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Design of Plough and SoilPulverizer

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ABSTRACT

This paper presents the concept of the integrated plough with pulverizer is an innovative agricultural implement designed to streamline soil preparation processes. This system combines traditional ploughing with pulverizing capabilities, allowing for a more efficient and comprehensive approach to land cultivation. The plough component incorporates robust cutting blades and adjustable depth settings to effectively turn and invert the soil, while the integrated pulverizer utilizes a series of rotating tines or blades to break down clumps and create a fine, uniform seedbed. The synergy between ploughing and pulverizing operations minimizes soil compaction, improves aeration, and enhances moisture retention, ultimately promoting optimal conditions for crop growth. Additionally, the adjustable features of the implement cater to various soil types and field conditions. This abstract highlights the key design principles and benefits of the integrated plough with pulverizer, illustrating its potential to revolutionize modern agricultural practices and contribute to sustainable and productive farming systems. Agricultural soil preparation is a crucial step in modern farming practices, aimed at enhancing soil structure and fertility. Traditional ploughing and pulverizing processes are often carried out separately, leading to increased time and resource consumption. This study presents the design and development of a novel agricultural implement – a plough with an integrated pulverizer. The integration of these two functions into a single tool offers several advantages, including reduced fuel consumption, labor, and time. The plough-pulverizer combination is engineered to effectively break up compacted soil, mix organic matter, and create a suitable seedbed in a single pass.

KEYWORDS: Plough, Seed sowing, Farming, Soil, Pulverizer, Soil structure, Seed generation, Culitivation, Oraganic matter, Soil distributing

1. INTRODUCTION

The plough cum pulverizer is a farming implement designed to perform two essential functions in a single operation: ploughing and pulverizing. Ploughing is the initial step in preparing the soil for planting crops, while pulverizing involves breaking down clods of soil into finer particles, creating a more conducive environment for seed germination and root growth. This combined implement aims to streamline the cultivation process, potentially saving time and labor for farmers.machines are commonly used in industries such as construction, fabrication, and repairs, where mobility and flexibility are essential for on- site projects. The integration of ploughing and pulverization techniques in agriculture represents a promising approach to optimize soil preparation for crop cultivation. Ploughing involves the turning over of soil to bury surface residues and bring nutrient-rich subsoil to the surface, while pulverization aims to break down soil clods into finer particles, improving seedbed conditions. This combined approach holds the potential to enhance soil structure, nutrient availability, and water

retention, ultimately leading to improved crop yields and sustainability in agriculture. The design process involves careful consideration of various factors, including the type of soil, local agricultural practices, and the power source available for the implement. Additionally, factors such as the depth of ploughing, the degree of pulverization required, and the overall durability of the implement must be taken into account. As agriculture continues to evolve and face new challenges, the design of implements like the plough cum pulverizer plays a crucial role in supporting sustainable and productive farming practices. A plough with a pulverizer is a specialized agricultural implement designed to perform two key functions in one machine: ploughing and pulverizing. This combination tool is particularly useful for preparing soil for planting crops. A plough is a traditional agricultural tool used for primary tillage operations. Its primary function is to break and turn over the soil, bringing nutrient-rich lower layers to the surface and burying weeds or crop residues. Ploughs come in various designs, but the basic components include a blade (or moldboard) that cuts into the soil and a share that initially breaks the ground. A soil pulverizer is an attachment or a separate implement that follows the plough to further refine the soil structure. Its purpose is to break down large soil clumps into smaller particles, creating a finer and more uniform seedbed. This is crucial for better seed-to-soil contact, improved water infiltration, and enhanced root growth.Combining a plough with a soil pulverizer in a single implement streamlines the tillage process, saving time and reducing the number of passes over the field.The plough initially breaks and turns over the soil, and immediately following this, the soil pulverizer refines the soil structure. This combination helps create an ideal seedbed for planting, promoting optimal conditions for seed germination and crop growth. The design of a plough cum pulverizer combines the functions of a plough and a pulverizer, offering a versatile solution for agricultural activities. This innovative equipment serves various purposes in modern farming, contributing to enhanced efficiency and productivity.

One primary use of the plough cum pulverizer is in soil preparation. The ploughing component helps in breaking and turning the soil, facilitating aeration and promoting better water absorption. This is crucial for creating an ideal seedbed, ensuring optimal conditions for seed germination and plant growth. By integrating a pulverizer, the equipment further refines the soil structure, breaking down clods and improving its overall texture.

