# DESIGN AND FABRICATION OF MULTI PURPOSE AGRICULTURE MACHINE

A PROJECT REPORT

Submitted by

**SACHIN J**

*In partial fulfilment of the degree*

*of*

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Certified that this project report titled "**DESIGN AND FABRICATION OF MULTI PURPOSE AGRICULTURE MACHINE"** is the Bonafide work of **SHRIRAM SUJIN V (811722114041), PARTHA SARATHI A B (811722114307), SACHIN J (811722114038), ROOPAN VIGNESH V (811722114037),** who carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported here in does not form part of any other project report or dissertation on the basis of which a degree or award was inferred on an earlier occasion on this or any other candidate.

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**INTERNAL EXAMINER** **EXTERNAL EXAMINER**

## DECLARATION

I jointly declare that the project report on **"DESIGN AND FABRICATION OF MULTI PURPOSE AGRICULTURE MACHINE"** is the result of original work done by us and best of our knowledge, similar work has not been submitted to **"K RAMAKRISHNAN COLLEGE OF TECHNOLOGY"** for the requirement of Degree of **BACHELOR OF ENGINEERING**. This project report is submitted on the partial fulfilment of the requirement of the award of Degree of **BACHELOR OF ENGINEERING**.

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# ABSTRACT

Multipurpose agricultural equipment is essential and crucial for maximizing agricultural yields. The Indian economy is based primarily on agriculture field. There are several issues in this field, like how to reduce costs, boost productivity, and limit losses. This field of agriculture involves a lot of fieldwork, including sowing, reaping and other tasks that were formerly completed with conventional machinery. Due to their poor incomes, the majority of farmers are struggling to make the investment necessary to buy a large machine. Farmer has to use various agricultural equipment's and labours for caring out these steps. Our purpose is to combine all the individual tools to provide farmers with multipurpose equipment. We want to create a multipurpose, highly effective agricultural machine that will increase output while cutting down on labour costs and time. The crop cutter and sprayer are the primary goals of this project. we believe that advanced machinery can replace human and animal labour, making it appropriate for small-scale farmers from an effort and cost perspective. Therefore, we are creating this equipment to meet all of these needs.



**Keywords:** Multipurpose, Efficiency, Increase production, Low cost

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# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION TO AGRICULTURE:

The foundation of the Indian economy, agriculture is essential to maintaining food security, promoting rural development, and making a substantial contribution to GDP. Nearly 50% of the workforce is employed by it, primarily in rural areas where more than 65% of the population lives, and it contributes roughly 17–18% of India's GDP. India is one of the world's top producers of rice, wheat, sugarcane, pulses, and cotton due to its varied agroclimatic zones, which allow for the production of a wide range of crops. Notwithstanding its significance, Indian agriculture confronts a number of difficulties, such as low production, reliance on the monsoon, dispersed landholdings, and a lack of technology.

**Figure 1.1 Agriculture Machines**

In India, agriculture is ingrained in the history, culture, and customs of the nation and is not merely an economic endeavour. It provides about half of the population with their main source of income and contributes significantly to the country's economy, making up between 17 and 18% of GDP. India's varied climate and rich soils allow for

the production of a wide variety of crops, making it one of the world's top producers of cash crops like sugarcane, cotton, and tea as well as staples like rice, wheat, and lentils. The industry also contributes significantly to exports, supplying processed goods, fruits, vegetables, and spices to the world market.

Indian agriculture is progressively undergoing a transformation because to technological innovations like digital platforms, drones, and precision farming, which enable farmers to make data-driven decisions and increase output. Agriculture is becoming more ecologically friendly and efficient as a result of initiatives to advance organic farming, improve mechanization, and incorporate artificial intelligence. In an effort to meet the food needs of a growing population while also promoting rural development, poverty reduction, and global food security, Indian agriculture is undergoing a revolution thanks to rising investments, legislative changes, and increased knowledge of sustainable techniques.

**Figure 1.2 Traditional Method**

Farming methods have been transformed by the use of machinery, which has increased their productivity, sustainability, and efficiency. In order to decrease manual labour, improve yields, and increase precision, machinery is essential for everything from land preparation to harvesting and post-harvest processing. While planters and seed drills guarantee even sowing, tractors, ploughs, and tillers aid in effective field preparation. Fertilizer spreaders enable uniform nitrogen delivery, while sophisticated irrigation systems like sprinklers and drip irrigation maximize water use. Harvesting tools such as forage harvesters and combine harvesters greatly expedite crop collecting,

cutting down on post-harvest losses and time. Precision agriculture has been made possible by modern technologies like drones and GPS-guided equipment, which allow farmers to monitor fields, manage resources, and boost output with little waste. Grain dryers, threshers, and packaging equipment are examples of post-harvest machinery that improves food storage and market readiness. The use of agricultural technology is making farming a more productive and profitable sector, despite obstacles like high costs and restricted access for small-scale farmers. This is helping to meet the world's expanding food need as the population grows.

## 1.2 HISTORY OF MACHINES IN AGRICULTURE SECTOR:

### 1.2.1 Ancient Method

Using sustainable and resource-efficient techniques that developed over generations, ancient agricultural methods were firmly anchored in harmony with the natural world. For planting, harvesting, and tilling, farmers employed simple implements like sickles, hoes, and wooden plough. Fieldwork relied heavily on animal power, particularly oxen and bullocks, which helped with transport and ploughing. Step wells, canals, and tanks are examples of water management systems that were cleverly created to store and transport water for irrigation, guaranteeing crop development even in desert areas. In order to preserve soil fertility and lessen pest infestations, crop rotation and intercropping were popular practices. Natural pest management techniques, such applying neem leaves or ash, protected crops without endangering the environment, while organic fertilizers, such as compost, animal manure, and ash, enhanced the soil. The expertise of choosing seeds was handed down through the generations, guaranteeing the survival of superior and regionally appropriate cultivars. Subterranean pits and clay or bamboo granaries were among the storage methods used to protect grains from dampness and pests. These traditional techniques laid the groundwork for modern agricultural methods utilized in many regions of the world since they were sustainable and closely matched with the local ecology.

### 1.2.2 Industrial Revolution and Modern Technologies

The Modern, efficient farming techniques replaced labour-intensive traditional farming methods with the advent of machines. Beginning with the development of basic tools like seed drills, mechanization progressively progressed to more complex machinery like tractors, combine harvesters, and irrigation systems. By drastically reducing the need for manual labour and animal power, these technologies allowed farmers to cultivate vast areas more quickly and precisely. The simplification of processes including ploughing, planting, watering, fertilizing, and harvesting increased output and decreased losses after harvest. Precision farming, which maximizes resource utilization and reduces waste, was made possible by the incorporation of cutting-edge technologies like drones, automated systems, and GPS-guided gear.

