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Department of Mechanical Engineering and Applied Science, Sri Krishna Institute of Technology, Bangalore, India

Study and Fabrication of Solar Powered Multiple Crop Cutter

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ABSTRACT: Solar power energy from the sun is converted into thermal or electrical energy which is the cleanest and most abundant renewable energy source. The U.S.A. has the richest solar sources in the world. Solar energy plays an important role in agricultural operations like drying food products, solar water and air heaters, solar cookers, irrigation, street lights and some home appliances. In Indian farms, the cutting operations are mainly performed by hand. Now a days, the use of mechanized cutting instruments, powered by fossil fuels can also been seen in some places. In hand cutting, the cutting of the crops consumes ample amount of time and labour charges, which is a drawback.

In mechanized cutting methods, the operating & fuel cost of the machine exceeds the budget of a common farmer. To overcome all these drawbacks, we can use renewable, Non-conventional energy source like solar energy as it is easily available in nature. An application of non-conventional, renewable energy source is the alternate solution for current energy demand. In this project solar energy is used which is non-conventional-renewable energy source which is freely available, to reduce the overall cost of the cutting operation. The mechanisms used are also simple. The machine is light weight & Compact. Most importantly, can be easily availed by the farmers.

KEYWORDS: Solar panel, Battery, DC Motor.

I. INTRODUCTION

In the country like India where the main source of income is agriculture. Needs to concentrate in some aspects like how to increase productivity and profit, how to reduce cost and how to solve and ease the problems of workers. To overcome this new manually operated cutter is fabricated for cutting of multiple types of crop during harvesting and named as "Multi Crop Cutter". It possesses four criterion ease in manufacturing, ease in handling, low cost and light weight. There are some procedures involved in fabrication of this device such as fabricating prototypes, material & component selection, etc.

Today, India ranks second among other countries across the globe in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 13.7% of the GDP in 2013, about 50% of the workforce. The economic contribution of agriculture to India's GDP is steadily decreasing with the country's broad-based economic growth. Still, agriculture is a demographically broad economic sector and plays a important role in the overall socio-economic fabric of India. According to WHO, Slow agricultural growth is an interest for policymakers as two-thirds of India's people depend on rural employment for a living. The agricultural practices which are currently employed are neither

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economically nor environmentally sustainable and India's yields for many agricultural material are comparatively low. Improperly maintained irrigation systems and almost universal lack of good extension services are among the factors responsible. Farmers' access to markets is hampered by poor roads, rudimentary market infrastructure, and excessive regulation.

II. RELATED WORK

Various approaches have been proposed for improving mechanized type of crop cutter in agriculture field. Designing a reaper machine to harvest grains more efficiently. The research work focusing on harvesting operation to the small land holder to cutting varieties of crop in less time and at low cost by considering the factor as power requirement, ease of operation , field condition , time of operation and climatologically condition. By the study Mr. P. B. Chavan, Mr. D. K. Patil, Mr. D. S. Dhondge. To increase the productivity and profit. How to cutting reduce the cost and how to solve the problem comes from workers. It is fabricated for cutting various crop varieties during the time cutting to the fabrication and performance test of an ultraportable crop cutter by G Maruthi Prasad Yadav , GMD Javeed Basha. This fabrication model small scale sugarcane harvesting machine consists petrol engine and mechanisms are used in this machine to compare to manual harvesting by using this machine has capacity to cut sugarcane in faster rate and economical. This study done by the Adarsh J Jain, Srinivas Rarod, Vinay N Thotad and Kiran. In this research work was made to investigate the cutting energy and force required for the pigeon pea crops. The commercially available blade it has been attached to the lower end of the arm of pendulum type dynamic tester which cut the stalk at 900 to the stalk axis with knife velocity ranging between 2.28m/s to 7.23 m/s the diameter of stem at 42.6 % (wb) moisture content. The cutting force I directly proportional to cross sectional area "stem cutter was design and developed by Atul R. Dange, S. K. Thakare, I Bhaskarao and Umarfarooq momin.

III. COMPONENTS USED

DC Motor: A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electro-mechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC Drive Motor: DC drive technology is efficient, reliable, cost effective, operator friendly and relatively easy to implement. DC drive provides many advantages over AC drives, especially for regenerative and high power applications. DC drives have been widely used in industrial drive applications in order to offer very precise control.

Solar Panel: Solar panel is a device that converts light energy into electrical energy. These are called solar panels because the most powerful source of light available from the Sun called Solar energy. A solar panel is a collection of solar cells.

Battery: A lead acid battery is a type of rechargeable battery in which lead ions move from the negative electrode to the positive electrode during discharge and back when charging. Lead- acid batteries use an intercalated lithium compound as one electrode material, compared to the metallic lead used in a non-rechargeable lead acid battery. The electrolyte, which allows for ionic movement, and the two electrodes are the constituent components of a lead acid battery cell.

