

# Design & Fabrication of Solar Operated Thresher Machine

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**Abstract**— This paper deals with the development of a rice threshing machine. Available evidence suggests that the mode of threshing rice in the rural areas in Nigeria is by traditional use of hand beating of the paddy. This method is time wasting, energy sapping and often the grains are broken. The developed rice thresher has the ability to winnow the premature grains and leaves, which are often lighter, thus, leaving aside the massy grains that, will be collected. It is also capable of reducing time wastage, reduction in breakage of the grains and separation of the stalk from the grains. Thresher is a rice seed threshing tool. Threshing is an integral part of the process in rice post-harvest management, in which the rice that has been harvested is threshed to separate the grains from the rice straw. One of the main problems faced by the farmers, especially during the post-harvest time is the difficulty to carry the thresher to the harvest site since it is inaccessible for four-wheeled vehicles to reach the sites, and thus the further transport is conducted by manpower of at least six people using bamboos to bear the rice. Data gathering method is conducted by separating the parts of the thresher in four categories namely the frames, the feeding parts, the thresher, and the cover, and then data of each production.

**Key words:** Blower, Feeder, Traditional Threshing Method, Mechanized Threshing Method, Flow Thresher, Mobile Thresher, "Through-Flow" Thresher

## I. INTRODUCTION

The thrashing machine, or, in modern spelling, threshing machine (or simply thresher), was a machine first invented by Scottish mechanical engineer Andrew Meikle for use in agriculture. It was invented (c.1784) for the separation of grain from stalks and husks. For thousands of years, grain was separated by hand with flails, and was very laborious and time consuming. Mechanization of this process took much of the drudgery out of farm labour.

Thresher is a rice seed thresher. Threshing is an integral part of the process in rice post-harvest management, in which the rice that has been harvested is threshed to separate the grains from the rice straw. The working principles of the thresher are by bearing the rice straws so that the grains will fall off. One of the main problems faced by the farmers especially in the postharvest time is the difficulty to carry the rice thresher to the harvest sites, in which the thresher has a big body and the field is difficult to reach, especially in the rural areas where the fields are in the hills and the dikes are narrow. It is inaccessible for four-wheeled vehicles to reach the sites, and thus the further transport is conducted by manpower of at least six people using bamboos to bear the rice. To overcome this problem, there is a need to handle the post-harvest management so that it can reduce the difficulty in carrying the thresher so that they will have longer working hours, and production increasing.

In this project we design and fabricate a machine for the purpose of threshing the rice. In many ways even now the

rice are separated manually. Due to this manual process in industries there is wastage of money and time. In order to avoid this wastage we have designed the following model called rice thresher machine. This is an advanced and easy process to separate rice from the plant. In this process we do not need any high electrical supply to operate the machine. This model has the following parts in it Rotating drum, a hopper and cam operated tray arrangement.

## II. OBJECTIVE

- Project aims to replace the inefficient, labour intensive manual threshing process and to automate the pepper threshing process at the required rate with minimum damage to the pepper berries.
- To design the thresher using Break Down System for rural areas
- To increase the thresher productivity.

## III. LITERATURE REVIEW

### A. Threshing Methods

After being harvested, paddy bunches may be stacked on the plot. The in-field storage method results in a pre-drying of the rice ears before threshing, the purpose of which is to separate seeds from panicles.

### B. Traditional Threshing

The traditional threshing of rice is generally done by hand: bunches of panicles are beaten against a hard element (e.g. a wooden bar log, bamboo table, or stone). In many countries in Asia and Africa, and in Madagascar, the crop is threshed by being trodden underfoot (by humans or animals); this method often results in some losses due to the grain being broken or buried in the earth (Food Agency Organization 1995).

### C. Mechanized Threshing

Two main types of stationary threshing machines have been developed. The machine of Western design is known as "through-flow" thresher, because stalks and ears pass through the machine. It consists of a threshing device with pegs, teeth or loops, and (in more complex models) a cleaning-winnowing mechanism based upon shakers, sieves and centrifugal fan. In the 70s, IRRI developed an axial flowthresher, which has been widely manufactured at local level (Saxena, et al. 1971). More recently, a small mobile thresher provided with either one or two threshers was developed. This machine has been widely adopted in many rice-growing areas (Policarpio and Mannamy 1978). The simple design and work rates of these machines seem to meet the requirements of rural communities (Food Agency Organization 1995). The main disadvantages of these machines are their fragility.

Rice will be separated from the stalks or straw through a blower that produces wind. These winds can make a power to separate the rice from the straw. The rice will come

out under thresher and the empty hay and grain will be separated from the grain that contains rice. Regulators used to modify the speed (rpm) are adjusted based on the type of rice. To obtain a more detailed picture of the Thresher Machine system design.

