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Design and Fabrication of Corn Peeling and Cutter Machine

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ABSTRACT: There are many maize threshing techniques in India which are used in day to day life. Maize is world's largest resourceful seed crop. The techniques used to separate seed in old days are removing the leaf by hand or by chopping the corn by wooden rod. The main problems with these machines are that they are not affordable to farmers who are having less acreage farms and which they do not require these big threshing machines. Also, in this process the kernels were getting damaged and the rate of production was less. Many farmers in India are not affordable to use these machine system can be established these machine provides simple mechanical design. The existing machine of corn de-seeding in agriculture industry consists of separation of grains only. But for making the past of corn another machine is required which is not affordable for farmers. so in this concept by keeping these things in mind we design the new concept which consist of three operation like seed separation, seed paste and cob crushing in single assembly. In this concept there is no need of any extra attachment. The concept model of machine was made by using AutoCAD software and required calculation were made. After freezing concept, later it was converted into 3D model using CATIA-software.

KEYWORDS: Corn, Peeling, Deseeding, Cutter, Combo, AutoCAD

I. INTRODUCTION

In India, Corn is one of the most important crop and it has a source of a large number of industrial products besides its use as human food and animal feed. Every part of Corn has economic value as the grain, leaves, main crop stalk, tassel and cob can all be used to produce a large variety of food and non-food products. After harvesting with sickle and plucking of cob manually, de-husking of cob is done by hand to remove its outer sheath and further grain is obtained by shelling the cob traditionally, i.e. by beating the de-husked cobs with sticks or with fingers or sickle, etc. To overcome this problem of removing its outer sheath and de-husking the cobs this machine was developed. The machine basically comprises of separate shelling chamber, threshing chamber, collecting tray and motor (2HP). The arrangement of these parts is connected by belt and pulley mechanism. In India, most of the farmers shell corn by mainly three methods namely shelling cob grain by hand; hand operated corn Sheller and beating by stick method were carried for removing corn kernel from the cob. For removal of corn shells and to deseeding of the cobs with minimum damage to the cobs, people uses various methods out of those two methods are described below:

I.I. Manual shelling and threshing:

In many regions of the India corn shelling and threshing is done manually, this method is conventional but productivity and output from that method is low and that's why there is a need to switch to mechanical motorized system for corn shelling and threshing.

I.II. Mechanical shelling and threshing:

Mechanical motorized corn Sheller and thresher gives more desirable results than manual conventional method of corn shelling and threshing. It tends to saving of the time and also leads to save money. It is desirable to use low cost corn Sheller and thresher for economical work and to increase the productivity.

Traditional shelling methods do not support large-scale shelling of maize, especially for commercial purposes. Locally in Nigeria, the region that is the highest producer of maize is the northern part of the country it was observed that most shelling of maize was done by hand shelling. Hand shelling take a lot of time, even with some hand operated simple tools. It was also observed in the study area, Nasarawa State, most mechanical shellers were designed for multi-grain

threshing or shelling, which causes great damage to the maize seeds besides breaking the cob into pieces. The available shellers locally, were equipped with rotating threshing drum with beaters or teeth, which cause damages to the seed. Besides, the cost of purchasing such shellers were high for the poor rural farmer, and therefore necessitated the design of low-cost system that will be affordable and also increase threshing efficiency but reduce damage done to the seed.



Fig.1. Actual fabricated model of corn peeling and cutter machine

II. LITERATURE SURVEY

This section of the paper provides the brief background about corn peeling and cutter machine. The title Design and Fabrication of Corn Peeling and Cutter Machine requires an amount of good understanding on the knowledge of the science. Therefore, executing a research is necessary to obtain all the information available and related to the topic. The information or literature reviews obtained are essentially valuable to assist in the construction and specification of this final year project. With this grounds established, the project can proceed with guidance and assertiveness in achieving the target mark.

