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Fabrication of Multipurpose Agriculture Machine

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ABSTRACT

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 multi purpose 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.

Key Words: Multipurpose, agricultural, equipment, labour.

INTRODUCTION

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. ―A man without food for three days will quarrel, for a week will fight and for a month or so will die‖. Agriculture is a branch of applied science. Agriculture is the science and art of farming including cultivating the soil, producing crops and raising livestock. It is the most important enterprise in the world. Over the years, agricultural practices have been carried out by small-holders cultivating between 2 to 3 hectares, using human labor and traditional tools such as wooden plough, yoke, leveler, harrow, spade, big sickle etc. These tools are used in land preparation, for sowing of seeds, weeding and harvesting. Modern agricultural techniques and equipment are not used by small land holders because these equipment are too expensive and difficult to acquire. By adopting scientific farming methods we can get maximum yield and good quality crops which can save a farmer from going bankrupt but the majority of farmers still use primitive methods of farming techniques due to lack of knowledge or lack of investment for utilizing modern equipment. The use of hand tools for land cultivation is still predominant in India because tractors require resources that many Indian farmers do not have easy access to. The need for agricultural mechanization in India must therefore be assessed with a deeper understanding of the smallholder farmer‘s

activities. There is a huge gap in technology adoption and implementation used with small and marginal farmers. Sustainable improvement in the livelihoods of poor farmers in developing countries depends largely on the adoption of improved resource conserving cropping systems. While most of the necessary components already exist, information on the availability and performance of equipment is lacking and effective communication between farmers and agricultural research and development departments is unsuccessful.

Main Features of Indian Agriculture

1. Source of livelihood: Agriculture is the main occupation. It provides employment to nearly 61% of the total population. It contributes 25% to national income.
2. Dependence on monsoon: Agriculture in India mainly depends on monsoon. If monsoon is good, the production will be more and if monsoon is less than average then the crops fail. As irrigation facilities are quite inadequate, agriculture depends on the monsoon.
3. Labor intensive cultivation: Due to increase in population the pressure on land holding increased. Land holdings get fragmented and subdivided and become uneconomical. Machinery and equipment cannot be used on such farms.
4. Under employment: Due to inadequate irrigation facilities and uncertain rainfall, the production of agriculture is less; farmers find work a few months in the year. Their capacity of work cannot be properly utilized. In agriculture there is under employment as well as disguised unemployment.
5. Small size of holdings: Due to large scale sub-division and fragmentation of holdings, land holding size is quite small. Average size of land holding was 2 to 3 hectares in India while in Australia it was 1993 hectares and in the USA it was 158 hectares.
6. Traditional methods of production: In India methods of production of crops along with equipment are traditional. It is due to poverty and illiteracy of people. Traditional technology is the main cause of low production.
7. Low Agricultural production: Agricultural production is low in India. India produces 27 Qtls Wheat per hectare. France produces 71.2 Qtls per hectare and Britain 80 Qtls per hectare. Average annual productivity of agricultural labour is 162 dollars in India, 973 dollars in Norway and 2408 dollars in USA.
8. Dominance of food crops: 75% of the cultivated area is under food crops like Wheat, Rice and Bajra, while 25% of cultivated area is under commercial crops. This pattern is the cause of backward agriculture.

Major Challenges Faced By Indian Agriculture

1. Stagnation in Production of Major Crops: Production of some of the major staple food crops like rice and wheat has been stagnating for quite some time. This is a situation which is worrying our agricultural scientists, planners and policy makers. If this trend continues, there would be a huge gap between the demand of ever growing population and the production.

2. High cost of Farm Inputs: Over the years rates of farm inputs have increased. Farm inputs include fertilizer, insecticide, pesticides, HYV seeds, farm labour cost etc. Such an increase puts low and medium land holding farmers at a disadvantage.
3. Soil Exhaustion: Soil exhaustion means loss of nutrients in the soil from farming the same crop over and over again. This usually happens in the rainforest.
4. Depletion of Fresh Groundwater: Most of the irrigation in dry areas of Punjab, Haryana and Western Uttar Pradesh was carried out by excessive use of groundwater. Today the fresh groundwater situation in these states is alarming. In the coming few years if this type of farming practice continues, these states are going to face water famine.
5. Adverse impact of Global Climatic Change: Among various challenges, global climatic change is the recent one. It is predicted that due to climate change, temperature would increase from 2°C to 3°C, there would be increase in sea level, more intense cyclones, unpredictable rainfall etc These changes would adversely affect the production of crops.
6. Impact of Globalization: You can see the effect of globalization on the farm sector in India. All developing countries have been affected by it. The most evident effect is the squeeze on farmer‘s income and the threat to the viability of cultivation in India. This is due to the rising input costs and falling output prices. This reflects the combination of reduced subsidy and protection to farmers.

