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DESIGN AND FABRICATION OF SOLAR SEEDS SPRAYER FOR SMALL SCALE FARMERS

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ABSTRACT

Application of renewable energy is the only alternative solution for non-renewable energy demand. The recent trends focus usage of renewable energy in agriculture field. Solar energy plays an important role in drying agriculture products and for various purpose in remote village without electricity. In rural areas spraying pesticides is done by hand sprayers and power sprayers. Seed sprayers is mainly useful for agricultural purpose. It require fossil fuel. This paper is focused to develop solar seed sprayer. The main advantage of this developed protocol is it does not affect farmer helped by any means and does not contribute to green house gas emission.

INTRODUCTION

In recent times, rural development has received a great deal of attention in development, in national plans, on political platforms and in the lending programme of most donor countries. This is because it has now been realised, that an improvement in the working and living conditions of the rural people is the first steps towards the achievement of a balance urban – rural development, which has come to be regarded as indispensable in any worthwhile development programme. However, the need for rural development is more pressing in the developing countries, where the rural sector is appreciably large than the urban sector.

Poor agricultural performance hinders the growth of the rest of the economy and limits the resources available to promote development. Another important aspect of food production is its contribution to the formation of human capital. Malnutrition causes both mental and physical retardation and poor diet also affects general health. As a result worker absenteeism is higher and on-the-job productivity lower than would be the case with a well-nourished labour force. A slowly growing agricultural sector can also result in inflationary pressures. If domestic food production is not growing rapidly and particularly if food imports are limited by foreign exchange constraints – both the absolute and the relative price of food will tend to rise. These inflationary effects will be particularly burdensome for the very poor, who spend 50% or more of their income on food. The second major role of agriculture in the process of development is

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to provide a market for the products of the industrial sector. This paper deals how a Power Sprayer which is already in use and works with fossil fuel can be converted into solar sprayers works without any fossil fuel.

LITERATURE SURVEY

Boico et.al [1] suggested that the UNSW school of photovoltaic and renewable energy engineering grew out of the Australian research council photovoltaic's centre of excellence in response to the growing industry of renewable energy. Building on world-leading research, including holding the record for the most efficient silicon solar cell for over two decade.

Joshua et.al [2] suggested that"Energy - demand" is one the major thread for our country. Finding solutions, to meet the "Energy -demand" is the great challenge for Social Scientist, Engineers, Entrepreneurs and Industrialist of our Country. According to them, Applications of Non conventional energy is the only alternate solution for conventional energy demand. Solar energy plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote villages without electricity. This Technology on solar energy can be extended for spraying pesticides, Fungicides and Fertilizers etc., using Solar Sprayers.

LaukikRaut [3]suggested that in order to meet the food requirements of the growing population and rapid industrialization, modernization of agriculture is inescapable. Mechanization enables the conservation of inputs through precision in metering ensuring better distribution, reducing quantity needed for better response and prevention of losses or wastage of inputs applied. Mechanization reduces unit cost of production through higher productivity and input conservation. Farmers are using the same methods and equipment for the ages. In our country farming is done by traditional way, besides that there is large development of industrial and service sector as compared to that of agriculture. The spraying is traditionally done by labour carrying backpack type sprayer which requires more human effort. The weeding is the generally done with the help of bulls which becomes costly for farmers having small farming land. So to overcome these above two problems a machine is developed which will be beneficial to the farmer for the spraying and weeding operations.

Lei Tian et.al [4] suggested that a machine-vision-system-guided precision sprayer was developed and tested. The long term objectives of this project were to develop new technologies to estimate weed density and size in real-time, realize site-specific weed control, and effectively reduce herbicide application amounts for corn and soybean fields. This research integrated a real time machine vision sensing system with an automatic herbicide sprayer to create an intelligent sensing and spraying system. Multiple video images were used to cover the target area.

To increase the accuracy, each individual spray nozzle was controlled separately. Instead of trying to identify each individual plant in the field, weed infestation zones (0.254 m by 0.34 m) were detected. The integrated system was tested to evaluate the effectiveness and

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performance under varying field conditions. With the current system design and using 0.5% weed coverage as the control zone threshold, herbicide savings of 48% could be realized.

Nathan [5] suggested that at present, solar energy conversion technologies face cost and scalability hurdles in the technologies required for a complete energy system. To provide a truly widespread primary energy source, solar energy must be captured, converted, and stored in a cost-effective fashion.

Masatoshi Takeshita et.al [6]suggested that an improved snow thrower and specially an improved blower therefore that improves efficiency and reduces the likelihood of snow accumulation. The blower casing is connected to the auger housing by an exit opening that is disposed and sized so that snow blown by the blower will not re-enter the auger housing. The peripheral edge of the blower casing is curved soars to reduce the likelihood of snow accumulation.

Rizk et.al [7]suggested that the potential system benefits of simple tracking solar system using a stepper motor and light sensor. This method is increasing power collection efficiency by developing a device that tracks the sun to keep the panel at a right angle to its rays. A solar tracking system is designed, implemented and experimentally tested. The design details and the experimental results are shown.

Samuel et.al [8]suggested that few bio pesticides are currently used commercially as alternatives to chemical pesticides. Part of the problem is that methods of application of biological agents have not been adequately considered. This paper reviews current information on the application of bio pesticides and concludes that more research and development is needed to develop effective application technologies so that those bio pesticides showing promise, under laboratory conditions, can be applied by farmers.

