



# CRRRI Mini Modern Paddy Parboiling Unit

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- ⇒ The total rice recovery is around 74% with hardly any broken, light in colour and absolutely no bad smell.
- ⇒ It takes around 50 minutes to cook this rice, which is 5-7 minutes more than that for raw rice.
- ⇒ The cost of parboiling paddy with this mini plant is Rs 30/- per quintal, which is less by Rs 10/- compared to traditional practice. Thus the pay back period of this system is less than a year or equivalent to processing 20 tonnes of paddy.
- ⇒ The risk involved in adopting this technology is minimal, equal to cost of owning the unit. Sustainability rating of this technology is high with small rice farmers who prefer preparing their own parboiled rice.
- ⇒ The drum can also be used for storage of milled rice after removing the inner components, which are detachable.

Parboiling refers to partial boiling or cooking of rice with husk intact. It is a pre-milling process for paddy, which originated perhaps in India and has been practiced from time immemorial. Among cereals, rice is the only grain, which is preferred as whole kernel for cooking and consumption. Unfortunately, rice is prone to breakage during milling. The reasons could be either genetic factors or cracks developed due to improper handling of the crop during pre and post harvest stages. To withstand the pressure exerted during milling, the kernel has to be hardened by some processing technique. By parboiling, the required hardness to the grain is imparted along with some nutritional advantage.

Essentially, the process consists of soaking paddy to saturation, steaming for gelatinizing the starch followed by drying to about 14% moisture level, which is optimum for milling. A multitude of parboiling techniques, each varying in soaking and gelatinization steps exist. Traditionally, parboiling is done in one of two slightly different ways. In one called, single boiling method, paddy is soaked in cold water for 2-3 days, then steamed and dried in the sun. In the other called double boiling method, raw paddy is first steamed and then soaked for a day. The soaked paddy is again steamed and dried as before. Both these methods give good rice as such but with more or less disagreeable smell and dark colour due to long soaking period. In order to overcome this problem, in modern parboiling plants paddy is soaked in hot water at around 70°C for 3-4 hours, steamed at 4 kg/cm<sup>2</sup> pressure and then dried.

In the states of Assam, Orissa, West Bengal, TamilNadu and Kerala, there is a strong consumer preference for parboiled rice. Farmers in these states follow the tedious traditional method of parboiling paddy in small batches



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and produce poor quality rice. However, farmers process about sixty per cent of the total parboiled rice in the country for their own consumption. Considering the need for an appropriate improved parboiling technology suitable for rural use, a mini modern parboiling system was developed in the Engineering Department of Central Rice Research Institute, Cuttack and popularized among the farm families. The system employs improved method of parboiling with slight modification to make it workable under rural situation.

### Design and Description

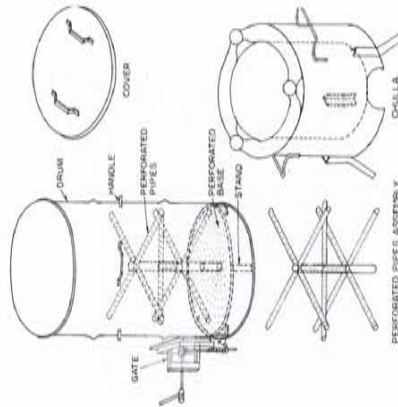
It is a miniature form of modern parboiling plant. The unit is cylindrical in shape and is made of 20 gauge mild steel sheet.

The prototype however makes use of an empty oil barrel of 200 liters capacity to minimize its manufacturing cost.

It comprises two chambers separated by a perforated partition at a lower level to enable both soaking and steaming in the same unit.

A central G.I. pipe with perforated laterals is provided for uniform distribution of steam. A tap is provided just below the partition to drain out water.

A water-tight outlet is provided for discharging parboiled paddy.



|                        |                       |
|------------------------|-----------------------|
| <b>Specification :</b> |                       |
| Type / model           | : Portable / batch    |
| Capacity               | : 75 kg per batch     |
| Diameter               | : 570 mm              |
| Height                 | : 895 mm              |
| Weight                 | : 37 kg               |
| I.D. of central pipe   | : 25 mm               |
| I.D. of laterals       | : 12.5 mm             |
| No. of laterals        | : 12                  |
| Unit cost              | : Rs. 2000 / - (2004) |

### Parboiling Process

The process involves soaking the paddy in hot water at an average temperature of 70°C for 3-4 hours followed by open steaming for about

45 minutes and drying in the sun with care up to around 14% moisture content.

To facilitate the process at farmers' level, the parboiling unit is placed on a conventional wood stove of appropriate size. It is filled with about 100 liters of water and boiled till simmering. The temperature of water at this stage is about 95°C. It takes about one hour to attain this stage. One bag of paddy (75 kg) is now poured into this hot water, which brings down the mixture temperature up to about 75°C. Paddy is soaked in this condition for 3.5 hours. During this period, the paddy-water mixture temperature is maintained at around 70°C without further fuelling. This is possible due to the left out smoldering charcoals in the chullha, which slowly burns and supplies heat to the parboiling unit.

After hot soaking, water is drained out up to the tap level. The remaining water is further heated for steaming. The splitting of husk at the top layer indicates completion of parboiling. It takes around 45 minutes to complete the steaming operation.

The parboiled rice is removed through the discharge gate and dried in the sun, preferably in 2-3 stages till a constant weight is obtained. After 2-3 hours of drying, the grain should be heaped and covered for at least an hour (tempering) for equalization of moisture within the kernel to maintain uniformity and enhance the drying rate.

### Drying of Parboiled Paddy

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### Maintenance of the Unit

The life of the parboiling unit is at least 4 years if properly maintained.

After use in a season, it should be thoroughly washed and all the perforations are cleared if clogged. The unit is then dried and kept inside the house.

When the bottom portion gets damaged after prolonged use, it can be replaced by welding a 5 mm iron plate. After this repair, the same unit can be used again for 6-8 years.

### Performance and Economics

⇒ This mini modern paddy parboiling plant produces parboiled rice having quality at par with commercial grade.