LITERATURE SURVEY

The development of our agricultural robot and the idea used to implement them, started with the study of various papers

- “Agricultural Robot for Automatic Ploughing and Seeding” 2015 IEEE International Conference on Technological Innovations in ICT (TIAR 2015) **(Amrita Sneha.A, Abirami.E, Ankita.A, Mrs. R. Praveen, Mrs. R. Srimeena).** This paper strives to develop a robot capable of performing operations like automatic ploughing, seed dispensing. It also provides manual control when required and keeps tabs on the humidity with the help of humidity sensors .The main component here is the AVR At mega microcontroller that supervises the entire process. Initially the robot tills the entire field and proceeds to ploughing, simultaneously dispensing seeds side by side. On the field the robot operates on automated mode, but outside the field is strictly operated in manual mode
- Designing, employing, and examining an autonomous multipurpose vehicle with safe, reliable and economic operation. This autonomous vehicle goes through the crop lines of Agricultural land and performs duties that are tiresome and/or unsafe to the farmers. First, it's been prepared for spraying, but other configurations are also designed, such as: a seeding, plug system to reach the most notable area of the plants to execute different tasks (pruning, harvesting, etc.), and a truck to move the fruits, crops and crop waste products. The wheels of this robot are designed so that it can travel easily in soft and wet soil..
- . “Automated Farming Using Microcontroller and Sensors” (IJSRMS) ISSN: 23493371 **(Abdullah Tanveer, Abhishek Choudhary, Divya Pal, Rajani Gupta,** Farooq Husain) Farming can be done using new technologies to yield higher growth of the crops. In this project we are going to check temperature, light, humidity and soil moisture. The paper here is all about automatic control features with latest electronics technology using microcontroller and GSM phone line. The project works automatically and hence reduces the manpower

- Improvement in agriculture techniques like automatic planting of seed products on ploughed land by using automatic robots. A robotic vehicle having four tires and steered by DC motors was developed. The seed planting device is fixed on the automobile to seed the seed products in an even manner. The device will cultivate the plantation by considering particular rows and specific columns at predetermined distances depending on different seed products. The obstacle recognition is considered and sensed by an infrared sensor. The complete assemblage is driven by a 12V rechargeable battery pack. The battery pack can be recharged by using solar power which is also attached to the robot. This robot can perform bed preparation, seed mapping, seed placement and reseeding operations.
- The design, development and the fabrication of the automatic robot which can dig the ground, put the seed products, leveller to close the soil and sprayer to apply water, these complete systems of the automatic robot works together with the power supply and the solar powered energy. Steering operation of the robot is done using a rack and pinion mechanism. Relay switch regulates power input for the motor. Obstacle detection is done using an IR sensor. A lot more than 40% of the populace on earth selects agriculture as the principal occupation; lately the introduction of the autonomous vehicles in the agriculture has experienced increased interest
- "IOT Based Smart Agriculture" IJARCCE June 2016 **(Nikesh Gondchawar1, Prof. Dr. R. S. Kawitkar2)** In this paper a project model for agriculture robots describes the newer scenario of decreasing water tables, drying up of rivers and tanks, unpredictable environments that present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture sensors at suitable locations for monitoring of crops is implemented in an algorithm developed with threshold values of temperature and soil moisture can be programmed into a microcontroller-based gateway to control water quantity. The system can be powered by photovoltaic panels and can have a duplex communication link based on a cellular internet interface that allows data inspection and irrigation scheduling to be programmed through a web page. The technological development in wireless sensor networks made it possible to use in monitoring and control of greenhouse parameters in precision agriculture. After the research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day. However, use of technology in the field of agriculture plays an important role in increasing the production as well as in reducing the extra man power efforts. Some of the research attempts are done for betterment of farmers which provides the systems that use technologies helpful for increasing the agricultural yield

