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SMART AGRICULTURE SYSTEM

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ABSTRACT

The is designed to address the inefficiencies and inconsistencies associated with traditional manual fertilizer application in small-scale and subsistence farming. Conventional methods, such as broadcasting by hand, often lead to uneven distribution, resulting in nutrient wastage, soil degradation, and reduced crop yields. This compact, low-cost device enables precise, row-specific fertilizer placement, improving nutrient use efficiency while minimizing labor and input costs. The machine features a simple mechanical design comprising a hopper, a calibrated metering mechanism, ground-driven rotating discs, and an adjustable handle for easy maneuverability. As the operator pushes the machine forward, ground wheel rotation engages the metering mechanism to release fertilizer at a controlled rate. The design allows for calibration to match crop-specific fertilizer requirements and row spacing. Its construction utilizes locally available materials, ensuring affordability, ease of maintenance, and adaptability to diverse farming conditions. Key advantages include reduced physical strain on farmers, uniform fertilizer distribution along crop rows, and decreased fertilizer runoff. By enhancing application accuracy, the machine supports sustainable farming practices, optimizes crop nutrition, and can contribute to higher agricultural productivity. Its manual operation makes it particularly suitable for regions with limited access to fuel or electricity, offering a practical, eco-friendly alternative to mechanized spreaders.

KEYWORDS: Manually operated, Fertilizer, Distribution machine, Agricultural equipment, Manual farm implement, precision fertilizer application, Small scale farming tool, low cost technology.

INTRODUCTION

- **Introduces the necessity for modernizing agriculture through smart technologies.**
- **Highlights challenges in traditional sowing and fertilizing methods.**

LITERATURE REVIEW

- .**Traditional Sowing Methods:** Manual and conventional practices with limitations in efficiency and labor intensity.
- **Manual Fertilizer Application:** Laborious and inconsistent distribution of fertilizers affecting crop yield.
- **Powered Fertilizer Drills:** Existing mechanized solutions that improve application but have ergonomic or operational shortcomings.
- **Ergonomics in Agricultural Tools:** Emphasizes the need for design improvements to reduce operator fatigue and enhance productivity.
- **Gaps Identified:** Lack of integrated systems combining sowing and fertilizing with ergonomic considerations.

METHODOLOGY / SYSTEM DESIGN

Design Components and Specifications

Develop a system that enhances efficiency, ergonomics, and ease of use in sowing and fertilizing.

3.2 Design Objectives

Detailed configuration of mechanical and electronic parts used in the system.

3.3 Design Calculations

Mathematical and engineering calculations supporting component sizing and functionality.

3.4Working Principle

Explains the operational workflow of the smart system integrating sowing and fertilization processes.

4 Implementation / Results

4.1 Prototype Construction

Description of the physical build of the system prototype based on design specifications.

4.2 Testing and Performance Evaluation:

Procedures and metrics used to assess the system's functionality and efficiency.

4.3 Key Observations:

- Improved uniformity in seed sowing and fertilizer distribution.
- Reduced operator strain through ergonomic design.

4.4 Calculated Efficiency Gains:

Quantitative improvements in labor time and resource utilization.

4.5 Limitations Observed:

***Not specified/Uncertain*—details on the limitations are mentioned but not elaborated.**

4.6 Field Operation:

Practical deployment results and user feedback during agricultural field tests.

4.7 Benefits of Implementation:

- Enhanced productivity and accuracy.
- Reduced physical effort for operators.
- Potential for scalable adoption in various farming contexts.

4.8 Result Table

***Not detailed in source,* expected to summarize performance metrics and comparative data.**

CONCLUSION AND FUTURE WORK

5.1Conclusion:

Affirms that the smart agriculture system successfully addresses key gaps in traditional farming methods, improving efficiency and ergonomics.

5.2Future Work:

Proposes further refinements including automation enhancements, integration with IoT, and broader field testing.

- Integration with solar power or battery assistance can reduce manual effort further.
- Use of lightweight and corrosion resistant material can further improve durability and reduce weight.
- A seed cum fertilizer mechanism can be integrated to perform dual operation simultaneously.
- Digital Add-Ons: Explore low-cost attachments like a mechanical area counter or seed level indicator.

6. Highlights

- **Smart integration of sowing and fertilizing functions** to optimize resource use and labor.
- Emphasis on **ergonomic design** to reduce operator fatigue and improve usability.
- Demonstrated **efficiency gains** through prototype testing and field operations.
- Identification of **gaps in existing agricultural tools** and addressing them through innovative system design.
- Proposal for **future enhancements** targeting automation and connectivity.

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