An invstigational review on Multifunctional Solar pesticide Sprayer with Crop Cutter Mechanism

***Prof. Sandip G. Ghugal 1, Dr.K.D.Ganvir2 , Prof Saroj Borkar3***

 *Department of Mechanical Engineering , Priyadarshini Bhagwati College Of Engineering, Nagpur , Maharashtra.*

*2,3,4Students, Department of Mechanical Engineering, Priyadarshini Bhagwati College Of Engineering, Nagpur , Maharashtra*

*Corresponding Author*

*Email Id:-kanchan.ganvir100@gmail.com*

***ABSTRACT***

In India, an agricultural country, 70% of all food is produced locally. However, as the population grows, property rights are divided among families, and the average Indian farmer owns only two hectares of land. In addition, the inability to afford tractors and other expensive machinery has left farmers in dire financial straits, forcing them to return to traditional farming. Basically, many farmers in India also use horses, buffaloes and cows. Compared to the rest of the world, it cannot meet the energy needs of agriculture. Therefore, we believe that labor-intensive and expensive human and animal labor can be replaced with advanced mechanization suitable for smallholder farmers. We developed this device to meet all these needs and solve the problem of human resources

***Keywords: Solar Energy, Agriculture Machine, Pesticide sprayer, watering, cutting etc.***

# Introduction

agriculture is the backbone of India. In his one of the youngest agricultural sectors, the rice and wheat sector, there is little involvement of growers and scientists. This area is about how to maximize productivity, how to improve productivity, and how to reduce costs. In India, he said two different forms of agricultural machinery are used: mechanical and manual (conventional) machinery. The use of hybrid devices between energy sources and work is called mechanization. Typically, this hybrid device converts motion from rotary motion to linear motion and offers a number of mechanical advantages, including: B. Adjust speed or gain. Agricultural machinery is used in agriculture and other agricultural operations. The use of agricultural machinery to automate farm work is known as mechanized farming and greatly increases the productivity of farm workers.

The Indian economy is heavily dependent on agriculture. The history of agriculture in India began with the Indus civilization and even earlier in some parts of southern India. Currently, India ranks second in the world in value of agricultural production. Special vehicles play an important role in various fields such as industry, medicine and military. The productivity of the special vehicle industry in the agricultural sector is gradually increasing. The biggest problems facing Indian agriculture are rising production costs, availability of skilled labor, lack of water resources and crop management. Automation technology has been used in agriculture to solve these problems. Agricultural automation helps reduce labor for farmers. This vehicle is designed for cutting, pesticide and watering processes. All these features have not yet been implemented in vehicles. robots are developed here for effective focus and are also expected to perform functions independently. The proposed idea applies the vehicle to tasks such as cutting and pesticide spraying. These functions can be integrated into a single vehicle and then launched.

# Problem Identification

Design and development of agricultural robots that cut and spread pesticides in fields. Spraying insecticides is also effective. The control unit of this farming system must be wired and can be used to display farm work. Build controllable models that can demonstrate functionality using solar panels. In addition, we design and analyze the real-time system of this system, provide solutions, and propose models that can be used in real time. - Lack of agricultural mechanization
・Various processes are time consuming.
- Needs more effort.
- The process takes too long to run

.

# Objective

●Reduce manpower at agricultural sites with small machines.
• Increase productivity and save time by performing all major functions simultaneously.
• Complete large amounts of work in less time.
●The battery can be charged using solar energy. The machine works on site, so it can harness sunlight to generate solar energy. • Provision of general purpose agricultural machinery for logging, pesticide application and irrigation.

# Literature Survey

* **Joshua *et al.* (2010)** developed a power sprayer with two stroke petrol engine. Since the operating cost was found high they suggested a solar operated sprayer.
* **Rao *et al*. (2013)** reported the performance of a multiple power supplied fertilizer sprayer, which could

be able to spray 580 litre of pesticide in about 5-6 acre land using a fully charged battery.

* **Khan (2014)** designed a spray jet which can be operated by a DC pump run by PV panels.
* **Chavan *et al.* (2015)** created a prototype 20 Wp PV module and brushless DC motor (12 V, 2.2 A) agricultural pesticide sprayer. In addition to these, literature is available with thorough details on a few other types of solar-powered pesticide sprayers.
* **(Kulkarni *et al*., 2015, Lad *et al*., 2015; Patil *et al*., 2014; Sawalakhe *et al*., 2015).**

With an aim to reduce human drudgery while spraying in field carrying conventional sprayer on user’s back, few researchers have also designed and developed vehicle for carrying the sprayer **(Kshirsagar *et al*., 2016).** The goal of this study was to design and create a solar PV sprayer that could be pulled by a person to move it over a field.

* **J P SINHA et. al. Jan 2018,** Development of solar powered knapsack sprayer **,** This paper With a land holding percentage of 46.1% and a production contribution of 51.2%, India's small and marginal farmers account for 83.3% of all farmers. Knapsack sprayers are widely utilized by small and marginal farmers in India to manage pests since they are inexpensive, simple to use, but produce lower outputs. A solar-powered sprayer with a higher output (0.3 ha/hr), less physiological energy consumption, and less discomfort was developed. For protection against deep drain and overcharging of the battery for a longer operational life, an

electronic control had been inserted. Within two hours of exposure, the system could be fully charged by solar energy and could run continuously for six hours. This guarantees a good spray with consistent droplet size throughout the swath. For trouble-free operation and a longer nozzle life, an anti- clogging filter had also been inserted in the nozzle head before the nozzle.

