

Agricultural Fertilizers and Pesticides Sprayers - A Review

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Abstract

Day by day the population of India is increasing and to fulfill the need of food modernization of agricultural sectors are important. Due to chemical fertilizers the fertility of soil is decreasing. Hence farmers are attracted towards organic farming. By mechanization in spraying devices fertilizers and pesticides are distributed equally on the farm and reduce the quantity of waste, which results in prevention of losses and wastage of input applied to farm. It will reduce the cost of production. It will reduce the cost of production. Mechanization gives higher productivity in minimum input. Farmers are using same traditional methods for spraying fertilizers and pesticides. Equipment is also the same for ages. In India there is a large development in industrial sectors compared to agricultural sectors. Conventionally the spraying is done by labors carrying backpack sprayer and fertilizers are sprayed manually. The efforts required are more and beneficial by farmers having small farming land.

Keywords: Backpack, Fertilizers, Lite-Trac, Mechanization, Pesticide Sprayer

I. INTRODUCTION

In India about 73% of population is directly or indirectly depends upon the farming. Hence it is said that India is an agricultural based country. But till now our farmers are doing farming in same traditional ways. They are doing seed sowing, fertilizers and pesticides spraying, cultivating by conventional methods. There is need of development in this sector and most commonly on fertilizers pesticides spraying technique, because it requires more efforts and time to spray by traditional way.

Most of Asian nations are at developing stage and they are facing the problem of high population and as compared to that agricultural productivity is much lower as compared to developed nations. India is one of the nations who is facing the same problem. This is caused due to low level farms, insufficient power availability to farms and poor level of farm mechanization.

In order to meet the requirement of food of growing population and rapid industrialization, there is a need of the modernization of agriculture sector. On many farms production suffers because, delay in sowing, improper distribution suffer because delay in sowing, improper distribution of pesticides and fertilizers, harvesting. Mechanization solves all the problems which are responsible for low production. It conserves the input and precision in work and get better and equal distribution. It reduces quantity needed for better response, prevent the losses and wastage of input applied. It get high productivity so that cost of production will reduced.

To reach the requirement of production Agriculture implement and machinery program of the government take steps to increase availability of implement, pumps, tractors, power tillers, harvester and other power operated machines. Special emphasis was laid on the later as more than 65% of the farmers fall in small and marginal category.

Generally mechanization of small forms are very difficult and non-affordable but Japanese make it happens. They are by proper mechanization they did farming and get more production than Indian. They are using the modern time saving machine of required sizes to get more production. Japanese led agriculture to new heights.

II. LITERATURE REVIEW

A. Spraying Methods:

One of the more common forms of pesticide application, especially in conventional agriculture, is the use of mechanical sprayers.

1) Backpack (Knapsack) Sprayer:

One type of backpack sprayer is a compressed air sprayer with a harness that allows it to be carried on the operator's back.

Another type of backpack sprayer has a hand-operated hydraulic pump that forces liquid pesticide through a hose and one or more nozzles. The pump is usually activated by moving a lever. A mechanical agitator plate may be attached to the pump plunger. Some of these sprayers can generate pressures of 100 pounds per square inch (psi) or more. Capacity of both these types of backpack sprayers is usually 5 gallons or less.



Fig. 1: Backpack Sprayer

Hydraulic sprayers consist of a tank, a pump, a lance (for single nozzles) or boom, and a nozzle (or multiple nozzles). Sprayers convert a pesticide 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. This conversion is accomplished by forcing the spray mixture through a spray nozzle under pressure. The size of droplets can be altered through the use of different nozzle sizes, or by altering the pressure under which it is forced, or a combination of both.

Large droplets have the advantage of being less susceptible to spray drift, but require more water per unit of land covered. Due to static electricity, small droplets are able to maximize contact with a target organism, but very still wind conditions are required. But, in this type of spraying, the labor has to carry all the weight of the pesticides filled tank which causes fatigue to labor and hence reduces the human capacity.

2) Lite-Trac:

Lite-Trac is a trading name of Holme Farm Supplies Ltd, a manufacturer of agricultural machinery registered in England and based in Peterborough. The Lite-Trac name comes from "lite tractor", due to the patented chassis design enabling the inherently very heavy machines manufactured by the company to have a light footprint for minimum soil compaction.



