

MULTI-TASKING AGRICULTURAL MACHINE TOOL

Swetabh¹, Manish Kashyap², Yash Yadav³, Ashutosh Singh⁴, Dhruv Kumar⁵

Abstract: -The paper proposed with multi-purpose agriculture machine tool for spraying pesticides, fertilizers, water, plugging and cutting purpose. Thus paving way for a more economical and multi-usable equipment for farmer which is also easy to clean and maintain, easy to handle and do not require fuel, hence cost gets reduced and helping farmers to a great extent in their fields

Keywords: - sprinkler machine, spray machine

1. INTRODUCTION

India is known for its agricultural economy. According to 2011 census, 61.5% of Indian population is rural and dependent on agriculture. But still this major population lacks in mechanised agriculture. Since independence efforts are being made to modernise our economy by introducing newer kinds of technology. This modernisation has been applied to our agriculture too, but due to prevailing socio-economic situation the three A's (accessibility, availability, affordability) are still missing or in layman words our poor farmers hasn't been able to access the new technology. Agriculture involves many processes. This includes preparation of soil, sowing adding, adding manures and fertilizers, irrigation, weeding, harvesting, threshing, and the last one is storage.

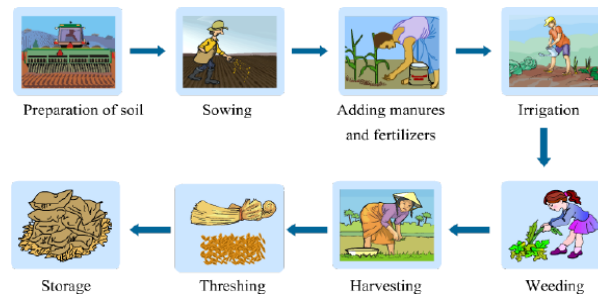


Fig. 1 Processes involves in agriculture

The above figure clearly explains different processes involves in farming. The processes involve in farming are: -

1.1 Preparation of soil: -

This is basic and important step in agriculture before cultivation of crops. It includes loosening of soil, removing weeds from the soil before sowing of seeds. Loosening of soil improves the air circulation in soil and enhances the water retaining capacity of the soil.

1.2 Sowing: -

This is the process of planting seeds in ground. An area or object that has had seeds planted in it will be described as being sowed.

1.3 Adding manures and fertilize: -

Manures and fertilizers are substances that are added in the form of nutrients for healthy growth of plants.

1.4 Irrigation: -

It is the application in which controlled amounts of water is provided to the plants at needed intervals.

1.5 Weeding: -

This is a process to remove weeds from a piece of ground.

1.6 Harvesting: -

¹ U.G Student, Department of Mechanical Engineering, JIMS Engineering Management Technical Campus, Gr.Noida, India
^{2,3,4,5} Department of Mechanical Engineering, JIMS Engineering Management Technical Campus, Gr.Noida, India

Harvest is the process of gathering mature crops from the fields. Reaping is the cutting of grain or pulse for harvest.

1.7 Threshing: -

Threshing is the process of loosening the edible parts of grain (or other crop) from the husks and straw to which it is attached. It is the step-in grain preparation after reaping and before winnowing, which separates the grain from the chaff.

1.8 Storage: -

It is the final step where the crops are stored.

There are many mechanical tools that are employed to carry out these processes. Mechanical tools that employs at different processes of agriculture can be divided into two parts.

2. CONVENTIONAL TOOLS:

Conventional tools can be easily defines as manually operated tools. These are pocket friendly tools and are generally employed to work in small farms. These tools don't require any skilled labour to operate. Maintenance as well as operational cost of these tools are generally very low. These tools generally work on mechanical energy provided by man. As these don't require energy such as electrical energy and also doesn't require fuels so, operational cost of these tools is also low. As we know every coin has two faces these tools have many advantages but yet they consist many disadvantages too such as this increases the process timing, this requires huge human efforts. This doesn't require any type of skilled labour but the requires heavy work load. There is not much accuracy and precision.

Mechanized tools: - Mechanized mechanical tools can be simply defines as those tools that doesn't require manual work. These tools require electricity as well as petroleum product such as diesel as a fuel to operate. These tools help in increasing the productivity as well as quality of agriculture, this reduces manual work and time to perform the task. This enables the farmers to operate different tasks with the help of single machine but every coin has two faces these tools also have many drawbacks such as these tools are very complex in use. These tools require skilled labour to operate these machines they are very costly which stops a farmer to afford. If we look to the tools employed for the same agriculture operation we get. Sowing: Sowing operation in done by using plough, which is a large farm tool and pulled by using a tractor or by an animal. When it is pulled by using animal it comes under conventional tools and when it is pulled by tractor it comes under mechanized tool.



Fig.2 Conventional tool (a) and mechanized tool (b) used for sowing operation.

