

## A Literature Review on Development of Solar Agro Sprayer (SAS)

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**Abstract:** Agriculture is the backbone of India. In Indian farms generally two types of spray pumps are used for spraying; hand operated spray pump and fuel operated spray pump, of which hand operated spray pump is most popular. The main disadvantage of hand worked spray pump is that the user can't use it for more than 5-6 hours nonstop as he gets tired after some hours where as fuel worked spray pump needs fuel which is costly and accessibility of fuel is not easy at rustic places. At the same time it exhausts carbon dioxide as pollutant which is harmful to our environment. In such condition we should reflect to move near some non-conventional energy. Seeing it, solar energy would be one of the explanations. This creation is about an agriculture insecticides sprayer, which uses solar energy as a source of power for spraying. Term as Solar Agro Sprayer(SAS) which consists of a solar panel of 20 watt, capacity, a 12 volt DC battery, charged by solar energy received by solar panel, a DC motor, operated by the battery, a pump, to spray the pesticides, a tank of 12 liters to hold the pesticide (in the form of solution / liquid). Solar agro sprayer facilitates effortless operation. The entire unit is portable and operated by one person or operator. Solar panel proposals gumshoe on the head of the worker which gives guard from high solar strength. This project emphasizes the spraying of pesticides for different crops like cotton, green gram, onion etc. in farmer's fields using solar power as energy. Solar agro sprayer can run 3 to 4 hours more after 5 hours of operation in full solar intensity which ultimately provides spraying operation facility at night. This sprayer can be most often used at various locations such as farms, gardens although it can become more popular in rural areas as well. It is quite economical and eco-friendly as it uses solar energy which can be easily affordable by small and marginal farmers. Further, its power can also be used for multi-purpose applications such as charging the battery of mobile, operating the radio and lighting the domestic light etc., which makes it more economically viable technology.

**Keywords:** Agriculture pesticides spraying pump, Eco friendly technology, Effective field capacity, Fast & effortless operation, solar energy operated technology.

### I. Introduction

Solar energy is one of the most important renewable energy sources that have been gaining enlarged attention in recent years. Solar energy is plentiful; it has the greatest availability compared to other energy sources. Solar energy is fresh and free of emissions, since it does not produce pollutants or by-products harmful to nature. India is set to be an agricultural based country approximately 3/4<sup>th</sup> of population of India is dependent on farming directly or indirectly. Our farmers are using the traditional methods and equipment for the ages e.g. seed sowing, spraying, weeding etc. Spraying is one of the important things for farming. There is need for development of effective spraying.

The application of pesticides using spraying equipment plays an important role. The chemicals are widely used for increasing agriculture production through better insect and pest management. Spraying is one of the most effective and efficient technique for applying small quantity of liquid through fine droplets to protect the crops. Sprayers are mechanical devices that are specifically designed to spray liquids rapidly and simply. They come in a number of different varieties. There are several types of sprayers available in the market such as manual or self-propelled sprayers, tractor mounted sprayer and aerial sprayers. In India, many versions of hand operated and power operated spraying equipment's are being used. At present, the farmers generally using all kinds of manually operated knapsack sprayer which can cover 0.4 ha/hr and motorized sprayer can cover 1.2-1.6 ha/hr for spraying of pesticides on crops like cotton, red gram. Farmers are facing the problem of coverage of large area within a short period of time as the pest attack is serious problem and spreads quickly. Many of the farmers generally spray 6-8 times in a season using manually operated or motorized sprayer to cover large area within short period of time. Modern spraying techniques will improve the operators comfort, safety and spraying effectiveness which would go a long way in increasing crop yield. Generally the power required for spraying is met out from either alone or combination of human source and mechanical power like petrol engine or dual fuel engines for operating the pump. Sometimes the batteries are used for running the motor which operates the pump for discharging the chemicals. But these batteries require electricity for charging them. However, due to

rapid rise in the price of fossil fuels and their limited availability, there is now greater awareness of the need for development of renewable energy gadgets, which is the need of the hour. Because of inadequate supply of electricity, there is frequent power cut and this situation is still worse in the rural areas. Hence, there is better scope for utilization of solar energy for generation of electricity using solar photovoltaic cells and further to utilize the same for spraying, water pumping, lighting etc.

In this project we will develop a solar operated agro sprayer. A sprayer of this type is a great way to use solar energy. Sun based built up bug sprays sprayer siphon is one of the better forms of petroleum motor pesticide sprayer siphon. It is interminably utilized in the agribusiness field and likewise utilized for a few purposes. This is having more favorable circumstances over petroleum motor sprayer siphon. It practices the solar power to run the motor. So it is a contamination free pump associated to petrol engine spray pump. Excess electricity can be stored in batteries and then excess of energy can be utilized for home appliances like glowing of CFL bulbs, mobile charging etc.

