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Design and Development of Variable Flow of Pesticide Sprayer for Agriculture Purpose

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Abstract: *Agriculture is India's economic engine. In order to protect crops from becoming rotten and contaminated by harmful organisms including fungi, bacteria, parasites, and insects, pesticides must be sprayed on the crops. At the moment, pesticide spraying is a manual process that uniformly covers a variety of crops with varying sizes and forms. Our farmers continue to spread the chemicals using an antiquated technique that damages their skin, requires a lot of time and effort, and involves carrying the chemicals on their backs and using their hands. So, our goal is to make the pesticide application process simpler. Considering that herbicides are sprayed, installing a removable farmer will only need to drive the cart with simple operation and spray a variable amount of pesticide based on the form and size of crops as a result of the introduction of a detachable setup for pesticide spraying.*

Keywords: Nozzle, Sensors, Arduin, Battery, Pump, Tank

I. INTRODUCTION

Farmers often spray crops using a backpack-mounted sprayer, which is time- and money-consuming and raises serious safety concerns about human tiredness. In today's agriculture, sprayers are crucial to the application of pesticides. Sprayers come in several forms, including motorised and hand-operated. An essential farming procedure is pesticide spraying. The market currently offers a wide variety of pesticide sprayers. Different pesticide sprayers come in a variety of sizes, styles, and carrying options, but they all serve the same purpose. Our project's current sprayer idea is to use it effectively to cut down on the amount of time, labour, and money spent spraying.

Attacks by pests, diseases, and weeds are the main causes of decreased crop output. For most insects, weeds, and illnesses, chemical control is the widely used strategy. With the use of a pump or duster, the chemicals are either sprayed, sprinkled, or dusted on the crop. One of the best ways to administer spray liquid to crops in order to protect them is through spraying. The design is built on a trolley-operated system, which allows us to work more efficiently and spend less time doing it. Farmers still use the same old technique for spraying pesticides, which may have a number of negative side effects like skin conditions and eye irritations as well as more serious health problems like cancer, asthma, and allergies. Farmers can quickly spray pesticides and distribute manure with the aid of this sprinkler because there is no need for additional manpower and the amount of time required is reduced. It will be useful to have a multipurpose tool that can be used in various farming spraying stages depending on the process's needs. So, in order to boost output while reducing farmer work, we have developed a pesticide spraying equipment. In addition to saving the farmer time, the equipment will increase spraying effectiveness. This particular model comes with a multi-nozzle pesticide sprayer pump that will execute spraying at maximum rate in shortest amount of time. For uniform nozzle pressure, constant flow valves can be used at the nozzle. Because of the need to save money and protect the environment from chemical pollution, a viable replacement to the spraying method should be found.

Due to the wide range in farm holding size and socioeconomic inequality in India, the country has a heterogeneous farm mechanisation landscape. In India, small and marginal landowners make up the majority of farmers. The sprayer's spraying process requires more time and energy. Due to current cropping patterns, the size of the accessible fields, and the state of the fields during the wet season, farmers have a tough time adapting to tractor-operated sprayers. To solve these issues Since tractors and other sources cannot be moved on fields during the rainy season, pesticide sprayers are an excellent option since they can be used on fields simply and without any problems.

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II. LITERATURE SURVEY

In Paper [1] title "Design and Development of Trolley type Agrochemical Sprayer," which details the design, analysis, and fabrication of a trolley type pesticide sprayer.

1. When determining the stress and strains (deformation) in the components, ANSYS is a very powerful and useful tool.
2. The fabrication costs are low due to the design's simplicity and compactness.
3. Thanks to government subsidies, the constructed model is inexpensive for farmers in the middle and lower classes.
4. The crank-slotted lever spraying mechanism used in the current project is more effective and requires less maintenance than other types of spraying mechanisms.
5. A pesticide sprayer needs a travel route that is at least 30 cm wide. Consequently, it may move along a narrow path without harming the crops.
6. The project fully removes labour wages and farmer- back sprayer tank transport.

Additionally, it can be said that the project work being done now will serve as a guide for engineers in the creation of new pesticide spraying techniques and processes in the future

The spraying mechanisms can be changed to carry out additional work since the current work is not yet exhaustive.

