

Pedal Operated Paddy Thresher Fitted with Winnower

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INTRODUCTION

Rice (*Oryza sativa*) belongs to the grass family Oryzae, and is one of the leading food crops in the world and is second only to wheat in turn of annual food consumption. Paddy is the basic food for two-thirds of the world population. Paddy is the most important kharif crop of India. Indian Economy is depending on the Agriculture. Nearly, 40% of the world population consumes rice as the major staple food. Also, it contributes about 43% of the total food grain production and 46% of the total cereal production in country. As per the data, India is the world's second-largest producer of rice.

Paddy threshing and winnowing is an important post harvest operation. In, Traditional way of threshing and winnowing is very tedious, more energy consuming process, in-efficient and uneconomical etc. Therefore, in UPCAR project has been planned for development of "Pedal operated paddy thresher with winnower" for threshing and winnowing of paddy.

Justification/Need of Pedal operated paddy thresher with winnower:-

Paddy is the most important kharif crop of India. In traditional method of threshing and winnowing reduces the quality and quantity of the grain. Broken, blown grain and damaged grain is unsuitable for the seed purposes and also domestic as well as commercial purpose. It is very slow process with low output (17 -20 kg/h) and low efficiency. This method is very labour consuming process with high energy requirement, so to reduce the drudgery and injury of the worker most suitable methods is the mechanical threshing method. This activity involves a lot of drudgery as these are done manually. Paddy threshing and winnowing with the hand beating makes woman's lives difficult and yields very low level of output. Moreover, threshing as a separate activity precedes winnowing that brings additional burden on farmers.

They have to employ labourers or use machine. But in villages, there is shortage of labourers, and their wages are also high. In order to make it affordable and more convenient for threshing and winnowing the paddy, we have developed a pedal operated paddy thresher with winnower. The machine so designed can be operated through pedal by applying manual force; both Threshing and winnowing operations can be performed simultaneously using this machine. The application of this machine for threshing and winnowing of paddy will enhance the productivity and output as well as reduce drudgery.

As per the ergonomic evaluation 12% less human energy is required with respect to heart rate and oxygen consumption rate for the foot operated equipment as compared to the hand operated equipment.(Rajaramet *al.*2011). Hence there is a need of pedal operated paddy thresher with winnower to facilitate the threshing and winnowing actions done at a time. This machine will be useful for the small farmers. Most of the agriculture machinery (threshing and winnowing) are beyond reach of small and marginal farmers in general among the low land holding capacity farmers due to poverty, ignorance and poor extension efforts.

Importance of pedal operated paddy thresher with winnower -

In earlier days, threshing and winnowing operation of paddy were done individually but now in this machine threshing as well as winnowing both operations can be performed in same time. The importance of the developed thresher with winnower includes less physical labour and more efficient (amount of grain threshed per unit time) less seed breakage is also a benefit of using a thresher as opposed to beating grains. Needing just a person to operate, it can thresh paddy ten times faster than four draft animal. The mechanized thresher with aspirator produces cleaner grain as compared to manual process.

Limitation of pedal operated paddy thresher with winnower –

It is not suitable for threshing of multiple crops (maize, wheat and groundnut). Energy requirement for when pedal operating the machine is high. There are no adjustments to change the speed of threshing drum and rate of flow of air through winnower for efficient threshing and winnowing operation.

Detail study on Pedal operated paddy thresher with winnower:-

Pedal operated paddy thresher with winnower is important for post harvest operation of paddy like threshing and winnowing. It consists of wire-loop type threshing cylinder, drives, winnower, mild steel sheet body and foot pedal etc. The threshing cylinder consists of wire-loops of 'V' shape embedded in wooden bars. A shaft carries the threshing cylinder and is connected to the transmission system. The transmission system consists of meshed gears or sprocket-chain mechanism. The larger gear or sprocket is connected to foot pedal/bar with links. The foot pedal/bar is always in raised position. On pressing the pedal the threshing cylinder starts rotating. For continuous rotation of the cylinder, the pedal is lowered and raised repeatedly. For operation, paddy bundle is held in hands and ear head portion of the crop is placed on the rotating cylinder. The wire-loops hit the ear head and grain get detached from the rest of the crop. The threshed grains fall on sieves which are held in front of threshing cylinder and it is act as a cleaning unit. Also the blower/winnower are placed at below the threshing cylinder, blower is an essential for the separation of chaff from the grains.