### Mechanization and Machinery

In agriculture, mechanization is the process of replacing traditional manual and animal labour with machines and sophisticated technologies to carry out farming chores effectively. The development of multipurpose agricultural machinery, which can carry out several farming tasks while lowering prices and boosting output, is a noteworthy advancement in this industry.

### Introduction of Machines

The advent of agricultural machinery transformed farming by greatly increasing productivity, efficiency, and operational scale. Mechanization began with the invention of early agricultural equipment like the plough and seed drill, which served as the forerunners to more sophisticated machinery. The first machine introduced to agriculture was the seed drill, invented by Jethro Tull in 1701. The seed drill mechanized the process of sowing seeds, and was a significant improvement over the previous method of scattering or hand-planting seeds.

## Tractors and Agriculture

Tractors are now an essential component of contemporary agriculture, helping to boost farm productivity and efficiency. These multipurpose machines are employed for a variety of operations, including as irrigation, harvesting, tilling, sowing, and ploughing. Tractors aid in preparing the soil for planting by aerating it, breaking it up, and guaranteeing correct seed placement with attachments like ploughs, seed drills, and harrows. In order to ensure that crops receive enough water, tractors are also essential for irrigation because they power water pumps and sprayers. When equipped with specialist attachments like combine harvesters, they can also be used for harvesting crops, moving equipment, and delivering products. Because of their versatility, they can handle a variety of duties, which eliminates the need for many pieces of equipment and increases farming's efficiency and also cost efficient.

## Increased Production and Efficiency

For many agricultural operations, machines have significantly increased speed and efficiency. Ploughing, seeding, irrigation, fertilization, harvesting, and other labour-intensive operations are automated by tractors, combine harvesters, and other equipment. As a result, farmers can oversee more land in less time, thus increasing agricultural yields and productivity. It is now possible to finish tasks that used to take days or weeks in a matter of hours, which minimizes downtime and maximizes resource utilization.

## Labour Dependencies:

The use of manual labour has decreased in agriculture since the invention of machinery. Large grain fields, for instance, may be harvested by combine harvesters in a fraction of the time it would take for humans to do it by hand. This is especially crucial in places where there is a labour shortage or when labour costs are on the rise. Additionally, by requiring less physical labour, farmers are able to concentrate on more technical farming tasks, increasing total productivity.

**Modern Impact**

Farming has become more efficient because to mechanization, but there are environmental risks as well. A greater reliance on non-renewable resources, greenhouse gas emissions, and soil erosion can all result from the widespread use of machinery, particularly that run by fossil fuels. But these consequences are being lessened by developments in electric-powered equipment and more environmentally friendly farming methods like precision irrigation and less tillage.

## 1.3 PURPOSE OF MACHINES

The goal of agricultural machinery is to increase farming operations' sustainability, efficiency, and production. Large-scale farming is supported by machines that automate and streamline agricultural processes, enhance precision, and require less manpower.

### 1.3.1 Production Rate

### Higher Crop Yields:

Higher yields and improved crop management are the results of agricultural machinery's accuracy and reliability. Modern tractors and planters, for instance, make sure that seeds are planted at the ideal depth and spacing, producing more consistent and fruitful crops. Furthermore, precise fertilizer and pesticide application is made possible by machines with GPS and sensors, enhancing crop health and reducing waste.

### Reduction in Post-Harvest Losses

Crop waste has decreased thanks to the use of machinery in harvesting and post-harvest processing. With the help of devices like combine harvesters, crops can be harvested more quickly and effectively, minimizing losses from overripe or damaged fruit. Furthermore, produce is better prepared for sale or storage with minimal losses thanks to machinery made for sorting, cleaning, and packaging.

### 1.3.2 Labour Dependencies

#### Reduced Labor Costs

While mechanization reduces the need for physical labour, it has led to a shift toward the demand for skilled labour. Operators are now needed to drive and maintain machinery. This includes knowledge of how to operate advanced tractors, harvesters, and precision farming tools, as well as the ability to troubleshoot and repair equipment. Therefore, the agricultural labour force is increasingly required to have technical skills rather than the traditional manual labour skills, which can contribute to job creation in the form of machinery operators and technicians.

#### Shift from Physical to Skilled Labor:

The demand for skilled labour has increased as a result of mechanization, even while it lessens the necessity for physical labour. These days, operators are required to operate and maintain machines. This includes being able to troubleshoot and fix equipment, as well as having an understanding of how to handle sophisticated tractors, harvesters, and precision agricultural instruments. As a result, technological skills are becoming more and more important for agricultural workers than conventional manual labour abilities, which can lead to the establishment of jobs as technicians and machinery operators.

### 1.3.3 Precision and Consistency

#### Reduction in Input Costs:

Overuse of these resources is decreased when machines apply inputs (such as pesticides, seeds, and water) more precisely and consistently. For instance, farmers can apply items where they are most required by using variable rate technology (VRT) in fertilizer spreaders and sprayers. This lowers costs and uses fewer chemicals.

#### Consistent Crop Quality

For marketplaces that require uniform supply, such supermarkets or processing facilities, where differences in size, shape, or quality may lead to rejected goods or reduced prices, this uniformity is crucial.

### 1.3.4 Economical impact

#### Access to Larger Markets:

Farmers can expand their businesses through mechanization, opening up new markets and export prospects. Mechanized farmers are able to meet the increased demands of both home and foreign markets by cultivating more land and producing more crops.

#### Long-Term Savings:

It increases harvest efficiency and lessens the demand for seasonal labour by harvesting a far bigger area in less time. Additionally, farming becomes more cost-effective when machines that enable more accurate application of inputs like herbicides and fertilizers prevent overspending on these resources.

## 1.4 RAW MATERIALS

Over time, paper production has utilized diverse materials including cotton, wheat straw, sugar cane waste, and various plant sources like flax, bamboo, and hemp. The primary requisite for paper production remains same till date.

### 1.4.1 Agricultural Genetics

#### A. Seeds

These raw materials serve as the foundation for agricultural activities, assisting in the production of food and promoting the sustainability of economies and ecosystems. In order to solve issues like resource scarcity, food security, and climate change, sustainable management of these inputs is essential.

**B. Cereal:** A large percentage of the world's population is fed by staple crops, which are based on cereal seeds, which constitute the cornerstone of global agriculture. The reproductive organs of cereal grains, a class of grasses grown for their edible seeds, are these seeds. Food security and economic sustainability depend on their effective usage in agriculture.

**C. Vegetable:** Growing a variety of vegetables that are vital to human nutrition and economic activities requires vegetable seeds. They supply the raw materials needed to grow vegetables for processing, fresh consumption, or cooking.

