



Design, Development, And Fabrication of a Multi-Purpose Cutting Machine for Agricultural Use

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ABSTRACT

We all know that our nation is known as "AGRARIANS," so we must concentrate on agriculture, particularly in India, and on issues like how to increase productivity and profit, how to cut costs, and how to address issues that arise from workers, as we can see that many farmers are working hard despite the difficulties they face. To overcome this, The newly designed yield-cutting machine requires less physical effort to operate because it required only electricity. This gear uses connected sharp edges to cut yields efficiently. The straws of various food grain crops, such as Groundnuts Striping, Seed Sugarcane, Straw Cutting, can be cut with the help of the modern, manufactured harvest shaper. The work is straightforward, and the development is simple. The range of study in agricultural types of equipment, despite everything, remains a fertile arena for original ideas. The yield shaper is truly a use of pure mechanical knowledge to improve the nature of work with the least amount of work and time.

The majority of farmers with rural backgrounds are unable to afford the more pricey, contemporary agricultural equipment. Given that the majority of Indian farmers have fairly small landholdings, it might not be financially feasible for them to acquire this more expensive equipment. Most farmers go about their daily activities as normal. Due to their low wages, most farmers find it challenging to purchase expensive equipment. It is crucial to build such gear that will serve a variety of functions and, most significantly, will be inexpensive in view of the factors mentioned above.

Keywords: Groundnuts Striping, Seed Sugarcane Cutting, Straw Cutting.

1. Introduction

In India, agriculture has faced real challenges such a lack of agrarian labour throughout peak working seasons and also during off-peak hours. However, as cities grow, the numbers of arable land are decreased. Agricultural mechanisation is one solution to this issue. Wheat, sugarcane, paddy, and groundnuts are the four staple crops in India.

Work bulls are currently primarily utilized by small-scale farmers for land preparation. Using them for other farm tasks like plowing, harrowing, applying fertilizer, sowing seeds, and weeding can increase their use and save money. Further developed hand instruments will likewise work with ranch work. Throughout the year, oxen can pull a cart, keeping them in training. Tools used during the season include ploughs, ridgers, seeders, and weeders. The manual method of planting seeds limits the size of the fields that can be planted because it results in poor seed placement, low crop yield, and significant back pain for the farmer. The majority of our farmers are unable to afford imported planters due to their high cost. If laborious planting tasks can be minimized or eliminated entirely, farmers can significantly boost grain production.

For the most part development of any yield includes different advances like seed choice, field arrangement, preparing, planting, water system, germination, diminishing and filling, weed expulsion, vegetative stage, blossoming stage, pesticide showering, natural product or unit arrangement stage, reaping and sifting. Our goal is to combine all of the individual tools to provide farmers with multipurpose equipment that implements all of the scientific farming techniques and specifications and is suitable at the lowest possible cost for all types of seed-to-seed cultivation. Farmers must use various agricultural equipment and labor to carry out those steps. The design and construction of multipurpose equipment for land preparation, sowing, fertilization, leveling, and weed removal is the primary focus of this project. The main frame, adjustable handle, seed hopper, seed metering disc, adjustable furrow opener, adjustable furrow closer, drive wheels, and seed tube make up the multi-crop planter, which is capable of precisely delivering seeds with uniform spacing between seeds and a uniform depth in the furrow. The seed metering disc was made to be interchangeable so that different kinds of seeds could be sown. The multipurpose agricultural equipment is easy to use, can be adjusted easily, and doesn't need to be maintained.

1.1 Problem Identification

Most of our agricultural work is done entirely by hand. This situation changed after people learned about machines. They start using machines that are designed for agricultural use. There are now a variety of lower-effort machines on the market. Some of them are really useful for farmers, but mowers and harvesting all depend on conventional energy and such machines are not environmentally friendly. Because the fuel used for them pollutes the environment and fuel flexing is the biggest problem in the coming days. Taking care of all such problems, conventional energy is replaced by unconventional energy. An oil-based cleaning saw is not environmentally friendly. Using a renewable source lowers operating costs compared to petroleum fuel used in agriculture.

2. Objectives

Indian farmers in rural places and on little farms can profit from the introduction of multifunctional agricultural equipment systems. It would raise the level of life for Indian farmers by lowering the cost of farming activities including gathering in the sectors, sugarcane cutting seeds, straw cutting, and stripping groundnuts. It is proper for high volume production of cultivating things.

