

Multipurpose Agriculture Vehicle

¹Humbade A.B., ²Kalingwar C.M., ³Kadam. N.S., ⁴Davargave M.M., ⁵Prof. Lande.S.B.

Department of Mechanical Engineering, UCOER, Pune, Maharashtra, India

Abstract: A Study has been carried out to develop multipurpose agricultural equipment, for performing major agricultural operations like spraying pesticides, feeding fertilizer, ploughing and many more to increase the efficiency and reduce the production and handling cost. Modifications were carried out, and the modification includes fabricating a vehicle, which is small, compact in size which can move easily across the fields. Which consists of various agricultural implements like inter-cultivator, pesticides sprayer, plough which can be easily assembled and Disassembled by a single person, the cost of equipment is less by 83% compared to a tractor And 40% compared to a tiller (price in India).

This Project presents work on design of a new agricultural multipurpose vehicle to be used for various applications. As global competition is pressing farmers on many fronts, mechanized agriculture has become one of the important modern agricultural methods. In India 60% population involved in agricultural work, Conventional mechanized systems may increase productivity but are less adaptive and flexible. As a consequence, there have been initiatives in developing advanced mechanized systems. We are evolving a multipurpose vehicle for farm, which can easily use for digging, seeding, spreading fertilizer.

Keywords:-Rack and pinion gear, piston pump, nozzle, Bearing etc.

1. INTRODUCTION

The agriculture plays a very important role within the Indian economy therefore so as to utilize this field to implement a thought in palmy manner there square measure monumental opportunities. These square measureas are spraying pesticides, feeding chemical, tilling and plenty of additional. Our basic task is to use our ideas and information to create some new techniques and equipments to boost the agricultural method to scale back effort and time needed. additionally we have a tendency to square measure sons of farmer and extremely interested to create the project connected with agricultural field, therefore by doing the survey of sure villages and by perceptive the accessible techniques of farming in villages we have a tendency to could conclude that there's want of implementing sure new ideas and technique within the field of agriculture so farmers can have comfort and safety in their work. so we have a tendency to created Agriculture useful Vehicle", by implementing this vehicle within the field of agriculture, we are able to provide additional certainty that it is used for varied crops and additionally potency of crops is hyperbolic during a respectable manner. It reduces time and efforts needed for constant task that is antecedently performed by typical technique.

2. METHODOLOGY:

To achieve the above-mentioned objectives the following methodology is preferable for the proposed work:

Ploughing:

This is the mechanism used in all the agricultural fields to maintain the fertility of land, due to forward movement of the equipment the plougher is attached to the front of the equipment with predesigned number of teeth and teeth depth.

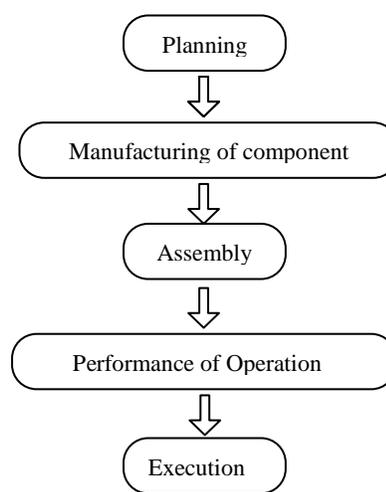


Fig. Flow Chart of Methodology

Fertilizer spraying:

Spraying of fertilizer is accomplished by help of a storage tank provided with stirrer and a nozzle attached to it.

Digging of soil:

By providing blades on the periphery of the rolling wheel digging is carried out and soil becomes softer for more cultivation.

Digging of soil:

By providing blades on the periphery of the rolling wheel digging is carried out and soil becomes softer for more cultivation.

Survey of Crops

We performed a survey to sort out the crops for which we can use our vehicle for spraying and fertilization operation. The crops that we find suitable for our application are as follows:

Sugar Cane

Sugar cane is high demanding and time consuming crop, which needed frequent attention for its proper growth. Sugar cane required spray of pesticides in its initial phase up to 3 months and up to the height of 2-2.5 feet.