1. Mr. Anant J. Ghadi in his paper focuses on various corn de-husking methods. The Aztecs and Mayans made processes to cook or grind the corn which is cultivated in numerous varieties throughout central and southern Mexico. Due to these processes the crop spread to rest of the world. In agriculture industry the existing methods of corn de-husking was done manually with help of hands or by using large machinery for deseeding. So methods are not effective for a developing economy countries where farmers have little money for investment like India. Hence there is need for innovative idea or product that is feasible, safe, cost effective and productive for the India farmers.
2. Mr. Anirudha G. Darudkar suggested that corn processing machine like corn Sheller is major problem of corn production. In short this paper describe about design of various components of corn Sheller machine. It involves the process of design different part of this shelling machine by considering forces and ergonomic factor of people. This project is mainly about generating a new concept of corn shell with simple mechanism to bring anywhere and easier to thresh corn. We are trying to make innovative idea in machine which is power
3. Mr. J. N. Nalghare focuses on various sources to increase the net profit of farmers. The objectives of work were to design, construct and evaluate a low cost maize shelling machine for Nigeria farmers. In these method system collect opinion from farmers on their Sheller needs. Due to this communication methods, they also determine shelling problem from these appropriate material were selected, utilization of theories of failure that enable the determination of allowable shear stress on the bearing support. The system was made comparison between the machine performance and the human performance index for shelling, for example in commercial method human



mechanical efficiency throughout put capacity and grain handing capacity is 45%. For machine indices, the capacity of grain handing is 86%.

4. Mr.Praveen Kiranthe author explained about constraint and requirement of the Indian farmers. The threshing machine has been designed, in survey development and fabrication of this machine is useful and cost effective for Indian farmers. The machine designed as the sitting posture was comfortable which can easily operate by either male or female. This proposed machine has been designed to be fabricated with the use of local available materials.

5. Dr .C.N. Sakhale focuses on human powered machine for rural farmers. Because in these developing world, maize threshing is done by various PTO operated machine which requires constant electricity as an energy source which is impossible for rural areas of India. The survey to system which shows cost effective and functional viable. In last two

decades for rural application the pedal operated energized flywheel motor has been adopted for many designs. In recent past study the human pedal powered process machine has been developed for turning wood.

III. EXISTING APPROACH

The Pedal Operated Energized Flywheel Motor has been adopted for many design of rural Applications in the last two decades In recent past a pedal powered process machines has been developed for wood turning (Modak and Bapat, 1993), washing (Dhakate,1995), brick making (Modak and Moghe, 1998). The main objective to design and develop a machine, which uses the Pedal, operated energized flywheel motor as an energy source, consisting of a bicycle mechanism, use of non-conventional energy as source Non availability of power in Interior areas and large scale unemployment of semi-skilled worker. In the context of the presentcondition in India of Power shortage and exhaustion of coal reserves and unemployment, it is felt that “Pedal Operated Maize Thresher” for Maize Threshing is very necessary. This machine is environment friendly i.e. non-pollutant. It will bring innovation and mechanization in agricultural engineering. Unskilled women may also get employment. Development of such energy source which has tremendous utility in energizing many rural based process machines in places where reliability of availability of electric energy is much low .The average work rate of a Any manufacturing process requiring more than 75W and which can be operated intermittently without affecting end product can also be man powered. Such man powered manufacturing process can be based on the following concept. In this processes a flywheel is used as a source of power. Manpower is used to energize the flywheel at an energy input rate, which is convenient for a man. After maximum possible energy is stored in flywheel it is supplied through suitable drive (Gupta, 1997) and gearing system to a shaft, which operates the process unit. The flywheel will decelerate at a rate dependent on load torque. Larger the resisting torque larger will be the deceleration. Thus theoretical a load torque of even infinite magnitude could be overturn by this man-flywheel system. Pedal driven Maize Thresher operates on the basis of above principle. If such machine is developed it will be great help to farmers of rural area because it does not need conventional energy. It is environment friendly machine.

