Long straw or un-threshed panicles if any should be removed before putting the material in the machine for cleaning.

All the nuts and bolts of the machine should be checked and tightened if necessary. The belts may be tightened if necessary by sliding the idler pulley or motor.

If some good grains blow away with air, then airflow may be controlled by reducing the opening at the suction ends of the blower and/or raising the damper plate provided with the discharge chute. A combination of these two adjustments gives the best results.

If chaffs come along with the good grains, more air is blown by increasing the opening at the suction ends and/or lowering the damper plate at the discharge chute.

In case of excessive noise, all bush and bearing points and the eccentric cam may be greased or oiled.

Performance and Economics

The machine was put under large scale trial to clean more than 30 tons of paddy in one season. There was no break down or failure of components. The test results and its economics are as follows:

Suitability for crops	:	All varieties of rice
Capacity	:	500 kg/hr (clean grain)
Labour requirement	:	Two (For feeding and supply or removal of grain)
Cleaning efficiency	:	99%
Unit cost	:	Rs 14,000/- (Including motor and starter)
Useful life of the machine	:	10 years
Cost of operation (machine)	:	Rs 6/- per quintal
Cost of operation (manual)	:	Rs 16/- per quintal
Pay back period	:	Less than a year or 110 tons of processed paddy

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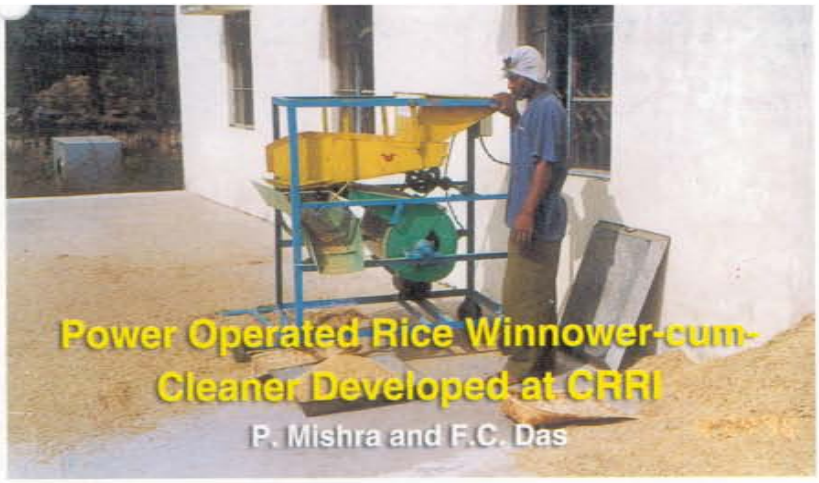

Power Operated Rice Winnower-cum-Cleaner Developed at CRRI

P. Mishra and F.C. Das

Winnowing is a primary processing operation to obtain clean grain from the threshed crop at farm level. Properly cleaned grains add value to the produce, help it for longer and safer storage and smooth milling operation. Rice crop after threshing contain 8-10% non-grain type materials like straw, chaff, dust, impure grains, sand and soil clods. These contaminants are usually removed at the farmyard in a traditional way by dropping the threshed materials from a height against natural wind and further cleaning by manual winnowing. This process is time consuming, inefficient and full of drudgery besides the winnowing may be badly affected due to less wind, rains and non-availability of labour, leading to improper cleaning of paddy. Improperly cleaned grains do not meet the fair average quality (FAQ) norms to fetch the Government' minimum support price in the market. Of late, machines are developed to avoid the risk involved in the winnowing process. But commercially, cleaner cum graders are costly and beyond the reach of common farmers. Considering the above requirement, a low cost power operated winnower cum cleaner, which can be used by all categories of farmers for producing clean grain from the threshed crop at the farm level was designed and developed at the Engineering Department of Central Rice Research Institute, Cuttack.

Fair Average Quality Norms for Paddy

Government has fixed certain quality norms for paddy to enable the farmers to fetch the minimum support price in the market.