**Figure 1.3 Seed Bank**

**D. Oil:** Oil seeds are seeds that are grown mainly to extract industrial and food oils. These oils are widely utilized in food preparation, cosmetics, and biofuels and are a significant source of dietary fats.

**D. Hybrid and GM Seeds:** Genetically modified (GM) and hybrid seeds are cutting-edge agricultural advances intended to improve crop production and satisfy rising food demands. In order to combine desired features like increased yield, disease resistance, and environmental adaptability, two genetically different parent plants are crossed to create hybrid seeds. Although these seeds must be bought every season since their characteristics might not reproduce consistently in succeeding generations, they frequently provide robust, consistent crops.

**Figure 1.4 Hybrid Seeds**

### 1.4.2 Soil

**Importance:** Soil is essential to agriculture as it provides the foundation for plant growth and sustains crop production.

**Characteristics:** The texture, which depends on the balance of sand, silt, and clay, affects how water and nutrients are retained or drained, while the soil structure determines root penetration and aeration.

**Applications:** It aids in nutrient management, crop selection, and irrigation, ensuring optimal conditions for farming.

**Figure1.5 Soil**

### 1.4.3 Energy Source

**Importance:** The use of energy enables mechanized processes such as planting, tilling, harvesting, and processing, reducing labour costs and increasing the speed and scale of agricultural operations.

**Characteristics:** Energy sources in agriculture are characterized by their ability to power machinery, irrigation systems, and climate-controlled environments.

**Applications:** Energy is crucial for operating irrigation systems, enabling water supply in areas with irregular rainfall**.**

### 1.4.4 Livestock

**Importance:** Livestock plays a vital role in agriculture by contributing to food production, income generation, and ecosystem health.

**Characteristics:** They are valued for their role in soil fertility through manure and as draft animals for labour. Livestock vary in size, breed, and productivity, and can be raised for different purposes.

**Applications:** provide draft power for ploughing and transportation, particularly in traditional farming systems

### 1.4.5 Fertilizer & Pesticides

**Importance:** Pesticides are applied in agriculture to protect crops from pests, diseases, and weeds, reducing crop damage and increasing yields.

**Characteristics:** Fertility is determined by the presence of essential nutrients and organic matter, and the pH level affects nutrient availability to plants.

**Applications:** They are used to provide essential nutrients to plants, enhancing soil fertility and promoting healthy crop growth, leading to improved productivity.

## 1.5 Machines in Agriculture

They increase sustainability, efficiency, and productivity, machines have completely changed the agricultural industry. The widespread use of tractors for jobs like tilling, ploughing, and towing other machinery speeds up and reduces the labour-intensiveness of soil preparation. For crops like rice, soybeans, and wheat in particular, combine harvesters streamline the harvesting process by integrating reaping, threshing, and winnowing into a single operation. Planters and seed drills make planting accurate and effective, guaranteeing even seed dispersion and the right depth. Water distribution is automated by irrigation systems like sprinklers and drip systems, and precision farming is supported by cutting-edge technologies like drones and GPS-guided equipment that monitor crop health and maximize resource use. These developments boost yields, drastically cut down on physical work, and support sustainable farming methods.

he papermaking industry stands as a cornerstone of global commerce and everyday life, seamlessly weaving its significance into numerous sectors. Rooted in the intricate processes of pulp production, refining, and paper formation, this industry relies on diverse raw materials, including wood pulp, recycled paper, and alternative fibres, to create an extensive array of paper products. Its scope spans from the production of printing and writing papers to packaging materials, tissues, newsprint, and specialty papers used across education, communication, packaging, and commerce. Technological advancements have propelled the industry forward, enabling improved

efficiency, quality, and environmental sustainability through cutting-edge machinery, digitalization, and recycling technologies. However, environmental concerns, notably deforestation and resource usage, persist, prompting a continuous drive toward sustainable practices and responsible sourcing. Despite the advent of digital alternatives, the papermaking industry's adaptability, innovation, and focus on ecofriendly solutions continue to position it as an indispensable player in the global marketplace, adapting to evolving consumer demands while navigating environmental challenges to maintain its relevance in the future.

## 1.6 SEPARATE MACHINES

### 1.6.1 Grass Cutting Machine

As shown in Figure 1.6, In contemporary agriculture, grass-cutting equipment is essential, especially for maintaining pastures and managing animal feed. Often called mowers or forage harvesters, these devices are made to effectively cut grass and other feed crops like clover and alfalfa. They aid in the preparation of hay and silage, both of which are necessary for animal feed. Modern grass-cutting equipment has features like automated collecting systems, height-adjustable blades, and even the ability to mulch to increase productivity. These devices guarantee well-kept fields and a consistent supply of animal feed by lowering physical work and saving time, which greatly increases agricultural businesses' productivity and sustainability. They aid in the preparation of hay and silage, both of which are necessary for animal feed. Modern grass-cutting equipment has features like automated collecting systems, height-adjustable blades, and even the ability to mulch to increase productivity.


**Figure 1.6 Grass Cutting Machine**

### 1.6.2 Seed Blower Machine

A seed blower machine, which separates seeds according to their density, size, and weight, is a crucial instrument in agricultural and seed processing. In order to ensure that only premium seeds are kept for planting or sale, this machine is frequently used to clean and grade seeds by eliminating contaminants like husks, chaff, and other lightweight debris. The blower efficiently separates seeds without harming them by producing a regulated air stream, which is essential for preserving the seeds' capacity to germinate. By starting with higher-quality seeds, seed blower machines minimize labour-intensive sorting procedures, increase processing efficiency and accuracy, and help farmers increase crop yields.

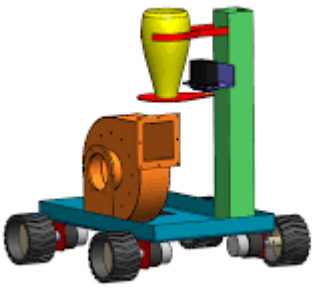

**Figure 1.7 Seed Blower Machine**

### 1.6.3 Fertilizer Sprayer Machine

These machines, which can be handheld, tractor-mounted, or drone-based, ensure precise application of liquid or granular fertilizers, minimizing waste and reducing labour-intensive manual spreading. Advanced sprayers often feature adjustable nozzles and GPS-guided systems for precision farming, allowing targeted application based on soil and crop needs. Fertilizer sprayer machines are designed to distribute fertilizers evenly across fields to enhance soil fertility and promote healthy crop growth. By increasing efficiency and ensuring uniform fertilizer distribution, fertilizer sprayer machines contribute to higher crop yields, less environmental impact, and more sustainable farming practices.

