Chapter 1

INTRODUCTION

The mankind is heading for a major energy shortage in 20 years unless a massive effort is made to harness all energy resources as well as to reduce the energy losses occurring through numerous industrial and household installations. Wood and agricultural wastes currently cover about half the energy needs of the developing world. Unfortunately the efficiency of utilization of biomass as energy source is extremely low. The traditional cooking stove (CHULHA) which burns about 82 per cent of the fire wood in Indian village homes has an efficiency of less than 10 per cent. Similarly, traditional parboiling systems, utilizing rice husk , are also low efficiency operations and consume a huge quantity of biomass in the traditional parboiled rice consuming states of India. The paddy parboiling technology has been gradually spreading outside the Indian subcontinent. It is, therefore, desirable to make detailed studies of existing parboiling technology with a view to assess the existing problems and to develop improvements to conserve energy and improve technology.

India produces nearly one-fourth of the total paddy produced in the world. The states of Assam, Bengal, Orissa, Tamil Nadu, Bihar and Madhya Pradesh produce parboiled rice in higher proportion than the raw rice whereas the rest of the states do predominently raw rice (49). Out of the total quantity of rice produced in the country, parboiled rice constitutes

approximately 60 per cent. The percentage is likely to increase in the coming years.

The level of paddy production in the country has been targeted at 86 million tonnes for the year 1982-83 (43). More than 50 million tonnes of this produce would be required to pass through parboiling operations. The contribution of modern parboiling plantsbeing meagre, major portion of the paddy will have to be parboiled by traditional and semi-modern methods. The overall heat utilization efficiency of these two methods taken together does not exceed 10 per cent. Therefore, at this level of energy use efficiency, the total energy demand of parboiling alone will exceed 12×10^{10} MJ. This necessarily means that, at the present level of technological deployment, the parboiling process will eat-up the entire quantity of husk produced by the parboiled paddy. Any attempt to improve this state of affairs would be worth a trial.

Considerable advances have been made in the parboiling process. The traditional method of soaking paddy in tanks followed by steaming in vats are being replaced by the owners of the large capacity modern parboiling plants. Considerable decrease in soaking time of paddy has been achieved by adopting hot soaking method. A further decrease in overall time requirement of the process has been achieved by the introduction of Pressure Parboiling method. All these advances helped in increasing the daily turnover of the plant and decreasing the energy input in the process by increasing the heat utilization efficiency. In spite of this break-through achieved in early sixties,

the traditional method continues to predominate and only a small portion of total paddy parboiled comes from modern parboiling plants (Table 1.1).

Table 1.1 An estimate of parboiled paddy produced by various methods

Parboiling method	Estimated + quantity handled, million tonne	Estimated ++ energy requirement, MJ
A. Conventional method	36.0	9.5×10^{10}
(a) Open Drum method	8.0	
(b) Double Steaming method	10.0	
(c) Traditional method	18.0	
B. Modern method	15.0	2.5×10^{10}
(a) CFTRI method	12.5	
(b) Pressure Parboiling method	2.0	
(c) Others	0.5	

+ Estimated total quantity of paddy parboiled in India was taken as 51 million tonnes.

++ Estimated total energy requirement in parboiling in India was taken as 12×10^{10} MJ.

Harvesting of short duration paddy varieties recommended for the up-lands of Assam, plateau region of Bihar and West Bengal

coincides with the receding monsoon. Paddy harvested during this period has high moisture content (more than 20 per cent). In the absence of mechanical dryers and favourable weather. conditions, handling of such paddy lots becomes difficult. Considerable damage has been reported to such a crop as the farmers have no alternative to protect it. Steaming of such paddy lots without soaking might prove to be a reasonable solution. Research information on these aspects are inadequate (24).

In general, conventional method of parboiling including all its variations handles about 65-75 per cent paddy earmarked for parboiling in the country; and the remaining portion is shared by the Central Food Technological Research Institute (CFTRI) and Pressure Parboiling methods. The Pressure Parboiling method has just made a beginning in the recent past (1975), therefore, the bulk of the paddy parboiled in modern plants comes from the CFTRI method. The contribution of other methods, such as the one developed at the Jadavpur University, Calcutta and the Kisan Continuous method developed at Kanpur, is insignificant. The conventional method is well distributed among the parboiled paddy producing states. The CFTRI method has also gained prominence with major concentration in Tamil Nadu, West Bengal, M.P. and Orissa states. The Pressure Parboiling method made a very good beginning in Punjab, Haryana and West Bengal but the pace of adoptation and spread are rather slow.

While recommending the modernisation of parboiling industry, the Government of India intended to make available uniform quality rice of lower unit cost of production and to

achieve higher turn-over per unit. It was also felt that by combining parboiling, drying and milling operations, and treating them as components of a larger system, would enable complete mechanization of the process as practiced in industrialised countries and eventually, will pay the dividend.

Large number of parboiling plants installed in the premises of modern rice mills are run by co-operatives and public sector undertakings. Most of these plants are running either on marginal profit or in loss. Therefore, the prevailing condition do not provide an impetus to the private entrepreneurs. Capital investment in installing such plants is also very high, hence, only a limited number of entrepreneurs could participate in the modernization programme. The largest group of entrepreneurs who have the capacity to meet the requirements of the largest section of population, fall within medium capital investment group. Full involvement of this group in the parboiling industry would call for an appropriate and economically viable technology.

An advisory group, set up jointly by the International Development Research Centre (IDRC), Canada and the International Rice Research Institute (IRRI), Philippine in 1974, indicated the development of low cost methods and equipments for parboiling under high priority problem group (38). Similarly, an international research priority survey reported by the Food Technology Journal of U.S.A. in 1975, placed high priority on energy efficiency improvement in processing units and on unit process which are small and simple enough to be used on a local village level.

The National Planning Commission has also given more emphasis on small scale industries having rural bias. Thus far, no study has been reported on energy efficiency improvement in parboiling processes and on a commercial model of an efficient parboiling plant matching 0.5 to 1.0 tonne per hour capacity rice mills. The present series of investigations are an exercise in this direction.

The specific objectives of the project were:

(i) To investigate the practical significance of hydration in paddy parboiling and to test the feasibility of replacing soaking and steaming operations by hot soaking alone;

(ii) To study the parboiling characteristics of naturally moist high moisture paddy with a view to replace soaking and steaming operations by steaming alone;

(iii) To measure energy consumption in parboiling processes under controlled laboratory conditions;

(iv) To measure the level of energy consumption under actual plant conditions;

(v) To evolve an intermediate technology package by improving the existing boilerless parboiling system; and

(vi) To study the effect of promising pre-milling treatments on rice quality.