#### IV. DESIGN

##### A. Design of Solar Operated Type Thresher

The design dimensions of various component of thresher i.e. threshing drum, blower, concave (screen) were calculated and thresher was designed. The methodology is as discussed below.

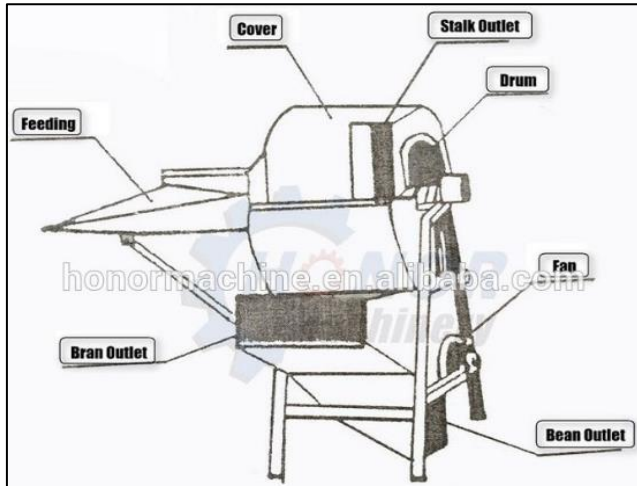


Fig. 1: Thresher Structure

##### B. Threshing Drum Design & Fabrication

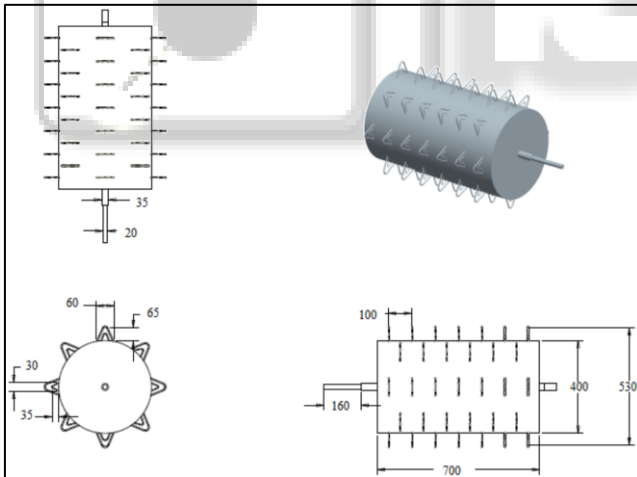


Fig. 2: Front, Top, Side & Schematic View of Threshing Cylinder of Developed Thresher

##### C. Blower

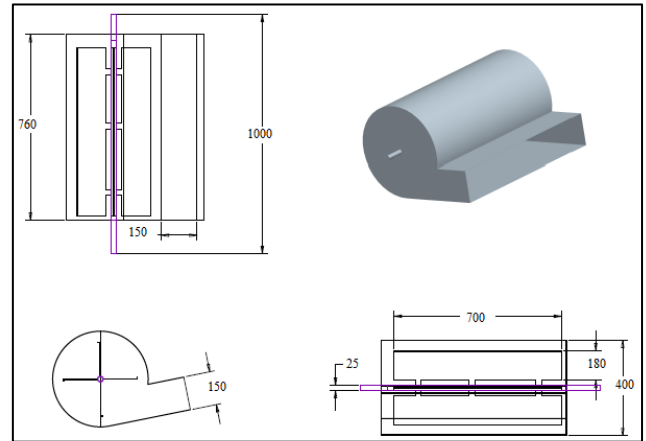


Fig. 3: Front, Top, Side & Schematic View of Blower of Developed Thresher

##### D. Prime mover

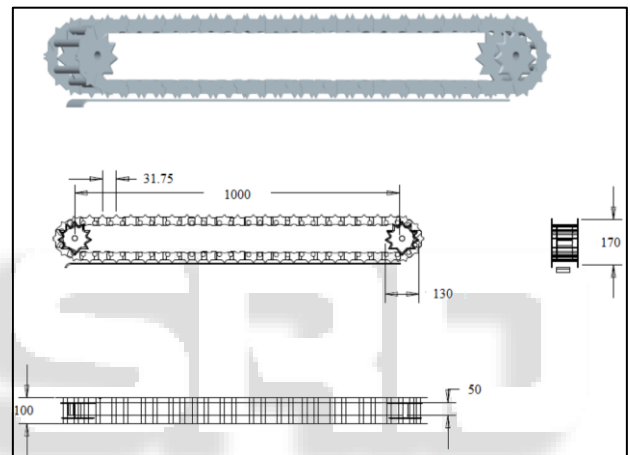


Fig. 4: Front, Top, Side & Schematic View of Pulley & Belt Conveyor of Developed Thresher

