

DESIGN AND FABRICATION OF UNIVERSAL CROP CUTTER

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Abstract

Agriculture plays a vital role in Indian economy. India is a country which is dependent on farming as a main source of income for many families. As far as Indian scenario is concerned, more than 75 percent farmers are belonging to small and marginal land carrying. So any improvement in the productivity related task help to increase Indian farmer's status and economy. Now a day's agriculture equipments have lot of limitation and it required more energy to operate. The purpose of the project is to fabricate and enhance the design specifications of harvesting machine for multipurpose crop which should be helpful for the farmers having less & marginal land. Further, the comparative study of harvesting from manual method, machine method and proposed machine method is discussed. It is observed from the results that, the proposed machine method shows reasonably good result when compared manual method and machine method.

INTRODUCTION

It is a science and art of cultivation on the soil, raising crops. It is also called farming. Agriculture plays a vital role in Indian economy. India is a country which is dependent on farming as a main source of income for many families. As far as Indian scenario is concerned, more than 75 percent farmers are belonging to small and marginal land carrying. So any improvement in the productivity related task help to increase Indian farmer's status and economy. The current agriculture equipments has lot of limitation and it required more energy to operate.

In India agriculture is facing serious challenges like scarcity of agricultural labour, not only in peak working seasons but also in normal time. This is mainly for increased nonfarm job opportunities having higher wage, migration of labour force to cities and low status of agricultural labours in the society.

METHODOLOGY

(Problem Definition and Solution)

Agriculture serves as the backbone of India, playing a pivotal role in its economic and social fabric. However, the agricultural sector in India encounters formidable challenges, notably the scarcity of agricultural labor, which persists not only during peak working seasons but also in regular periods.

This scarcity can be attributed to the allure of increased non-farm job opportunities offering higher wages, the migration of laborers to urban areas in search of better prospects, and the relatively low social status associated with agricultural labor.

In India, there are two predominant methods of crop cutting: the traditional manual approach, also known as the conventional method, and the mechanized approach employing crop cutting machines. Crop cutting represents a crucial stage in the agricultural process, directly impacting the yield and subsequent profitability for farmers.

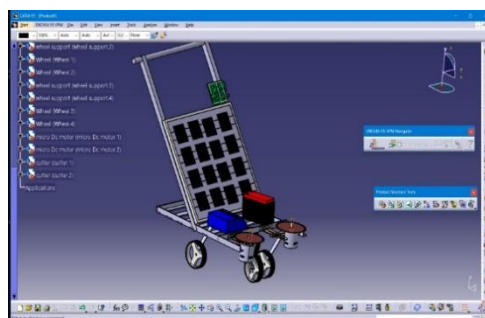
At present, the majority of Indian farmers rely on the conventional method of manual crop cutting, wherein laborers manually cut the crops using handheld tools. However, this method is inherently labor-intensive and time-consuming, often posing significant challenges for small-scale farmers with limited resources. To address these issues and support Indian farmers, there is a pressing need to introduce innovative solutions such as the design and implementation of efficient crop cutting machines. By utilizing advanced software tools like CATIA, the design process for these machines can be streamlined, ensuring optimal performance and cost-effectiveness.

The introduction of mechanized crop cutting machines holds tremendous potential to revolutionize the agricultural landscape. Such machines would not only reduce the cost and time associated with crop cutting but also contribute to elevating the economic standards of Indian farmers, particularly those working on small farms. By mechanizing the crop cutting process, farmers can enhance their productivity, minimize labor dependency, and allocate their resources more efficiently.

Moreover, while crop cutting is a critical stage, the final phase of the farming process, crop harvesting, also demands considerable time and effort from farmers in India. Currently, harvesting is predominantly performed manually, further exacerbating the labor burden on farmers. Recognizing this challenge, our objective is to introduce an innovative "Agricultural Approach to Crop Harvesting." This approach entails the development of a simple mechanism powered by a 12v Battery, designed to optimize the harvesting operation. Such a solution would not only be cost-effective for farmers but would also significantly reduce the time required for harvesting, allowing farmers to allocate their efforts to other important farming activities.

By embracing mechanization and adopting advanced technologies tailored to the specific needs of Indian farmers, the agricultural sector can overcome its challenges and foster sustainable growth. The transformation brought about by efficient crop cutting machines and improved crop harvesting approaches would empower farmers, increase productivity, and enhance the overall economic prosperity of India's agricultural landscape.

