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CONCEPTUAL MODEL PREPARATION FOR WHEAT CUTTER FOR SMALL SCALE FARMER

ANKUR S. SAKHARE[1], PROF. SACHIN V. DAHAKE[2]

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1. M. Tech Student, CAD/ CAM, Prof. Ram Meghe Institute of Technology & Research, Badnera, Amrawati, (M.S), India

2. Associate Professor, Mechanical Engineering, Prof. Ram Meghe Institute of Technology & Research, Badnera, Amrawati, (M.S), India

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Corresponding Author

Mr. Ankur S. Sakhare

Abstract

Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production. India is developing country; the maximum population of farmers in India still below the poverty level. To meet the increasing demand of food they have to cope up with new techniques. This Paper deals with the wheat cutter design for the small scale farmers in India. The comparison between the traditional harvesting method and the new proposed machine which can perform a number of simultaneous operations and has number of advantages. As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement.

1.0 INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 percent of world population from 2.3 percent of world geographical area and 4.2 percent of world's water resources. The present cropping intensity of 137 percent has registered an increase of only 26 percent since 1950-51. The net sown area is 142 Mha.

Harvesting is the process of collecting the mature rice crop from the field. Paddy harvesting activity includes cutting, stacking, handling, threshing, cleaning, and hauling. It is important to apply good harvesting methods to be able to

1) Maximize grain yield, and

2) Minimize grain damage and quality deterioration.

Figure: Conventional Combine harvester (Grain harvesting)

Harvesting can be done manually using sickles and knives, or mechanically with the use of threshers or combine harvesters. Regardless of the method, a number of guidelines should be followed to ensure that good grain quality is preserved during harvest operations and harvest losses are kept to minimum.

Harvest commonly refers to grain and produce, but also has other uses. In addition to fish and timber, the term harvest is also used in reference to harvesting grapes for wine. Within the context of irrigation, water harvesting refers to the collection and run-off of rainwater for agricultural or domestic uses. Instead of harvest, the term exploit is also used, as in exploiting fisheries or water

resources. Energy harvesting is the process by which energy (such as solar power, thermal energy, wind energy, salinity gradients and kinetic energy) is captured and stored. Body harvesting, or cadaver harvesting, is the process of collecting and preparing cadavers for anatomical study. In a similar sense, organ harvesting is the removal of tissues or organs from a donor for purposes of transplanting.

Figure: Harvesting of crop by human worker.

2.0 Limitations of Conventional harvesting Methods

The following are the limitations of Existing Machine:-

1. The Weight of the Machine is more.
2. Available for Tractors drive.
3. Requires more fuel and may damage the crops.
4. Adjustment of row spacing is improper.
5. The cost of machine is more.

2.1 Need of Project

So there is the need to make a machine which can perform the following operations,

1. Easy harvesting of crops
2. Less manual Efforts
3. Low cost and less maintenance
4. Do not disturb the leveling of soil

3.0 LITERATURE REVIEW

Gupta et al[1] at Punjab observed significantly higher grain yield of wheat due to wider row spacing(22.5 cm) as compared to normal sowing(15 cm). Sharma and Mahendra singh [2] concluded that wide row spacing (23 cm) caused for significant enhancement in wheat grain yield (5535 kg/ha) than normal sowing of 15 cm (5418

kg/ha). This was attributed to increase number grains per spike. Uttam and Das [3] concluded that at Kanpur under rain fed condition, wider row spacing(25 cm) recorded higher plant height, ear length, ear weight, number of grains per ear, 1000 grain weight and eventually grain yield(16.65 q/ha) of wheat as compared to 20 cm row spacing (15.01 kg/ha).

Umed Ali Soomro at al. [4] in Pakistan has evaluated three sowing methods and seed rate in a four replicated RCBD method and concluded that drilling method of sowing at seed rate 125 kg/ha is optimal for yield and quality of wheat grains, because the said sowing method and seed rate distribute seed uniformly and desired depth which provide appropriate depth for seed germination and crop establishment.

A.U.Malik [5] conducted the field experiment to evaluate the effect of different seed rates on different sowing dates to suggest the appropriate seed rate of wheat for different sowing dates and suggested the farmers that wheat should be preferably sown on 15 november with seed rate of 125 kg/ha for better production.

N.Iqbal [6] studied the effect of seed rate and row spacing on yield and yield components of wheat and concluded that seed rate of 150 kg/ha performed better for late sowing of wheat up to 28 November. Among row spacing 22.5 cm row spacing produced higher grain yield as compared to 11.25 and 15 cm row spacing.

Mohammed Jamil rajput et al [7] studied the effect of row and plant spacing on yield and yield components in soyabean and concluded that the combination of 45 cm row spacing and 20 cm plant spacing gave the best results.

4.0 USE OF MACHINES IN HARVESTING

In the recent year's machines such as reapers, threshers an even combine harvests have been introduced in India. These machines have, however, proved successful only on big farms. The harvesting with the help of machines enables the farmers to complete the process within a short climatically favorable period and thus the loss of crop due to untimely rains and storms can be saved to a large extent. This also gives farmers sufficient time to prepare the field for next sowing.