Additionally, the plough cum pulverizer is advantageous for weed control. The thorough cultivation provided by the ploughing action disrupts weed growth and buries weed seeds, reducing the competition for nutrients and sunlight. The pulverizing function aids in the decomposition of organic matter, including weed residues, contributing to a healthier soil ecosystem.

The equipment is also valuable for residue management after harvest. By effectively incorporating crop residues into the soil, the plough cum pulverizer promotes decomposition and nutrient recycling. This can have positive implications for subsequent crops, enhancing their access to essential elements and minimizing the risk of pest and disease carryover.

Furthermore, the design of the plough cum pulverizer is often adjustable, allowing farmers to customize the depth and intensity of both ploughing and pulverizing operations based on specific crop requirements and soil conditions. This adaptability makes it suitable for a variety of crops and diverse agricultural landscapes.

In conclusion, the plough cum pulverizer serves as a multifunctional tool in modern agriculture, streamlining soil preparation, weed control, residue management, and overall crop health. Its versatility and customizable design make it a valuable asset for farmers seeking efficient and sustainable farming practices.

2. LITERATURE REVIEW

1. Development of a Vertical Disc Push-Type Double- Row Carrot Seeder for Small-Scale Farmers Marvin T. Valentin, Published online 31 December 2016.

This study was conducted to develop a push-type double-row carrot seeder. Specifically, the study investigated the performance of the carrot seeder at different operating speeds in terms of field efficiency, field capacity, germination, and uniformity of seed discharge. In addition, the study aimed to establish optimum operating speeds and compare the use ofthe device and manual sowing of carrot seeds. The device consists of a hopper, seed metering disc, soil opener, and seed coverer, grip handle, ground wheel, and power transmission; all attached to the frame. The metering disc is synchronized with the ground wheel as a source of power during operation. The design of the carrot seeder was prepared using AutoCAD software. It was fabricated using locally available materials. Three operating speeds (0.75, 1.0, and 1.25 m/s) were used during the evaluation. An area of 225 sq. m was used. It was divided into 9 plots with dimension of 50 cm by 500 cm.

2. International Journal of Current Microbiology and Applied Sciences ISSN: 2319-7706 Volume 7 Number 09 (2018) -Design and Evaluation of Tractor Operated Raised Bed Mechanical Carrot Planter Shiddanagouda Yadachi1* and Indra Mani2.

Is a major vegetable crop which is a good source for human diet. Carrot planting, conventionally done by manual dibbling, is a labour intensive and thus, costly operation. The mechanization of carrot planting aims to reduce the operational costs, minimizing human drudgery and enhance the production. The appropriate cropmachine and operational parameters were identified. Tractor operated prototype mechanical carrot planter was designed and evaluated for its field performance 4 using treatments viz. uncoated carrot seeds (S1), biogas slurry coated seeds (S2) and Thirame coated seeds (S3).

3. Automatic Seed Sowing Robot Vidya Yedave1, Punam Bhosale2, Jyoti Shinde3, Prof. Jagdish Hallur4 Apr(2019);

In the field of agriculture, an idea was developed to see if several small autonomous machines could be more effective than traditional giant tractors and human forces. This article attempts to design and build a machine to automate critical activities such as slogging, sowing, and soil covering in order to reduce human effort (sowing process - Fatigue due to continuous bending) and speed up the process. Numerous drive systems, including wheeled hybrid and reconfigurable mechanisms, have been extensively researched. The propulsion mechanism for wheeled locomotives is typically bio-inspired and offers several advantages. The main aim of this paper is to design an efficient and low-cost machine that can perform multi-tasks like plowing, seed sowing, and covering of the soil using technologies. The paper focuses on the synthesis and analysis of a mechanism capable of moving across any terrain with the least amount of difficulty and effort. Mechanisms for soil covering, seeding, and slogging on a variety of terrains have been developed in this work.

4. Ratnesh Kumar, Aadhar Govil, Parth Daga, Shubh Goel, Saurabh Dewangan Materials Today:

Earth's population is projected to cross 10 billion by 2050, and the amount of food required to feed that population double of what we produce today. There is an immediate need to increase the efficiency of our agricultural practices. This is ever more relevant in India, where an estimated 70% of population is finds employment in the agricultural sector, compared to 2% in a developed country like the United **States**

5. SA Bobade, Nikhil Yavalkar, Abhishek Bankar, Pranil Tiwaskar, Shubham Bhorgade EPRA

International Journal of Agriculture and Rural Economic Research. Agriculture is the backbone of Indian economy. Agro- Technology is the process of applying the technology innovation occurring in daily life and applying that to the agriculture sector which improves the efficiency of the crop produced and also to develop a better Mechanical machine to help the agriculture field which reduces the amount and time of work spent on one crop. Hence in this work of project we decided to design a better mechanical machine which is available to the farmers at a cheaper rate and also which can sow and seed the crop at the same time. This project consists of the better design of the machine which can be used specifically for sowing of soybean, maize, pigeon pea, Bengal gram, groundnut etc. For various agricultural implements and non-availability of sufficient farm labor, various models of seed sowing implements becoming popular in dry land regions of India.