SwapnilKolhe et.al [9]suggested that as on today the whole world is facing a problem of energy crisis. If we want to continue for prolonged use of energy then we must try to save it as much as we can whether it is on large scale or small scale. In today's world, we use various spraying technologies involving use of electrical energy, chemical energy of fuels. This fact makes us know that how large content of energy is getting used at such a places where mechanical energy can be used instead of direct energy sources. This is a reason why we have implemented some mechanical sprayers getting powered by human effort. Although these are serving the purpose, their range of working is not enough. They take considerably larger time for spraying.

Thus what this paper is focussed to design such a technology which will run on mechanical power but requiring less time for spraying than those which are hand operated. Thus considering today's demand, we have come up with mechanically operated multipurpose spray pump which is purely mechanical. This device is having the advantage of taking less time for spraying once it starts. If we want to decrease the time further we just need to increase size of our piston and no. of nozzles with relative change in effort.

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WORKING PRINCIPLE OF SOLAR SEED SPRAYER

Solar radiation can be converted directly into electricity using semiconductor devices, which are known as Photovoltaic (PV) cells. When sunlight falls upon the solar cell a part of the light is absorbed and it is converted into electrical energy by means of electron movements. The solar panel is to be placed at the top in the device and is supported by the frame. The panel traps the solar energy and converts it into electric energy this electricity is then stored in a battery placed at the bottom of the device on the frame. The battery provides the necessary electricity for the operation of the device. The motor can be turned on and off with the help of a switch placed near the frame. A tank is attached at the back of the frame whose capacity is up to 12 litres and it is used to carry seeds or store liquefied pesticides and fertilizers. The battery runs the motor placed at the centre. The shaft of the motor drives the air blower which blows the air out at high speed through the sprayer

Figure 4.3 Solar seed sprayer

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List of components

Sl. No.	Part name	Material	Quantity
1.	Solar panel	Silicon	1
2.	Stand	M.S	1
3.	Hooper	Plastic	1
4.	Nozzle	Plastic	1
5.	Blower	M.S	1
6.	Impeller	Aluminium	1
7.	Battery	Lead-Acid	1
8.	D.C motor	Aluminium	1
9.	M.S rod And flat plates	M.S	1
10.	Adjustable Screw	M.S	1
11.	Connecting Wire	Cu	2 meter

MATERIALS COST:

Sl. No.	PART NAME	MATERIAL	QUANTITY	AMOUNT (RS)
1.	Solar cell	Silicon	1	2000
2.	Stand	M.S	1	200
3.	Hooper	M.S.Sheet	1	20
4.	Nozzle	Plastic	1	100
5.	Blower	Sheet metal	1	2000
6.	Impeller	Aluminium	1	100
7.	Battery	Lead-Acid	1	1500
8.	D.C motor	Aluminium	1	1000
9.	M.S rod And flat plates	M.S	1	100
10.	Adjustable Screw	M.S	1	10
11.	Connecting Wire	Cu	2 meter	20

TOTAL= 7,050

TESTING OF CHARGING TIME AND RESULTS

The solar panels time measurement was tested and the obtained results are tabulated in table. The other observations noticed from the test are given below the table,

Testing of charging time

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Sl. No.	Description	Time taken (hours)
1	When the Solar radiation is between 200 to 300 mW/cm^2	3 to 4 hours
2	When the Solar radiation is between 300 to 400 mW/ cm^2	2 to 3 hours
3	When the Solar radiation is between 400 to 600 mW/ cm^2	1 hour
4	Running period	3 to 4 hours

When testing the solar seed sprayer for its performance three different seeds were taken for testing which can be broadcasted using hand also. Three different seeds were used such as rice, wheat and maize for obtaining the tabulated result. The readings are tabulated below in table. The results are given below,

Particulars	Storage weight (kg)	Time (min)	Distance (m)
Rice	1	4	7
	¾	3	7
	½	2.5	7
	¼	1	7

Particulars	Storage weight (kg)	Time (min)	Distance (m)
Wheat	1	5	6
	¾	4	6
	½	3	6
	¼	2	6
Maize	1	5	5
	¾	4	5
	½	2.5	5
	¼	2	5

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Results Obtained For Fertilizer

The fertilizer used for testing was potassium (k). These fertilizers are used in agriculture just before seeding. The results obtained the test are tabulated in the table 4.5.

Readings for fertilizer

Particulars	Storage weight (lit)	Time (min)	Distance (m)
Fertilizer	12	60	10
	10	40	10
	8	30	10
	5	15	10

CONCLUSION

The project solar seed sprayer is used to spray seeds, fertilizer and pesticides. The device is thus fabricated and tested at its best and the results are shown in the tabular columns mentioned above. It is very useful for small scale farmers which does not affect the farmer's health in any way while spraying and easy to carry on the field. Any unskilled labor can operate it easily. This developed model reduces the weight and also eliminates the harms to the farmers. It proves to be an efficient and thus it is a step forward to enrich our rural agricultural sector. The main advantage of this developed protocol is, it does not affect farmer health by any means and also it does not contribute to greenhouse gas emission. This technology is most suitable for energy alternate device for power sprayers

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