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DESIGN AND FABRICATION OF MULTIPURPOSE AGRICULTURE MACHINE

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Abstract: The design and construction of a multipurpose agricultural device that integrates a solar panel system is the main objective of this project. The idea is to combine many agricultural chores into one adaptable machine that is fueled by renewable energy sources, thereby providing small-scale farmers with an efficient and sustainable alternative. The multifunctional agricultural machinery integrates functions including seeding, harvesting, plowing, and spraying, all managed via an easy-to-use interface. The multipurpose agricultural machine is built and assembled during the fabrication phase of the project, which also includes the integration of the electrical and solar panel systems. Strict validation and testing protocols guarantee that the device satisfies safety requirements and performance benchmarks. The finished result is a creative approach to sustainable agriculture, providing small-scale farmers with a cost-effective and environmentally responsible substitute for conventional farming practices.

Index Terms - Multipurpose, agriculture machine, solar, cost-effective, sustainable.

I. INTRODUCTION

Farming has stood as the spine of the Indian economy and will without a doubt hold its unmistakable quality for the predictable future. The advancing socio-economic scene, driven by liberalization and globalization, is reshaping the rural division. A noteworthy parcel of the country's people remains dependent on agribusiness, emphasizing its pivotal part. As the Indian populace proceeds to develop, so does the request for expanded trim generation per hectare.

This requires the utilization of productive and high-capacity agrarian machines. Mechanization is urgent in changing the Indian economy, encouraging fundamental assignments such as furrowing, leveling, working, seeding, and weeding. Despite its foremost significance, advanced agrarian procedures and hardware stay slippery for numerous little landholders. The restrictive costs, bulkiness, and procurement troubles pose challenges for these ranchers in receiving modern cultivating strategies. The tireless utilization of primitive cultivating strategies stems from a need for information or insufficient speculation for securing cutting-edge. This extension envisions a progressive progression for little ranches in India, tending to a costeffective and productive approach. The proposed multipurpose agrarian machine points to diminishing machine weight and streamlining seed-bolstering and crop-cutting forms. The extension recognizes and addresses major challenges confronted by little to medium-scale ranchers, including dependence on conventional and time-consuming generation strategies, the unaffordability and bulkiness of present-day rural gear, heightened cultivate input costs, and the effect of globalization on yield costs.

The vehicle's usefulness pivots on tackling sun-powered vitality, changing it into electrical vitality, and utilizing it to control distinctive operations such as water showering, furrowing, and seed sowing through a switch control component. The show is particularly outlined for little ranches, guaranteeing compelling execution in exercises like burrowing, furrowing, water sprinkling, and seed sowing. Little to medium-scale ranchers hook with conventional generation strategies, which are timeconsuming and lead to lower efficiency.

The modernization of agrarian methods experiences obstacles due to the tall costs, bulkiness, and openness issues related to progressed gear. In tending to these challenges, the extend points for an altar for little ranches in India, advertising a cost-effective and effective arrangement. This venture is outlined to cater to the special needs of little ranches, promising not as it were expanded productivity but too financial upliftment for Indian ranchers. The multifaceted capabilities, counting burrowing, furrowing, water sprinkling, and seed sowing, position this machine as a comprehensive arrangement for the challenges confronted by small-scale agriculturists subsequently acting as a signal of trust for changing little ranches in India into center points of maintainable and proficient rural hones.

II. PROBLEM STATEMENT

The ordinary agrarian hones regularly include numerous machines for diverse assignments, driving to expanded operational costs, natural affect, and diminished generally effectiveness. In light of these challenges, the plan and creation of a multipurpose horticulture machine points to supply a comprehensive arrangement that addresses the fracture of cultivating apparatus, advances natural supportability, decreases operational costs, and meets the differing needs of ranchers over diverse locales and edit sorts. This venture looks for to contribute to the headway of maintainable and proficient agrarian hones, cultivating a flexible and eco-friendly future for the cultivating community.