In Paper [2] title "Application of variable spray technology in agriculture" (paper no. All walks of life are paying growing attention to the negative consequences brought on by this issue, such as the low utilization rate of pesticides and environmental degradation. The development of a wide range of high-performance variable application techniques with various atomization properties is the key to enhancing the quality of precision application. The nation has recently increased its expenditure in scientific research as it has become increasingly concerned with environmental protection and food safety. Technology will inevitably produce the most precise agricultural indicator of the variables. The current development is mostly focused on software, specifically signal processing and pattern recognition, even though the detection and recognition of the target is divided into hardware and software. Academic activities are quite busy, and there are a lot of new ideas, methods, and algorithms available because of the multidisciplinary nature of signal processing and pattern recognition, as well as the existence of specialised international academic organisations. With the new concepts, there are still lots of opportunities for innovation and development.

In Paper [3] title "Sprinkler design with agricultural applications", This study discusses the fact that this two-in- one design requires relatively little actual field work, making it user-efficient at a comfortable level. This technique can enhance the amount of area sprayed every hour. The tricycle- operated machine may perform very efficiently in terms of covering area, time, and cost of the spraying process, according to a comparison between the old machineries and the current machine.

It appears economical as well. It is suited for spraying and has low costs, allowing farmers to readily afford it.A project that is affordable for low- and middle-income farmers thanks to government subsidies.

In Paper [4] title "Real-time nozzle flow uniformity when using automatic section control on agricultural sprayers" appears in Paper [4]. The rate controller's VCN programming had an impact on the nozzle flow stabilization period. For speedier nozzle flow stabilisation, various field operating and driving behaviour scenarios from SS1 (343 VCN), SS2 through SS4 (313 VCN), and SS5 (323 VCN) required distinct VCNs. The outcomes highlighted the fact that applying a single VCN to multiple scenarios would not produce the best nozzle flow response. In comparison to ASC actuation (0.1- 3.7 s; _20-4.7% with 313 VCN), scenarios involving sprayer acceleration and deceleration had longer nozzle stabilisation times and larger application errors (5.6-13.3 s; _10-96.2% with 313 VCN). The lowest accumulation during acceleration and deceleration ranged from 524 to 543, but for point rows it ranged from 36 to 60. The control system would be more stressed during flow regulation due to operator behaviour during acceleration and deceleration, which frequently required new goal rates.

III . METHODOLOGY

In addition to the fact that industrial and service sectors have developed far more rapidly than agriculture in our nation, farming is still done in the traditional manner. The labor- carrying backpack type sprayer has historically been used for spraying, which demands more human effort. They are typically carried out with the aid of our project, which is expensive

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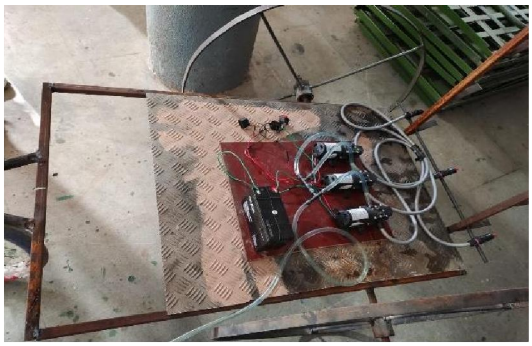
for farmers with modest farming lands. In order to resolve these issues, we worked to find solutions and created equipment that would be useful to farmers when spraying crops.



Data gathering methods include literature surveys, user studies, and market analyses using surveys, videos, and other methods like observation.

In this process is carried out by the take servral steps :

- Step1- Firstly sensors is use to collecting the data for environment.
- Step2- After collecting the data is transfer to the controller and controller control the flow as usually .
- Step3 – It can control the flow of the nozzle and variable flow are produces .
- Step4- In this project , Sprayer Pump can be manually operated ,if we want the higher pesticide flow then press the 3 switch button in ON mode and so on .