IV. STATEMENT OF THEPROBLEM

Traditional shelling methods do not support large-scale shelling of maize, especially for commercial purposes. Locally in Nigeria, the region that is the highest producer of maize is the northern part of the country it was observed that most shelling of maize was done by hand shelling. Hand shelling take a lot of time, even with some hand operated simple tools. It was also observed in the study area, Nasarawa State, most mechanical shellers were designed for multi-grain threshing or shelling, which causes great damage to the maize seeds besides breaking the cob to pieces. The available shellers locally, were equipped with rotating threshing drum with beaters or teeth, which cause damages to the seed. Besides, the cost of purchasing such shellers were high for the poor rural farmer, and therefore necessitated the design of low cost system that will be affordable and also increase threshing efficiency but reduce damage done to theseed.



IV.I Problem Formulation

1. The de-seeding machine should be designed, developed and fabricated keeping in mind the constraints and requirements of the Indian farmers as a corn is one of the favorite types of food amongst the people, especially in the Maharashtra region.
2. No. of machines & equipment's are available which are costly & consume more time for the de-seeding of corn.
3. Corn paste can be used for making various dishes, such features can also be designed while fabrication of machines.
4. Corn powder can also be used as fodder for cattle's in villages which is good for gradients.
5. Machine can be designed technically which will save time, money & employment can be generated as a micro, small enterprise as a bakery product.

V. METHODOLOGY

The methodology is simple as like a thresher. The roller having a sheller line which acts as a shear force on seeds. Impact of force is very high due to high speed rotation. It causes removal of seeds from the cob. These separated cobs are sent to a cob crusher and separated seeds are allowed inside the cutter casing. Both operations are carried out with each other. At the top of the sheller drum there is one adjuster mechanism which adjusts the size of the casing according to the size of the cob. There are different slots provided on the adjuster casing to adjust the size of the sheller casing.

VI. CONSTRUCTION AND WORKING

➤ **Construction:-**

The construction of a corn de-seeding machine is simple in operation which is made up of mild steel angle bars and plate in order to resist the load of the machine. Both the mechanisms are mounted on a steel frame. The peeling mechanism is located on the top of the frame, whereas the cutter mechanism is located at the bottom of the frame. A hopper on the top safely feeds the corn for peeling. The motor is attached with a pulley where the motion from the motor is transmitted with the help of a belt to the sheller shaft and the cutter shaft. As a result, the shaft and cutter rotate. Firstly, corn is fed manually through the hopper at which corn grains are separated from the cob and can be easily de-seeded. After that, the separated seeds are cut into small pieces to make a paste of it. After the peeling operation, it is necessary that the corn should be properly fed to the cutter mechanism. The cob after de-seeding of seeds from corn enters into the cob cutter section where it is broken into small pieces. The seed cutter is made up of HSS plate strips. The strips having sharp edges and these strips are welded to the bush. The bush is fixed on the shaft which is inside the cutter mechanism. The cob crusher has two types of blades: moving blades and stable blades. Both blades are made of the same material.

➤ **Working:-**

When the machine is switched on, the rollers start rotating. Then the corn is fed through the hopper. This mechanism is simple as like a thresher. The roller having a sheller line which acts as a shear force on seeds. Impact of force is very high due to high speed rotation. The center roller functions as the feeding rollers as well as they help in peeling of the shell by pushing the corn on adjacent spiked rollers.

It causes removal of seeds from the cob so these separate cobs are sent to a cob crusher and separated seeds are allowed inside the cutter casing. When the corn cutter machine is working, the corn cob is fed through the feeding hopper. Both operations are carried out with each other. At the top of the sheller drum there is one adjuster mechanism which adjusts the size of the casing according to the size of the cob. There are different slots provided on the adjuster casing to adjust the size of the sheller casing. Corn kernels drop through the sieve and corn kernels are discharged through the grain discharge outlet.



Fig.2 CAD Model of corn peeling machine

VII. CONCLUSION

Design and fabrication of corn peeling and cutter machine has been developed keeping in mind the constraints and requirement of the Indian farmers. The corn peeling and cutter machine was tested in the machine shop and later taken to the field. This machine worked well in the field condition and gave output of 432kg/hour. It is multipurpose machine so it performs additional operation. Additionally, it can deseed various type of food item such as rice, chilly powering, potato paste, corn de-husking. This additional operation can be done by changing the teeth and drum.

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