Tomato

We find tomato is also suitable for our application of spraying. We can perform spraying for this crop up to the period of 1.2-2 months and its height at that time is 1 feet approximately

BT Cotton

Cotton is required spray of pesticides up to the period of 3-4 months and at this time its height is approximately 2-2.5 feet. Also there are many more crops that are suitable to select for our application.

- Onion
- Soya bean
- Wheat

3. LITERATURE REVIEW:

In order to carry out this work we have undergone extensive literature survey and contribution of by various authors is as follows,

[1] D.A. Mada, Sunday Mahai, [2013], In this research paper author has mentioned importance of mechanization in agricultural by giving examples. The conclusion from the paper was need of multifunctional single axel vehicle for pre and post harvesting . We have taken this as base for our research and further production of our multifunctional agricultural vehicle.

[2] V.K. Tewari, A. Ashok Kumar, Satya Prakash Kumar, Brajesh Nare[2012] In this research papers author have done case study on farm mechanization in west Bengal as being part of India it give clear status about availability and progress in India. This ensured us to take right steps compared to current steps.

[3] F.A. Adamu, B. G. Jahun and B. Babangida [2014]In this paper authors draws our attention towards the performance factor of a power tiller. Among those demand for light weight power tiller was sought out most. Fuel efficiency and field capacity such parameters are also discussed. We taken those points in consideration while designing a sustainable multifunctional agricultural vehicle.

[4] David D. Wilson and John H. Lumkes[2015] In this papers authors have used certain multipurpose machine with help of this paper we were able to derive our attention to broader way also how attachments can be used for making a model more useful in efficient and sustainable way.

[5] Mohammad Muneer Uz Zaman Author have emphasized on designing parameters of the grass cutter and he done research on reduction of cost of the material to be used. We taken this information for our design our one of the attachment which is related to grass cutter.

[6] M. A. Quayami & Amin Muhamaad Ali [2012] Author have done extensive study by taking case study of Bangladesh. They have come with growth scope and other terms. We used their conclusion as one of the basic points to start our design for the multifunctional agricultural vehicle.

[7] Adamade, C.A. and Jackson B.A. [2014] fellow researcher worked on Mechanization is recognized as the necessary major means needed to accelerate agricultural production and create a period of surplus in Nigeria. Indeed food sufficiency can only be attained in Nigeria by encouraging and promoting local designs and manufacture of implements and equipment at low cost. We have taken the useful data from this research paper.

(8) Parminder Kamboj, Rohinish Khurana, Anoop Dixit [2012] Disc harrow, tractor, lase leveller, rotavator, BT cotton seed drill are available in more than 85% of societies. Tractors which are available in societies are ranging from 50-60 hp. Most of the hiring charges vary from 25-40 Rs. h-1 except that of laser leveller whose hiring charge is 500 Rs. h-1 and tractor hiring charge is 150-250 Rs. h-1 and rotavator hiring charge is 70-80 Rs. h-1. In more than 70% of the societies, annual use of the rotavator was 550 h. And annual usage of tractor.

(9) G. Moitzi, T. Szalay, M. Schüller, H. Wagentristl, K. Refenner, H. Weingartmann, P. Liebhard, J.Boxberger, A. Gronauer [2013] The tractor-implement combination influenced via working speed and working width, the work time and fuel consumption. A tractor-implement combination operated in a high engine load had a great potential in reducing fuel consumption A well loaded “small tractor” with small implements are more fuel efficient than a worse loaded “big tractor”. This data have been used accordingly.

(10) P. Šařec, O. Šařec [2015] The lowest values of soil penetration resistance below the cultivated profile were determined with the cultivators equipped with chisel shaped shares, i.e. in the case of Farmet and Köckerling. Cultivators Väderstad TopDown 400 and Farmet Turbulent 450 showed good capacity in embedding plant residues. This results have taken for our research basis.