Adding manures and fertilizers: -Manures and fertilizers are provided to the crops by spraying in the field by using sprayer this comes under conventional tools and when this is sprayed by tractor it comes under mechanized tools.

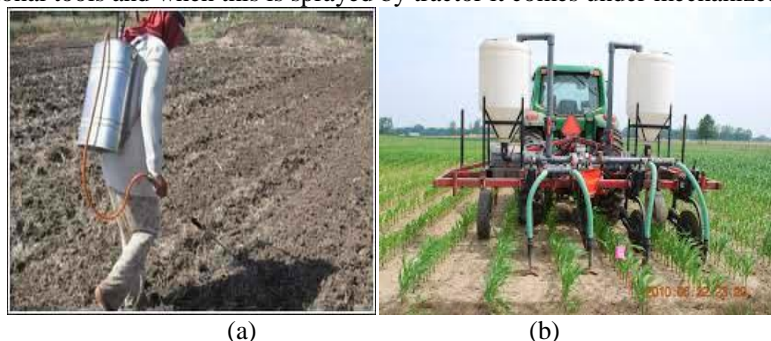


Fig.3 Conventional tool (a) mechanized tool(b) use to add manures and fertilizers to the field.

Irrigation: - In conventional technique paths are provided so that water flows from water source and reaches every crop. In mechanized technique water is supplied to the sprinkler with the help of pump which is connected to the water source.



Fig. 4Irrigation process is carried out a) by using conventional technique (a) by using mechanized technique

Sprinkling of pesticide: - Sprinkling of pesticide in conventional techniques is done by using sprinkler which is connected to pesticide tank which people can carry on their back, while in mechanized technique it is done by using agriculture aircraft. Mechanized technique is generally used in big farms.



Fig. 5Conventional tool (a) and mechanized tool (b) use for sprinkling of pesticide.

Cutting of crops: - Under conventional technique cutting is done by using sickle which is a curved hand-held agricultural tool. The inside of the curve is the cutting edge and is serrated. While in mechanized technique cutter is use which is connected by motor that is further connected to the electric source.

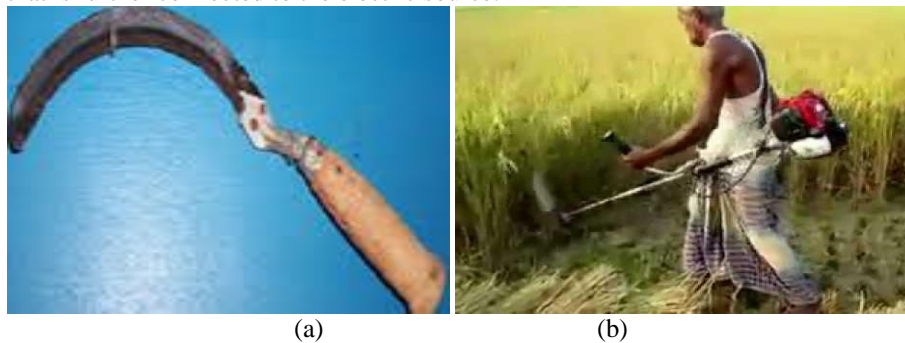


Fig.6 Conventional tool (a) and mechanized tool (b)used in cutting operation.

So, from above figure we can conclude that mechanized tool is far better than conventional tool for conducting any operation but it will increase the overall cost of production also many mechanized tools can't be employed to small farms. So, we can say mechanized tools solve the problems raised by conventional tools but creates many more problems. So, to solve the problems raised by conventional tools and mechanized tools we must look a tool that lies between conventional and mechanized tools and carries advantages of both the tools. Conventional mechanical tools don't require any type of fuel consumption. So, advancement in conventional tools and producing a machine which is not as efficient as mechanized tool but in compare with conventional tools it must be far better is the solution of problems that farmers faces today. The tool that doesn't require electric energy or fuel consumption, that will help farmers to cut operation cost and increase profit. The machine which is pocket friendly and doesn't require any much maintenance. The machine that is simple in design and operate easily so, it doesn't require skilled labour. This project is a step forward to provide solution of the problem face by farmers. This project is use to perform the operations such as sowing, sprinkling of pesticide, sprinkling of water, cutting of crops. This project just works on the conversion of rotary motion into the reciprocating motion. This rotary motion is provided by the movement of wheels. This project doesn't require fuel or electric energy to operate so, it is cost effective or we can say its operational cost is low. Also, it more efficient as compare to conventional tool. It doesn't require bulls to pull the plough. Also, it reduces human load by providing a frame for sprinkler and converting rotary motion of wheel to

reciprocating motion of connecting rod. As it only requires a push force by humans so, it doesn't require skilled labour to operate. Design of the project is simple. Also, maintenance cost is low. The accuracy of this equipment is much better than conventional agricultural tool. Design is compact. This project works on the conversion of rotary motion to reciprocating motion. The driving component of the project is wheel. Its wheel rotary motion which is converted to the reciprocating motion of the connecting rod which is further utilised in sprinkling of water operation, sprinkling of pesticide. Sprinkling operation is done by using single slider crank mechanism. For cutting motion we use whitworth quick return mechanism. For sowing operation plough has to pull down with the help of screw and then by pushing machine sowing operation can be performed. Sprinkling of pesticide and sprinkling of water can be performing by utilizing same tank.

