A Review on Multipurpose Agricultural Robot

B. Venkatesh Naik¹ and Dr. R. Raman Goud²

¹PG Student, Design for Manufacturing, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, Telangana, India,

²Professor, Mechanical Engineering, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, Telangana, India.

Abstract

Agriculture is one of the major occupations in India. The implementation of new techniques is very essential in this field in order to increase the yield of crops, even though lot of research has been carried out in this area. It is unfortunate that, these research ideas are not been implemented in the actual field. This is due to high cost of those machinery and is complicated for small scale farmers. Conventional method of planting and cultivating is a laborious process and hence for that reason there is a scarcity of labours and many farmers in India also use bullocks, horses and he-buffalo for farming operations. This will not satisfy the need of energy requirement for farming as compared to other developed countries in the world. This results in delayed agriculture, these difficulties can be overcome by using Multipurpose Agricultural Robot. This Robot can perform various Agricultural Operations like Tilling, Seed sowing, Water/Pesticide spraying, Applying Fertilizer and Grass cutting.

Keywords: Agricultural Robot, multi-functional

I. Introduction

• Modern agricultural techniques and equipments are not used by small land holders because these equipments 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 majority of farmers still uses primitive method of farming techniques due to lack of knowledge or lack of investment for utilizing modern equipment.

• Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. Agriculture is the science and art of farming which includes 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 land holders cultivating between 2 to 3 hectares, using human labor and traditional tools such as wooden plough, yoke, leveler, harrow, mallet, spade, big sickle etc. These tools are used in land preparation, for sowing of seeds, weeding and harvesting.

• 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 small holder farmer’s activities. There is huge gap in adoption and Implementation of technology in 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 department is unsuccessful.

II. Literature Survey

• M.V. Achutha et al presents work on a single system which performs multiple operations like Sowing, Fertilizer Chemical sprayer, weeding and inter cultivation. The equipment can also be used for transportation purpose as a bicycle. It can be easily assembled and dismantled. Reduces external charges like fuel and electricity. Three different design concepts which use different mechanical arrangements like gear mechanism, chain and sprocket are proposed in this paper.[1]

• Dr. C.N. Sakhale et al developed an equipment which can be used in many of the agricultural needs and to solve labour problem. In this equipment they have used 24cc engine for digging operation. Spraying is done using a motor with 12V battery. Next two operations are manual based which are cultivation and sowing. By using above attachments one may perform various farming operations in less time and economically.[2]

• Nithin.P.V et al designed robot which performs operations like digging the soil, seed sowing, leveller to close the mud and water sprayer. The whole system works on battery which is charged by using solar panel. In this all the operations can be performed at a time. The robot can be operated through a remote.[3]

• Amol B. Rohokale et al compared between conventional sowing method and new proposed machine which can perform number of simultaneous operation. The required row to row spacing, seed rate, seed to seed spacing and fertilizers placement varies from crop to crop can be achieved by the proposed machine. This machine reduces the sowing time, human efforts and labour cost[4]

• V.M. Martin Vimal et al designed a multipurpose sowing machine for small scale farmers to improve their...
productivity. In this machine a common seed storage place is introduced to reduce the cost of the machine. The existing conventional sowing machine had the individual storage place and separate seed metering mechanism which leads to more cost. The drawbacks in the existing sowing machine are rectified successfully in this machine. It will be more useful for small farmers and the agricultural society. [5]

Sheikh Mohd Shahid Mohd Sadik et al designed a multipurpose farming machine which does four operations i.e. ploughing, seed sowing, irrigation and transportation purpose. The multipurpose farming machine is driven by 100cc engine. [6]

Prof. P.S.Gorane et al designed a machine based on enhancement farming processes. This machine is made up to accomplish two tasks first one is seed sowing and another task is fertilizer spraying. Both of these mechanisms work at a same time. The main objectives of these operations are to place the seed as well as fertilizer at proper place and seeds at proper distance from each other with appropriate soil compaction. [7]

Roshan V Marode et al designed a machine which deals with the various sowing methods used in India for seed sowing and fertilizer placement. The comparison between the traditional sowing method and the new proposed machine which can perform a number of simultaneous operations and has number of advantages. As day by day the labor availability becomes the great concern for the farmers and labor cost is more, this machine reduces the efforts and total cost of sowing the seeds and fertilizer placement. [8]

III. Methodology

3.1 M.V.Achutha et al developed three concepts in the design of multipurpose agricultural machine [1]

The first concept is shown in fig.1, below the frame is in cubic shape and the attachment like sprayer, flow pipe of fertilizers and sowing were assembled, and the inter cultivator is placed at the bottom side. The front wheel has snipers which helps in easy flow in wet land, and there are two rear wheels which are supporting to the machine, cutter can also be adjusted by the handle provide to it, the sprayer is driven by the front wheel drive. The cubic structure is bulky and it’s not such easy to operate by the operator and also it’s not economical.