Paddy shall be in sound merchantable condition, dry, clean, wholesome of good food value, uniform in colour and size of grains and free from moulds, weevils, abnoxious smell and admixture of deleterious substance like Argenome mexicana, Lathyrus sativus (Kesari).

Paddy shall be classified into Grade "A" (L/B is >3.5) and common group.

Schedule of Specification

Refractions	Maximum Limit (%)
Foreign matter	
a) Inorganic	1.0
b) Organic	1.0
Damaged, discoloured, sprouted and weeviled grains	3.0
Immature, shrunken and shriveled grains	3.0
Admixture of lower class	10.0
Moisture	17.0

Within the overall limit of 1.0% for organic foreign matter, poisounous seeds shall not exceed 0.5% of whichDhatura and Akra seeds (vicia species) not to exceed 0.025% and 0.2% respectively.

Design and Description

A medium capacity power operated winnower cum cleaner was designed and developed to clean paddy after threshing at farmers' level.

The machine is made of mild steel and consists of a blower, an electric motor (1 hp), hopper, vibratory feeding tray, discharge chute with two screens (top scalping and bottom grading screen) and supporting frame with trolley wheels.

The blower is of centrifugal type with long axis and straight blades. The length of the axis is equal to the width of the feeding tray. The two suction ends are provided with adjustable shutters to control the inflow of air. The delivery end opens just below the lower end of the feeding tray.

A medium capacity power operated winnower cum cleaner was designed and developed to clean paddy after threshing at farmers' level.

The machine is made of mild steel and consists of a blower, an electric motor (1 hp), hopper, vibratory feeding tray, discharge chute with two screens (top scalping and bottom grading screen) and supporting frame with trolley wheels.

Power is transmitted from the motor to the blower shaft and eccentric drive shaft through 'V' belts and pulleys. The eccentric drive is connected with the vibrating tray. The diameter of the pulleys are decided in such a way that the blower shaft and eccentric drive shaft rotate at around 700 rpm and 350 rpm respectively. With this, airflow and vibration of the tray are optimum for cleaning operation.

The hopper is truncated trapezoidal in shape opening on to the vibrating tray. An adjustable gate at the bottom opening of the hopper controls the feed rate of impure grain.

The vibrating tray is hinged with the main frame at slight inclination. Thick wire strips are welded like teeth of a comb at the lower end of the tray.

The discharge chute, rectangular in shape, is fixed with the vibrating feeding tray below its lower end. One top scalping screen having slotted holes (2.8x19 mm) and one bottom grading screen having round holes (1.8 mm) are provided in this discharge chute for cleaning operation. A damper is provided along the chute to obstruct the air flow to prevent good grains blowing away with chaffs.

The whole unit is mounted on trolley wheels along with a handle to make it movable.

Specification

Type	:	Movable
Over all length	:	1120 mm
Over all width	:	720 mm
Over all height	:	1320 mm
Total weight	:	100 kg
Motor	:	One hp
Blower type	:	Centrifugal
Blower shaft rpm	:	700 (approx)
Blowing air velocity	:	8-10 m/sec
Eccentric drive rpm	:	350 (approx)

Working Process and Advantages

The distinct feature of CRRI, power operated winnower cum cleaner is its feeding mechanism.

In this unit the threshed paddy from the hopper does not fall directly on to the air stream. Instead, it falls on the inclined vibratory feeding tray, which breaks the grain-straw mass during its movement and evenly drops the material along the entire length of the air stream. This helps effectively separating the heavy grains from extraneous light materials.

Thick wire strips, fixed at the lower end of the vibratory feeding tray prevent falling of long straw (if any) with the clean grains. The straws are thrown out due to vibration and airflow.

Feeding and airflow rates are controlled depending on the type and quantity of impurities present.

Soil clods and fine sands are separated from the grains through the perforated sieves provided in the discharge chute.

Precautions and Maintenance to be Undertaken

Threshed crop may be dried in the sun for a day or two if moisture content is too high before cleaning.