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REVIEW PAPER ON DESIGN & DEVELOPMENT OF PADDY HARVESTER MACHINE

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Abstract - The aim of our project is to fabricate a crop harvester for farmers with land holding lesser than 2-3 acres or small scale farmers who cannot afford modern harvesting alternatives like combine or modern harvesters. The product will be capable of cutting various crops with cutter blades attachment and collecting mechanism. The projects focuses on giving the small scale farmers the best alternative for their hardships faced because of unavailability of labours & high expenses of harvesting.

Key Words: Portable Harvesters, Cutter Blade, Small scale farmers, Petrol engine, Collecting mechanism, Low cost fabrication

1. INTRODUCTION:

Agriculture being one of the major occupation in India, it is very essential to discover and implement new idea in this field. It is unfortunate that, these ideas are not been implemented properly in actual field. This is due to high cost and is complicated for rural people. Conventional method of planting and cultivating crops is a laborious process and hence for that reason there is a scarcity of labours, this result in delayed agriculture to overcome these difficulties, multipurpose agriculture equipment is designed. This machine targets the small scale farmers who have land area of less than 2 or 3 acres. This machine is compact and can cut up to two rows of wheat, millet, jowar & rice crops.

Paddy is rice before it is milled. Rice is the seed of the monocot plants oryza sativa. As a serial grain, it is the most widely consumed staple food for a large part of the world's human population, especially in Asia. Paddy cultivation involves different steps like preparation of field, transplantation, field maintenance, harvesting and threshing. It is the grain with the third highest worldwide production, after sugarcane and maize, according to data of FAOSTAT 2013[8]

2. LITERATURE REVIEW:

This chapter deals with research work done in past by various investigation on the performance,

Christopher Molica's [5] project was done by the students of Worchester Polytechnic Institute. They have created a small scale harvester which was combined reaper and binder. This machine was developed concerned to the small scale grain growers.

Yuming Guo's [2] paper describes the relation between the stalk strength and the cutting force that is required for cutting the soybean. The paper was helpful in guiding on the calculations front. This paper briefly describes the strength of various crops and compares it with the soybean. This relationship helps in giving a rough idea about the cutting speed required to cut the crop.

Asia and Pacific Commission on Agricultural Statistics Twenty-Third Session Siem Reap, Cambodia, 26-30 April 2010 [3] was intended to discuss the characteristics of small scale farmers across Asia. This commission identifies the problems faced, the average land holdings and the average income of the small scale farmers.

Designed a crop cutting machine that runs with petrol engine cut two rows of soya bean. They used belt driven and sliding cutter mechanisms to cut the crop with in less time and low cost.[12]

Fabrication of low-cost manual crop harvesting machine by M.Rajya Lakshmi[7],SK.Mahaboobbasha,R.Sandeepkumar,V.Anusha,SK.Sharukdeveloped a low cost manually operated reaper to cut different types of crops with in less time. They used different cutting mechanisms based on the crop type.

S. S. Kohli [13] in 2015 describes Mechanical cotton cutting tools or harvesters, i.e. strippers are commercially available, but these cannot be used for cotton harvesting from varieties presently grown in India due to design constraints and ergonomic practices. Higher initial cost and field capacity make cotton cutting tools or harvesters unsuitable and unaffordable for small & medium farms. Hence, a comprehensive review of cotton harvesting mechanisms developed is carried out.

3. PROBLEM DEFINATION:

Recently observed that there is shortage of skilled labour available for agriculture. Because of this shortage the farmers have transitioned to using harvesters. These harvesters are available for buying but because of their high costs, they are not affordable. However, agriculture groups make these available for rent on an hourly basis. But the small holding farm owners generally do not require the full-featured combine harvesters. Also, these combine cutters (Harvesters) are not available in all parts of rural due to financial or transportation reasons. Thus, there is a need for a smaller and effective combine harvester which would be more accessible and also considerably cheaper.

The mission is to create a portable, user-friendly and low cost small harvester. These problems gave the basic idea about what was required in the current situation. The idea was to create a machine which is cheap and will reduce the labour required to harvest crops. This machine has the ability and the economic value for fulfilling the needs of farmers having small land holdings (less than 2 acres. This machine is cost effective and easy to maintain and repair for the farmers.[6]

4. METHODOLOGY:

In this project the main goal is the development of manually driven reaper by reviewing the previous reapers used for grain harvesting and drawbacks of the reapers. The objective identified to accomplish the goal were:

- Studying and identifying the present mechanisms,
- Identifying the potential problem through abstraction.
- Collecting useful data.
- Interpreting data as the problem definition.
- Developing conceptual design and selecting optimum design,
- Finally preparing the embodiment design of the product

4.1. Harvesting

It is the operation of cutting, picking, plucking digging or a combination of these operations for removing the crop from under the ground or above the ground and removing the useful part of fruits or grains from plants. i.e. collecting the mature crop from the field.[7]

