

Development of the Grain Collecting Trolley

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Abstract: The manually operated grain collector and bagging made of locally available materials using local manufacturing technology was designed, fabricated, and tested for collecting and bagging of grains (paddy) dried on concrete pavement. The invention belongs to the technical field of agricultural machines, and relates to a tool applied when grains are collected after being aired, in particular to a manual grain bagging machine. Grains are automatically loaded into a dustpan by pushing the manual grain bagging machine with hands, a hand wheel of a drive assembly is rotated so that a gear can push a rack to move upwards at first and then move horizontally, and a stop bar on the dustpan is blocked by a left arc baffle and a right arc baffle so that the dustpan can tilt to pour the grains into an opening bag. A simple manually operated grain collector and bagging had the following major components: frame, wheel, long pipe, vertical stand frame (bars), horizontal bars, collector, and bag. Radial flat bladed type base plate, slot bar, sweeping box, bagging area, frame and the conveyance system. Results showed significant differences on the collecting capacity, and noise level. Other parameters such as collecting efficiency, air velocity, augmented cracked grain percentage. The design was made based on certain assumptions and calculations and the collector was built, tested and evaluated.

Keywords: Grain Collector, Bagging Machine

I. INTRODUCTION

Product design is the process of creating a new product which has to be accepted by the customers. In a broad concept, it is essentially the efficient and effective generation and development of ideas through a process that leads to new product. In a systematic approach, product designers will conceptualize and evaluate ideas, turning them into tangible inventions and products. The product designer's role is to combine art, science, and technology to create new products so, that the consumers can use. To check the losses of agricultural grain crops in the field, it is needed to measure the amount of grains fall to the ground during harvest by combine. Separating the grains from the soil and collecting them from the ground and in the groove of the land by hand and by holders is a hard work and time consuming to that is not precisely done. Hence the need for a machine to collect the grains in the field has been identified.

The development of a growing population increases the need of food day by day. This project aims to design and fabrication of collecting and storing of grains by manually. Main objective behind designing and fabricating the bagging and collecting of grains is to reduce the human effort and also reduce time taken for storing. This project mainly helpful to the former the problems faced by small scale farmers relating with availability of labors and cost of collecting and storing finally It is also capable of reducing time wastage, reduction in breakage of the grains.

A review of the literature reveals that, different types of grain collector machines have been successfully used for grain collecting bagging machine. However, most of the studies deal with effect of change in power sources likes electrically operated, engine operated, hydraulically, Pneumatic machines etc. to run a machine and collecting grains. Survey also provides clear idea about the drawbacks of traditional type of grain collector machine and how this machine can overcome from these drawbacks.

The benefit of manually mechanically operated systems and without using electric power source is not found in the literature till date. So, came to know there is no machine is used for collecting grains, therefore we develop our model to overcome those problems. The present work explores this possibility by mechanically operated collecting grains without use of electric power.

1.1 Objective of the Project:

The general requirements to be achieved are as follows:

- ❖ To fabricate and assemble small machinery for efficient collection of all types of small size grains.
- ❖ The machine has a simple construction work and light in weight to handle.
- ❖ Reduce the manpower and hard work for farmers.
- ❖ Reduce the time for collecting grains.

1.2 Problem Definition:

Each and every day the prices of labour cost keep on fluctuating. They increase with higher rate but never fall down. So basically, it is important to design new equipment. By collecting the grains from labours, it takes a more time. Each person to lift a weight of about 8 to 15 kg, 50 kg bag loading stand food needs 3-6 times lower operational efficiency, labour intensive, and sometimes encounter should rain the weather, the food collected will not timely rain.

II. LITERATURE REVIEW

Anbarasan.b (2004) stated that the main objective of this study was to design and fabricate a hand operated pedal powered thresher for threshing, separating, and cleaning rice paddies. The major components of the machine include threshing, separation and cleaning units. Threshing operation is achieved by rotational motion of a cylinder fitted with beater spikes above a stationary grid which results in the removal of the paddies from the bulk straws. After being beaten out, the grains fall into the cleaning unit which consists of a sieve that undergoes a reciprocating motion. The machine is simple, less bulky and the ergonomic consideration in the design allows for comfortable use and can easily be operated by either male or female. The designed and fabricated pedal powered paddy thresher fitted with winnowing equipment substantially reduces human drudgery in threshing at an affordable cost and also reduces the time used for threshing operation on small farms. Threshing was efficient for moisture content between 20% and 23%. Total power required by the machine was 84 watts operating at 400 rpm.