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**Figure 1.8 Fertilizer Sprayer Machine**

### 1.6.4 Ploughing and Seed Sowing Machine

In agriculture, ploughing and seed-sowing machines are revolutionary technologies that streamline the process of preparing the soil and planting. In order to improve aeration, mix organic materials, and prepare the field for planting, ploughing machines—which are frequently mounted on tractors—break and churn the soil. Following this, seed-sowing devices carefully plant seeds at consistent depths and spacings to guarantee the best possible germination and growth. Modern models combine the two capabilities, enabling simultaneous seeding and ploughing, which maintains efficiency while saving

time and labour. These devices greatly increase yields and promote sustainable farming methods by lowering manual labour, increasing the accuracy of seed distribution, and ensuring quicker and more consistent crop establishment.

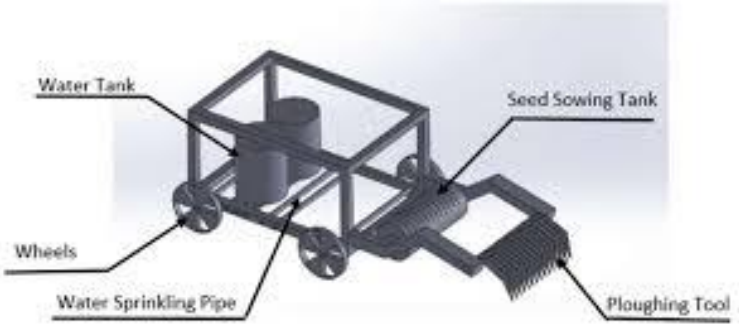


Fig 1 Operation of Multipurpose Agriculture Machine

**Figure 1.9 Other Multi-Purpose Machine**

## 1.7 IMPORTANCE OF MULTI PURPOSE MACHINES

Because they are adaptable, efficient, and economical, multipurpose machines are essential to modern agriculture because they can handle a variety of farming requirements with a single piece of machinery. These machines eliminate the need for numerous specialized tools by doing a variety of operations like ploughing, tilling, sowing, fertilizing, and even harvesting. Small and medium-sized farmers can save money on equipment and storage space because to this versatility.

With their ability to combine cost-effectiveness, efficiency, and usefulness, multipurpose machines are transforming modern agriculture and are a vital tool for farmers. With a single unit or flexible attachments, these machines may do a wide range of jobs, including ploughing, tilling, planting, fertilizing, spraying, and even harvesting. Because of its adaptability, fewer specialized machines are required, which lowers equipment prices, maintenance costs, and storage difficulties. Multipurpose machines provide small and medium-sized farmers with an economical way to update their farming methods and boost output.

Additionally, by handling several tasks at once, multipurpose machines simplify processes and save time and labour. By facilitating precision agriculture, which makes

the best use of resources like seeds, water, and fertilizers, they also support sustainable farming. These technologies enable farmers to boost production and adjust to a variety of agricultural operations in areas with limited access to sophisticated technology.
These devices not only have financial advantages but also save a great deal of time and effort, enabling farmers to finish a variety of tasks fast and effectively. By facilitating accurate seed, fertilizer, and water application, they promote sustainable practices by reducing resource waste and increasing yields. Because they can adapt to different crops, soil types, and farming situations, they are especially helpful in locations with a variety of agricultural needs. Due to technological improvements, multipurpose machines today frequently incorporate automation, sensors, and GPS, which enhances their use and functionality. Multipurpose machines are essential for addressing global food security and advancing sustainable agriculture because they make farming more accessible and effective.

## 1.8 STATISTICS FOR INFLUENCE OF MACHINE

In 2021, The influence of machinery in agriculture is transformative and supported by compelling statistical evidence. Mechanization has significantly boosted productivity, with global data showing that it contributes to a 30–50% increase in farm output, according to the Food and Agriculture Organization (FAO). In countries like India, mechanized farms report an 18–20% higher yield per hectare compared to traditional methods. Labor efficiency has also improved drastically; for example, a tractor can replace the work of approximately 15 manual labourers for ploughing tasks, and in the United States, mechanization reduced labour hours for wheat production by 50% per **acre** between 1980 and 2020. Additionally, modern machinery lowers production costs by 10–20%, as equipment like combine harvesters, seed drills, and fertilizer sprayers optimize resource use and minimize wastage. This statistical evidence underscores how machines are not only enhancing agricultural efficiency and sustainability but also enabling farmers to meet the rising global demand for food.

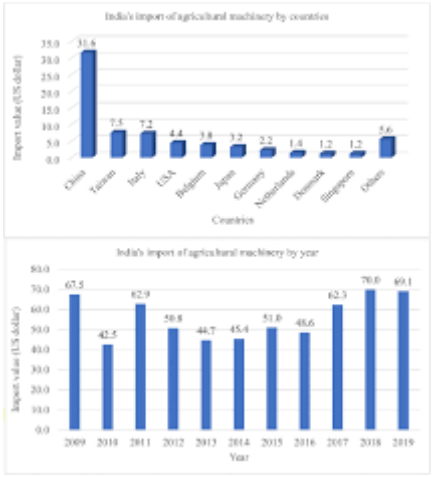


**Figure 1.10 Influence of Machine in Agriculture Statistic**

## 1.9 MULTI PURPOSE MACHINE IN INDIA

In India, the adoption of multipurpose machines in agriculture has brought about significant improvements in farming efficiency, productivity, and sustainability. These machines, which can perform a variety of tasks such as ploughing, sowing, fertilizing, and spraying, are particularly beneficial for small and medium-scale farmers who may lack the resources to invest in multiple specialized pieces of equipment. For instance, a single tractor equipped with attachments can replace several traditional tools, reducing labour costs and time spent on farm operations. According to the Indian Ministry of Agriculture, the use of multipurpose machines has led to a 15–20% increase in farm productivity and a 25–30% reduction in labour costs in certain regions. In addition, these machines allow for more precise and uniform planting, which improves crop yields and reduces wastage of seeds and fertilizers. Furthermore, they help promote sustainable farming practices by minimizing resource use and supporting the shift toward mechanized, precision agriculture, particularly in areas where manual labour is scarce. The increasing availability of affordable and versatile agricultural machinery is paving the way for more efficient and profitable farming practices across India.