3. LITERATURE REVIEW

References	PROPOSED WORK
Achutha et al., 2016	This MAE is a project which is used for various purposes such as sowing, fertilizer, pesticides sprayer, transportation vehicle. This project can be worked without any external source like (electrical, solar energy).
Nitin Kumar Mishra et al., 2017	This machine included solar panel, battery and motor. This project is a multipurpose agro equipment as it includes all the three equipment together i.e. Seed feeder, pesticide sprayer and crop cutter. A solar photovoltaic panel is fixed that converts solar energy into electric energy, further this electric energy is used to run motor which further runs the pump which is used to spray pesticides.
Dipam Patel et al., 2016	This minimizes the situation of carrying the pesticide tank on back of operator which is a conventional method. This sprayer is mechanically operated as when operator pushes the cart, rotational motion of tires converts into reciprocating motion that further used by pump.
Shree Harsha B T et al., 2017	This project is mainly small version of agriculture vehicle such tractor, harvester etc. This is easy to run. This vehicle works on solar power which charges the battery with help of solar photovoltaic cell present on solar panel. This vehicle uses instruments such as motor, solar panel, batteries which are expensive.
Dhatchanamoorthy. et al., 2018	This is a vehicle which used for multiple purposes of agricultural field such as ploughing, seed sowing, levelling operation, water spraying operation, pesticide spraying operation, harvester. This vehicle runs on petrol as a fuel, engine type is 4 stroke single cylinder. It's a vehicle in which operator (farmer) can easily sit in it and operate it as a automobile. This is an automobile which is mounted with agricultural equipment.
Laukik P. Raut et al., 2013	This project is a mechanically operated sprayer and weeder. The rotary motion of pinion is converted into reciprocating motion of pump which further pumps the pesticide through sprayer. The crank mechanism is used in this project.
Vishakha Bodke et al., 2017	This machine is used to spray pesticide. This vehicle uses single slider crank mechanism. When the vehicle is pushed forward by using handles, front wheel rotates and the gear mounted at the axle of wheel is start to rotate and its rotation is then transferred to the pinion through the chain drive. The rotary motion of pinion is converted into reciprocating motion of pump which further pesticide is pushed to sprayer pipes and sprayed through nozzle.
Patil Nikhil V et al., 2018	This vehicle's main objective is drilling, leveling, fertilizer spraying, seed sowing and ploughing. This vehicle runs on a 100-cc engine. When engine is started the bit drill tool will activated to drill hole for seed sowing after that operator press lever for drop a seed from hopper then the digging and sowing operation will be completed. Ploughing is done manually.
Thange R.B et al., 2016	In this equipment, engine is used which is connected to the front wheel by using chain drive. Rotary motion of wheel is connected to sprayer pump. So, at running position sprayer will automatically work. Now for sowing operation automatic seed feeder mechanism start their function by rotation of wheel. As wheel, rotates seed feed mechanism allows seed to come down in proportion with speed of equipment. For cutting operation power is supplied to cutter.
Karan Thakkar et al., 2017	This project works with help of reciprocating pump, nozzle, storage tank, control valve, wheel etc. The mechanism is same as other mechanically operated agricultural vehicles the rotary motion of wheel is converted into reciprocating motion of piston which is placed in reciprocating pump, which further sprays the pesticide through nozzle into the field.
.Deshpande, et al., April 2017	This project uses mechanical energy of reciprocating pump which is connected to crank with help of connecting rod. The tank of this project is very wide which is difficult to run through field.

3.1 Proposed Work Methodology: -

The main factors of selecting material specially for body is wide variety of characteristics such as thermal, chemical or mechanical resistance, ease of manufacture and durability. Typically, the material used to construct vehicle chassis and

frames is carbonsteel; or aluminiumalloys to achieve a more light-weight construction. In the case of a separate chassis, the frame is made up of structural elements called the rails or beams.

Frame Design

The design is made which is suitable supporting all the operations. The frame is made for a compact size vehicle.