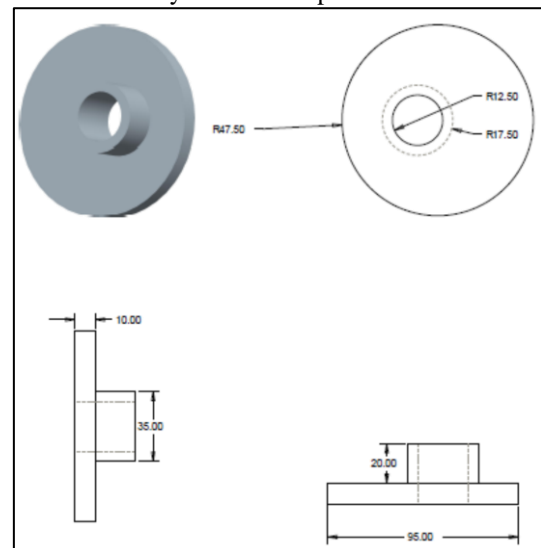


Fig. 5: Front, Top, Side & Schematic View of Cam

#### V. DESIGN OF OTHER COMPONENTS

In this section design procedure and the preliminary calculations for different components of thresher is given as follows. These are listed as bellow,

- 1) Shaft
- 2) Belt
- 3) Pulley

#### A. Shaft

A shaft is a rotating element, which is used to transmit power from one place to another. In order to transfer the power from one shaft to another, the various members such as pulley, gears etc. are mounted on it.

Shaft may be designed on the basis of

- a) Shafts subjected to twisting moment only
- b) Shaft subjected to bending only
- c) Shaft subjected to combine twisting and bending moment

#### B. Belt

##### 1) Length of Open Belt

A V-belt drive consists of an endless flexible belt that transmits power by contacting and gripping the sheaves, which are keyed on the shafts of driving and driven mechanisms.

#### C. Pulley

The pulleys are used to transmit power from one shaft to another by means of flat belts, V belts or rope.

### VI. BLOCK DIAGRAM

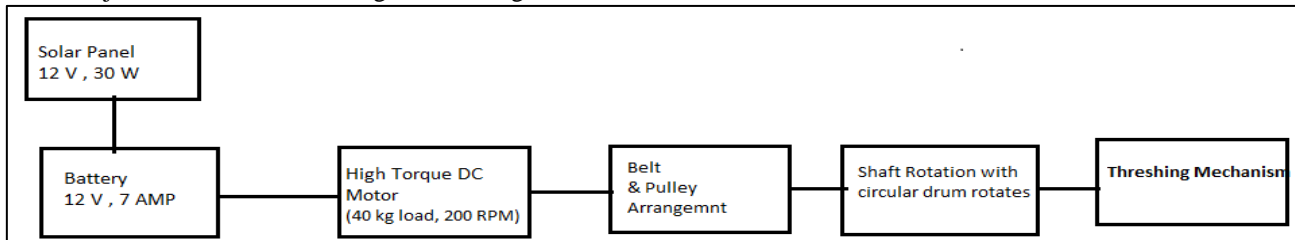


Fig. 6: Block Diagram of Threshing Machine

#### A. Working Principle

- As solar panel observe the solar energy from sun and convert into electrical energy. This electrical energy is stored in battery which will further used for various applications.
- As battery is charged it utilized to drive the high torque dc motor.
- Switch on The button DC motor starts rotating, with the help of which it also drive the Belt and pulley mechanism.
- This pulley is attached to long shaft through which whole thresher mechanism is attached.
- After continuous rotation of drum / thresher mechanism the rice is separate out from rice crop, and collect into container.

#### B. Actual Images



Fig. 7: Actual Image

### VII. SCOPE FOR FUTURE WORK

- 1) High HP dc motor can be used in future to get greater output.
- 2) Automatic feeding of the the rice to the machine can be done.
- 3) Conveyer can be added to the setup.

#### A. Advantages

- Best alternative source of energy.
- Low maintenance cost.
- Human power is easy to use and there is no need of special training.
- No air pollution takes place as there is no combustion of fuel.
- Human operated machines are self-dependent source of energy.

### VIII. APPLICATION

- For home uses.
- And also for small scale industries.
- Agricultural uses.

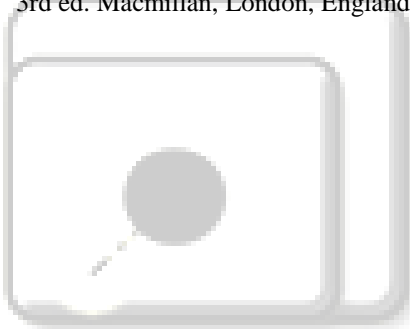
### IX. CONCLUSION

The design and fabrication of a rice threshing machine has been successfully carried out by this work. The machine is capable of threshing, separation of stalk from rice and reduction in number of broken rice, thereby, giving a better method of threshing than the traditional methods. All the materials used were locally sourced.

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