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Review on Design and Fabrication of Multipurpose Agricultural Vehicle

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Abstract
Farming plays a vital role in the Indian economy. In agriculture, many fieldwork tasks like ploughing, reaping, sowing, etc. were traditionally done using manual equipment. However, this approach had its challenges, including minimizing losses, increasing productivity, and reducing costs. In India, there are two types of agricultural methods used: manual and mechanized. The manual method is tedious, laborious, and time-consuming. On the other hand, mechanization involves using hybrid devices to transfer motion and provide mechanical advantages, making farming quicker and easier. There is a wide range of machines available for almost every task in agriculture, from land preparation to crop harvesting. While these machines are efficient, they arecostly and cannot be afforded by most rural farmers with small land. As a result, most farmers stillrely on traditional methods. Additionally, since most farmers have low incomes, investing in largemachines is not feasible. Therefore, there is a need to develop low-cost equipment that can be usedfor multiple purposes.

Keyword: Farming, Agriculture, Ploughing, Harvesting, Equipment, Multipurpose

Introduction

Agriculture involves farming, including the cultivation of soil, production of crops, and raising oflivestock. It is the most significant industry in the world. Historically in India , small landowners, cultivating between 2 to 3 hectares, have carried out agricultural practices using traditional tools like wooden ploughs, yokes, levelers, harrows, maillots, spades, and big sickles. These tools are useful for land preparation, sowing of seeds, weeding, and harvesting. Small landholders do not use modern agricultural techniques and equipment because they are expensive and not easily available. By adopting scientific farming methods, farmers can increase their yield and obtain good quality crops, which can prevent them from going economically weaker. However, most farmers still use primitive farming techniques due to a lack of knowledge or investment to use modern equipment.In India, hand tools are still predominantly used for land cultivation, as tractors require resources that many Indian farmers do not have easy access to. The need for agricultural mechanization in India needs a deeper understanding of the activities of smallholder farmers. There is a significant gap in technology adoption and implementation used with small and marginal farmers.

Mechanized farming involves the use of agricultural machinery to automate agricultural labor. This has

led to a significant surge in the productivity of agricultural workers in recent times. As aresult, many agricultural jobs that were previously done using manual labor with the help of working animals like oxen, horses, and mules have now been replaced by mechanical machinery.

Literature Review

Dr. C.N. Sakhale et al. [1], as per the author's perspective, the multifunctional agricultural vehicleis designed to cater to the fundamental challenges faced by farmers. These challenges mainly include seed sowing, water spraying, cultivation, and digging. Additionally, the vehicle offers a removable cultivation tool that requires manual force for operation.

Sheikh Mohd Shahid Mohd Sadik et al. [2], agriculture is one of the primary occupations in India,and it plays a crucial role in the Indian economy. Indian agriculture has experienced significant growth in recent decades. While a lot of work has already been done in this field, it is still essentialto explore and implement new ideas. Unfortunately, these ideas are often not implemented effectively due to their high cost and complexity, which particularly affects rural communities. The multipurpose agriculture or farming machine is a fundamental and critical tool for agriculture to maximize yield.

Vishal S G et al. [3], India is a country that relies heavily on the agricultural sector, with a significant focus on cultivating a diverse range of crops including ground nuts, corns, cereals, among others in its rural areas. The agricultural equipment currently available to farmers is primarily imported from foreign countries and is characterized by high costs and large sizes. To address this issue, a project was pursued to design and fabricate multipurpose agriculturalequipment specifically for small-scale farmers at a cost not exceedingly approximately 15000 rupees per unit. The project involved a comprehensive study aimed at developing equipment capable of performing various agricultural operations, such as carrying goods, spraying pesticides, sowing, seeding, weeding, and cutting operations, with the aim of improving efficiency while reducing land preparation and handling costs.

Asit Dhawale et al. [4], The 4-wheeler arrangement of the product was created by implementing the existing engine-operated sweeper weeder machine. In addition, it features a spraying unit andcultivator cum seed Sower arrangements. The device is crafted to be easily used in the field. Vehicle power is supplied by a four-stroke petrol engine, and controls are located at the footrest. The steering mechanism is simple and easy to operate, and the equipment control is easily accessible. Spraying operations can be controlled by a switch. This device is ergonomically designed to be pushed in the forward direction, allowing it to drag the cultivator or sweeper bladewhile transporting the nozzle to cover the entire farm area. This fabrication is considered value formoney.

Arunkumar S. M et al. [5], This agricultural vehicle is versatile and can be used for fertilizing, sowing, and removing weeds. The equipment is designed to be easily rearranged or assembled to meet the specific needs of the farmer in every stage of agriculture. This concept of multipurpose equipment is new and can be patented, making it a viable solution for real-life farming situations.Farmers will benefit from the comfort and increased productivity provided by our multipurpose agricultural vehicle, which can be used for spraying, sowing seeds, and weeding at a low cost. Theweeder is most effective when used on moist soil, allowing it to remove unwanted grass easily. The vehicle's performance will be enhanced when it is operated on a smooth or less uneven surface.

Sarfaraz Riyaz et al. [6], Based on the overall performance of the cultivator, it can be observed that it satisfactorily addresses the needs of small-scale farmers who face challenges in purchasing costly agricultural equipment. The cultivator requires minimal manpower and less time comparedto other

cultivators, making it a cost-effective option for large-scale farming. This approach has the potential to reduce agricultural costs and improve efficiency, thereby contributing to the overall goal of reducing farming expenses in India."

Asst. Prof Dilip Radkar et al. [7], We can confidently say that the project will cater to the needs ofsmall-scale farmers as they are currently unable to afford expensive agricultural equipment. The machine requires less manpower and time as compared to traditional methods. If manufactured ona large scale, we expect the cost to significantly reduce which will partially address the challenges faced by Indian agriculture. Our solution addresses the labor problem that is currently prevalent inthe farming sector of India.

K. Venu et al. [8], The main objective for the project is to reduce manpower and equipment costs.Our multipurpose agricultural equipment can be used for Pesticide spraying and crop cutting. Theequipment is designed in such a way that it can be easily assembled and rearranged in every stageof agriculture with fasteners to fit the required length and specifications of field operation. Our team has successfully combined many ideas from different fields of mechanical engineering and agricultural knowledge to improve the yield and reduce labor effort and expenses.

Conclusion

The development and implementation of a multipurpose agriculture vehicle for small landholderspresent a promising solution to address various challenges faced by farmers. Through the integration of diverse functionalities such as ploughing, seeding, spraying, and harvesting, this innovative machinery offers increased efficiency, productivity, and sustainability in agricultural practices.

The multifunctionality of such a vehicle not only optimizes time and labor but also enables small landholders to diversify their crop production and adopt modern farming techniques. By streamlining operations and reducing manual labor, farmers can significantly improve their yieldswhile minimizing resource usage and environmental impact.

Furthermore, the versatility and adaptability of the multipurpose agriculture vehicle make it suitable for various terrains and cropping systems, enhancing its applicability across different regions and agricultural contexts. Its potential to enhance agricultural productivity and income generation for smallholders underscores its importance in promoting food security, rural development, and economic growth.

In essence, the introduction of a multipurpose agriculture vehicle for small landholders represents a significant step towards modernizing and revolutionizing traditional farming practices. With continued innovation, investment, and adoption, this technology holds the promise of transforming small-scale agriculture into a more sustainable, efficient, and resilient sector, ultimately benefiting farmers, communities, and the environment alike.

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