MULTIPURPOSE ECO PEST CONTROL VEHICLE USED IN AGRICULTURE FIELD

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Abstract:

The excessive and inappropriate use of agrochemicals has undeniably resulted in adverse and sometimes irreparable effects on the environment including human health. Bio pesticides sprayers are the set of tools whose applications will help farmers transit from highly toxic conventional chemical pesticides into an era of truly sustainable agriculture. Helping farmers move from their current chemical dependency to organic agriculture and beyond requires tools for the transition and tools for a new era. Chemical pesticides have been widely overused by farmers can be minimized by developing eco-friendly equipment and scarcity of labor can be replaced by Semi-Automated Guided Vehicle (SAGV). The possible solution will be researched to enhance multipurpose farming equipment.

In this work multi-purpose eco pest control SAGV was developed. The battery assembled on the SAGV was easily replaceable and detachable type. The battery used for SAGV can be chargeable by solar panel and path for the SAGV was controlled by remote and pest sprayer control was used to kill the insects. Performance of the machine helps to improve the rate of yield. Solar based panel connected to lamp helps in killing the harmful insects during the evenings and night time. The pest sprayer control was used to kill the insects during the day time. Based on the overall performance of the machine it can be concluded that, the project will satisfy the need of the small scale farmer due to low cost equipment.

Index Terms **- Automatic root crop washer, Cleaning the root vegetables, Filtering.**

I. INTRODUCTION

Agriculture is the art and underlying science in production and improvement of field crops with the efficient use of soil fertility, water, labour and other factors related to crop production. It is the most important enterprise in the world and about 70% of Indian populations are either farmers or involved in some agricultural related activities. Multifunctional agricultural vehicle mainly focuses on the basic problems faced by farmers such as fertilizers spraying. Due to revolution in small farms in India, low cost and more efficient way farming was performed. Farming is called as backbone of Indian economy but very complicated as it contains various operations like weeding, sowing, harvesting etc. Harvesting depend on nature for various reasons like climatic changes, this leads to change in growing conditions of plant in farms. The changes causes various diseases on plants which decreases productivity and hence increases the cost of production. Thus pesticide spraying operation is suitable to protect plants from diseases and plays an important role in agriculture sector.

Pranoy et.al [1] fabricated pesticide series sprayer with the feature of 360º pipe rotation and adjustable pipe length. In their work the model was designed by using CATIA and fabrication was carried out by different techniques and testing was carried out at different agricultural crops.Akhilesh et.al [2] studied many areas in agricultural sector where speed of modernization is quiet slow. One of the main sectors is pesticide spraying machine and by modernization in this sector pesticides can be evenly distributed on farms which will reduce wastage of pesticide and hence prevents wastage of inputs applied on farms which reduces cost of production. Mechanization in pesticide spraying technology produced higher productivity with minimum input.

Shalini et.al [3] designed real time to guide the platform on the basis of detection of crop using Ultra-Sonic sensor. The system basically developed to implement an agricultural production and very useful in agriculture field to spray the pesticide to different crops. This automatically sense crop of both sides by using ultra-Sonic sensor. Embedded Chip ARM 7 LPC2148 is heart of this work and the system and KEIL C software was used to code the algorithm.Gaodi et.al [4] reviewed paper to develop a new mechanical system which will overcome all the above problems and will help farmers. Dhraj Kumbhare et.al [5] studied different types of pesticides sprayer available in India. The most commonly used sprayer was backpack type sprayer which is used by farmers because it is cheaper, easy to use and main thing about it is less costly.

Hermosilla et.al [6] novel approach used for designing vehicle can operate different tools such as a spray system for applying plant-protection product, a lifting platform to reach the top part of the plants to perform pruning and harvesting tasks, and a trailer to transport fruits, plants, and crop waste. Regarding autonomous navigation, it follows the idea of AGVs, but now laser emitters are used to mark the desired route. Raju et.al [7] In their work the three sets of infrared sensors (IR sensors) are used to build fully Automated Guided Vehicle. The material loading was counted with IR sensor and vehicle starts running from the starting station. The vehicle is stopped by the end station by another IR sensor which is fixed to the end station. The loaded material is removed from the vehicle and this is counted by the sensor.