India's paper recycling industry demonstrates a recycling rate estimated at around 27-30% of the nation's total paper consumption. The sector boasts a substantial capacity, recycling several million metric tons of paper annually and collecting approximately 3.5 to 4 million metric tons of waste paper for recycling each year. This recycled paper

finds application across diverse industries within India, including packaging, printing, writing, tissue production, and specialty papers. Notably, corrugated cardboard, extensively used in the packaging industry, stands as a significant product manufactured from recycled paper within the country. To visualize the distribution of recycled paper usage across various sectors in India, a pie chart can effectively represent the allocation: approximately 40% utilized in the packaging industry, 20% in printing and writing paper, 15% in tissue paper production, around 10% in specialty paper manufacturing, and the remaining 15% allocated for other industrial uses. These statistics underscore the substantial contribution of recycled paper to different sectors of the Indian economy, emphasizing its pivotal role in fostering sustainable practices and resource conservation. This breakdown as shown in Figure 1.11 would offer a visual representation of how recycled paper is allocated across different sectors in India. It helps demonstrate the substantial role of recycled paper in diverse industries, particularly in packaging and printing, and provides insights into the distribution of recycled paper usage in various sectors of the Indian economy**.**

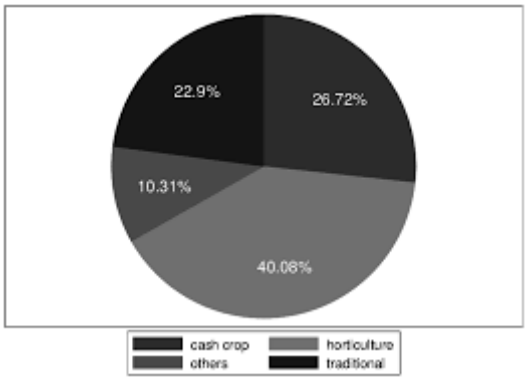


**Figure 1.11 Farming Methods**

# CHAPTER 2
# LITERATURE SURVEY

## 2.1 LITERATURE REVIEW

**Dilip Radkar, et.al2021 [1]** Farming is the backbone of Indian economy. In this agriculture sector, there is a lot of fieldwork, such as ploughing, reaping, sowing etc. these operations previously were done by traditional equipment's. This field faces some problems such as how to minimize the losses, how to increase productivity and how to minimize cost. In India, two types of agricultural methods are used, manual method (conventional method) and mechanize type method. In Manual method they are working with those equipment's was tedious and laborious. Also, traditional ways are time consuming. Mechanization involves the use of a hybrid device between the power source and the work. This hybrid device usually transfers motion, such as rotary to linear, or provides sample of mechanical advantages. Mechanization in agriculture made farming easier and quick. There are variety of machines are available for almost every task in agriculture. Beginning with preparing land to the harvesting of crop and further process can be done by machines. This machines not only easier way to do this task but also very efficient. The agriculture machineries that are used now days are costlier and cannot be afforded by most of farmer with rural background. Most of the farmers in India own very small pieces of land and owning these costlier machines may not be feasible for them. Most farmers are still stick to their old ways. The fact that most of the farmer are low level income earners, they cannot invest on the purchase of large machine. Considering above mentioned factors there is need to develop such an equipment,

**Venu K, et.al2023 [2]** Multipurpose agriculture equipment is basic and major equipment involved in agriculture for maximum yielding. Conventional method of planting and cultivating the crops is a laborious process and hence for that reason there is a scarcity of labours, this result in delayed agriculture to overcome these difficulties, multipurpose agriculture equipment is designed. The main objective of

this project is sprayer and crop cutter. Our aim is to produce a highly efficient multipurpose agriculture machine which will reduce time, cost of labour, and enhance production. Presently, small land holding farmers use work bulls mostly for land preparation. Their use can be increased and made more economical by using them for other farm operations

**Dhawale A, et.al2023 [3]** Farming is the backbone of Indian economy. In this agriculture sector, there is a lot of fieldwork, such as weeding, reaping, sowing etc. these operations previously were done by traditional equipment's. Working with those equipment's was tedious and laborious Also traditional ways are time consuming. Mechanization in agriculture made farming easier and quick. There are variety of machines are available for almost every task in agriculture. Beginning with preparing land to the harvesting of crop and further process can be done by machines. This machines not only easier way to do this task but also very efficient. The agriculture machineries that are used now a days are costlier and cannot be afforded by most of farmer with rural background. Most of the farmers in India own very small pieces of land and owning this costlier machine may not be feasible for them. Apart from this most of farmers consider the traditional ways of farming as primary methods. Considering above mentioned factors there is need to develop such an equipment, which will be of multiple use and especially will be of low cost.

**Sakhale C N, et.al2016 [4]** India is an agriculture-based country in which, 70% of people depends on the outcome of farming. But if we observe that with increase in population the farm gets distributed among the family and because of this, farmer in India held averagely only two-acre farm. Also economically, farmers are very poor due to which they are unable to purchase tractors and other costly equipment's hence they use traditional method of farming. Basically, many farmers in India also use bullocks, horses and he-buffalo for farming operation. This will not satisfy need of energy requirement of the farm

**Gaikwad S N, et.al 2023 [5]** In Multipurpose agricultural equipment is becoming increasingly popular in India as a way to reduce the time and labour required for farming. This type of equipment can be used for a variety of tasks, including spraying, sowing, and mulching. In this paper, we present the results of a

study on the use of multipurpose agricultural equipment in Indapur, India. The study was conducted on a farm in the Indapur district and involved the use of a battery powered multipurpose agricultural equipment. The equipment was used to spray pesticides, sow seeds, and mulch crops. The results of the study showed that the use of battery-powered multipurpose agricultural equipment can save time and labour. The equipment was able to spray pesticides more quickly and efficiently than a traditional backpack sprayer. The equipment was also able to sow seeds more evenly and accurately than a traditional hand seedier. The equipment was also able to mulch crops more quickly and easily than a traditional rake. The results of this study suggest that battery powered multipurpose agricultural equipment can be a valuable tool for farmers in India. The equipment can save time and labour, which can free up farmers to focus on other tasks. The equipment can also help farmers to improve the efficiency of their operations. Furthermore, the study highlighted the potential economic benefits of using multipurpose agricultural equipment in Indapur. By reducing the time and labour required for farming tasks, farmers can increase their overall productivity and potentially achieve higher yields. This can lead to improved profitability and economic sustainability for farmers in the region.

**Pillai A V**, **et.al 2021 [6]** The agriculture segment is one of the key regions to distinguish the quantity of utilizations for work using obsolete resources. Our project relates to seed fodder, pesticides and multipurpose farming machinery for fertilizers and dumping, giving the farmer the most economical and multi-use tools that are clean, easy to maintain, effortless to handle and don't require direct fuel, thus reducing costs and helping farmers in their fields. This machine uses the power of the tractor to carry out all agricultural operations. Mechanization employs the utilization of a hybrid machine between the source of power and the work. The project uses power take off wire to transmit power from the tractor to the multipurpose machine. This power extends to all the necessary processes such as sowing, watering, spraying, ploughing and cutting. of efficient strategies for eliminating contaminants in recycled fibre.