* **Kumawat Mukesh M et. al . May 2018**, Solar operated pesticide sprayer for agriculture purpose***,*** In this paper , The solar sprayer offers a lot of benefits. There is a fuel/petrol savings in addition to the spraying cost reduction. Additionally, saving on transportation means saving on petrol. The solar sprayer requires minimal upkeep. The vibration is decreased. In comparison to pumps driven by internal combustion engines (ICEs), the operation of solar-powered pumps is more cost-effective, primarily because of lower operating and maintenance expenses. When there is no access to grid electricity, solar pumps are a good alternative, especially when compared to petrol sprayers. The farmer can perform the

# Block Diagram

spraying procedure without hiring help, enhancing spraying effectiveness.

* **Ms. Avhad Jayshri et. al. 2019**, Solar Operated Spray Pump System***,*** Sprayers are mechanical tools made especially for fast and easily dispensing liquids. They are available in numerous variants. We'll look at a solar-powered spray pump in this project. This kind of sprayer is an excellent way to rapidly and easily cover big areas like lawns. The typical components of a sprayer are a tank for the liquid to be sprayed, a solar panel, a motor to pump out the liquid, spray nozzles that disperse the liquid automatically in a downward direction over a sizable area, ball valves, a chassis with wheels on which the sprayer is mounted, and a hose attachment for spraying. The apparatus is mechanically propelled from behind, and the liquid is sprayed as soon as the pump's power source is turned on. This kind of sprayer is frequently used to apply pesticides to lawns, including herbicides, insecticides, and fungicides.



***Fig. 1****. Block Diagram*

# Working Principle

The basic aim of this project is to develop a multifunctional machine, which is used for cutting crops and pesticide sprayer to close the mud and water sprayer to spray water with least changes in accessories with minimum cost. This whole system of the robot works with the battery and the solar power.

Solar is placed on top of the tank and is connected to the battery for charging the battery. Thus the max efficiency is utilized from the sun by the solar panel and to the battery. The whole robot requires the 12v battery to operate the system.

We can quickly attach and detach all of the functions because the entire system we attached is so portable. Here, solar energy is the power source being used. Solar energy is captured and converted into electrical energy by solar panels (12v 25w). Batteries are used to store this electrical energy. Other uses for the battery's (12 volt, 8 amp) stored energy include cutting, watering, and spraying pesticides.

One end of the frame, cutter is fitted which is used to cuts the crops by high speed dc motor and cutter.

DC high speed motor of 10000 RPM is used to cutting function. The blade system is around 5 inch in size. It can easily cuts the crops in farm.

The frame-mounted DC liquid pump motor has an input pipe going into the tank. And the pipe outside is utilised for watering purposes. Just attach a nozzle for the pesticide spraying function to spray crops.

With the control box located at the handle, all functions, including cutting, watering, spraying pesticides, and lighting, are controlled. All systems were therefore interconnected to create a multifunctional agricultural machine.

# Advantages

The solar agriculture machine has many advantages:

* The developed system used for spraying the fertilizer, pesticides, fungicides and insecticides.
* It is also use as water pumping on solar energy.
* It is used to cutting spreading function.
* Easy in construction
* More economical
* Easy to clean and maintain
* It is a renewable energy powered
* It does not create air pollutant & noise
* Easy to handle
* Do not require fuel hence cost reduce & Light in weight.

# Disadvantages

* Due to the high cost, not all formers can afford to offer solar spray systems. If the government can assist formers in obtaining such equipment, it will be beneficial to them.
* How do I use it? questions for past students. Before using such a system, formers must receive training in it.
* Accurately align the solar panel's spray mechanism to prevent panel damage.
	+ It can only function properly in the presence of sunshine; during cloudy weather, it cannot.

# Conclusion

After the manufacturing and trail on the “Solar powered Multipurpose Agricultural Automobile (Farm Machine)” conclusion which we made are as follows:

* Based on the machine's overall performance, it is certain that the project will meet the needs of small- scale farmers who cannot afford to buy expensive agricultural machinery.
* The machine requires less labour and time than conventional methods, thus it is more expensive to produce on a wide scale.

**References**

1. Srinivasan R.Zanwar, R.D.Kokate (June2012), Advanced Agriculture System, International Journal of Robotics and Automation (IJRA) magazine.
2. R. Eaton, J. Katupitiya , S.D. Pathirana (2008), Autonomous Farming Modelling And Control Of Agricultural Machinery in a unified framework,15th international conference on mechatronics and machine vision in practice, New Zealand.
3. Blackmore S. (2007). A systems view of Agricultural Robotics. Precision Agriculture conference, Wagon Academic Publishers, Netherlands.
4. Simon Blackmore, Bill Stout, Maohua Wang, Boris Runov (2005), Robotic agriculture – The future of agriculture mechanism, Agro Technology, the royal veterinary and agriculture University.
5. Butler, S. (1887). Luck, or cunning, as the main means of Organic Modification? An attempt to throw additional light upon Darwin’s theory of natural selection. (London: Trübner & Co.) Reprinted as vol 8 of The Shrewsbury Edition of the works of Samuel Butler (London: Jonathan Cape, 1924)
6. Leropoulos I., Greenman, J., and Melhuish, C. (2003). Imitating metabolism: Energy autonomy in biologically inspired robots. AISB '03 Second international symposium on imitation in animals and artefacts. Aberystwyth, Wales, pp.191-194.
7. Tillett, N.D., Hague, T. and Marchant,

J.A. (1998) A robotic system for plant scale husbandry. Journal of Agricultural Engineering Research, 69, 169-178.