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Design and Fabrication of Pesticides Sprayer for Agricultural

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Abstract: ***India is the agricultural based country majority of its population depend on agriculture, where more than 60%-70% of population is depending on agricultural ,at present time farmers are using motorized sprayer which requires different types of fuels, batteries and solar panels, Accordingly we have decided to make our project on sprayer which works without any fuel mechanism and by using crank and slotter quick return mechanism nozzle adjustable with x and y direction in 1:4 ratio The main drawn back of hand operated spray pump is that the user cannot use it for more than 5-6 hours continuously as it gets heat whereas fuel operated spray pump requires fuel which is expensive and a variability of fuel is not easy at rural places, In such situation we should think to move towards non-conventional energy. This review paper tries to develop new mechanical system which will overcome all the above problems and help farmers etc.***
Keywords: Usability, functionality, ergonomics, wheel driven, sprayer, nozzle.

I. INTRODUCTION

Farming is the backbone of Indian economy. About 60 to 70 per cent of Indian population based on the field of agriculture and by a recent report they contribute 15 to 16 per cent to GDP. Agriculture is developed to higher level in last 40 to 50 year. Out of the various reasons involved for this development is control of number of diseases on the plants. In the modern farming, the usage of pesticides is still increasing up to 80-85% of these pesticides are being applied on crops in the form of spraying which will maintain echo friendly approach. In Agricultural sector use of cheap and beneficial equipment for effective spraying for increase productivity which is very important for better contribution for India's GDP. The problem with using existing conventional equipment is that farmers will face economic difficulties in case of chemical and electrical powered pumps as well as they will face number of diseases and problem due to these spraying equipment The best way to overcome all these problems is to use the equipment developed for application of the pesticide through the use of mechanical energy. In choosing a pump for supply of pesticides on crops, or for spraying insecticides, herbicides or fungicides we must be sure it definitely full fill our requirements. The unit should strong In Agricultural sector use of cheap and beneficial equipment for effective weeding and spraying for increase productivity which is very important for better contribution for India's GDP .In the past century, agriculture has been characterized by enhanced productivity, the substitution of human labour for synthetic fertilizers and pesticides, selective breeding, and mechanization.
The recent history of agriculture has been closely tied with a range of political issues including water pollution, biofuels, Genetically modified organisms, tariffs, and farm subsidies. In recent years, there has been a backlash against the external environmental effects of mechanized agriculture, and increasing support for the organic movement and sustainable agriculture.

II. PROBLEM SUMMARY

The farmers who use these types conventional backpack sprayer faces many types of problems like fatigue, Tiredness, pain in spiral cord and muscles etc. Following problems can take place by use of this conventional type of pump.

A. Problem Identification

1) The fuel operated pump produce more vibrations which is hazardous to users back muscle, these pump makes unwanted noise.
2) The sprayer requires constant pumping to maintain the constant spray flow.
3) A sprayer carried on the back consist the capacity of 10 to 20 litre with adjustable strap continuously to pain of the shoulder muscle.
4) Easily affected the pesticide on our body some skin allergies.
5) Large size of pump causes inconveniences to operate.
6) Maintenance cost is high.

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III. LITERATURE REVIEW

Design and fabrication of pesticide serious spraying machine for multiple agricultural crop The sprayer is used to spray liquid in agriculture sprayer in piece of equipment that is used to apply pesticide and agricultural crops the general spraying technique uses hand operated and power sprayer is backpack by using existing sprayer is very less area is covered while spraying and hence more time is required spray and entire land petrol and diesel as the fuel so that the labour cost of the sprayer is also high, and serious with 360 degree feature and adjustable pipe length the real time testing and carried out at different agricultural crops [1]. Agricultural reciprocating multi sprayer the operator grabs the handle and pushes the cycle forward as cycle moves forward, the wheel rotate. When the wheel rotates then the gear sprocket mounted on wheel is also rotate at same speed. The chain drive transfers the motion of gear sprocket to pinion sprocket. The pinion sprocket and crank is mounted on either side of same shaft, the rotary motion of shaft is converted into the reciprocating motion with the help of crank and connecting rod mechanism. The connecting rod is also connected with lever and then the lever oscillates at fulcrum the piston connected at fulcrum produce reciprocating motion in cylinder and the required pressure is achieved [2]. Design, development and fabrication of manually operated multi nozzle pesticide sprayer pump, The pesticide use then fill the pesticides or water as your need then connect the chain drive to free wheel When we start applying running the machine remembers to adjust the nozzle direction and height as per requirement.by holding handle when we start pushing the spray pump the wheels start to revolve due to its motion The sprocket/freewheel transfers its motion to crank by chain drives the chain drive is connected to sprocket and crank.

