

DEVELOPMENT OF MULTIPURPOSE SPRAYER- A REVIEW

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Abstract - Automation for spraying in the field of agriculture has increased the productive output of the farms. Owing to this, labor problem has been solved. But the scenario in the country like India is different. The agriculture field being small, automation in such places are a difficult task also the economic condition of majority of Indian farmers is not well to do. Therefore, the manually operated sprayer finds wide application in such condition. In Indian farms two types of sprays are used: Hand operated and Fuel operated pump. The main drawback of hand operated spray pump is that the user cannot use it for more than 5-6 hours continuously as he gets tired whereas fuel operated spray pump requires fuel which is expensive and availability 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 a new mechanical system which will overcome all the above problems and will help farmers to.

Key Words: Spray, Multipurpose Sprayer, Agriculture,

1. INTRODUCTION

Agriculture Scenario in India: India's economic security continues to predicate upon the agriculture sector, and the situation is not likely to change in the future. Even now agriculture supports 58% of the population, as against about 75% at the time of independence. As of today, India supports 16.8% of world's population on 4.2% of world's water resources and 2.3% of global land. The country recorded impressive achievements in agriculture during three decades since the onset of green revolution in late sixties. This enabled the country to overcome widespread hunger and starvation; achieve self-sufficiency in food; reduce poverty and bring economic transformation in millions of rural families. The situation, however, started turning adverse for the sector around mid-nineties, with slowdown in growth rate of output, which then resulted in stagnation or even decline in farmer's income leading to agrarian distress, which is spreading and turning more and more serious. Natural resource is the base of

agriculture, which provides for sustainable production, is shrinking and degrading, and is adversely affecting production capacity of the ecosystem. However, demand for agriculture is rising rapidly with increase in population and per caput income and growing demand from industry sector. There is, thus, an urgent need to identify severity of problem confronting agriculture sector to restore its vitality and put it back on higher growth trajectory. The problems, however, are surmountable, particularly when new tools of science and technology have started offering tremendous opportunities for application in agriculture. The Equipment Our equipment is especially made to work in row crops such as cotton pulses etc. of an agricultural field. The economic condition of farmers and the cost of labor, owing to such conditions, this equipment can find its application. The equipment is intended to perform three important operations done in fields, namely, Spraying pesticide, spraying herbicide and applying urea. All the three operations can be performed simultaneously or individually. Application of urea to the crops is not being focused much by various agriculture equipment producing firm and the equipment available are mostly suitable for large field which are in hectares. Moreover, whatever methods are available for applying urea results in high wastage of urea, we have focused on the same.

2. LITERATURE REVIEW

The Food and Agriculture Organization (FAO) has defined pesticide as: Any substance or mixture of substances intended for preventing, destroying, or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals, causing harm during or otherwise interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances that may be administered to animals for the control of insects, arachnids, or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant, or agent for thinning fruit or preventing the premature fall of fruit. Also used as substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

- Shivaraja Kumar Parameswaramurthys paper on design and development of wheel and pedal operated sprayer - It is a portable device and no need of any fuel to operate, which is easy to move and sprays the pesticide by moving the wheel and also peddling the equipment.
- Sandeep H. Poratkar, Dhanraj R. Raut, "Development of Multinozzle Pesticides Sprayer Pump"- This paper suggests a model of manually operated multi nozzle pesticides sprayer pump which will perform spraying at maximum rate in minimum time. Constant flow valves can be applied at nozzle to have uniform nozzle pressure.
- Varikuti Vasantha Rao Sharanakumar Mathapati Dr. Basavaraj Amarapur, "Multiple Power Supplied Fertilizer Sprayer"

3. IDENTIFICATION & RESEARCH

Mostly in India we used the old method and equipment for the agriculture. For agriculture the pesticide and water is mostly required after the some interval of time to remove the insect from the agriculture land. In old equipment only one work has been performed at a time due to which the time as well as effort required is more. To remove the insect from the land we first put the pesticide and after that we give the water or another pesticide due to lack of technology. Even we required at the same time two pesticide.