6. BU Balappa, AC Lokesh, NC Mahendra Babu Materials Today:

Sowing is one of the important operations in agriculture which requires accuracy, timeliness and skilled labour. Majority of Indian farmers still follow traditional manual method of sowing due to various reasons. Considering the requirement of farmers with small land holding and variety of crops grown it is required to develop a compact, and economical sowing machine. Literature survey, filed visits and data collection from stakeholders revealed the need for development of semi-automated sowing machine for major crops; Groundnut, Maize, Sunflower and Toor dal cultivated throughout the year, thus justifies the capital investment. Adopting the first principles of engineering design, a semi- automated sowing machine was designed, synthesized and fabricated.The machine consists of three subsystems; power system, traction system, seed metering system. The machine is walk-behind vehicle that can carry out sowing operation in three rows simultaneously. The developed sowing machine has been tested for its working and found to be satisfactory. The estimated reduction in cost of sowing is found to be in the range of 80–85% apart from reducing the time involved in sowing operation.

7. Saurav Chaudhari, Praful Dhongade, Dilip R Rangari, Abhijit A Kansakar.

Sowing machine could be respectable to all granges, all types of fraternity, robust construction, also it should be dependable, and this is introductory demand of sowing machine. Therefore we made sowing machine which is operated manually but reduces the bid of growers therefore adding the effectiveness of planting also reduces the trouble encountered in homemade planting. For this machine we can plant unlike types and unlike sizes of seeds also we can vary the space between two seeds while sowing. This also increased the sowing effectiveness and delicacy. We made it from raw accoutrements therefore it was so affordable and veritably usable for small scale growers. For effective running of the machine by any planter or by any unpractised worker we simplified its design. Also its conforming and conservation system also simplified. The main significance of this semiautomated seed feeding vehicle is to inculcate the seed as per the needed depth with certain space and covering the seed with the soil with the help of closing jaw or crinkle closer. And this machine is also used for the crinkle in order to feeding the seed as per the depth.

8. Smita N Solanki, RT Ramteke, Pragati S Dhande International Journal of Research in Engineering, Science and Management.

The present review provides brief information about the various types of automatic seed sowing equipment. Agriculture forms an integral part of the Indian economy. The methodology implemented in carrying out agricultural activities as many constraints such as non-availability of labor low productivity rate, regularity due to whether constant and fatigue. To overcome this problem, we need to automate and mechanize the agriculture sector. During the Sowing operation we can carried out the other operations

simultaneously so the cost will reduce and also saves time. By using the seed sowing cum fertilizer sowing and pesticidessowing machine we can do this all the operation simultaneously

9. AJ Arsha, CM Drishya, P Nayana, KK Sri Mohana Priya,2021.

Farming is the significant area on the planet that assumes an imperative part in building up the economy of a country. The Agro innovation helps in improving the effectiveness of the harvest that are being created likewise helps in creating gadgets that are reasonable for doing mechanical works in the fields. Consequently, brings about minimization of the complete expense of creation, saving of time and decrease in the exertion associated with the cycle. In this seed planting machine has been built up that assist the ranchers in collecting the best harvest with least endeavors. Seed planting machine framework are utilized battery fueled haggles engine inbuilt in these wheels. In each total pivot of turning wheel there is seeds tumbles from this seed drum and the seed ranch interaction can occur easily just as without wastage of seeds. The most fundamental methodology is it licenses water protection as water gave in a zeroed in on manner near the root zone. Seed planting, burrowing and water system robot will continue ahead various ground shapes and performs tunneling, planting the seed and gives a decent climate for legitimate development. Cultivating machine can be used for different kinds of seeds and little plants additionally can automize the dividing between the seeds while working the seed planting machine.

10. Gaurav Kumar, Rishabh Singh, Pavan Kumar, Twinkle Rajput, Eram Neha, Yogesh Shrivastava Advances in Engineering Design: Select Proceedings of FLAME 2020, 595-602, 2021.