- To cut down on most of the handling time.
- To reduce labor costs.
- To beat the issue of work crises.
- It ought to require Less Labor.

3. Methodology

1. Sugarcane Seed Cutting-

The CAM Activity serves as the primary foundation for the sugarcane seed cutting machine. The sharp cutting edge of one shaft is positioned at the base of the vertical pole. Rotator movement is transformed into linear shaft movement. A pin is inserted at the base to prevent misuse of sugarcane and sugarcane with seeds.

2. Groundnut Stripper-

A peanut shelling machine consists of flexible sharp edges mounted on a small shaft that rotates with the help of a motor. The power of the engine is transmitted to the rims by the shaft. The peanut plant is physically fed into the cutting edges by a slide. At this point, turning the cutting edges isolates the peanuts from the plant.

3. Paddy Stripper-

The Paddy stripper consists of two edges. These hubs are mounted on a single combustion shaft and this hub is connected to the engine by pulleys and a belt. The power of the engine is transferred to the edges. The rotating edges isolate the paddy from the plants.

4. Straw Cutter-

The straw former consists of three sharp edges attached to a turntable connected to the motor by a belt drive. Engine power is transmitted to the tire using pulleys and belts. The rotating cutting edges cut the straw into small pieces.

4. Literature Review

1. Rudolf charles, Et al” in this paper titled “Design and fabrication of crop cutter for multipurpose application”, the author mentioned that the knife is built with farmers in mind. This developed grain harvester has a good harvest yield for small farms. Since no motor is used for its operation, cutting is done by turning the lever by hand.
2. “Pradeep Tyagi, Et al” in this paper titled “Design and fabrication of multi-crop cutter” the author mentioned that the study focuses on small farm harvesting operations that cut different types of crops in less time and affordably, taking into account factors such as power consumption, ease of handling, field conditions, working hours and climatic conditions.
3. “Sandeep Kumar, Et al” in this paper titled “Development of multi-purpose Agriculture cutter” the author mentioned how smallholders could harvest a variety of crops in less time and at less cost, taking into account a number of factors such as power requirements, equipment costs, ease of use, and field conditions.
4. “Dhatchanamoorthy. N, Et al” in this paper titled “Design and Fabrication of Multipurpose Agriculture Vehicle” the author mentioned that the design of the harvester depends on the design of the mower. The knife is stronger and more durable. It is easy to use to clear dense vegetation.

5. "Marco Bentini, Et al" in this research paper title "Prototype for the harvesting of cultivated herbaceous energy crops, an economic and technical evaluation" the author mentioned that a reliable supply network must be established to ensure efficient and sustainable cultivation. In particular, biomass harvesting and pretreatment steps can improve its properties, increase energy density, and reduce storage, transportation, and processing costs.
6. "J.P.Wagh, Et al" in this paper titled "Sensor Based Multipurpose Agricultural Cutter" With the "Kinematic overlay method," " the author mentioned that a kinematic linkage diagram and plan a mechanism with an eccentric movable arm carrier, movable crickets, etc. A two-dimensional kinematic connection design is created using Auto-Cad software.

5. Working -

The electric motor drives the main shaft via a belt drive. Pulleys and pulleys are mounted on the main shaft. The main shaft uses a blade mounted on it. The feed is fed through the hopper to the feed roller. The feed roller transfers the feed to the cutting blade. The blades cut the feed into small pieces and throw the final product through the feed collector. We use a good, efficient, properly designed sealed bag to collect small pieces of food, minimizing the possibility of large dust and food explosions.

The many components of this device are connected to a sturdy frame. Wheels are added to this mower so that it can be moved around the farm and work in different environments. A single phase motor starts rotating at 1400 rpm when starting. The speed drops to 700 rpm with a pulley and belt drive. This speed is transmitted to the gearbox, which includes a worm and a worm wheel with a gear ratio of 1:30. the speed is required 23 rpm.

The gearbox is connected to the cam, which makes the back-and-forth rotary movement of the cutter business. The hand-fed cane is cut as the cutter moves. The cutter frees the cane shoots by moving backwards, and the harvester collects those shoots. Using this technology, the rotary motion of the motor is converted and an oscillating motion is created in the cutting head.