4.2. Method of Harvesting

- Manual harvesting

The crop should be harvested immediately after maturity. There is no need to wait for stalks and leaves to dry as the plants of hybrid sorghum appear green even after the crop maturity. The right time for harvest is when grains become hard and contain less than 25% moisture. Generally 2 methods of harvesting i.e. stalk cut and cutting of earheads by sickles are adopted. However, in foreign countries, sorghum harvesters are used. In case of stalk cut method, the plants are cut from near the ground level. The stalks are tied into

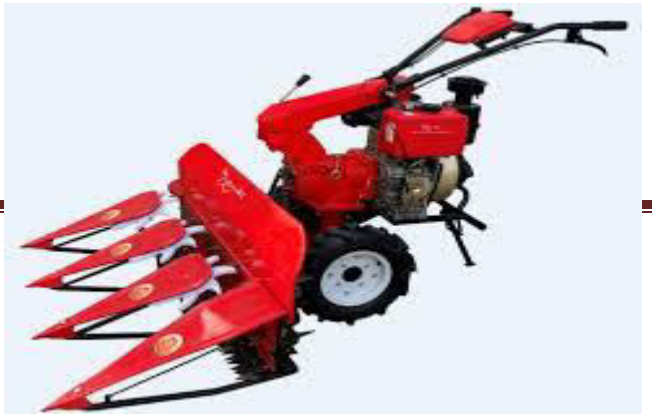
bundles of convenient sizes and stacked on the threshing floor. After 2-3 days, the earheads are removed from the plants. In other method, earheads only are removed from the standing crop and collected at the threshing floor for threshing after 3-4 days of sundrying.

- Combine Harvester

In market various combine harvester are available having 2-5m cutter in length. However, there is need of small combine harvester specially for small and medium farmers. A combine harvester is used to cut, thresh, sort and clean grain/seed. The main units of harvester are header unit, threshing unit, separation unit, cleaning unit and grain collection unit. The header cuts the crops and collect them for threshing. The crops get threshed between cylinder and concave. The cleaning mechanism consists of two sieves and a fan. The grain is conveyed with a conveyor and collected in a grain tank [7]

5. WORKING PRINCIPLE:

In this concept it is thought of making some changes to the existing paddy reaper keeping in



mind the cost like, instead of using the star wheel for collecting mechanism using collector belt with extensions on it. Cutter assembly cuts the paddy crop and collecting belt makes the paddy crop to move one side which helps the farmer to collect cut crop for further processing. rotary motion to linear Sliding motion. Scissoring action is obtained due to reciprocating movement of cutter blade over stationery blade is used to cut the crops. [8]

6.OBJECTIVE:

While making the project following points should be covered as much as possible:

- Designing a compact machine.
- Reduce the cost of machine
- Reduce the labour requirement for harvesting.
- Reduce the efforts required for harvesting.
- echanism to increase the efficiency of harvesting.

Fig.2 Paddy Harvester [11]

7. LIMITATIONS OF EXISTING PADDY HARVESTERS:

After reviewing the literature some of the limitation have been observed-

- The disadvantage of big heavy equipment is that, as a consumer of fossil fuels, it contributes to pollution. But you could argue that 20 or so employees commuting to the same farm for their whole days worth of hand labour would contribute the same or more.
- The second is soil compaction. They are big and heavy and can contribute to soil compaction.
- Due to high initial and operating cost, small and marginal farmers cannot adopt it.
- Height adjustment of collecting and cutter mechanism is not provided.
- Water is harmful for existing paddy harvester.
- The few trained personnel are not always available when machine break down.
- Replacement of parts is difficult.
- Requires relatively large field size.

8. PROPOSED SOLUTION:

- The machine can be made lighter as well as compact by doing detail analysis of design and removing excess material whenever is not necessary.
- With minimal modification in machine can be used for different types of crops.
- A single person can required for pushing the machine also can be easily affordable for farmers
- By using simple mechanism cost can be reduced and easy replacement of parts.
- Due to simplicity skilled worker can not be required.
- By using nut and bolt adjustment, height adjustment of collecting and cutter mechanism is can be provided.
- Instead of using petrol or diesel engine which can cause pollution, a battery or solar powered motor can be used.

9. CONCLUSION:

The harester we have designed is with a new cocept of power transmission mechanism. We

aimed to design the harvester for the small-scale land farmers. The design is compact, easy to operate low cost and efficient working. The small-scale farmers can use this machine if it further upgraded with small change in the type of cutters used. The cutter we have placed are to be upgraded with design and analysis process. So the final cutting process can be achieved with better performance. This conceptual design is very helpful for the farmers for better productivity. This machine can be operated by the single labour. This is very useful in the areas where labour scarcity is there, and more over skilled labour is not essential for operating the machine.so everyone can use and operate it easily.

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