The crank shaft provides its motion to piston pump it. The pump works vertically reciprocating, through pipe the pesticides or water sprays on crop [3]. Design and fabrication of agricultural sprayer for the spraying mechanism we have used a DC motor pump which is commonly used in cars and for the storage device we have taken a 4ltr container. The pump we have used is a submersible one so we have to insert a portion of pump into the container and the remaining portion is kept on the outer side of the container. This was done by drilling a hole through one side. The pump works on 12V DC supply and so it could be easily connected with the battery [4]. Hand driven four wheel automatic spraying machine. The sprayer operator pushes the handle of machine to moves it in forward direction d. When the engine rotates then the chain sprocket mounted on wheel is also rotate at same speed. The chain drive transfers the motion of sprocket to pinion sprocket. The pinion sprocket and lobe pump is mounted on either side of same shaft, the rotary motion of pump shaft is converted into the rotary motion with the help of chain speed. Due to the rotation of pump it produces displacement of lobe to create the required pressure for spraying the chemical by using nozzle [5].

IV. EXPERIMENTAL SETUP

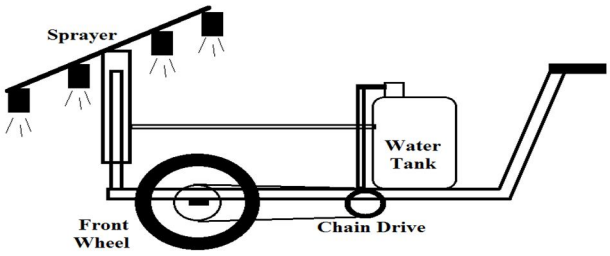


Figure 1. Experimental Setup of Pesticide Sprayer for Agricultural

V. DESIGN MODEL

A. Design Calculation

1) *Wheel:* Diameter = 50 cm and radius of the wheel =25 cm
2) *Trolley:* Length =75 cm, Width = 25 cm and height = 25 cm
3) *Handle:* Length = 55 cm
4) *Pesticide Tank:* Height = 420 cm, width = 300 cm, capacity = 161 liters, weight = 3 kg and material l = Plastic.
5) *Velocity:* $V=\sqrt{2} \times g \times h = \sqrt{2} \times 9.81 \times 1 = 4.429$ m/sec
   Where, V = Velocity in m/sec, g = Gravity 9.81 m/sec^2 and h = Head in meters or feet.
6) *Pressure (p)* = 320 KPa
7) *Discharge (Q)* = $d^2 \times 0.0666 \times \sqrt{p} = 1^2 \times 0.0666 \times \sqrt{p} = 1.1532$ liter/min
   Where, D = nozzle diameter in mm.

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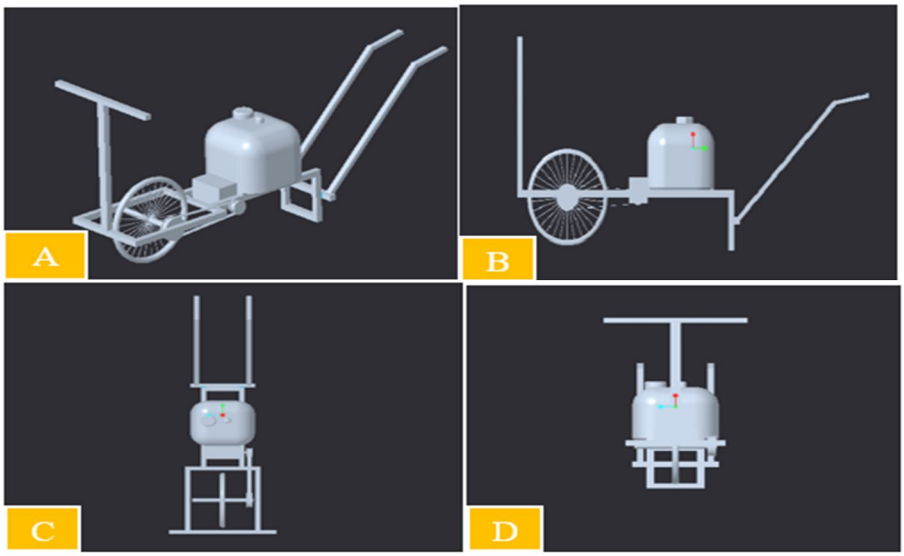


Figure 2 (a) Three Dimensional Model (b) Side View of the Model (c) Top View of the Model (d) Front View of the Model

VI. WORKING PRINCIPLE

The working of agricultural sprayer, it works on the principle that the rotary motion gets transfer into reciprocating motion. The farmer grabs the handle bar of the sprayer and pushes the sprayer in the forward direction. As the sprayer moves in the forward direction the wheel rotates which moves the sprocket. The sprocket brings the motion in the chain the chain moves another sprocket connected to the crank, this moves the crank as the crank moves it brings the motion in the connecting rod the connecting rod connected in the pump moves the pump upside down. As the pump moves the liquid inside is pumped towards the nozzles, the nozzle spray the liquid in the possible direction. The direction of the nozzles can be adjusted as needed to the person handling.