CONSTRUCTION (Design)



Manufacturing & Assembly Procedure :

- Firstly the frame of crop cutter is made according to the design finalized by using steel angle bars.
- Wheels are attached to the frame by means of stems and welding joints.
- The battery base is formed on frame by placing a plywood sheet and then the battery and solar charge converter is placed on it.
- Blades are then installed on the top end of the motors using nut and bolt fitment.

- Both the motors are then attached to the frame using a hinge that connects both the motors and the frame
- The solar panel is adjusted at a specific angle which would be the best for facing sunlight for the better solar utilisation for charging batteries.

- All the connections have been made using wires and heat sleeve tubes and proper arrangement of wires has been done.
- The blades included are of high quality and heavy duty.

WORKING :

Power Source: Crop cutting machines are usually powered by an internal combustion engine, such as a petrol or diesel engine. But to be on the greener side we've used solar panels and battery setup for it.

The cutting mechanism consists of multiple blades or cutting units that are strategically positioned on the machine. These blades are designed to effectively cut through the crop plants at the desired height. The crop cutting machine is maneuvered by the operator across the field. Depending on the design, the machine can be pushed manually. The operator guides the machine to ensure proper alignment and positioning for efficient cutting. As the machine moves forward, the motor powers the rotation of the blades. The blades spin rapidly, creating a cutting action as they come into contact with the crop plants. This Crop cutting machines often have a mechanism that allows the operator to adjust the cutting height. This adjustment enables customization based on the specific crop type and harvesting requirements. After the crops are cut, they can be collected using a collection tray or chute attached to the machine. The collected crops are then transported to subsequent processing or storage areas. Maintenance and Safety: Like any mechanical equipment, crop cutting machines require regular maintenance to ensure smooth operation. This includes blade sharpening, battery maintenance, and overall machine inspection. Safety features, such as blade guards etc. By using crop cutting machines with motorized blades, farmers can significantly reduce the manual effort and time required for crop cutting. These machines offer enhanced efficiency, precision, and productivity compared to traditional manual methods. Additionally, mechanized crop cutting machines contribute to reducing labor costs, improving harvesting speed, and increasing overall farm productivity.

CONCLUSION & RESULTS :

The primary objective of a crop cutter is to minimize labor costs associated with harvesting while addressing the challenges arising from labor shortages. This is particularly crucial as traditional labor-intensive harvesting methods often result in laborers experiencing back pain and blisters on their hands, limiting their availability for field work. To overcome these challenges, the implementation of a crop cutter offers several significant benefits:

Cost Reduction: The utilization of a crop cutter system can lead to a substantial reduction in harvesting costs, typically ranging from 60% to 70% compared to conventional methods.

Suitable for Small-scale Farmers: The crop cutter system is specifically designed to cater to the needs of small-scale farmers who own land areas ranging from 2 to 5 acres.

Time Savings: Compared to conventional methods, the crop cutter system significantly reduces harvesting time by approximately 50% to 60%.

Maintenance and Operation: The crop cutter system is designed for ease of maintenance and operation, allowing farmers to utilize the technology without extensive training or technical expertise.

Economic Efficiency: By eliminating the need for additional manual labor, the crop cutter system offers economical operation, maximizing cost savings for farmers.

Enhanced Safety: The crop cutter system ensures a high level of operational safety, minimizing the risks associated with manual labor and potential injuries.

By incorporating a crop cutter system into their farming practices, farmers can achieve substantial cost savings, reduce reliance on manual labor, improve efficiency, and enhance the overall safety of the harvesting process.

FUTURE SCOPE OF PROJECT

"The crop cutter machine" offers a wide range of possibilities for future advancements. Here are some potential avenues for development:

By simply adjusting the size of the cutting teeth, the crop cutter can be transformed into a lawn mower. This versatility allows for the machine to be utilized under different crops, adapting to varying loads by modifying the power and blade size accordingly.

To enhance efficiency, curved collectors can be added to the sides of the crop cutter. These collectors would gather the cut crops and automate the process of tying them into bunches. The bundled crops can then be expelled at the rear of the cutter for easier collection and handling.

In scenarios where the machine is used for sugarcane applications, additional power can be incorporated by employing parallel springs in the prime mover. For instance, the capacity can be increased by introducing four parallel springs, providing the machine with the necessary strength to handle the demands of sugarcane cutting.

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