3.1 Procedure

Supply power source to an electric motor:

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In this machine we use single phase power supply for single phase 2 H.P. engine The input speed of our electric motor is 1400 rpm. To turn the forage knife blades, we need to turn them with power drives.

Power transmission through V belt-pulley drive:

As a power drive, we decide on a belt and pulley installed on the shaft. A coupling shaft is used to connect the pulley belt system to the cutting blades. As a result, cutting blades rotate.

Food material Feeding

Through the hopper, we may feed fodder. We created fodder to serve as a reference for grass and fodder materials including dried wheat stalk, maize straw and fodder, which lessen the farmer's physical labour requirements and aid in increasing fodder output.

Collect fodder:

The spinning blades may chop the given fodder into tiny fragments as needed and remove them from the fodder when we feed it through the hopper.

6. Frame Work Designs –

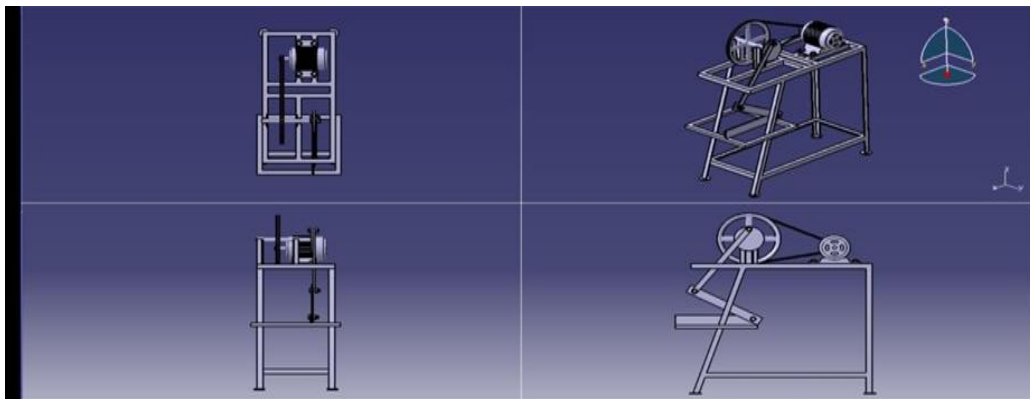


Fig.1

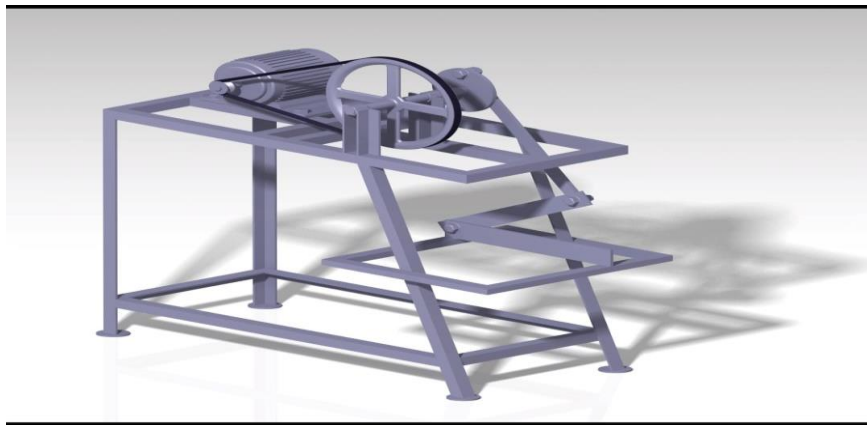


Fig.2 Machine Frame Work Design

7. Conclusion

Three distinct processes are included in the sturdy multi-purpose cutting machine. Because it speeds up the process and requires less personnel overall, using this technology can assist address the issue of a labour shortage. After being sowed, chopped seeds are simple and manageable. With the use of this equipment, the 15 to 25 operations per acre required for separating the pods from the facility for processing in the peanut shelling operation may be reduced.

More conventional techniques will be used during the grain husk process to separate the grains from its crushed debris. Because this machine can do the same tasks faster with two jobs as compared to seven or eight, using it will result in less waste. The farmer will undoubtedly be able to address the issue of employment crises, hence lowering the number of jobs, if the greatest number of farmers employ this equipment. Costs and procedures are sped up and made simpler.

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