VII. FUTURE SCOPE

The project is eco-friendly as no different types of fuels are required to run the machine. The sprayer can be used by the farmer with small scale of production in small lands, constant spray of the sprayer sprays equal amount of pesticides so the crops can grow healthy in future ,This project is affordable to the small scale farmer.

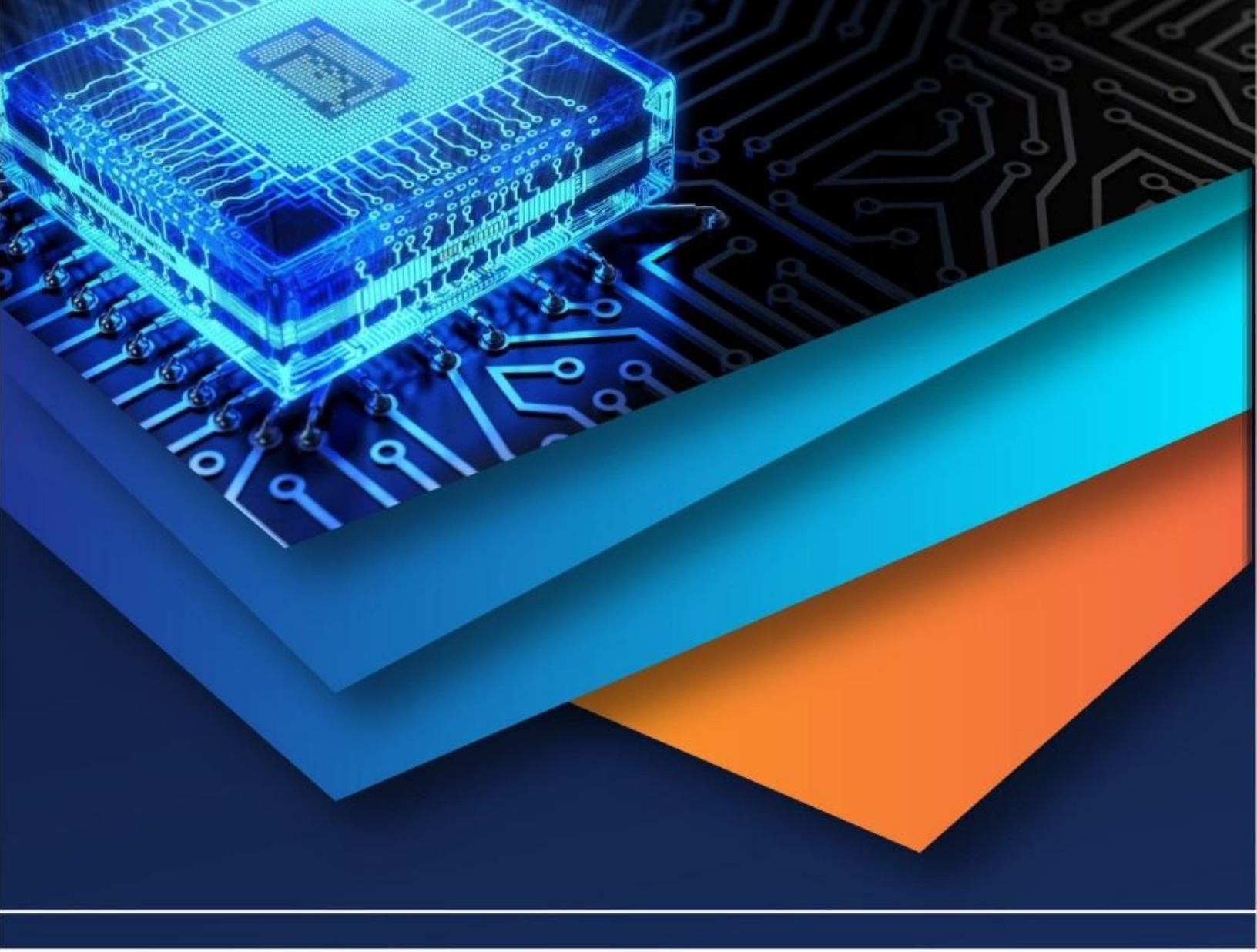
VIII. CONCLUSION

It is an improved sprayer and design that will be useful for small farmers. Consume less time and save money compared to conventional spraying and weeding. This machine does not require fuel or energy, so maintenance is lower. This model removes problem of back pain, vibrations and noise. This project can be used for the multiple crops. The model has provided multiple nozzles, and adjustable in x and y direction which has continuous spray over crop and this process takes less time than other sprayers for spaying.

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