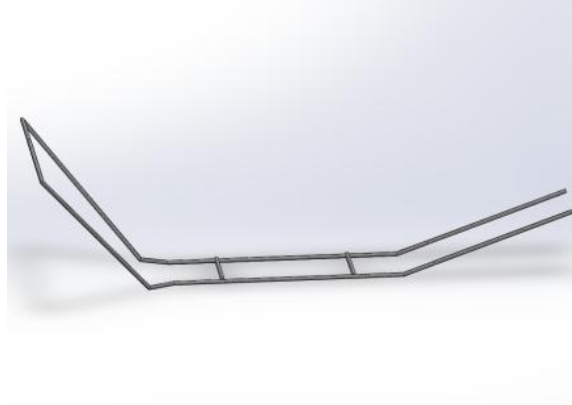


Fig.7 design of the frame (right plane view)

Sprayer A Sprayer is disclosed for dispensing fluids such as insecticides and herbicides. the sprayer comprises a supply container which holds the fluid to be dispensed, a manually operated (but here automatically operated) piston pump. The piston pump pressurizes the fluid and deliver through the pipe to the nozzles. A sprayer consists of handheld nozzles reciprocating pump, belt for carry on back, plastic lid with strainer.

Capacity of tank : 16lit.

Material of tank : HDPE(High density polyethylene)

Pressure : 0 Mpa to 0.2 Mpa

We made some changes in the original sprayer as per our requirement for project. Changes like we removed the handle of the pump and the connecting rod for the pump is extended for machine requirement, instead of handheld nozzle we put nozzles in the front of the chassis. the sprayer is placed in the middle of the chassis.

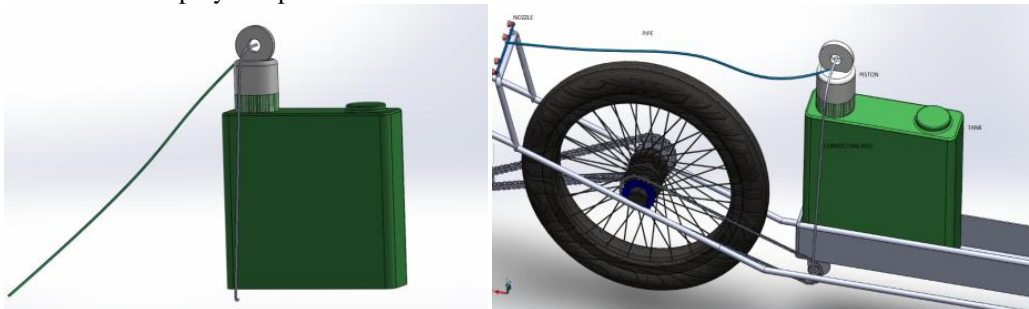


FIG: 8 Full Assemblies Of Tank, Connecting Rod, Pipe, Nozzle

3.2 Final design of the proposed model

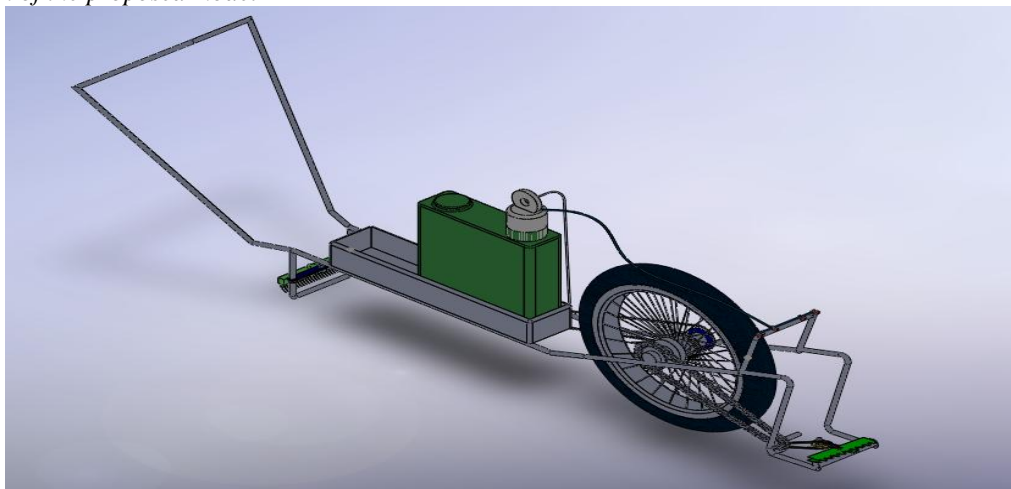


FIG:9 Final Design Of Proposed model

4. CONCLUSION

The top concentration of our design is the cost and operational ease in case of small farm units. This multipurpose agro equipment is thus designed to reduce the cost of harvesting, spraying and seed feeding. In the development of multipurpose agro equipment we utilize the past data and techniques. In this way the design of multipurpose agro equipment is safe. Such human powered machine systems will help to a great extent in improving the production per acre and increase profitability of small and middle class farmers. A new type of multipurpose mechanism is proposed which is different from other machines and will work on non-conventional energy source which is purely human operated.

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