If we take into consideration today's situation from the world point of view, we can say that world today is greatly dependent on fossil fuels and other conventional energy sources. So that it becomes necessary to find the alternate applications which are used in day to day life which uses non-renewable energy. The invention of a sprayer, pesticides, fertilizers, etc. brings revolution in the agriculture/horticulture sector. For the most part the development of sprayers, empower ranchers to acquire outrageous horticultural yield. Sprayers are additionally utilized for greenery enclosure showering, wildflower/bother control, fluid preparing and plant leaf cleaning. In Indian farms generally two types of spray pumps are used for spraying; hand operated spray pump and fuel operated spray pump. Among both sprayers hand operated spray pump is most popular. Now fuel operated sprayer is mostly used. The model is designed to be eco-friendly and lower cost and it will prove to be more efficient when compared to petrol based pesticide sprayer. The agro sprayer developed is based on the renewable energy sources which use only solar energy.

## **II. Solar Agro Sprayer**

The Solar Agro Sprayer is a horticulture pesticides splashing siphon/sprayer. Sunlight based Agro Sprayer which comprises of a sun oriented board of 20 watt, limit, a 12 volt DC battery, charged by sun based vitality gotten by sun powered board, a DC engine, worked by the battery, a siphon, to splash the pesticides, a tank of 18 liters to hold the pesticide (as arrangement/fluid). Sun based worked agro sprayer encourages easy activity. The whole unit is convenient and worked by one work or individual or administrator. Sunlight based board gives shadow on the leader of the administrator which gives assurance from high sun powered force. The release rate of sun based sprayer is estimated in field condition, which is about 0.023 liter/sec (82.8 liter/hour). The strolling velocity of administrator is about 2.8 km/hr and swath width of the sprayer is about 0.6 m, which relates to a hypothetical field limit of about 0.17 hectare/hour. The compelling field limit of the sprayer is seen to be 0.14 ha/h which relates to a normal inclusion of 1 hectare/day of 8 hours activity.

## **III. Hardware Components And Specifications:**

1. Solar panel:
  - a. Size: 0.5m x 0.3m
  - b. Normal peak power: 20 W
  - c. Peak power voltage: 17 V
  - d. Weight: 1 kg
2. Battery:
  - a. Voltage: 12 V
  - b. Current: 7 A
  - c. Weight: 2 kg
  - d. Output power: 84 W
3. Motor:
  - a. Operating power: 82 W
  - b. Operating voltage: 12 V
  - c. Operating current: 7 A
  - d. Weight: 1 kg
4. Mini charge regulator: 12-17 V
5. Tank capacity: 18 liter
6. Overall dimensions of unit: 480mm x 820mm
7. Total weight: 10 kg

#### IV. Block Diagram

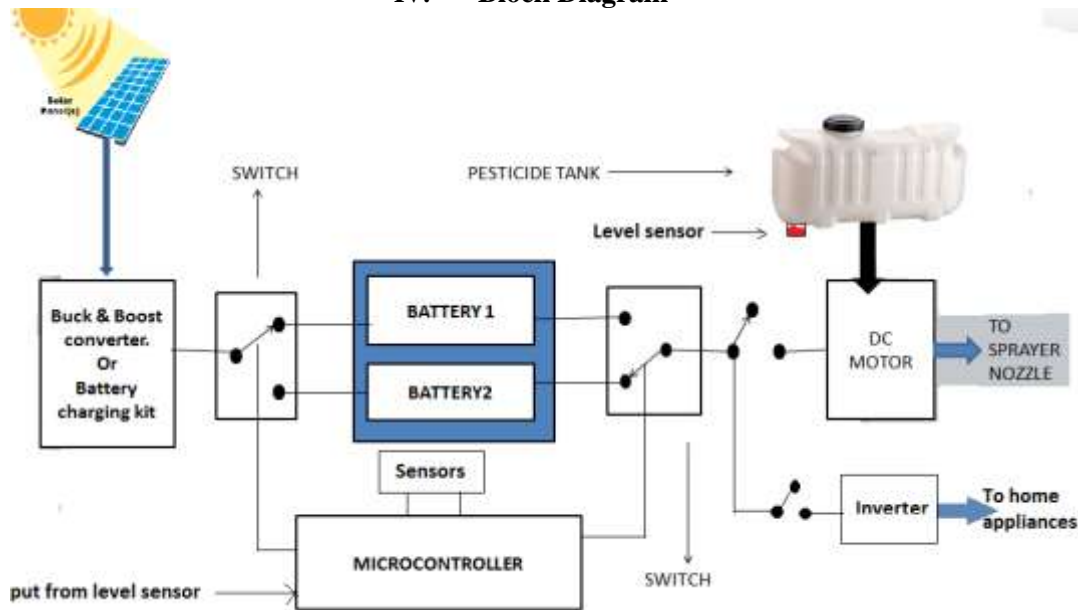


Fig.1: Structural Block Diagram Of Solar Agro Sprayer

#### 4.1 Sizing Of Main Components :

##### 4.1.1 Solar Panel

- a. Determine power consumption demands
- b. Calculate total Watt-hours per day needed from the PV modules.
- c. Size the PV modules