III. OBJECTIVE OF THE PROJECT

1. To design a multipurpose agriculture machine
2. To fabricate a multipurpose agriculture machine
3. To test the working of the multipurpose agriculture machine

IV. METHODOLOGY

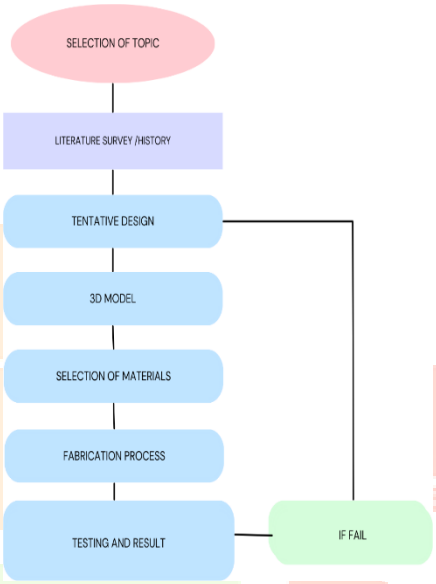

Figure 1 - Methodology

4.1 Literature Survey:

After the selection of the topic, the next step was to learn more about the project so we searched through internet sources and got different papers related to the project. The main papers we looked at were agriculture needs, different research papers on the design and fabrication of multipurpose agriculture machines, seed sowing technology, etc. After gathering all this information, we got a clear idea of how the project should proceed.

4.2 Tentative design:

After getting a clear idea about the project, the next step was to propose a tentative model of how the vehicle should look. This was done using the Solid Edge 2023 student version. The model was made in such a way that all the processes would take place systematically. This design needed some improvements which were done in the next steps.

4.3 Final 3D model:

After the tentative design was done, many criteria were not considered during the tentative design and this was solved and the final design of the model was done. Some of the issues were in frame design, hopper design, and the issue with integrating all the processes. This was also done through the Solid Edge 2023 student version software.

4.4 Selection of Materials:

After all the design and analysis part was done the next step was to start the fabrication part. The first step in fabrication was the selection of materials to construct the model. The first requirement was frame and we chose mild steel since it has good tensile strength and is costefficient, Hopper and ploughing tools are also done using mild steel along with PVC pipes used for the seed dropping. solar panels were selected and finally, other electronic products were procured.

4.5 Fabrication process:

The fabrication process was done in two stages. In the first stage, all the parts like the frame, hopper, levelling tool, ploughing tool, and handle were made separately. After this, the second stage comes in where all of these parts are welded and fastened as per requirement. All the fabrication was done as per the design. The vehicle will be fabricated using locally available tools like drilling machines, arc welding machines, etc.

4.6 Testing and result:

The main and crucial part of the project is testing and getting a desirable output. The completed model will be taken to a farmland and the testing will be done. Before that, certain calculations should be done to check whether the design is safe or not. If there is any dysfunctionality in the vehicle it will be identified and a suitable solution will be adopted.

V. COMPONENTS AND DESCRIPTIONS

5.1 Chassis of the Vehicle:

There are a variety of materials that can be used in automotive bodies and chassis. The most important criteria that a material should meet are lightweight, economic effectiveness, safety, recyclability, and life cycle consideration. Some of these criteria are the result of legislation and regulation. The material for the frame and chassis is steel. The main factors for selecting material specially for the body are a wide variety of characteristics such as thermal, chemical, and mechanical resistance which are easy to manufacture and durability.

5.2 Frame Design

The design is made which is suitable for supporting all the operations. The frame is made for a compact size vehicle. It is made up of mild steel consisting of 4 wheels.

Figure 2 – 3D Design of Frame

5.3 Ploughing Tool:

The Ploughing tool is designed in a way that it wouldn't break due to the sudden encounter of rocks and roots present in the soil. The new tool design is durable and affordable and can be used in all kinds of geographical regions. The breakage of the tool is reduced by using high-speed steel in the tip. The material used for plow tool is High Speed Steel.

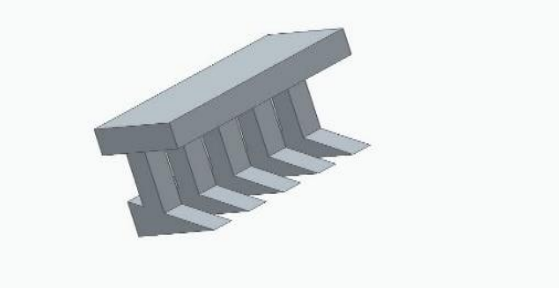

Figure 3- Plougher 3D Design

5.4 Hopper:

It is an arrangement to store the seeds. The shape of the hopper is a rectangular box so the wastage of the seed can be avoided. It is made up of a mild steel sheet which reduces the weight of the hopper. It can store seeds up to 3kg.

Figure 4 - 3D Model of Hopper

5.5 Spraying tool

The three-point spraying tool helps in spraying fertilizer and water to the crops. It is mounted in such a way that it could cover more area after the seeding process is done.