![Fig. 1. Schematic of multipurpose agricultural equipment Concept 1][1]

In the second concept as shown in fig 2, a single frame is used to mount all the equipments like chemical sprayer at the front side of the wheel and the cylinder to maintain the chemical in liquid form at the middle of the frame. The shape of the Hooper is V and is placed near to handle of the operator since it will be easy to operate the flow of seeds and fertilizers. Inter cultivator is placed at the rear side of the base frame.

![Fig. 2. Schematic of multipurpose agricultural equipment Concept 2][1]

In the third concept as shown in fig 3, it is mainly used for transportation purpose, a single frame and single attachment of bicycle results in reduction in space, cost, and also helps in local transportation.

![Fig. 3. Schematic of multipurpose farm equipment Concept 3][1]

3.2 Dr. C.N. Sakhale et al developed a machine to work on four agricultural operations Cultivation, Sowing, Digging, Spraying. [2]

The main components of this machine are, a 24cc engine, chasis Frame, Sprayer, Auger bit drill toll, Hopper, Fertilizer tank, 12V Motor and 12V Battery.

When engine is started the Auger bit drill tool will get activated and drills a hole for seed sowing after that operator presses a lever to drop a seed from hopper then the digging and sowing operation will be completed.

Cultivating tool is easily assembled and disassembled. This operation is done manually.

For spraying operation a motor, battery and switch is given. When switch is turned ON, fertilizer is pumped by the motor and enters the sprayer nozzle which is further sprayed on the agricultural field.

3.3 Nithin.P.V et al developed a multipurpose machine which is used for digging the soil, seed sowing, leveling the mud, and spraying pesticides, the whole system of the robot works using a battery and solar power. [3]

The base frame has four wheels which are connected with a DC motor to drive the machine.

One end of the frame is fitted with a cultivator which is also driven by a DC motor and used to dig the soil.

The seeds are placed in a funnel made of sheet metal and flows through the hole drilled on the shaft into the digged soil.

On the end a leveler fitted to close the seeds with soil and water is sprayed with sprayer.

A solar panel is placed on the top of the machine and is connected to the battery.

3.4 Sheikh Mohd Shahid Mohd Sadik et al designed a machine which is divided into two parts assembly. [6]

Part-1 assembly is the main machine. The part-1 assembly is used to do three operations i.e. Ploughing (also called as loosening of soil), seed sowing and irrigation.

For the loosening of soil, the iron plough tool is assembled to tool holder of machine and the gripper wheel is also attach to the tyre. The gripper is providing a proper grip into
soil and will stop the tyre for skidding action into soil. At a time only one row is plough. In seed sowing operation the seed sowing machine is assembled to machine and the furrows will be placed back of plough tool. The seeds are stored in hopper of seed sowing machine after storing seed into hopper the seed falls into the rotor box.

3.5 Prof. P.S.Gorane et al designed a machine to complete two agricultural operations. [7]

- First step is to manually fill the hopper with seed and the fertilizer in container. The Mechanism uses the manual push force for starting the machine.
- Rotary motion of wheels are connected to the sowing shaft by sprocket or belt drive. With a specific measured distance interval, seed sowed in the soil via pipe connecting seed hopper with the digger and then the seed is covered with the soil and provide compaction over seed.
- Sprayer mechanism works on battery. Here a electrically operated pump is used which is placed in the front of the machine. This electrical pump has is rechargeable battery.

IV. FUTURE SCOPE

- Multipurpose agricultural machine mainly focuses on the basic problems faced by small scale farmers. i.e. Seed Sowing, fertilizers spraying, cultivation and digging. We are looking this project as revolution in small farms in India, which is most uncovered area in this sector.
- Use of sensors in this machine helps in monitoring certain parameters in the farm.
- By using certain Programming and processors this machine can be developed in such a way that it could be able define its path Autonomously.
- Jiofensing technology can be implemented in this machine to make it a autonomous vehicle.
- Certain agricultural operations like removing weeds can be done using image sensing technology.

References


2. Dr. C.N. SAKHALE, Prof. S.N. WAGHMARE, Rashmi S.Chimote “A REVIEW PAPER ON MULTIPURPOSE FARM MACHINE” International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 - 0056, p-ISSN: 2395-0072 Volume: 03 Issue: 09 | Sep-2016.[2]


8. Roshan V Marode, Gajanan P Tayade and Swapnil K Agrawal “DESIGN AND IMPLEMENTATION OF MULTI SEED SOWING MACHINE” international journal of mechanical engineering and robotics research [8]