This power is produced through human operated pedal mechanism. Performance test revealed that the efficiency of the machine was 92% with a through put of 90 kg per hour. Clapp. D (2007) designed to reduce this dependency on importation, include decreased consumption which is not a viable option, increasing tariffs on imported rice, increasing the area under current cultivation, increasing productivity and proper post-harvest practices to minimize loss and improve quality. Majority of farmers in Kenya grow rice in small scale, they therefore lack enough capacity to acquire appropriate equipment such as combine harvesters to be used for threshing. They therefore resort to manual means of threshing rice like: smashing ears of rice with hard objects to separate the paddies from the ears or straws, sometimes pedal operated threshing drums are employed in fairly big farms, or even driving trucks or tractors on the un-threshed rice. Manual threshing is tedious, time consuming and above all results in too much post-harvest losses which can be in the range of 1-15%. According to Earth trend, postharvest food loss translates not only to human hunger and financial losses to farmers but also results in tremendous environmental wastes. In Kenya, rice production has remained low both in quantity and quality because of the inefficient production and processing techniques.

This research was conducted to determine ways of reducing post-harvest losses and tediousness resulting from traditional methods of rice threshing. The study involved designing of a pedal powered thresher from scrap metals and affordable power transmission element and to make the whole system affordable to the small scale farmers. Emmanuel. B (2009) before designing the CAD model, it was essential to consider various components necessary for the designing such as; threshing drum size and speed, power required for threshing and frame design. Among the threshing methods, the threshing of grain through impact force at an average speed (350 to 500 rpm) provide minimum seed damage. Therefore, threshing of rice paddies is based on the principle of impact force generated by beating action of the spikes.

The main design considerations for the entire machine include; dried rice paddy suitable for threshing by this machine should have moisture content of 20% to 23% to ease the removal of the paddy grain from the stalk, overall height of the machine to facilitate ease of operation by a rural farmer of average height, overall width and breadth of the machine for purposes of storage space in the rural farmers granaries, weight of the equipment for easy portability during operation on and off farm, the material to be used to be cheap and easily available to peasant farmers and the material should be strong for machine durability and should not rust resistant or if otherwise be painted.

III. DEVELOPMENT OF THE PROJECT**3.2 Diagram of the Project****3.3 Working of the Project:****Construction Details:**

The construction details of grain collector as shown in fig. this collector is developed to collect the grains from the floor. The current work divided into two portion front consists of hopper and back side consists of frame, handle and base plate. The frame is an important part of the collector and it must provide flexibility to withstand all loads and support for remaining parts of the collector. It is made up of mild steel L section having a height 31 mm, width 31mm and thickness 3mm. It consists of 11 L section pieces these L section mild steel pieces are welded. 3 pieces are cut into 550mm length, 4 pieces are cut into 755mm length and 4 pieces are cut into 610mm length.

The two rectangular section mild steel are welded to reduce the bending of frame and increase the strength of the frame. The cross section of the rectangular section is 5mm×30mm and cut into 760mm length. At the bottom of frame base plate is fabricated and it is having thickness of 3mm and it is cut into 610mm×550mm cross section. The main function of the base plate is to takes the overall weight of the bag. The circular handle is made up of mild steel having a diameter of 32mm and 142mm length. There are two handles are welded to a top backside of the frame to move the collector towards grains which is spread over the floor. The lifter is made up of mild steel L section and one hallow circular tube. The L section material cut into 6 pieces, 2 pieces are cut into 1590mm, 2 pieces are cut into 590mm and remaining 2 pieces are cut into 300mm. diameter of hallow circular shaft is 50mm, thickness is 3mm and length is 550mm. A solid circular shaft is made up of mild steel having length of 550mm and diameter is 25mm is welded to frame at the bottom. Wheels are attached to both ends of the shafts with the help of bearings and the diameter of wheels is 126mm and thickness is 20mm.

Working principal:

The grains spread over the floor that can be lifted and collected by using this collector. Here the hopper will be provided at the front of the machine and bag is fixed back side of the machine. Machine can be operated manually when at rest position of the hopper the machine is moved the grains which is presented on the floor is to be collected in the hopper up to 4 to 5 kgs of grains. Handle which is connected to the hopper that can be pulled down word whatever grains present in the hopper is collected into the bag, this can be done up to fill the bag.

IV. ADVANTAGES**4.1. Advantages of the Project:**

Advantages of the project as per following like as:

- ❖ Manually operated,
- ❖ No fuel and electricity
- ❖ Ease of operation i
- ❖ Single user is sufficient
- ❖ Single time investment and life time validity
- ❖ Reduces the mechanisms involvement

4.2 Future Scope:

The present work may be extended in one of the following ways:

1. Grain collector can be further implemented to fixing the motors to lift the grains. The system can be easily configured to require
2. It can be further implemented by using solar panels with battery operated to run the vehicle.
3. The developed mini grain collector is larger in size and there is a scope for making it more compact and light in weight.

4.3 Conclusion:

The literature study clearly indicates that all of the different types of grain collectors designed and fabricated have been able to collect grains in an effective way, which could be viewed as the goal of reducing human effort and saving time has been achieved. Where in other factors each grain collector has an edge over others in several specific ways. The literature survey is intended to promote fabrication of a further more developed grain collector so that grain collecting machines could be dependable by every farmer and every agriculture practitioner.

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