Suman et.al [8] developed automated guided vehicle and pre-defined manufacturing environment map, this was saved in the AGV memory to control unit of warehouse. AGV system essentially consists of vehicle peripheral on site component as well as stationary control system. Gaur et.al [9] reviewed AGV based material handling system. The various factors influencing the design and operation performance of AGV in a manufacturing unit. Donald et.al [10] reported many studies of pesticides and health effected from pesticides. Julian et.al [11] used principles of AGVs inside greenhouses, but avoiding the necessity of modifying the crop layout, and avoiding having to bury metallic pipes in the greenhouse floor. The designed vehicle can operate different tools, e.g., a spray system for applying plant-protection product, a lifting platform to reach the top part of the plants to perform pruning and harvesting tasks, and a trailer to transport fruits, plants, and crop waste.

Makim et.al [12] associated with the extensively documented disappearance of beneficial arthropods, notably pollinators, from farming systems. Tuan et.al [13] reviewed the design and control of automated guided vehicle systems. There addressed most key related issues including guide-path design, estimating the number of vehicles, vehicle scheduling, idle-vehicle positioning, battery management, vehicle routing, and conflict resolution.

In this work, eco-friendly pest control solution helps to protect the crops, increase the yield and profits to the farmers. It also helps farmers in reducing the labor cost by the use of SAGV powered by solar panels. The solar energy was stored in battery connected to vehicle used for glowing of bulb and spraying. The pesticides spraying which usually includes hand spraying or motor spraying with a backpack. The development of new portable techniques was adopted to fabricate multipurpose eco pest control semi-automated guided vehicle.

II. METHODOLOGY

Chemical pesticides have been widely overused by farmers can be minimized by developing eco-friendly equipment and scarcity of labor can be replaced by SAGV. The possible solution will be researched to enhance multipurpose farming equipment.

- In this work remote control were used to build Semi Automated Guided Vehicle.
- The vehicle starts running from the starting point and stopped by the end point by another IR sensor which is fixed to the end destination.
- Battery assembled on the SAGV is easily replaceable and detachable. The battery used for SAGV can be chargeable by solar panel and path programmed for the SAGV in a micro controller chip.
- The excessive and inappropriate use of agrochemicals has undeniably resulted in adverse and sometimes irreparable effects on the environment including human health will be minimized using solar based lamp to kill harmful insects.
- Bio pesticides sprayers are a set of tools whose applications will help farmers transit from highly toxic conventional chemical pesticides into an era of truly sustainable agriculture. Helping farmers move from their current chemical dependency to organic agriculture and beyond requires tools for the transition and tools for a new era.
- The use of bio-pesticides controls the weeds, insect infestation and diseases and does not harm the useful insects.
- The sprayer acts as different use of pesticides such as herbicides, fungicides, insecticides.
- The use of battery can also be charged by electricity during the uneven climatic conditions where there is scarce of solar energy..

III. DESIGN

The purpose of this project is to provide farmer with multipurpose equipment which implements all the scientific farming specifications and technology to get maximum yield and good quality crops by reducing investment and number of labor. There are many tractor powered equipment which are suitable and economical only for more than 5 acres of land. There are many hand pulled equipment's which are only suitable for gardening purpose. Figure 1 shows eco pest control machine and objective of design was to make multipurpose eco pest control semi-automated guided vehicle used in agriculture field. Hence it was most suitable for Indian economy and farming techniques.

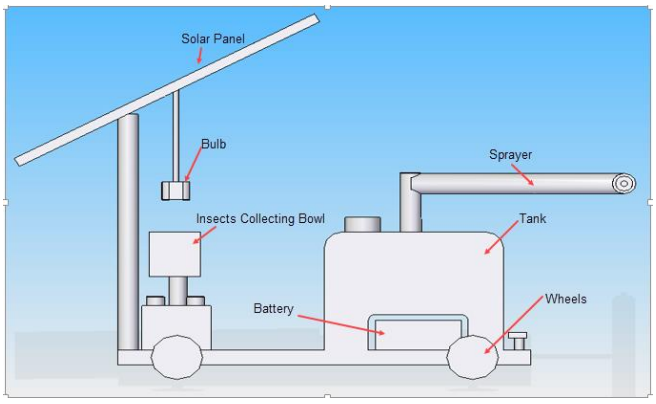

Fig 1 *Eco Pest Control Machine*

IV. FABRICATION OF ECO PEST CONTROL MACHINE

Fig 2 *Tank with sprayer and bowl*

Fig 3 *Bowl used to trap insects*

Fig 4 *Frame, wheels and support structure which holds the solar panel*

The Figure 2 to Figure 4 shows the fabrication of multipurpose machine and this machine used to improve the rate of yield. In multipurpose agricultural equipment all the parts are easily assembled with required length and specifications of field operation. The various parts connected and its functions are been discussed as follows

- Solar based panel, connected to lamp, helps to kill the harmful insects during the evenings and night time.
- The pest sprayer control is used to kill the insects during the day time.
- The use of the semi-automated guided vehicle helps in reducing the maximum human interference.
- Usage of bio pesticides reduces the growth of unwanted plants, and does not affect the useful insects and worms.
- Reduction of waste development of unwanted growth of plants.