4. TYPES OF SPRAYERS

4.1 KNAPSACK SPRAYERS

These sprayers are on the back of worker during operations. Tanks may be plastic or metal. Common Knapsack sprayers are:

1. Hydraulic
2. Manual pneumatic and
3. Motorized pneumatic. [2]

4.1.1. HYDAULIC SPRAYER

This is the manually operated sprayer, works with the help of hand lever to maintain constant pressure and has a tank capacity of 15 liters. This sprayer is used particularly for spot treatment.

4.1.2. PNEUMATIC OR COMPRESSED SYSTEM KNAPSACK

In this sprayer, pumping is not necessary during spraying. After filling the liquid $\frac{2}{3}$ rd capacity the tank is pressurized. It is used in limited amount to spray on weeds in paddy and jute.

4.1.3. MOTORIZED PNEUMATIC SPRAYERS

As a low volume sprayer suitable for spraying concentrated spray liquid. A blast of air flows through spraying jet of delivery hose and nozzle tube and ejects spray liquid in this blast. Air blast atomizes spray liquid in to fine droplets. Air acts as carrier. Faster the air is pressured more the atomization. Theses prayers are also used as blowers. Mist blower cause considerable loss of herbicide blower is: by winds. The main advantages of Knapsack are: 1. Portable working, and 2. fast spraying. Suited to post emergence translocate type. Herbicides as low volume Spraying is not so uniform with Knapsack blowers. Liquid - 60 liters / ha swath 7 to 8 m.



Fig. 3.1.1 Motorized Pneumatic Sprayer

4.2 FOOT SPRAYER/PEDAL PUMP SPRAYERS

This sprayer is operated by foot and popularly used for CPP application. It has provision of 1-2 long delivery hoses, fitted with either lance or 2-6 nozzle booms. This sprayer has advantage of high volume spray and covers large area.

4.3. TRACTION PNEUMATIC SPRAYER

Indian Institute of Sugarcane Research, Lucknow has developed bullock drawn sprayer with size nozzle boom that is powered from the wheels of the frame. It is efficient, easy to operate and simple in its construction. It uses two pneumatic pumps and develops maximum pressure of 2-8 cm² which is suited to minimize spray drift. Area covered is 2-3 ha/day equipment.

5. SPRAYING METHODS

5.1. BACKPACK SPRAYER

This is a hand operated sprayer loaded on the back of the worker. 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: 5.1. Backpack Sprayer [1]

5.2. 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. In which, addresses the two 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: 5.2. Bullet Santi [1]

5.3. AERIAL SPRAYER

This type of spraying technique is generally applied on large farms. In aerial spraying, the spraying is done with the help of helicopter which is controlled by the remote. In this the multi-nozzle sprayer is attached to it and sprayed from some altitude. This kind of spraying technique consumes less time and required less human effort.



Fig: 5.3. Aerial Spray [1]

REFERENCES

- [1] Nitin Das, Namit Maske, Vinayak Khawas, Dr. S. K. Chaudhary, Er. R. D. Dhete, *Agricultural Fertilizers and Pesticides Sprayers- A Review*, IJIRST – International Journal for Innovative Research in Science & Technology| Volume 1 | Issue 11 | April 2015
- [2] Malik, R.K., Pundir, A., Dar, S.R., Singh, S.K., Gopal, R., Shankar, P.R., Singh, N. and Jat, M.L. 2012. *Sprayers and Spraying Techniques – A manual*, CSISA, IRRI and CIMMYT. 20 pp.
- [3] Shivaraja Kumar Pwameswaramurthy, Design and development of wheel and pedal operated sprayer”, IPSInternational journal of mechanical Engineering (IJME), volume 2, Issue 6, June 2014.
- [4] Sandeep H. Poratkar, Dhanraj R. Raut, “Development of Multinozzle Pesticides Sprayer Pump”, International Journal of Modern Engineering Research (IJMER), Vol.3, Issue.2, March-April. 2013 pp-864-868.
- [5] Varikuti Vasantha Rao Sharanakumar Mathapati Dr. Basavaraj Amarapur, “Multiple Power Supplied Fertilizer Sprayer”, International Journal of Scientific and Research Publications, Volume 3, Issue 8, August 2013 1 ISSN 2250-3153.