**Achutha A, et.al 2016[7]** All trades of village artisanship in black-smith carpentry, stone etc. contributed to the design of development of farm tools through artisan's ingenuity. Carpentry made the counterpoise to lift the water from wells to irrigate crops. Big size of earthenware was made by potters to store grains for month to be safe from insects and pest's cobblers used whole skins of animals to carry water to irrigate horticultural crops besides entering dust roads. Farming is the backbone of Indian economy. In this agriculture sector there is a lot of field work, such as weeding, reaping, sowing etc. Apart from these operations, spraying is also an important operation to be performed by the farmer to protect the cultivated crops from insects, pests, funguses and diseases for which various insecticides, pesticides, fungicides and nutrients are sprayed on crops for protection. As agriculture was the mainstay of the population, farmer required hand tools to do work, improve labour productivity and quality of work, therefore the results in poor productivity and obtain low yield MAE (Multipurpose Agriculture Equipment) was developed. We have developed agriculture needs to find new ways to improve efficiency. One approach is to utilize available information technologies in the form of more intelligent machines to reduce and target energy inputs in more effective ways than in the past. The advent of new concept gives the opportunity to develop a completely new range of agricultural equip**.**

**Arcot Aashish Arun Kumar, et.al 2020[8]** The paper aims at the overall review of planning, development and thus fabrication of the multipurpose agriculture robot which is able to dig the soil, leveller to shut the mud, sprayer to spray water and fertilizer separately, these whole systems of the robot work with the battery, and therefore, the alternative energy. Quite 40% of the population within the planet chooses agriculture due to the first occupation, in recent year the autonomous vehicles within the agriculture have experienced increased interest. The vehicle consists of Relay switch and Bluetooth. This language input allows a user to interact with the robot which is familiar to most of the people. The agriculture robot works on solar energy. The advantages of these robots are hands-free, and fast data input operations. In the sector of agricultural autonomous vehicle, a concept is being developed to investigate if multiple light compact autonomous machine may be

more efficient than traditional large tractors and human forces. Hence, the device is to be designed which helps farmers to beat the stated problem.

**Anola Ku Panda, et.al (2022) [9]** The India is an agriculture-based country in which, 70% of people depends on the outcome of farming. But if we observe that with increase in population the farm gets distributed among the family and because of this, farmer in India held averagely only two-acre farm. Also economically, farmers are very poor due to which they are unable to purchase tractors and other costly equipment's hence they use traditional method of farming. Basically, many farmers in India also use bullocks, horses and he-buffalo for farming operation. This will not satisfy need of energy requirement of the farming as compared to other countries in the world. So, we are thinking that human and animal efforts can be replaced by some advance mechanization which will be suitable for small scale farmer from economical and effort point of view. So, we are developing this equipment which will satisfy all this need and to solve labour problem. In this equipment We used 24cc engine for digging operation and for spraying used motor with 12V battery. Next two operations are manual base which is cultivation and sowing. This machine performs four farming operation (digging, sowing, cultivation, spraying) which is used small scale far

**Zaalouk A K, et.al 2019 [10]** This study aimed to develop, manufacture, and evaluate a multi-purpose machine to achieve tillage operation for smallholding farms using two developed Ploughs (chisel Plough and rotary Plough). The tillage process was carried out at four different levels of forward speeds (1.2, 1.8, 3.0, and 4.4 km/h) and three depths (6, 12, and 18 cm). The results indicated that the maximum values of actual filed capacity were 0.80 and 0.91 fed/h, and field efficiency (76 and 87%) for the chisel plough and rotary plough at a forward speed of 4.4 km/h and tillage depth of 6 cm. The minimum values of power requirement were for chisel plough 1.52 and 1.25 kW and rotary plough at forward speed 1.2 km/h and tillage depth 6 cm. The maximum values of specific power were 5.36 and 4.26 kWh/fed for the chisel plough and rotary plough at a forward speed of 4.4 km/h and tillage depth of 6 cm. The optimum values of bulk soil density and soil smoothness were 987 kg/$m^3$ and 28% at a speed of 1.8 km/h and 775 kg/$m^3$ and 50%

at a speed of 3.0 km/h for chisel plough and rotary plough at tillage depth of 18 cm. Also, the results indicated that the maximum values of penetration resistance percentage were 58% for the chisel plough and 68% for the rotary plough at a forward speed of 4.4 km/h and tillage depth of 6 cm

**Rafiq, et.al 2023[11]** India is an agricultural nation where 70% of the people depend on successful agriculture. However, as the population grows, farms are distributed among families; as a result, the average Indian farmer holds just two acres of land. The system addresses the innovative idea of the Joystick based system in all farming systems. By implementing this project, we can eliminate many difficulties in agriculture. The system runs on solar energy, which is the cleanest energy in the world. Cultivators are very popular these days. The most common machines are used to trim soft grass. As part of our project, Joystick based solar cultivator, seeding and watering system is developed for use and construction. It is placed in a suitable machine structure. The motor has 1000 rpm and is connected to the power source by a coil of wire. The engine revolutions increased with the help of the gears. The electric switch-controlled motor makes it easy to use. The machine is controlled by a smartphone. The system is like a mobile robot with four wheels and a cultivator attached to the back of the robot. The seeding system is installed on the robot. The water pump and water tank are installed in the system and can be controlled wirelessly. These characteristics make the system ideal for farming. The aim of the project is to design and develop a complete system that can be used as a cultivator, seeding, irrigation system and mower. The system cultivates the field, sows the seeds and also has an irrigation system for the crops. The entire system is solar powered and controlled by a Joystick smartphone.

**Hariharan B R**, **et.al 2017 [12]** All trades of village artisanship in black-smith carpentry, stone etc. contributed to the design of development of farm tools through artisan's ingenuity. Big size of earthenware was made by potters to store grains for month to be safe from insects and pest's cobblers used whole skins of animals to carry water to irrigate horticultural crops besides entering dust roads as an Engineer we extend our hand in helping farmer by fabricating multipurpose agricultural machine. A detailed study is made on need of agricultural machine for

developing this multipurpose agricultural machine. The alteration in existing machine was made in significant figure. This project describes the practical implementation of forward-thinking trivial solution to various agricultural prorogue seen in premature period. During this mature period the cost which engrossed the farmer has to be reduced complimented with various another adeptness. The indentation of this project is cost reduction with basic amenities like easy compressing mechanism, simple bundling technique without much spill attached with easy detaching system and motor less working model with gear and sprocket arrangement. This model is effective with almost all types of crops and other agricultural crop residues. The crop collection may be effectively utilized by the farmers. The compressing mechanism finds its application in crop residue bundling which is either fed to animals or effectively used for construction of roofs in hut. This project aims at 50% reduction in the production cost of existing model.