V. RESULTS AND DISCUSSION

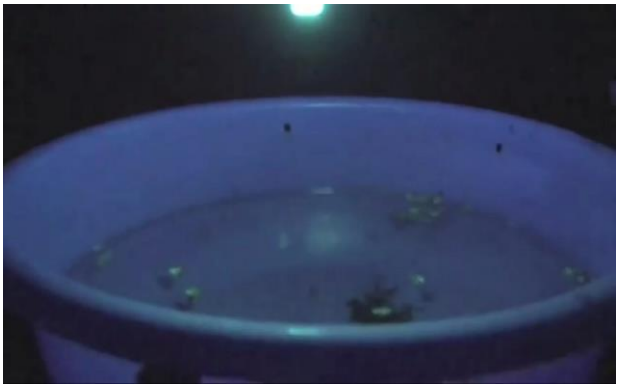

Fig 5 *Insects trapped in water bowl*

Fig 5. Shows the insects which were trapped in the late evening during the field visit and glowing of bulb by using the solar energy. The stored battery also used to light at night time. The different night insects harmful to the crops such as stem borer, bollworm, thrips pod sucking bugs, root borer and weevil were been killed effectively in the bowl.

Fig 6 *Pesticide spraying action in the field.*

From Fig 6 shows working model in which the sprayer is added with pesticides and water. The main pesticide was used was Neem powder, because it does not kill insects and worms but keeps them far away protecting the crops. The pesticides are sprayed uniformly over the all area of different plants tested such as saga palm plants, Aucuba and Mahonia.

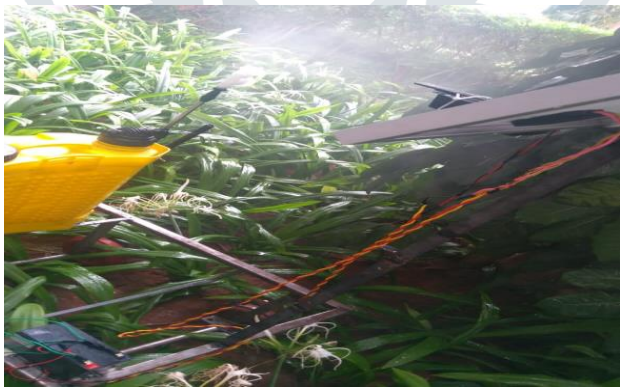

Fig 7 *Charging of battery by solar panels.*

Fig 7 shows semi-automated guided vehicle model equipped with solar panel. The batteries are charged with the help of solar panel in which the solar energy is used for spraying the pesticides and glowing of the bulb during night times.

Multifunctional agricultural vehicle mainly focuses on the basic problems faced by farmers in spraying fertilizers. This work helps the small farms, horticulture in India, with low cost and more efficient way. The developed eco-friendly pest control solution used to protect the crops, increases the yield and profits to the farmers. It also helps farmers in finding the availability of farmers and to curb the rising prices of labor's by the use of semi-automated guided vehicles powered by solar panels. The pesticides spraying which usually includes hand spraying or motor spraying with a backpack, this minimizes time consuming process, labor health problems, and higher wages. Finally this techniques of semi-automated guided vehicle, will be benefited to

sprays eco-pesticides powered by solar energy. The Crop protection and environmental protection are mutually ideas where they should go hand-in-hand. This design of pest control solution has high impact on the environment, health and safety.

CONCLUSION

- Portable semi-automated guided vehicle equipment used for multipurpose work. Solar based panel, connected to lamp, helps to kill the harmful insects during the evenings and night time.
- The pest sprayer control is used to kill the insects during the day time and use of the semi-automated guided vehicle helps in reducing the maximum human interference.
- Usage of bio pesticides reduces the growth of unwanted plants, and does not affect the useful insects and worms.
- Initial investment is less and maintenance free and reduces labors cost due to automation.
- The overall performance of the machine was good, the project will fulfill the needs of the small scale farmer because of low cost equipment and multipurpose machine.

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