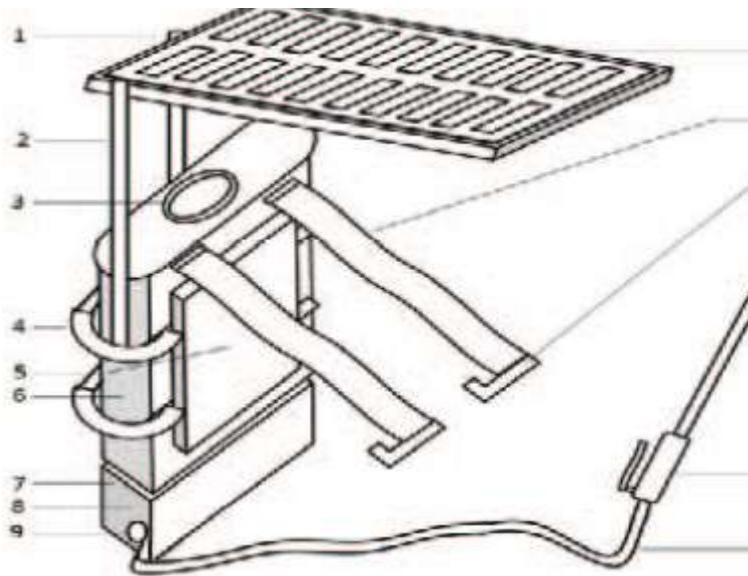
##### 4.1.2 Battery

- a. Calculate total Watt-hours per day used by appliances
- b. Divide the total Watt-hours per day used by 0.85 for battery loss.
- c. Divide the above obtained answer by 0.6 for depth of discharge.
- d. Divide the answer obtained in above step by the nominal battery voltage.
- e. Multiply the answer obtained in above step with days of autonomy (the number of days that you need the system to operate when there is no power produced by PV panels) to get the required Ampere-hour capacity of deep-cycle battery.
- f.

$$Ah = \frac{\text{total watt hours per day used by appliance} \times \text{days of autonomy}}{0.85 \times 0.6 \times \text{nominal battery voltage}}$$

##### 4.1.3 The Rough Model and working of Solar Agro Sprayer

##### 4.1.4 Rough Model



**Fig.2 :** Actual View of Solar Agro Sprayer

### **V. Working Of Proposed Model**

It comprises of sun oriented board, buck and lift converter, battery charging unit, limit switches, battery, DC engine, pesticide tank, shower spouts, and so forth. It utilizes sun based vitality to work. First the sun powered vitality is consumed by the sun based board. This sun powered vitality is then changed over into electrical vitality by the photovoltaic cell. Here buck and lift converter is utilized to supply a required voltage from sun based board to the battery. Charging of the battery is constrained by the microcontroller. Sun oriented worked agro sprayer encourages easy task. The whole unit is convenient and worked by one work or individual or administrator. Sunlight based board gives shadow on the leader of the administrator which gives assurance from high sun based power. The release rate of sun based sprayer is estimated in field condition, which is about 0.023 liter/sec (82.8 liter/hour). The strolling velocity of administrator is about 2.8 km/hr and swath width of the sprayer is about 0.6 m, which relates to a hypothetical field limit of about 0.17 hectare/hour. The viable field limit of the sprayer is seen to be 0.14 ha/h which relates to a normal inclusion of 1 hectare/day of 8 hours task.

### **VI. Conclusion**

Generally speaking plan of sunlight based worked agro sprayer puts load of board just as sprayer on shoulder, which eventually gives easy activity. Sun powered board gives shadow on the leader of the which at last gives showering task office during the evening moreover. There is an office of charging a battery through electrical source which some time required amid shower task in blustery season. The splash effectiveness diminished with reduction in voltage of battery. Rate of stream of fluid through sprayer was impacted by the fluid head. This Technology is most appropriate for Energy Alternative Device for power sprayers. administrator which gives security from high sun based force. Sunlight based board encourages to utilize it for different applications. Sprayer can pursue 3.5 hours more 5 hours of activity in full sun powered force

- 1) The farming community is more dynamic and they can accept the proved technology for implementation.
- 2) Moreover the same technique and technology can also be extended for all types of power sprayers.

### **VII. Future Scope**

By and large structure of sunlight based worked agro sprayer puts load of board just as sprayer on shoulder, which at last gives easy task. Sun based board gives shadow on the leader of the administrator which gives assurance from high sun based power. Sun oriented board encourages to utilize it for different applications. Sprayer can pursue 3.5 hours more 5 hours of activity in full sunlight based force which at last gives splashing task office during the evening moreover. There is an office of charging a battery through electrical source which some time required amid shower activity in stormy season. The splash productivity diminished with lessening in For greater dependability of agro sprayer we will be work microcontroller based sun powered sprayer and furthermore we can utilize double battery activity. As in double activity of battery robotization exchanging happens in battery charging and releasing. The all out load of the sprayer can be

decreased by utilizing low weight structure and low weight battery. voltage of battery. Rate of stream of fluid through sprayer was impacted by the fluid head.

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