**Mahesh K Borbale, et.al2020[13]** Generally cultivation of any crop involves various steps like seed selection, field preparation, fertilizing, sowing, irrigation, germination, thinning and filling, weed removal vegetative stage, flowering stage, pesticide spraying, fruit or pod formation stage, harvesting and threshing. Farmer has to use various agricultural equipment and labours for caring out those steps, our purpose is to combine all the individual tools to provide farmers with multipurpose equipment which implements all the scientific farming techniques and specifications and suitable for all type of seed-to-seed cultivation with as minimum cost as possible. This project work is focused on the design and fabrication of multipurpose equipment which is used for land preparation, sowing, fertilizing, levelling and weed removal process. The multi-crop planter has the capability of delivering the seeds precisely with uniform depth in the furrow, and also with uniform spacing between the seeds. The seed planter consists of the main frame, adjustable handle, seed hopper, seed metering disc, adjustable furrow opener, adjustable furrow closer, drive wheels, seed tube. Seed metering disc was designed to interchangeable to allow for sowing of the different varieties of seeds. The multipurpose agricultural equipment is very simple to use, the various adjustments are made with ease, and it is maintenance free.

**Dr Sunitha , et.al 2024[14]** The Agriculture Multi-Purpose Vehicle (AMPV) is an innovative solution designed to revolutionize farming practices by integrating multiple agricultural functionalities into a single platform. This prototype aims to streamline various tasks such as soil preparation, seed planting, irrigation, and crop maintenance, thereby enhancing efficiency, reducing labour requirements, and improving overall productivity in agriculture. The AMPV features modular attachments, motorized mechanisms, and a user-friendly control interface, allowing farmers to adapt to different cropping systems and field conditions with ease. This paper presents the design, development, and implementation of the AMPV prototype, highlighting its key features, operational capabilities, and potential applications in modern agriculture

**Ashwin Chandran**, **et.al 2020 [15]** The Multipurpose machine is used to sowing the seeds and fertilizer spray into land and grass cutting for making lots of plant production in agricultural field. It is a mechanical device here no electrical or other power source is not required. The cost of this machine is very low and easy to operate simple in construction. As there is tremendous development in the field of engineering the current scenario makes us to find solution for major problems faced by the agricultural field. Lot of equipment was inverted to sophisticate the work of labour in the farms. The main objective of this project is to improve the current way of farming by introducing multipurpose equipment. It helps farmers by grass cutting and sowing the seeds and fertilizers. The fabricated device called “Design and Fabrication of Multipurpose Farming Equipment (Sowing, Ploughing, Sprayer) With Solar)”. To sow the seeds first land should be cleaned and after sprayed the seeds the land should be filled. This equipment which we build will do the mentioned functions automatically. It will be very useful for agricultural purpose and very simple in construction and economical.

## 2.2 LITERATURE SUMMARY

Based on the literature, the following key points can be summarized

1. With more than 70% of the workforce employed in agriculture, the sector is vital to the Indian economy. The inefficiency of conventional farming practices, high operating expenses, and a lack of labour are some of the major issues facing the industry. Even though they are readily available, traditional tools require a lot of work and time, which lowers production and profitability, particularly for small-scale farmers. A crucial step in resolving these problems has been the introduction of multifunctional agricultural equipment, which offers smallholder farmers adaptable, economical, and efficient solutions.
2. The desire to limit labour dependency, save expenses, and increase efficiency has led to a growing need for mechanization in Indian agriculture, as noted by Dilip Radkar et al. (2021) and Dhawale et al. (2023). Despite their dependability, traditional farming methods fall short of contemporary efficiency norms. Conversely, mechanized farming adds a variety of equipment for specialized activities such as harvesting, spraying, ploughing, and seeding. However, most farmers cannot afford such equipment due to its high cost, especially those with tiny landholdings and low incomes. This calls for the creation of multifunctional machines that combine several functions into a single, reasonably priced apparatus.
3. The Innovative solutions have been investigated in this field of study. For instance, according to Gaikwad et al. (2023), battery-powered tools like sprayers and Sowers have shown themselves to be both economical and effective. These devices increase operational precision while saving time and labour. Similarly, hybrid devices driven by tractors and small autonomous machines that use solar energy are covered by Pillai et al. (2021) and Aashish et al. (2020). These developments solve financial and environmental issues while providing adaptability and sustainability. Devices that are operated by joysticks or cell phones offer an extra degree of versatility and user-friendliness, making them appropriate for a variety of farming situations.

4. A complete solution is provided by Sunitha et al.'s Agriculture Multi-Purpose Vehicle (AMPV) prototype, which combines crop upkeep, irrigation, seed sowing, and soil preparation into a single modular device. With its motorized mechanism and interchangeable attachments, this design is a prime example of how multifunctional agricultural equipment can improve production and streamline processes.
5. The adoption of these equipment is still heavily influenced by economic factors. The focus of studies by Borbale et al. (2020) and Hariharan et al. (2017) is on lowering manufacturing costs through maintenance-free operation and streamlined designs. For example, machines that use motorless designs, gears, and sprockets save money without sacrificing efficiency. Additionally, small-scale farmers may easily operate and access these devices due to their lightweight, portable designs.

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## 2.3 PROBLEM IDENTIFICATION

1. Traditional Sowing, weeding, and spraying are time-consuming, labour-intensive, and impractical farming chores, especially for farmers with limited staff or those with strict seasonal schedules.
2. Farmers' economic and environmental problems are made worse by conventional agricultural machinery's reliance on fossil fuels, which also raises operating costs and contributes to dangerous carbon emissions.
3. Small-scale farmers are frequently unable to adopt effective automated farming solutions to increase production and decrease manual labour because modern machinery is too costly for them.
4. The lack of proper safety features in traditional farming equipment raises the possibility of accidents or injuries during agricultural tasks including ploughing, cutting, and planting.
5. The use of numerous single-purpose machines for different jobs necessitates greater maintenance, storage space, and investment, which presents problems for farmers with little funding or smaller landholdings

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## 2.4 OBJECTIVES

1. To reduce the intensity of labors, count and to promote a user-friendly device to access the machine
2. To increase the efficiency of work and to reduce the time of work
3. To utilizing an eco-friendly and energy-efficient material like solar power or electricity to minimize carbon emissions in the design to support sustainable gardening and farming practices.

