

# Design and Fabrication of Organic Fertilizer and Pesticides Sprayers

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**Abstract**— Day by day population of India is increasing and in order to meet the food requirement of growing population mechanization of harvesting process is important rather than the extensive use of harmful chemicals for better yields because intake of these chemicals for longer duration may cause mutation of DNA and That may cause to cancer and many disease . So the use of organic fertilizer and pesticides with ;the mechanization process may helpful in better yields of crops , small scale farmers are aiming for lest investment in form of back pack type sprayers but it may cause mainly back pain and regular operation of hand lever which cause fatigue so to avoid all these demerit . I have propose sprayer of fertilizer and pesticides which can simply be pulled by hand or with the help of bullock . This paper suggests a model of manually operated multi nozzle pesticides sprayer. This will perform spraying at maximum rate in minimum time and optimum utilization of organic pesticides and evenly distributing it. In another tank there is tank of organic fertilizer and two knob arrangement for flow of liquid fertilizer which flows with the gravity force . Constant flow, valve can be applied at nozzle to have control of flow for fertilizer.

**Key words:** Mechanization, spraying time, organic fertilizers and pesticides sprayers

## I. INTRODUCTION

Insects are largely responsible for crop destruction and for curing we use chemicals fertilizer and pesticides which cause adverse effect on our health. Insecticides preparation is used use to kill insects otherwise control their reproduction. These are sprayed on the crops by devices known as sprayer. There is another method of using pesticides i.e. By Dusting Method, But the retention of it on the crops is less.

In India about 65% of population is involved in farming and there is less income they are generating with it, because of use of harmful and expensive fertilizer and pesticides there is need for improvement in farming procedure and use of cheap and beneficial equipment for effective spraying and weeding for increase in productivity

Agriculture sector is very important and growth of it is equally important for better contribution of GDP of Indian.

The growth of agriculture sector is important to meet the food requirement of the growing population and rapid industrialization, modernization of agriculture is ignored. for small farmer one of the reason for less yield of crops in improper seedbed, preparation and late sowing, harvesting and threshing. Mechanization will improve the circumstance through definiteness in metering ensuring more appropriate distribution , lessening quantity needed for better prevention of wastage of fertilizer and pesticides.

Mechanization helps in giving higher productivity through less effort . agriculture sector is facing many problem of decreasing revenue and labor scarcity and increasing customer demand . The assistance of traditional agriculture equipment aggrandizes these issues. Most farmer are Hysterically seeking different steps so that they can make larger profit from less investment or capital Thus, There is an opportunity to suggest an inexpensive mechanical sprayer for organic pesticides which can be easily mobile and carry large capacity tank so no need of frequent refilling the traditional back pack.

The traditional sprayer having the difficulty that the lever have to be continuously pushed up and down by hand to generate pressure for spraying and also they are heavy to be carried on back.

## II. LITERATURE REVIEW

### A. *Spraying Methods:*

One of the more common forms of pesticides application, especially in conventional agriculture is the use of mechanical sprayers. Hydraulic sprayers consists of a tank, a pump,lance(for single nozzle) or boom and a nozzle (or multiple nozzles).sprayers convert a pesticides formulation, often containing a mixture of water( or another liquid chemical carrier, such as fertilizer) and chemical into droplets, which can be large rain type drops or tiny almost invisible particles. The size of droplets can be altered through the use of different nozzle sizes, or by altering the pressure under which it is forced. Large droplets have advantage of being less susceptible to spray drift, but require more water per unit of land covered.

#### 1) *Backpack (Knapsack) Sprayer:*

the main principle use in spraying with knapsack type of sprayer is pressure difference created by hand operated lever. It has usually single nozzle through which liquid pesticides is forced to come out of the nozzle in fine droplet form. Some sprayers can generate pressure of 7kg/sq cm. Capacity are usually less than 20 liter or less.

The main components of hydraulic sprayer are tank, pump, lance, boon and a nozzle. Sprayers convert the pesticides into small droplets which can vary according to pressure & size of perforation of the nozzle.

Large size droplets are advantages in being less drift while spraying but there is wastage of pesticides in this method. The smaller size droplet is more evenly sprayed. The main demerit of back pack sprayer is that the labour has to carry nearly 5 gallon capacity on his back which cause severe back pain and cause fatigue to labour.

#### 2) *Hydraulic Sprayer:*

Most of the world's pesticides are mixed with water and sprayed through hydraulic nozzle: of one short of another. There are enormous variation in the scale, the way pumping is achieved and the configuration of atomizer, ut this >100

year old technology is still considered the method of choice by most farmers and other spray operators.

### 3) Large –Scale Tractor Mounted & Self Propelled Equipment Or Lite-Trac:

In this the motorized technique of spraying the pesticides in which “lite-tractor” is used. The lite- trac name comes from “lite tractor” due to patented chassis design, facilitating the naturally leaving machines manufactured by company to have a light footprint for minimal soil compression. Lite-Trac is currently the European largest manufacturer of four wheeled spraying tractor for crops. The stainless steel can accommodate around 8000 liters of pesticides for spraying so no need of frequent refilling. But main drawback is its high cost which small or medium scale farmer in India can’t bear. So we have designed a less expensive device for spraying of both organic pesticides and fertilizer for small scale farmers.

