1969, p.x.
- ⁸This is contrary to Wimberly's analysis which contends that unit fixed costs would show a sharp decline with increase in the size of the milling plant. This is obviously because Wimberly does not allow for differing degree of capitalization that may exist in small and large mills. Wimberly also uses unit fixed costs at full utilization of capacity of the different sized mills. See: James E. Wimberly, Cost Analysis of Rice Processing, A Report submitted to the Ministry of Agriculture and Works, Government of Pakistan, March 18, 1969.
- ⁹Uma J. Lele, Food Grain Marketing in India, op. cit.