# CHAPTER 3
# DESIGN AND FABRICATION OF MULTI PURPOSE AGRICULTURE MACHINE

## 3.1 METHODOLOGY

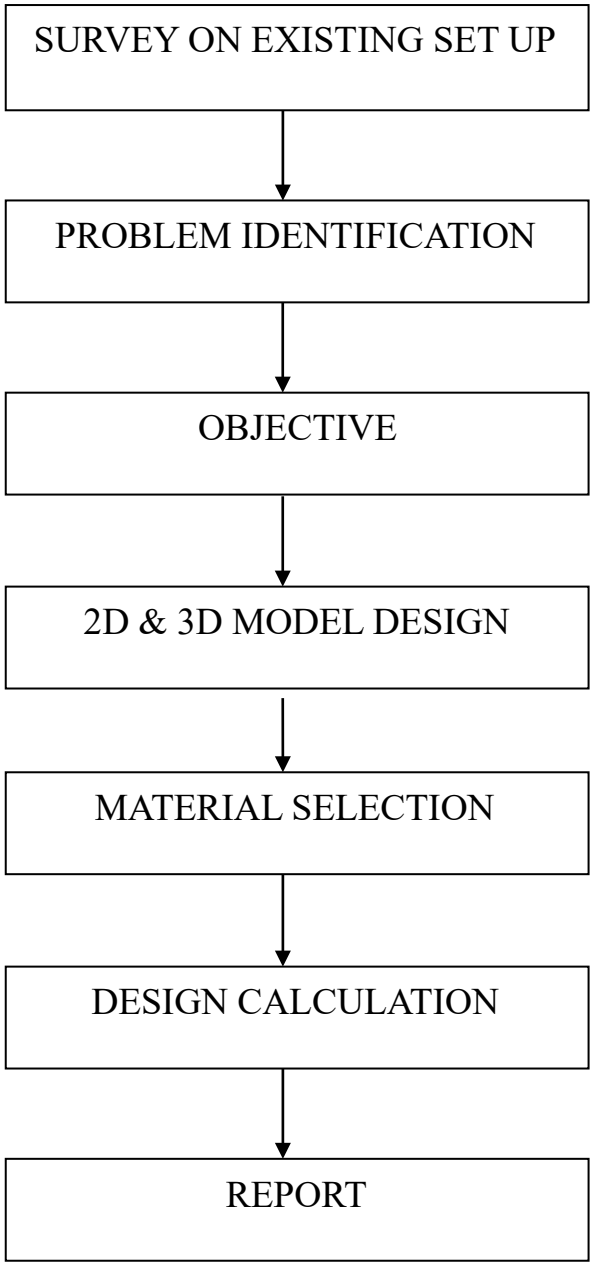


**Figure 3.1 Methodology**

### 3.4 BILL OF MATERIALS

- Main frame
- Wheels
- DC Motor 12V 500W
- DC Motor 12V 200W
- DC Motor 12V 75W
- SLA Battery
- Diaphragm Pump
- Height adjuster
- Storage Tank (5 litres)
- Adjustable Nozzle
- Switches
- Wire Tag
- Connecting Rod (SS-Steel)
- Miscellaneous

# CHAPTER 4
# DESIGN CALCULATION

## 4.1 SPECIFICATIONS OF MOTOR

- DC Gear tooth Motor 12V 500W (For Wheel)

  Speed = 1500 - 2500 Rpm

  Torque = Power/2*3.14*N

  = 500 / 2*3.14*2000

  Torque = 0.04 Nm

  Gear ratio = 5:1

  Torque Reduction (Due to Gear Ratio) = 0.04 * 5 =0.2 Nm

  Wheel Speed = Speed / 5 = 400 Rpm

- DC Motor 12V 200W (For Blade)

  Speed = 3000 – 6000 rpm

  Torque = Power/2*3.14*N

  = 200 / 2*3.14*2500

  Torque = 0.012 Nm

- DC Motor 12V 75W (For Pump)

  Torque = Power/2*3.14*N

  = 200 / 2*3.14*2000

  Torque = 5.96 * 10*-3 Nm

## 4.2 SPECIFICATION OF BATTERY

- SLA 12V 45Ah

  Battery Capacity (Ah) = Power * Time (in Hours)/ 12

  (500+200+75) *0.5/12

  Battery Capacity = 32.5 Ah

## 4.3 SPECIFICATION OF WHEEL

Diameter of Wheel = 30 cm

Clearance = 30/2 = 15 cm

## 4.4 DIMENSIONS OF STORAGE TANK

Capacity = 5 litre

Length = 171 mm

Width = 171 mm

Height = 171 mm

## 4.4 DIMENSIONS OF FRAME

Length = 910 mm

Width = 450 mm

# CHAPTER 5

# COST ESTIMATION

## Table 5.1 Cost Estimation

| SL No | Items | Quantity | Unit Cost (Rs) | Proposed Cost (Rs) | Actual Cost (Rs) |
|---|---|---|---|---|---|
| 1 | Main Frame | 1(Nos) | 700 | 700 | |
| 2 | Wheels | 4(Nos) | 500 | 2000 | |
| 3 | Dc Motor 12V 500W | 1(Nos) | 1000 | 1000 | |
| 4 | Dc Motor 12V 200W | 1(Nos) | 850 | 850 | |
| 5 | Gear Setup | 1(Nos) | 1000 | 1000 | |
| 6 | SLA Battery | 1(Nos) | 1300 | 1300 | |
| 7 | Diaphragm Pump | 1(Nos) | 1000 | 1000 | |
| 8 | Height Adjuster | 1(Nos) | 500 | 500 | |
| 9 | Storage Tank (5 lit) | 1(Nos) | 800 | 800 | |
| 10 | Adjustable Nozzle | 1(Nos) | 300 | 300 | |
| 11 | Switches | 3(Nos) | 150 | 150 | |
| 12 | Wire Tag | 1(Nos) | 100 | 100 | |
| 13 | SS rod | 2(Nos) | 250 | 500 | |
| 14 | Controller System | 1(Nos) | 800 | 800 | |
| 15 | Solar Panel | 1(Nos) | 1500 | 1500 | |
| | | | **TOTAL** | **13,500** | |

# CHAPTER 6

# CONCLUSION

In conclusion, the development of multipurpose agricultural equipment represents a significant step forward in addressing the challenges faced by small-scale farmers, particularly in economies like India, where agriculture forms the backbone of livelihood for a majority of the population. Traditional farming methods often require substantial labour, multiple tools, and incur high costs, creating a financial burden for farmers with limited resources. Our proposed machine aims to consolidate essential farming functions such as crop cutting and spraying into a single, efficient piece of equipment. This not only reduces the reliance on human and animal labour but also optimizes time and resource utilization. By combining advanced technology with practicality, this equipment is designed to be cost-effective, user-friendly, and adaptable to the specific needs of small-scale farming. Ultimately, this initiative strives to empower farmers, boost agricultural productivity, and contribute to a more sustainable and economically viable farming sector.

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