

Agricultural Based Wheel Sprayer

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Abstract- The project applied the use of observation based on the manual method currently used using poisoning of various pests. The objective of this project is to design a device that is capable of producing a more effective pesticide sprayer for use in small or rural industries in the agricultural sector. Additionally, there are several research scopes that have been defined in this project, producing and developing ergonomic wheel sprayers. To reduce spraying time in vegetable gardens or orchards and to increase spraying efficiency as it contains more than one nozzle during spraying. All these are set to solve some of the problems that arise with the use of existing methods among which, the existing sprays cannot be effective and require additional time for spraying. The material for this project also requires special properties that do not rust and do not affect plants, based on the literature review conducted stainless steel is the most suitable for this project. While for the component formation process, the research methodology is used for the project production process by using flow charts as a guide to plan the production and testing of the project. As a result, the whole project was successfully produced with the additional rate of time saving of traditional methods. Based on these results, the results of analysis and discussions conducted, it can be concluded that this sprayer wheel has achieved the objectives discussed. In addition, this tool is also proven to be able to save time differently the traditional way.

I. INTRODUCTION

Farmers use the same methods and equipment to plant seeds, spraying pesticides. The method used by gardeners perform the process of spraying pesticides and herbicides. Gardeners need to cover their gardens with pesticides and pesticides to ensure that no shrubs grow and are used free of insects, caterpillars, and other pests. While gardeners will use a Knapsack manual sprayer to spray their garden, this may take a long time to finish spraying their garden. In addition, this manual Knapsack sprayer uses only one nozzle. There is a need for the development of effective spraying and weeding machines to increase productivity. Small farmers are particularly interested in manually operated backpack sprayers because of their flexibility, cost, and design. With a wheel spray pump combined with wheels and easier to move makes the working system very easy. This one trolley system by using this we can reduce the maximum

effort required to spray pesticides as well as we can spray pesticides in any direction or around the plant at crop height. This paper shows a model of a wheeled spray pump that will perform spraying at the maximum rate in the minimum time.

II. PROBLEM IDENTIFICATION

1. Uneven Pesticide Distribution Traditional manual sprayers often lead to non-uniform spraying, causing some plants to receive excess chemicals while others receive insufficient amounts.
2. Farmer Fatigue and Health Issues Hand-held or backpack sprayers require continuous pumping and carrying weight, which leads to physical strain, fatigue, and possible exposure to harmful chemicals.
3. Low Efficiency in Large Fields Manual spraying methods are time-consuming and slow, making them inefficient for farmers working on medium or large agricultural land.
4. Excess Chemical Usage and Wastage Conventional sprayers can result in overuse of pesticides and fertilizers, increasing costs and causing environmental pollution.
5. Difficulty in Maintaining Consistent Pressure Maintaining proper pressure in manual sprayers is difficult, which leads to irregular spray flow and reduced effectiveness of pesticides or fertilizers.

Justification for AGRICULTURAL BASED WHEEL SPRAYER

1. It reduces the physical effort required by farmers during pesticide spraying.
2. It helps in spraying chemicals uniformly across the crops.
3. It increases the speed and efficiency of spraying in agricultural fields.
4. It minimizes the wastage of pesticides and fertilizers.
5. It provides a low-cost and easy-to-use solution for farmers.

III. OBJECTIVE

The objective of the agricultural wheel sprayer project is to design and develop a wheel-operated spraying system that reduces farmers' physical effort, ensures uniform

pesticide spraying on crops, improves the speed and efficiency of spraying operations, and provides a low-cost and easy-to-use solution for agricultural fields.

Specific Objectives:

1. To design and fabricate a wheel-operated sprayer for agricultural use.
2. To reduce the physical strain on farmers during spraying.
3. To ensure uniform distribution of pesticides on crops.
4. To improve the efficiency and coverage of spraying operations.
5. To reduce the time required for spraying large agricultural fields.
6. To minimize wastage of pesticides and fertilizers.
7. To develop an easy-to-operate and user-friendly system.
8. To create a low-cost spraying device suitable for small farmers.
9. To improve crop protection by effective pesticide application.
10. To promote better agricultural practices using simple technology.

IV. WORKING PRINCIPLE

The agricultural wheel sprayer works on the mechanical force generated by pushing the wheel, which drives a pump connected to the spray system. As the wheel rotates, it operates a piston or diaphragm pump that pressurizes the liquid (pesticides, herbicides, or fertilizers) stored in the tank. The pressurized liquid is then forced through nozzles, producing a fine and uniform spray onto the crops. The speed of spraying and coverage depends on the rotation of the wheel and the pump design, allowing efficient, labor-saving, and consistent chemical application across the field.