Specifications

- (Length × Width × Height) 119cm × 98cm × 89cm
- Capacity - 95 kg /hr.
- Power requirement - Human

Utility

It is used for threshing and winnowing of paddy at a time. It is operated by pedal and specially develops for small and marginal farmer.

Performance of Machine:-

During the testing of machine, find out the Effect of cylinder speed and grain moisture on threshing efficiency, grain loss, cleaning efficiency. The harvested paddy was threshed at different grain moisture levels i.e. 13 per cent, 15 and 17 per cent and grain loss (weight of whole grain, damaged grain and un-threshed grain at chaff outlet, straw outlet and scattered grain) was measured.

The performance evaluation of machine, the machine was operated at different cylinder speeds i.e.180, 200 and 220 rpm and different moisture content of grain consider. Figure 1 show the trend of increasing threshing efficiency, cleaning efficiency and grain loss with increasing cylinder speed but with decreasing grain moisture. From figure 1. Threshing efficiency (η_t), cleaning efficiency (η_c) and grain loss (GL) is increased from 96.3

per cent to 97.9 per cent, 97.63 per cent to 99.2 per cent and 3.08 per cent to 3.18 per cent respectively at 180, 200 and 220 rpm. figure 2, it seen that threshing efficiency (η_t), cleaning efficiency (η_c) and grain loss (GL) is decrease from per cent 95.05 to 94.6 per cent, 98.6 per cent to 98.25 per cent and 2.06 per cent to 3.18 per cent respectively at 13 per cent, 15 and 17 % grain moisture. figure 2, it seen that threshing efficiency (η_t), cleaning efficiency (η_c) and grain loss (GL) is decrease from per cent 95.05 to 94.6 per cent, 98.6 per cent to 98.25 per cent and 2.06 per cent to 3.18 per cent respectively at 13 per cent, 15 and 17 % grain moisture. It was observed that section at cylinder speed 220 threshing efficiency, cleaning efficiency resulted highest values of 94.9 per cent, 98.9 per cent and minimum grain loss of 3.18 per centre.

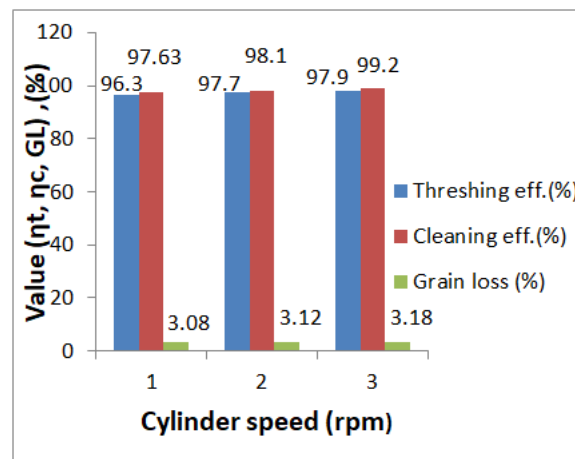


Fig (1) Effect on cylinder speed at threshing efficiency, cleaning efficiency and grain loss (%)

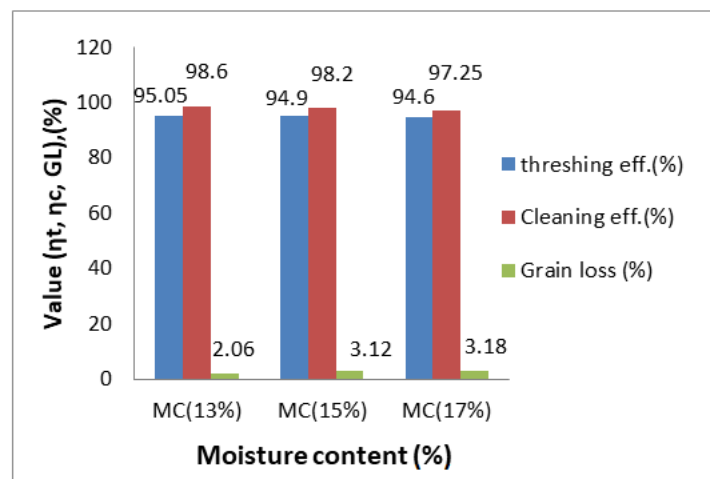


Fig (2) Effect on grain moisture at different threshing efficiency, cleaning efficiency and grain loss

Hence the thresher was operated at cylinder speed 220 rpm, grain moisture 13 per cent. The thresher was operated for 30 minutes for each test and it was replicated for three times. The threshing efficiency, cleaning efficiency, grain loss and output capacity was measured.

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