Figure 5 - 3D Model of Sprayer

5.6 Solar Panel

A square solar panel, a 12V photovoltaic cell is used for the charging of the battery. This has a power capacity of 255W but it depends on external environmental conditions.

5.7 Battery

A 12V lead acid battery is used which has a battery capacity of 7Ah. It requires 3 to 4 hours to charge depending on the solar panel.

5.8 DC Motor

A high torque,12V, 1 amp DC motor is used which is run through the battery.

5.9 Leveler

A leveler tool made of mild steel with a 500mm width is attached at the end of the vehicle to close the plowed area.

VI. 3D Model

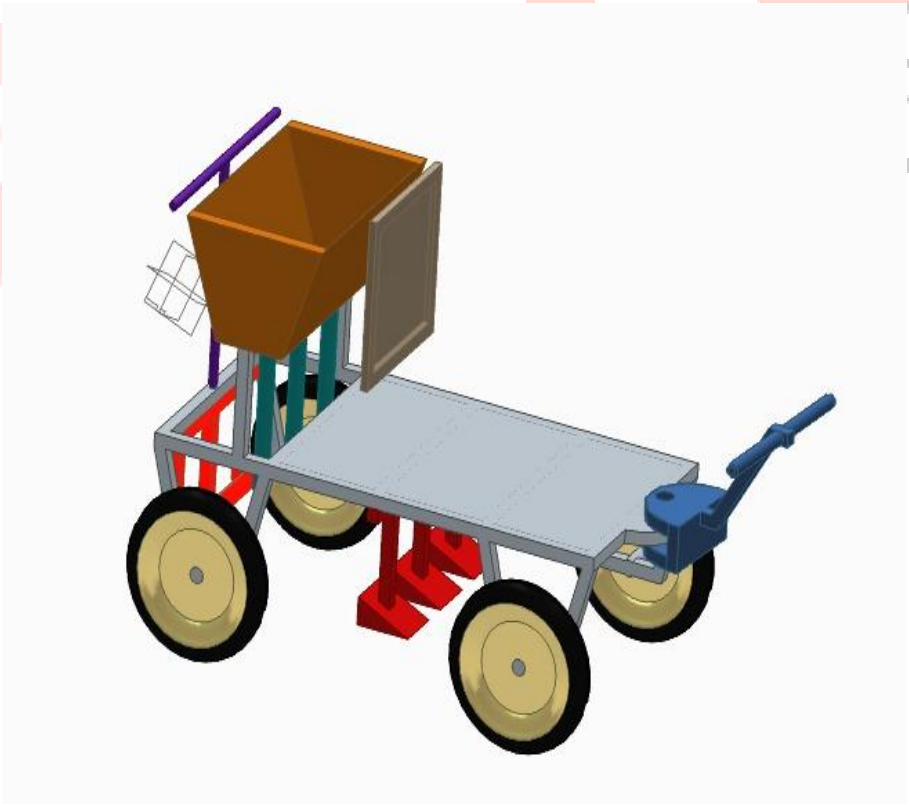

Figure 6 - Assembled Model

VII FABRICATED MODEL

Figure 7 - Fabricated Model

VIII FUTURE SCOPE

Designing and fabricating a multipurpose agriculture machine involves integrating various functionalities like planting, irrigation, and harvesting into a single unit. It requires engineering expertise to optimize efficiency, durability, and adaptability to different farming tasks while considering cost-effectiveness and environmental sustainability.

Furthermore, it can be modified or enhanced as following

1. Make the vehicle completely automated with artificial intelligence so that it can make decisions and be more user-friendly.
2. Increasing the distance between plowing tool blades so they can be used for a wide range of crops.
3. A conical-shaped hopper could be provided to reduce the wastage of the seed.

IX CONCLUSIONS

The multipurpose agriculture machine proves invaluable for small land-holding farmers, offering increased efficiency through streamlined operations like planting, harvesting, tilling, and spraying. It drives cost savings by consolidating tasks, reducing machinery expenses, and labor requirements. Versatility enables adaptation to diverse farming practices and environmental conditions. Integration of precision farming technologies enhances crop management, maximizing yields and input efficiency. Moreover, it promotes environmentally friendly practices by reducing fuel consumption, soil compaction, and chemical usage. This innovative solution merges engineering and manufacturing expertise to address agricultural challenges, promising improved functionality and security across various settings.

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