PDS would be produced by ranking the features in the QFD according to the user needs and related technical requirements. Digital modelling and sketching would be used to create concepts .Make some doodle sketches, then five concepts and a digital model will be produced utilizing CATIA software and have intricate features. concept assessment and Using a weighted ranking system, the winning concept was chosen. A working prototype with specific features would be created, and feedback would be gathered.

IV. COMPONENTS

NOZZLE : It is a device which converts the pressure energy of fluid into kinetic energy, spray nozzle is a precision device that facilitates dispersion of liquid into a spray. Nozzle is used for purpose to distribute a liquid over an area. Nozzles break the liquid into droplets, form the spray pattern, and propel the droplets in the proper direction. Nozzles determine the amount of spray volume at a given operating pressure, travel speed, and spacing.

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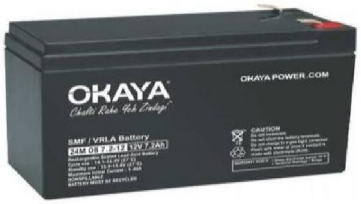
PUMP : It consists of piston and cylinder arrangement, it has a lever to operate the motion of piston in reciprocating direction. The pump generates the pressure of 2 bar and discharge.

BATTERY: A battery is a device used to power electrical equipment that consists of one or more electrochemical cells with external connections.



WHEEL: A circular component designed to rotate on an axle bearing is referred to as a wheel. In the wheel and axle, one of the six simple machines, the wheel is one of the essential parts. When wheels and axles are used together, large things can be transported or moved more readily while bearing a load or carrying out work in machines. It is employed while moving a car from one location to another.

FRAME: A frame's primary job is to support the weight of the entire assembly, so it must be sturdy enough to do so. Mild steel was used to build the frame, which is made of square pipe.

ARDEUINO: The Arduino UNO is an ATmega328P-based microcontroller board. It contains 6 analogue inputs, a 16 MHz ceramic resonator, a USB port, a power jack, an ICSP header, and a reset button. It also has 14 digital input/output pins, six of which can be used as PWM outputs.

SENSORS: Automatic target identification orchard sprayers now use infrared device detection technologies to identify targets and automatically regulate the spray system. Compared to ultrasonic sensors, infrared sensors are more affordable and respond more quickly (US).The infrared sensor performs better inside than outside. Whether an object is light or dark depends on the sort of thing that has to be detected by the infrared sensor.

IV . FUTURE SCOPE

Future agricultural technology applications for the mechanized agriculture sprayer vehicle are possible.

1. Electrical power loss can be prevented by using an electrical system to drive the vehicle.

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2. The system has the ability to be modified into a multifunctional device that can perform more than two tasks at once.
3. The mechanized agriculture sprayer vehicle trolley wheels can be improved further to allow for operation on rough terrain.
4. Because it has the capacity to accommodate one, you can utilise a weeder and cutter mechanism. It may have a place for carrying agricultural tools and equipment.

V. CONCLUSION

The tools were specifically created for farmers with small farms, say 5 to 6 acres. It can be used for both spraying and weeding at the lowest possible cost to the farmer, allowing him to afford it. When used for weeding, the equipment will work better if the soil is damp since the weed cutter can more readily penetrate and dig out the weeds. This will make the weeding process go more quickly. When operating on a smooth surface or one that is less uneven, the equipment will function better. It will also work better when used on crops that are close in height to one another and when there is less space between them. Since there is no longer a need to carry the tank on one's back and solder, the back discomfort issue has been solved by the suggested model. There are more nozzles available, covering a larger area of spray in less time at a faster rate.

A well adjusted crop facility in the model helps to reduce the overuse of pesticides, which lowers pollution.In the field, hollow cone nazzles that were imported should be employed for improved performance. There is no longer a muscular issue, and using the lever is unnecessary.One pump can be used for several different crops.We discovered after a trial that using a push-type machine is simple for most people. Following a test, we have discovered that one finds it simple to operate.

The pump can deliver the liquid at a sufficient pressure where the output of the nozzle in 1 minute is 0.3 and spray width is calculated to be 0.4m so that it spreads evenly over the spray surface and reaches all of the foliage.

Although a touch heavy, it functions effectively in the challenging farm settings. All types of farmers may afford it because it is economical.

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