### 4) Motorized Mist Blowers:

Motorized mist blower usually rely on air – shear atomization , but they may be supplied (or retro- fitted) with rotary atomizer . motorized mist blower were originally developed for spraying pests in tall trees such as cocoa capsids. Mist blowers have have also been used to improve horizontal throw and penetration into crops. Here, a kioritz DM9 is being used to apply a fungicide against rice sheath blight in Vietnam.

### 5) CDA/ULV Application Equipment:

Rotary nozzles are normally used to achieves controlled droplet application (CDA): The reliable way of applying pesticides at ultra-low volume (ULV) Rate of application. Hand-held equipment is cheap and nowadays reliable: the micron sprayer “ulvat”, with its predecessor: the “micro ulva”. The vehicle mounted “ulva mast”: used for ULV spray operation against migrant pest such as Locusts.

The micron “motox” was developed with a number of collaborators, including staff from canicafe and IPARC, in order to improve fungicide and insecticides delivery and work rate in coffee.

### 6) Granule Application Equipment:

Granule application can be as simple as distributing the formulation to plant bases or central whorls with a (gloved) hand. The use of a horn seeder, such as the Hudson model can aid spreading, control flow and reduce operator contamination. Granular formulation are frequently prepared for toxic pesticides: but manual application equipment is not recommended for poisonous( especially class I) compounds.

## III. DESIGN REQUIREMENT

### A. Shortcoming in Existing Sprayer Pumps:

The normally used spraying pump by farmers in India (small, marginal or medium) is the back pack sprayer. The main limitation of using it is that of its small capacity and carrying it on back cause pain and continuous lever movement for pressure generation can cause muscular disorder. Developing adequate pressure is a laborious and tedious and time consuming process. It takes longer time to spray the entire land due to frequent refilling it because it has small capacity of 10-15 liter tank.

### B. Providing Alternative to Small Farmers:

the backpack(Knap-sack) sprayer for spraying pesticides by the farmer cost around Rs. 2000-4500 and for rich farmers there are lite-Trac available ch are beneficial for larger land a but it cost more which the small farmers can’t bear. So, we have proposed an organic fertilizer cum pesticides sprayer device for the convenience of the farmer. Which can be hand driven or bullock driven. The cost may be around Rs. 25000/- but it would be one time investment for the farmers for higher productivity of crops.

Sr no.	Types of sprayer	No. of workers required	Area for which spraying is used	Time required
1	Bullock driven	1	Larger area	Less time and effort
2	Hand driven	1	Smaller area	Larger time and effort

Table 1: Existing high features of sprayer

Sr. No.	Name of crop	Distance between(c.m.)	Height of crop(c.m.)
1.	cotton	60-90	60-150
2.	groundnut	40-50	45
3.	Pigeon pea	40-50	30
4.	Sugar cane	40-50	160-210
5.	Soya bean	40-50	100-150
6.	wheat	40-50	60-100
7.	paddy	40-60	60-100

Table 2: distance between and height of crops

## IV. DEVELOPMENT OF CAD MODEL

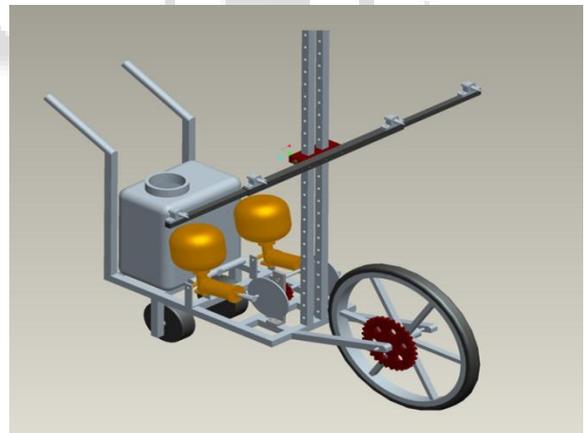


Fig. 1: Development of CAD model

## V. WORKING

The working of this manually operated organic fertilizers cum pesticides sprayer is based on the principles of motion of trolley which transmit its rotary motion from chain and sprocket arrangement and reciprocating piston into the cylinder for pumping the pesticides. When the operator pushes the trolley forward, the wheel rotates in counter clockwise direction hence sprocket move in counter clockwise which is mounted on same shaft of wheel. This motion is transfer to flywheel and big spur gear are mounted on same shaft, it rotates in counter clockwise direction. Its motion rotates the disk on which there is a link present

which move reciprocating motion. the piston or plunger also move in reciprocating motion, hence spray the pesticides through the nozzle.

#### VI. CONCLUSION

- 1) The suggested model has removed the problem of back pain, since there is no need to carry the tank (pesticides tank) on the back.
- 2) as suggested model has more number of nozzles which will cover maximum area of spraying in minimum time & at maximum rate.
- 3) The c.f. valves can also be applied which help in reducing the change of pressure fluctuation and c.f. Valves helps to maintain pressure.
- 4) Proper adjustment facility in the model with respect to crop helps to avoid excessive use of pesticides which result into less pollution.
- 5) Imported hollow cone nozzles should be used in the field for better performance.
- 6) Muscular problems are removed and there is no need to operate the lever.
- 7) This alone pump can used for multiple crops

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