Nowadays, farmers generally use large machinery called Harvesters or Combines that have headers that either cut through the last few inches of the crop, or pick-up swaths that have already been cut by another machine called a Swather or Windrower on rented basis. Once the crop plant has been gathered into the machine, chaffers separate the seed from the rest of the plant, and the seed is separated and stored in the storage compartment on the top of the combine. The chaff is then chopped up and dispersed onto the ground. Once the storage container on the combine is full, the auger attached to the combine is positioned out via hydraulic controls, a grain truck or wagon drives up under the auger, and the auger is switched on and moves the seed from the storage container on the combine to the truck or wagon. The truck/wagon carries the harvested grain to another auger that moves it to a grain bin for storage until the grain is used for seeding next year, or sold for a profit.

However, harvesting with machines also has certain disadvantages as given below:

1. Harvesting machines result in shattering of the grain. In case of harvesting with sickles, shattering of the grain is negligible.

2. Harvesting through machines such as combined harvests results in loss of hay and thus yields less fodder.

5.0 HARVESTING TYPES

There are 4 different methods of harvesting the rice crop using a combination of manual and machine methods.

1. Manual (Hand) Harvesting

The use of traditional threshing tool such as racks and animal for trampling.

2. Manual Harvesting and Machine threshing

3. Machine reaping and machine threshing

4. Combine harvester

All the processes are combined and done with the help of harvester

6.0 CONCEPTUAL MODEL USING CAD SOFTWARE

6.1 CAD modeling for Wheat Cutter design:

Pro/ENGINEER is a parametric, feature based, solid modeling System. It is the only menu driven higher end software. Pro/ENGINEER provides mechanical engineers with an approach to mechanical design automation based on solid modeling technology and the following features.

6.1.1 3-D Modeling

The essential difference between Pro/ENGINEER and traditional CAD systems is that models created in Pro/ENGINEER exist as three-dimensional solids. Other 3-D modelers represent only the surface boundaries of the model. Pro/ENGINEER models the complete solid. This not only facilitates the creation of realistic geometry, but also allows for accurate model calculations, such as those for mass properties.

- PRO/E – For 3D Component Design.
- Pro/Assembly- For Assembling Components of Wheat Cutter
- PRO/Mechanism – For Mechanism

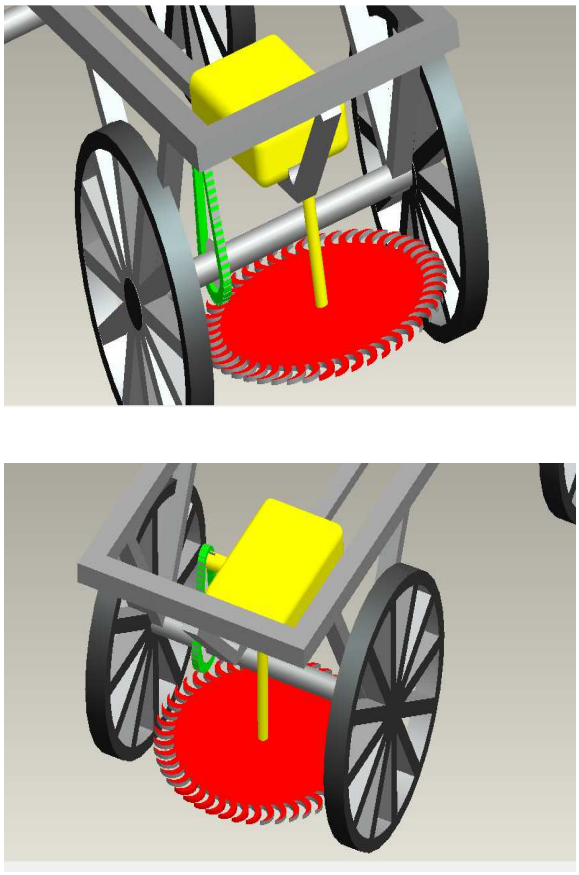

Figure: Cutter and Gear box arrangement.

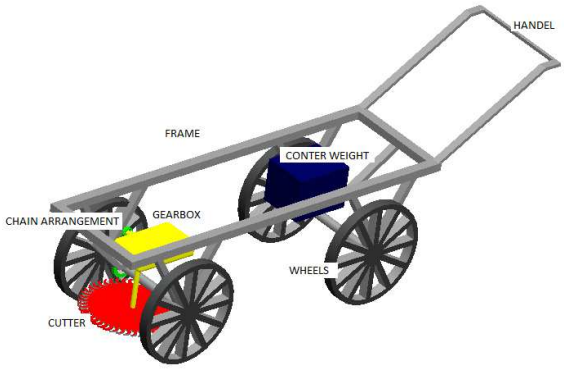

Figure: Conceptual model of wheat cutter for small scale farmer.

7.0 CONCLUSION

The conceptual model is created by using CAD software ProE. The working will be exactly like the conventional harvester. The cutter provided at front is for the crop cutting purpose which is driven by the gear box. Gear box is of horizontal to vertical shaft arrangement type whose one shaft is directly connected to wheel rod and other to cutter.

Sprocket - chain arrangement is also used for motion transmission purpose. The counter weight is placed at bottom to maintain the balancing of the trolley. The trolley is manual drives having handle provided at back.

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