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GRAIN DEHUSKING MACHINES- A REVIEW

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ABSTRACT:- *The present paper describes the innovations that took place in dehusking machines from the earliest times to the present times for rice, wheat, pulses. Different setups were used from hand pounding to single stage mills to latest high capacity mills. The advantages and limitations of all mechanisms and their analysis are discussed in detail & information about the process carried out during dehusking and how the grain has to pass through different processes so as to obtain clean grain. The literature survey call for developing a low cost and efficient grain processing machine for household with quality for sustainable agricultural production using human energy.*

Keywords: Threshing, Grains, Paddy, Processing machines, Husk, Bran

1. INTRODUCTION

Rice is one of the most popular grain in India. It is the staple food of the people within the eastern and southern parts of the country. India is one among the world's largest producer of white and brown rice. As rice is the basic food crop and being a tropical plant, it flourishes comfortably in hot and humid climate.

Grains such as maize, wheat, millet and others are widely produced cereals in the world, most of which is destined for human consumption thus its contribution to energy intake is significant. The processing of grains to flour is carried out in flour mills.

Pulses are mostly consumed within the sort of dehusked splits, commonly referred to as dal. The outer layer of the grain (husk) is attached to the protein and starch bearing cotyledons of the grains. Pulse milling is that the third largest food processing industry after rice and flour milling.

(A) Rice Dehusking Process

Rice dehusking is post harvesting process of removing the husk and bran from the paddy rice and producing white rice grains that are milled, free from impurities and contains minimum number of broken grains.

There are two methods:
A) Traditional Methods: In hand-pounding, a wooden Mortar having one or more deep pockets for keeping the paddy and one or two rural women folk pound by means of 5-6 feet long wooden log called Pestle. The limitation with this method is the difficulty in the uniform quality of product as well as time consuming with more human power engagement. The rice has got more nutritional value as compared to rice milling machines. It would produce a lot of broken and cracked grains during the process and would require number of cycles to de-husk & to some extent the grains would be polished. It is very energy intensive and small quantities of rice can be processed at one time.

Figure 2.1: Mortor and Pestle

B) Mechanical Methods: With the introduction of newly mechanized & electrically operated mills, hand-pounding method has decreased radically because it couldn't compete with the quantity and quality of processed rice by the machine mills. The material used for Mortar & Pestle is wood and rural household was employing a great deal of wood, which may deforestation and it also effect our ecosystem.

The mechanical mills are often classified as :
a) Simple one or two stage Mill (conventional)
b) Multi stage Mill.

a) Simple one or two stage Mill (conventional):
The conventional mills in use can be categorized into three main types:
- Huller mills
- Sheller-Huller mills
- Sheller-Cone Polisher mills.

Huller & Sheller Mills: In order to process rice into a form which can be consumed, the inedible husk must be removed and to offer a better quality of product, the grains are polished to get rid of the bran layers from the kernels. This removal of materials from the grain is collectively referred to as "Milling".

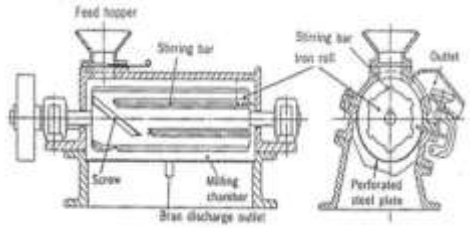

Figure 2.2: Milling Machine

b) Multistage Mill : A multistage rice milling performs various tasks like pre-cleaning the paddy prior to milling, removing the husk or outer layer from the paddy, polishing or whiting the rice to get rid of the bran layer, separating the broken grains from the entire kernels, bagging the milled rice. The general capacity of mills varies from hundreds to tons of kilograms of paddy per day.

Figure 2.3: Multistage Rice Mill

(B) Wheat Dehusking Process

The operation of detaching the grains from the ear head, cob or pod is named as threshing. It is basically the removal of grains from the plant by striking, treading or rupturing. The traditional method of threshing using manual labours requires 150-230 man-h/ha.

The threshing can be achieved by two methods:

A)Traditional Method : Threshing is accomplished by treading the grains under the feet of animals or under the tractor tyres, striking the grains with sticks, pegs or loops and removing the grains by rubbing between stone or wooden rollers on a threshing floor or between the rasp bar and a concave of combine having either 1)Rubbing action
2) Impact.

Figure 2.4: Traditional Wheat Dehusking Methods

B) Mechanized Threshing Machine:

A thresher is employed to separate the grain from the straw and other light materials. It is, essentially, a three-step process: In the first stage, bundles of grain and straw were pitched into the hopper. The feeder(hopper) controlled the rate of feed passing into the machine to prevent overloading.

Figure 2.5: Mechanized Thresher

(C)Pulses Dehusking Process

Pulses are mostly consumed within the sort of dehusked splits, commonly referred to as dal. The outer layer of the grain (husk) is attached to the protein and starch bearing cotyledons of the pulse grains. The process of removal of husk from the cotyledons is named dehusking and therefore the entire process of dehusking and subsequent splitting of cotyledons, its cleaning, polishing and grading is known as milling. Dehusking improves product appearance, texture, product quality, palatability and digestibility.

Milling of pulses involves two major steps:

1)loosening of husk
2)removal of husk and splitting into cotyledons with the assistance of suitable machine.

All kinds of pulses require some pre-milling treatment for simple husk removal. However, processes and equipments for loosening of husk, separation of husk from cotyledons and its splitting differ from crop to crop, cultivar to cultivar and place to put. Dehusking is an age-old practice, which originated reception and later developed into a industry and now has grown into a large-scale organized industry..

Figure 2.6: Traditional Pulse Dehusking

Figure 2.7: Modern Dal Mill

2. CONCLUSION AND RECOMMENDATIONS

The problem with traditional grain pounding method is that the excessive human efforts, breakage of grain, requires longer to finishing whereas the power operated Baby hullers, consuming electricity up to minimum of 2-3 HP or diesel operated hullers up to 10 HP are available; big mills are very costly& located far away Most of the mills are located distant, so farmers are required to hold their paddy over an extended distance.

Since all the machines available are single purpose machines, thus, it becomes necessary to design and develop a hand or pedal operated machine that can dehusk more than one grain. This machine are going to be very helpful for farmers also as for little group of families during a village to cater their daily demand of grain. Multi-grain dehusking machine will not depend on a single seasonal crop and will be useful in all seasons for dehusking multiple grains.

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