IV. EXPERIMENTAL RESULTS

As discussed in the above mentioned related work, the conventional crop cutters are of engine operated or manually operated types. In conventional crop cutting, the labour has to work hard for many hours in field. In case of engine operated crop cutter, the maintenance and operating cost will be high. So our main objective in this project is to reduce the manual effort, maintenance, operating cost and to design and fabricate a multiple cutting machine.

Low initial cost, thus affordable by indian farmers, no cost of fuels, low operating & handling costs, low maintenance cost, light in weight & compact and use of non-conventional source of energy, thus conserving fossil fuels.

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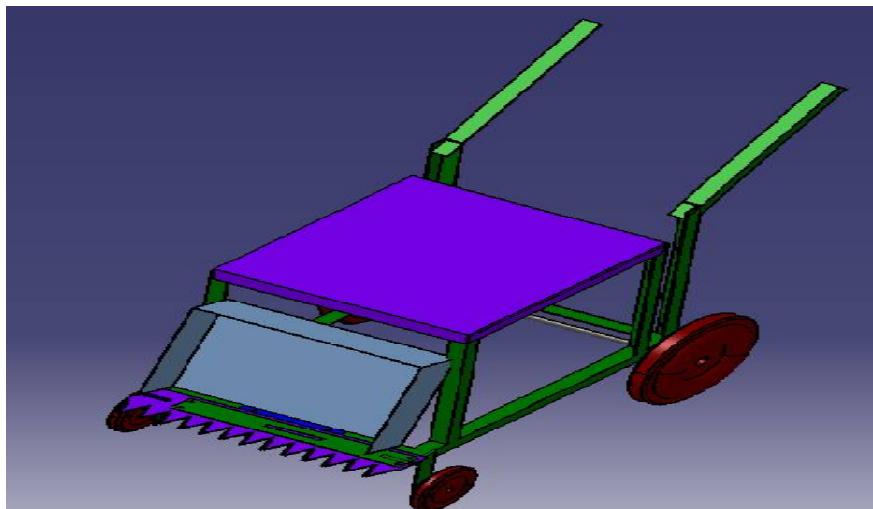


Fig. 1: Shows the 3-dimensional & 2-dimensional view of the assembled component.

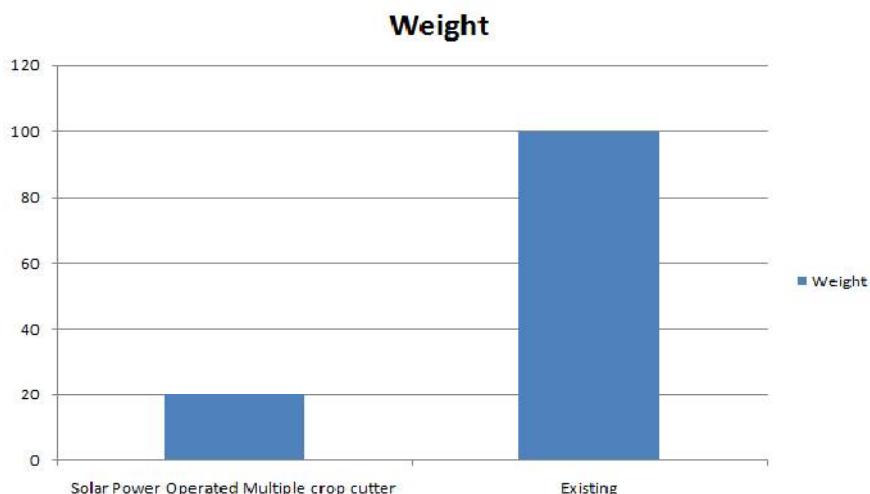


Fig. 2: Graphical comparison of Weights of existing cutters v/s. Solar Powered Multiple crop cutter

Advantages:

- Low Initial Cost, thus affordable by Indian Farmers.
- No cost of Fuels.
- Low Operating & Handling Costs.
- Low Maintenance Cost.
- Light in weight & Compact.
- Use of Non-Conventional Source of Energy, thus conserving Fossil Fuels.

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Fig. 2. Application of the solar operated multiple crop cutter in rice plant

V. CONCLUSION

As we know 70% of population of our country lives in villages and their main occupation is agriculture. Moreover, the farmers in India have small land holdings, likely 1-2 acres and their financial status is also poor. Hence, they cannot buy the available crop cutters, so they opt for hand cutting, which takes several man hours and labor charges. The overall weight of the model can be minimized by modern techniques, such as composites, the battery backup can be increased by adopting some new technology in electric fields. This design is to be operated by partial automated movement, i.e., forward & backward movement. But in future this model can be developed as a fully automated vehicle such that it can move over the pre-defined path on its own by installing a steering mechanism which can provide left & right direction movement, more powerful motors can be used to this model for cutting operation and the blades of the model can be made adjustable to lower and upper for cutting grass and trees altogether along with crops.

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