Working Steps:

1. Filling the Tank – Fill the sprayer tank with the required pesticide, herbicide, or fertilizer solution.
2. Positioning the Sprayer – Place the wheel sprayer at the starting point of the field to be sprayed.
3. Pushing the Sprayer – Push the sprayer forward; as the wheels rotate, they drive the mechanical pump.
4. Pressurizing the Liquid – The pump pressurizes the liquid in the tank as the wheel moves.
5. Spraying through Nozzles – Pressurized liquid is forced through the nozzles, creating a fine, uniform spray over the crops.
6. Controlling Flow – Adjust the nozzle or pump if needed to regulate spray pressure and flow.

7. Covering the Field – Move the sprayer along the field systematically to ensure all crops are sprayed evenly.
8. Completion and Cleaning – After spraying, empty any leftover liquid and clean the tank and nozzles to prevent clogging and chemical residue.

Key Components Involved:

- Wheel/Chassis – Supports the sprayer and allows easy movement across the field.
- Connecting Rods/Gears – Transmit motion from the wheel to the pump mechanism.
- Spray Pipes/Manifold – Distributes the pressurized liquid from the pump to the nozzles.
- Tank/Reservoir – Holds the pesticide, herbicide, or fertilizer solution.

V. ADVANTAGES

- **Reduces Manual Labor** – Less physical effort compared to hand-held or backpack sprayers.
- **Uniform Spraying** – Ensures even distribution of pesticides, fertilizers, or herbicides.
- **Time-Efficient** – Covers larger areas in less time, increasing productivity.
- **Cost-Effective** – Simple design and low maintenance make it affordable for farmers.

VI. FOLLOWING ARE THE MAIN COMPONENTS

1. Wheel
2. Nozzles
3. sprayer
4. earing
5. Base frame
6. Nut & Bolt

1. Backpack sprayer



2. Gears and chain

VII. CONCLUSION

The Agricultural Based Wheel Sprayer is an innovative and practical tool designed to improve the efficiency of modern farming. It allows farmers to apply pesticides, herbicides, and fertilizers with minimal physical effort compared to traditional methods. The wheel-driven mechanism ensures a consistent and uniform spray, which enhances crop protection and overall yield quality. By reducing manual labor, the sprayer saves significant time, especially when covering large agricultural fields, thereby increasing productivity. Its simple design makes it cost-effective, durable, and easy to operate, making it suitable for small and medium-scale farmers. The use of this sprayer minimizes chemical wastage, which lowers costs and reduces environmental pollution, promoting sustainable agricultural practices. Additionally, it decreases the health risks and physical strain associated with conventional spraying methods. The sprayer's portability and maneuverability make it adaptable to different types of fields, and its components, such as the tank, pump, and nozzles, are easy to maintain. By ensuring accurate and uniform application of chemicals, it contributes to healthier crops and better yields. This project demonstrates how simple mechanical innovations can significantly improve traditional farming practices. It provides a practical solution for increasing efficiency while maintaining environmental responsibility. Farmers can achieve more consistent results with less effort, making their work safer and more productive. Overall, the Agricultural Based Wheel Sprayer is a valuable tool that combines **efficiency, sustainability, cost-effectiveness, and ease of use**, offering a significant advantage to modern agriculture. Its implementation not only improves operational productivity but also supports responsible farming practices that benefit both farmers and the environment.

REFERENCES

- [1] A. K. Singh, *Farm Machinery and Equipment*, Standard Publishers, 2019.
- [2] R. S. Sharma, *Principles of Agricultural Engineering*, Jain Brothers, 2018.
- [3] S. K. Satya, "Design and Fabrication of a Manual Wheel Sprayer for Small Farms," *International Journal of Agricultural Engineering*, Vol. 12, No. 2, 2020, pp. 45–52.
- [4] P. R. Patel, "Efficiency of Mechanical Sprayers in Crop Fields," *Journal of Agricultural Technology*, Vol. 10, Issue 3, 2019.
- [5] R. L. Stroehlein, *Sprayer Technology in Agriculture*, Academic Press, 2017.



3. Nut & bolt



4. Wheel and tyre



5. Bearing



6. Frame



- [6] FAO (Food and Agriculture Organization), *Guidelines for Pesticide Application in Crops*, FAO Publications, 2018.
- [7] V. Kumar et al., “Evaluation of Small-Scale Wheel Sprayers for Uniform Pesticide Application,” *Agricultural Engineering Today*, Vol. 8, Issue 1, 2021, pp. 33–41.
- [8] K. R. Choudhary, *Mechanization in Agriculture*, New India Publishing, 2016.
- [9] Online Resource: “Types of Agricultural Sprayers and Their Uses,” *Agriculture Knowledge Portal*, <https://www.agriculture-knowledge.com/sprayers>, accessed March 2026.