To meet future food demands, it is essential to provide new technologies to the farmers. There are several processes, viz. excavation, planting, irrigation, etc. for which the farmers are still worried. Mechanization reduces the cost of labor and improves overall productivity without any effect on the quality of the soil. Hence, it is necessary to provide them with some useful economic solutions for these problems. In the present work, the problem of seed sowing has been addressed. The conventional method of seed sowing is not efficient and is time-consuming. In the present work, a multifunctional seed sowing machine has been designed, which can sow the seed and can discharge the fertilizer simultaneously. The design of the machine has been done using SolidWorks, and the analysis has been done with the help ANSYS workbench15.0

3. SPECIFICATION

It The primary objective of employing the plough cum pulverized technique is to optimize soil conditions Efficient incorporation of organic matter and crop residues into the soil, which helps improve soil fertility and nutrient availability.

1. Breakdown of compacted soil layers, allowing for better root penetration and nutrient uptake by crops.
2. Creation of a well-prepared seedbed with a fine, uniform texture, conducive to even seed distribution and germination.
3. Minimization of soil erosion and runoff by promoting better water infiltration and retention.
4. Reduction of weed competition through thorough burial ofweed seeds and residues.
5. The pulverizer component of the implement is designed to break down large soil clods into finer particles.
6. This facilitates better mixing of soil and incorporation of organic matter, nutrients, and fertilizers
7. The design should ensure that the plough cum pulverizer is durable and robust enough to withstand

the rigors of field operations, providing a long and reliable service life.

8. The design may aim to create furrows and ridges that helpin retaining moisture in the soil.
9. This is particularly important in arid or semi-arid regions where water conservation is crucial for crop growth.
10. The implement should create a well-prepared seedbed by breaking clods and smoothing the soil surface. This is essential for promoting uniform seed germination and emergence.
11. The plough cum pulverizer is designed to uproot and bury weeds, preventing their growth and competition with crops.

4. MATERIALS AND METHODS

WELDING OF FRAME :

First,we welded the frame by using L- bended rods and we welded the four sides of the rods in a rectangular shape to form a frame like structure.

COMBINING OF FRAME WITH TINES BYWELDING:

We combined the frame and tines with rods by theprocess of welding.

ROLLER MANUFACTURING:

By using rods we made the roller first,we take a three rodsand we bend the circular in shape.

COMBINING OF PLOUGH AND ROLLER WITHSPRING:

By combining the two parts with springs which provides suspension for the roller. n serves as the heat regulator because as the welding machine operates, the transformer generates a lot of heat and thus needs to be cooled.

5. REVEIW

The literature on the plough cum pulverizer presents a comprehensive overview of a versatile agricultural implement that combines the functions of ploughing and pulverizing soil in a single unit. Numerous studies highlight the significance of this integrated tool in modern farming practices, emphasizing its ability to enhance soil preparation efficiency and optimize resource utilization. Researchers have explored various aspects of the plough cum pulverizer, including its design, working mechanism, and impact on soilstructure.

Several investigations focus on the engineering aspects of the plough cum pulverizer, evaluating parameters such as blade design, cutting angles, and power requirements. These studies contribute valuable insights into optimizing the implement for different soil types and agricultural conditions. Additionally, the literature underscores the importance of considering factors like tractor compatibility and ease of operation, ensuring the practicality and accessibility of the tool for farmers with varying levels of technological expertise.

Environmental considerations are also addressed in the literature, with researchers examining the impact of the plough cum pulverizer on soil health and nutrient distribution. Comparative studies between traditional ploughing methods and the integrated approach provide valuable information on the potential benefits of adopting this multifunctional implement, including reduced soil erosion, improved water retention, and enhanced nutrient availability.

Moreover, the literature emphasizes the economic implications of using a plough cum pulverizer. Cost-benefit analyses and case studies explore the economic feasibility and return on investment for farmers, shedding light on the long-term advantages of incorporating this technology into agricultural practices.

In conclusion, the literature on the plough cum pulverizer offers a well-rounded perspective on the technical, environmental, and economic aspects of this agricultural implement. The collective findings contribute to a comprehensive understanding of its potential role in sustainable and efficient farming systems, providing a valuable resource for farmers, researchers, and policymakers alike.

Benefit:

- Time and Labor Efficiency: Combining the plough and pulverizer functions in a single implement saves time and reduces the need for multiple passes through the field.
- Improved Seedbed Preparation: The pulverizer ensures that the soil is finely tilled and ready for planting, which can lead to better seed germination and crop establishment.
- Weed and Residue Management: The plough effectively buries crop residues and weeds, reducing the need for separate weed control measures.