CROP CUTTING

The cutting of crop after it is mature is called harvesting. A plant cutting is a piece of a plant that is used in horticulture for vegetative (asexual) propagation. A piece of the stem or root of the source plant is placed in a suitable medium such as moist soil. If the conditions are suitable, the plant piece will begin to grow as a new plant independent of the parent, a process known as striking. A stem cutting produces new roots, and a root cutting produces new stems. Some plants can be grown from leaf pieces, called leaf cuttings, which produce both stems and roots. The scions used in grafting are also called cuttings.[1]
Propagating plants from cuttings is an ancient form of cloning.[2][3] There are several advantages of cuttings, mainly that the produced offspring are practically clones of their parent plants. If a plant has favorable traits, it can continue to pass down its advantageous genetic information to its offspring. This is especially economically advantageous as it allows commercial growers to clone a certain plant to ensure consistency throughout their crops.[4]
A **crop** is a plant that can be grown and harvested extensively for profit or subsistence.[1] When the plants of the same kind are cultivated at one place on a large scale, it is called a **crop**. Most crops are cultivated in agriculture or hydroponics. Crops may include macroscopic fungus (e.g. mushrooms) and marine macroalga (e.g. seaweed), some of which are grown in aquaculture.
Most crops are harvested as food for humans or fodder for livestock. Some crops are gathered from the wild often in a form of intensive gathering (e.g. ginseng, yohimbe, and eucommia).
Important non-food crops include horticulture, floriculture and industrial crops. Horticulture crops include plants used for other crops (e.g. fruit trees). Floriculture crops include bedding plants, houseplants, flowering garden and pot plants, cut cultivated greens, and cut flowers. Industrial crops are produced for clothing (fiber crops e.g. cotton), biofuel (energy crops, algae fuel), or medicine (medicinal plants).

PESTICIDE SPRAYER

A sprayer is a device used to spray a liquid, where sprayers are commonly used for projection of water, weed killers, crop performance materials, pest maintenance chemicals, as well as manufacturing and production line ingredients. In agriculture, a sprayer is a piece of equipment that is used to apply herbicides, pesticides, and fertilizers on agricultural crops. Sprayers range in size from man-portable units (typically backpacks with spray guns) to trailed sprayers that are connected to a tractor, to self-propelled units similar to tractors with boom mounts of 4–30 feet (1.2–9.1 m) up to 60–151 feet (18–46 m) in length depending on engineering design for tractor and land size.[1] Sprayers are fully integrated, mechanical systems, meaning they are composed of various parts and components that work together to achieve the desired effect, in this case: the projection of the spray fluid. This can be as simple as a hand sprayer attached to a bottle that is pumped and primed by a spring-lever, tube, and vacuum-pressure; or as complex as a 150 foot reach boom sprayer with a list of system components that work together to deliver the spray fluid.
For more complex sprayers, such as agricultural sprayers, common system components include: the spray nozzle, sometimes with a spray gun, fluid tank, sprayer pump, pressure regulators, valves and gaskets, and

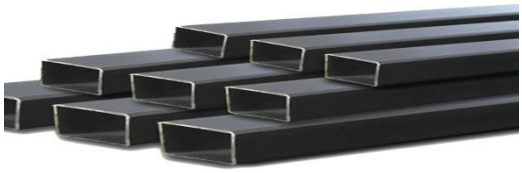
fluid plumbing. The sprayer pump can be just as important as the sprayer type itself as there are many sprayer pump design types with various construction materials, inlet/outlet sizes, and performance specifications. Common sprayer pump types include diaphragm, centrifugal, and roller pumps

COMPONENTS

- SQUARE TUBE
- PESTICIDE SPRAYER
- CROP CUTTER
- WHEEL
- BEARING
- FREEWHEEL & CHAIN

SQUARE TUBE

Rectangular and square HSS are also commonly called tube steel or box sections. Circular HSS are sometimes mistakenly called steel pipe, although true steel pipe is actually dimensioned and classed differently from HSS.Square tubes are generally used for maintenance and structural purposes. Some examples of applications would be building construction, railings, and sign posts. They are measured by their outside dimensions and their wall thickness.Square Steel Tube is a welded structural grade tubing that is available in either type A513 or A500 Grade B, depending on it's size and wall thickness. Either grade is ideal for all structural applications, general fabrication, manufacturing and repairs.