Fig. 2: Lite-Trac

Holme Farm Supplies Ltd agricultural products, sold under the Lite-Trac name, include tool carriers, self-propelled lime and fertilizer spreaders, sprayers, granular applicators and tank masters. Lite-Trac is currently the manufacturer of Europe's largest four-wheeled self-propelled crop sprayers. The company's products are identifiable by the combination of unpainted stainless steel tanks and booms with bright yellow cabs and detailing. A Lite-Trac crop sprayer, or liquid fertilizer applicator, mounts onto the SS2400 Tool Carrier centrally between both axles to maintain equal weight distribution on all four wheels and a low centre of gravity whether empty or full. The stainless steel tanks are manufactured in capacities of up to 8,000 liters, whilst Pommialuminium booms of up to 48 meters can be fitted, making these Europe's largest four-wheeled self-propelled sprayers.

3) *Motorcycle Driven Multi-Purpose Farming Device (Bullet Santi):*

In 1994, Mansukhbhai Jagani, developed an attachment for a motorbike to get a multi-purpose tool bar. It which addresses the twin problems of farmers in Saurashtra namely paucity of laborers and shortage of bullocks. This motor cycle driven plough (Bullet Santi) can be used to carry out various farming operations like furrow opening, sowing, inter-culturing and spraying operations. Mansukhbhai's intermediate-technology contraption proved efficient and cost-effective for small-sized farms.



Fig. 3: Bullet Santi

It could plough one acre (0.4 ha) of land in less than half an hour on just two liters of diesel oil.

Using motorbike-santi, the cost of weeding a typical field was found to be just Rs 8/ha because as much as 10 ha land could be covered in a single day. But, this spraying equipment needs fuel for its running and proper operation which increases its operating cost.

4) *Aerial Sprayer:*

Aerial sprayer is another type of spraying; it is beneficial for the farmers having large farms. This technique is not affordable by farmers having small and medium farm. It is modern technique in agricultural field. In aerial spraying the spraying is done with the help of small helicopter controlled by remote. On that sprayer is attached having multiple nozzles and sprayed it on the farm from some altitude. It is less time consuming and less human effort required to spray fertilizers.



Fig. 4: Aerial Sprayer

III. CONCLUSION

Sprayers are commonly used on farms to spray pesticides, herbicides, fungicides, and defoliants as a means of crop quality control. To produce more output from the farm mechanization in the industrial sector is needed. It gives more productivity in less input. By mechanization we can reduce the efforts of labors and uniformly spray the fertilizers and pesticides all over the farm. So there is a need if mechanization in industrial areas in India.

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REFERENCES

- [1] R. Joshua, V. Vasu and P. Vincent. (2010) "Solar Sprayer - An Agriculture Implement", "International Journal of Sustainable Agriculture 2 (1): pp. 16-19, ISSN 2079-2107"
- [2] M. A. Miller, B. L. Steward, M. L. Westphalen "Effects of multi-mode four-wheel steering on sprayer machine performance", American Society of Agricultural Engineers ISSN 0001-2351
- [3] R. D. Fox, R. C. Derksen. (2003) "Visual and image system measurement of spray deposits using water-sensitive paper" Applied Engineering in Agriculture Vol. 19(5): pp. 549-552. American Society of Agricultural Engineers ISSN 0883-8542.
- [4] Laukik P. Raut , Smit B. Jaiswal, Nitin Y. Mohite. (2013, Nov.) "Design, development and fabrication of agricultural pesticides sprayer with weeder", International Journal Of Applied Research and studies(iJARS), pp. 1-8, ISSN: 2278-9480.
- [5] Mohd.Hudzari Haji Razali. (2012, May). "Sprayer Technology for Farm Mechanization Course", Technical Journal of Engineering and Applied Science(TJEAS), pp. 107-112, ISSN: 2051-0853.
- [6] Sandeep H. Poratkar and Dhanraj R. Raut. (2013, Mar.) "Development of Multinozzle Pesticides Sprayer Pump", International Journal of Modern Engineering Research (IJMER), Vol.3, Issue.2, pp-864-868, ISSN: 2249-6645.