6. PROBLEM IDENTIFICATION

1. Soil Compaction: Continuous ploughing in the same area can lead to soil compaction, which hinders root growth and reduces water infiltration.
2. Loss of Soil Structure: Aggressive ploughing can break down soil aggregates and destroy its natural structure, leading to reduced fertility and increased erosion.
3. Erosion: Improper ploughing techniques, especially on slopes or in areas with loose soil, can lead to erosion as the topsoil is exposed to wind and water.
4. Loss of Soil Organic Matter: Intensive ploughing can accelerate the decomposition of organic matter in the soil, leading to a reduction in soil fertility.
5. Disruption of Soil Microorganisms: Ploughing can disturb the beneficial soil microorganisms and earthworms that play crucial roles in nutrient cycling and soil health.
6. Energy Consumption: Traditional ploughing methods often require significant energy inputs, particularly if using mechanized equipment.
7. Greenhouse Gas Emissions: Tillage, especially when done with large machinery, can release greenhouse gases from the soil, contributing to climate change.
8. Time and Labor Intensive: Depending on the size of the field and the equipment used, ploughing can be time- consuming and require a significant amount of labor.
9. Costs: The cost of equipment, fuel, and maintenance associated with ploughing can be a financial burden for farmers.

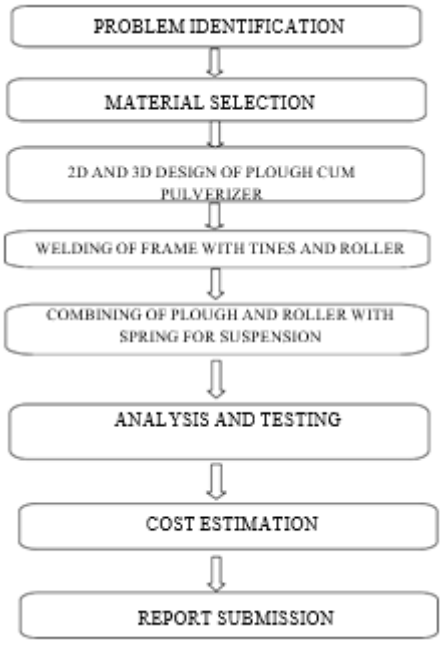
7. PROBLEMS DURING PULVERIZING OPERATION:

1. Equipment Wear and Tear: The machinery used for pulverizing, such as crushers, mills, or grinders, can experience significant wear and tear over time. This can lead to increased maintenance costs and downtime.
2. Energy Consumption: Pulverizing can be an energy- intensive process, especially when dealing with hard or dense materials. This can result in high operational costs.
3. Material Hardness and Toughness: Some materials are inherently harder or tougher than others. For instance, grinding hard minerals or metals can be more challenging and may require specialized equipment.
4. Contamination: Depending on the materials being pulverized and the equipment used, there is a risk of contamination. For example, in the pharmaceutical industry, it's critical to ensure that the

pulverizing process doesn't introduce impurities or foreign substances.

5. Product Uniformity: Achieving consistent particle size distribution can be a challenge, especially for materials that have a tendency to agglomerate or clump together during pulverization.
6. Dust and Air Quality: Pulverizing operations can generate a significant amount of dust, which can be a health hazard for workers and may require dust control measures to be in place. 7.Safety Concerns: The operation of pulverizing equipment can present safety risks, including the potential for accidents exposure to harmful substances, and ergonomic challenges for workers.
7. Environmental Impact: Depending on the materials being pulverized and the processes involved, there may be environmental considerations, such as emissions, waste disposal, or the use of water resources.
8. Regulatory Compliance: Depending on the industry and location, there may be regulatory requirementsthat govern the pulverizing process, such as emissions standards or safety protocols.

8. METHODOLOGY



9. COCLUSION

Adjustable Depth and Width: The implement should have the capability to adjust the depth and width of the ploughing and pulverizing actions to accommodate different soil types and conditions.Blade or Share Design. The plough blades or shares should be designed for efficient cutting and turning of soil, while the pulverizing component should have robust teeth or tines to break down soil clumps effectively. Power Source: The implement can be designed to be either tractor- mounted or self-propelled, depending on the scale of operation. Safety Features: Safety mechanisms should be in place to prevent accidents or damage to the implement, such as overload protection and guards around moving parts. Adjustable Pulverizing Intensity Farmers should be able to adjust the intensity of the pulverizing action based on their specific needs and soil conditions. Durability and Reliability: The implement should be built to withstand the rigors of agricultural work and be made from high-quality materials. Easy Maintenance It should be designed for easy cleaning and maintenance to ensure longevity and efficient

operation. Optional Attachments

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11. Depending on the specific requirements of the farm, additional attachments could be designed to enhance the functionality of the plough with a pulverizer. For example, a seeder attachment could be added for direct planting after soilpreparation.