FREE WHEEL & CHAIN

A bicycle chain is a roller chain that transfers power from the pedals to the drive-wheel of a bicycle, thus propelling it. Most bicycle chains are made from plain carbon or alloy steel, but some are nickel-plated to prevent rust, or simply for aesthetics. New chains usually come in a stock length, long enough for most upright bike applications. The appropriate number of links must be removed before installation in order for the drive train to function properly. The pin connecting links can be pushed out with a chain tool to shorten, and additional links may be added to lengthen.

In mechanical or automotive engineering, a freewheel or overrunning clutch is a device in a transmission that disengages the driveshaft from the driven shaft when the driven shaft rotates faster than the driveshaft. An overdrive is sometimes mistakenly called a freewheel, but is otherwise unrelated.The condition of a driven shaft spinning faster than its driveshaft exists in most bicycles when

the rider stops pedaling. In a fixed-gear bicycle, without a freewheel, the rear wheel drives the pedals around.An analogous condition exists in an automobile with a manual transmission going downhill, or any situation where the driver takes their foot off the gas pedal, closing the throttle: the wheels drive the engine, possibly at a higher RPM. In a two-stroke engine, this can be catastrophic—as many two stroke engines depend on a fuel/oil mixture for lubrication, a shortage of fuel to the engine starves oil from the cylinders, and the pistons can soon seize, causing extensive damage.

BEARING

A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races.

The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotates it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding against each other.

WHEEL

A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the key components of the wheel and axle which is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines. Wheels are also used for other purposes, such as a ship's wheel, steering wheel, potter's wheel and flywheel.

Common examples are found in transport applications. A wheel greatly reduces friction by facilitating motion by rolling together with the use of axles. In order for wheels to rotate, a moment needs to be applied to the wheel about its axis, either by way of gravity or by the application of another external force or torque. Using the wheel, Sumerians invented a contraption that spins clay as a potter shapes it into the desired object.

10MM ROD

Rebar (short for reinforcing bar), known when massed as reinforcing steel or reinforcement steel, is a steel bar used as a tension device in reinforced concrete and reinforced masonry structures to strengthen and aid the concrete under tension. Concrete is strong under compression, but has weak tensile strength. Rebar significantly increases the tensile strength of the structure. Rebar's surface features a continuous

series of ribs, lugs or indentations to promote a better bond with the concrete and reduce the risk of slippage.

Other readily available types of rebar are manufactured of stainless steel, and composite bars made of glass fiber, carbon fiber, or basalt fiber. The carbon steel reinforcing bars may also be coated in an epoxy resin designed to resist the effects of corrosion, especially when used in saltwater environments. Bamboo has been shown to be a viable alternative to reinforcing steel in concrete construction.[3][4] These alternate types tend to be more expensive or may have lesser mechanical properties and are thus more often used

PROJECT IMAGES

FRONT VIEW

TOP VIEW

ADVANTAGES

- Modern machines can reduce the efforts of farmers.
- It can reduce the production time.
- It is chemical pest control.
- Increase the price and demand of the products.
- Less maintenance cost.
- Does not need a skilled operator.

DISADVANTAGES

- High cost.
- Displacement of workers.
- Compaction of soil.
- It causes environmental pollution.
- Degradation of landscape.
- Land tenure system.
- Destruction of soil structure.
- Redundancy of farm labour.

APPLICATIONS

- AGRICULTURE LAND
- PLOUGH
- FERTILIZER
- GROUNDS

CONCLUSION

This project is mainly based on minimizing man power as well as cost of the equipment. Practically our multipurpose agricultural equipment can be used for Pesticide spraying and crop cutting. All the parts are connected in such a way that in every stage of agriculture the equipment can be rearranged or easily assembled with fasteners to required length and specifications of field operation. Our team has successfully combined many ideas from various fields of mechanical engineering and agricultural knowledge to improve the yield and by reducing the labor effort and expenses.

FUTURE WORK

In this paper the author tried to present related work of agricultural robots as labour problems can be reduced as compared to the manual and tractor based sowing time. The energy required for this robot machine is less. At the same time, by using solar energy, environment pollution can also be reduced. Rests of modules are pending, such as flow chart, programming, graph plots and output result of the agricultural robot. It will publish in next paper

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