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ONION CULTIVATING MACHINE

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ABSTRACT

The onion harvesting machine aims to simplify and reduce the labor and cost involved in harvesting onions, particularly for small-scale farmers. It's designed to efficiently fulfill harvesting needs while cutting down on expenses. This machine features straightforward mechanisms and a user-friendly manual operation system, requiring minimal human effort. The goal is to lower the overall production expenses for onion farming, allowing farmers to increase their output and income, which is particularly beneficial for small-scale operations.

I. INTRODUCTION

India holds the position of being the world's second-largest producer of onions. Renowned for their pungency, Indian onions are available year-round. The country experiences two onion harvest cycles: from November to January and from January to May. While the onion is technically a hardy cool-season biennial, it is typically cultivated as an annual crop. Characterized by narrow, hollow leaves and a base that swells to form a bulb, onions come in white, yellow, or red varieties and require 80 to 150 days to mature. Maharashtra, Madhya Pradesh, Karnataka, Gujarat, Rajasthan, Bihar, Andhra Pradesh, Haryana, West Bengal, Uttar Pradesh, Chhattisgarh, Odessa, Tamil Nadu, Jharkhand, and Telangana are among the major onion-producing states in India. Onions thrive in various soil types, including sandy loam, clay loam, silt loam, and heavy soils, but they flourish best in deep, crumbly loam and alluvial soils with proper drainage, moisture retention, and organic content. High acidity, alkalinity, salinity, and waterlogged conditions are detrimental to onion cultivation. The optimal pH range for onions is 6.0 – 7.5, although they can tolerate mildly alkaline soils. However, onions struggle in soils with a pH below 6.0 due to trace element deficiencies or potential aluminium or manganese toxicity.

Considering these factors, the development of an onion harvesting machine becomes essential. This machine is designed to streamline the harvesting process, starting from loosening the soil to lifting the onions with their green leaves intact above the ground. While manual harvesting can be time-consuming and may result in damage to the onions, the harvesting machine aims to expedite the process while ensuring clean and efficient removal of the onions without any damage.

II. LITERATURES SURVEY

- By employing this way of Onion cultivation machine, time is saved over the traditional or manual approach, which takes a long time.
- The literature review revealed that the efficiency of the machine was higher than that of the traditional method for multipurpose agriculture machine.
- This machine need minimal maintenance.
- The chain drive, battery, rotor, iron strips, nut-bolt, and flange are the components utilized in the machine.
- This may be modified in the future so that sensors are used to make it more beneficial for everyone.

SPECIFICATION

Table of Components and specification

Components	Specification
Battery	12 V
Rotor	24 iron spiks
Wheel	2
Wiper Motor	9 Nm torque

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Starter Motor	12 Nm torque
Mounting Fabrication	1
Conveyor	2 Metal chain, Rod of 3mm dia
Switch	

PROBLEM DEFINITION

The conventional method of onion harvesting typically involves manual labour where workers manually pull onions out of the ground. However, this method comes with several drawbacks:

1. Low onion removing rate: Manual harvesting can be slow, resulting in a low rate of onion removal from the field. This inefficiency can lead to delays in harvesting and potential losses if onions are left in the ground for too long.
2. More labour & time requirement: Manual harvesting requires a significant amount of labour, as workers must bend over to pull onions from the ground one by one. This not only increases labour costs but also extends the time required to harvest a field, especially in large-scale operations.
3. High investment cost: While the initial investment for manual harvesting equipment may seem low, the long-term costs associated with labor and time can be significant. Additionally, the need for manual labor may limit the scalability of onion harvesting operations.

III. METHODOLOGY

Stage 1: Data Collection In this stage, the project team gathers all relevant information related to onion harvesting, including existing methods, technologies, and challenges. This may involve researching scientific papers, industry reports, and other reference materials to understand the current state-of-the-art in onion harvesting machinery. Additionally, the team will develop a methodology for the project, outlining the steps involved in designing and developing the modified onion harvesting machine.

Stage 2: System Design Once the necessary information is collected, the project team moves on to designing the mechanism for the modified onion harvesting machine. This involves conceptualizing the machine's components and how they will work together to perform the desired harvesting operation. The design may incorporate innovative features to address the drawbacks of existing harvesting methods and machines, such as improved digging and lifting mechanisms.

Stage 3: Part Design In this stage, the individual parts of the onion harvesting machine are designed based on the system design developed in the previous stage. The project team calculates the appropriate dimensions for each part based on the required forces and functional requirements. Standard parts may be chosen from design manuals to streamline the manufacturing process and ensure compatibility with existing components.

Stage 4: Production Drawings Using computer-aided design (CAD) software such as CATIA, the project team creates detailed production drawings for each part of the machine. These drawings include precise dimensions, tolerances, and other specifications necessary for manufacturing. The CAD software allows for accurate visualization of the parts and ensures consistency across the entire design.

Stage 5: Material Selection and Process Development Once the production drawings are complete, the project team selects appropriate materials for each part based on factors such as strength, durability, and cost. Additionally, the team develops manufacturing processes for producing the parts, taking into account factors such as machining, welding, and assembly techniques.

Stage 6: Manufacturing and Assemblage In the final stage, the parts are manufactured according to the production drawings using the chosen materials and manufacturing processes. The machine is then assembled according to the assembly drawing, with each part being carefully fitted together to ensure proper functionality. A trial run of the modified onion harvesting machine is performed to evaluate its performance and make any necessary adjustments. Throughout each stage of the project process, careful attention is paid to quality control and continuous improvement, ensuring that the final product meets the desired specifications and effectively addresses the drawbacks of existing onion harvesting methods and machines.

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OBJECTIVES

The objective of an onion harvester is to efficiently and effectively harvest onions from the field. This involves several key goals:

- **Maximizing Efficiency**: The harvester should be designed to maximize the rate of onion removal from the ground, reducing the time and labor required for harvesting.
- **Minimizing Damage**: Onions are delicate crops, and the harvester should be gentle enough to avoid damaging them during the harvesting process. Minimizing damage ensures that the harvested onions remain intact and marketable.
- **Adaptability**: The harvester should be adaptable to different field conditions, soil types, and onion varieties. It should be able to harvest onions efficiently regardless of variations in these factors.
- **Ease of Operation**: The harvester should be user-friendly and easy to operate, allowing farmers to quickly learn how to use it effectively. This reduces training time and increases overall productivity.
- **Cost-effectiveness**: The harvester should provide a cost-effective solution for onion harvesting, helping farmers reduce labor costs and increase profitability.
- **Scalability**: The harvester should be scalable to accommodate both small-scale and large-scale onion farming operations. It should be able to harvest onions efficiently across different farm sizes and production volumes.
- **Minimizing Environmental Impact**: Where possible, the harvester should be designed to minimize its environmental footprint, such as reducing fuel consumption or emissions during operation.

IV. IMAGES OF PROJECT

COMPONENTS USED

1. Control unit = 1
2. Battery = 1
3. Wheel = 2
4. Mounting Fabrication = 1
5. Motor = 2
6. Rotor = 1
7. Other material as requirement.

V. CONCLUSION

- By adhering to the design specifications, the resultant output of the machine will cater effectively to the requirements of small-scale farmers who face constraints in procuring costly agricultural machinery.
- The onion harvestor efficient operation demands minimal human intervention and time compared to conventional methods. Scaling up production on a larger scale is anticipated to substantially reduce costs, thus presenting a viable solution to bolster Indian agriculture.
- Consequently, this approach addresses the pressing labour shortages prevalent in contemporary Indian farming practices, offering a timely solution to meet the demands of the agricultural sector.

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