4. WORKING PRINCIPLE

Spray Assembly

In case of spray assembly it consist of one base frame over that one we mount one storage tank .Within that tank pesticides solution are placed .When we push the vehicle either forward or reverse direction, then with the help of piston pump the compression of fluid take place inside the tank. After compression as there is connection of one nozzle tube ,so within that tube this compressed fluid is flowing up to the two separate branches of nozzle .As in the nozzle the cross-section is very small , by throttling process pressure drops take place & velocity increases .These high velocity pesticides fluid is directly bombarding over the crops .In this vehicle we are able to control the flow of fluid depending on the requirement & applications.



Fig.2: Spray Assembly

Bio-Fertilizer Spreading System

Sowing and Fertilizer is used for line sowing and fertilizing of cereals and other crops. It is a low cost line-sowing device in which seed metering is done manually by the operator by dropping the seeds in the funnel provided for the purpose. This is the second assembly of agriculture multipurpose vehicle ,which is useful for insertion of bio-fertilizer in the farm .For insertion purpose, we prepared one hopper through which we are able to insert the fertilizer for base of that hopper we kept one control valve & below that control vale two separate branching is there for insertion of bio-fertilizer in two separate sides for covering more area .The arrangement of this branches is in such way that we are able to arrange that distance depending on condition/situation of the distance between two crop lines .The capacity of hopper is up to 10 to 12 kg so that we are able to handle vehicle easily.

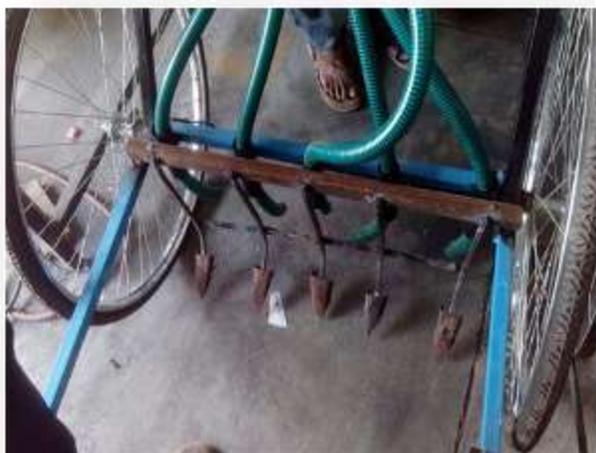


Fig.3: Bio-fertilizer Spreading System

Ploughing system

The primary purpose of ploughing is to turn over the upper layer of soil, bringing fresh nutrients to the surface, while burying weeds, the remains of previous crops, and both crop and weed seeds, allowing them to breakdown. The plough used in farming for initial cultivation of soil in preparation for sowing or planting to loosen or turn the soil.

The following are the objectives of this project work:

It is the best and economic to farmers in today's world without any huge investments and it can be worked without any external source like (electrical, solar energy) and we can contribute today's world without air pollution and water pollution. And it can accessed by any kind of farmer at low cost. The recommended down to row spacing seeds rate, seed to seeds spacing and depth of seed placement vary from crop to crop and for different agro-climatic conditions to achieve optimum yields. To improve the soil conditions by reducing evaporation from the soil surface, improve infiltration of rain or surface water; reduce runoff to maintain ridges or beds on which the crop is grown and to reduce competition of weeds for light, nutrients and water.



Fig.4: Ploughing System

5. ACTUAL MODEL



Fig. 5: Multipurpose Agriculture Vehicle

Chemicals are widely used for controlling disease, in sects and weeds in the crops. They are able to save a crop from pest attack only when applied in time. They need to be applied on plants and soil in the form of spray, dust or mist. The chemicals are costly. Therefore, Equipment for uniform and effective application is essential. so to adopt new method of applying chemicals, by using chemical sprayer equipment.

ADVANTAGES

1. To give comfort & relaxation to the farmers
2. To improve crop efficiency and try to get more quality as well as quantity of the crop.

3. With the help of this vehicle, we can complete work in less time and with the help of less manpower.
4. Try to maintain manufacturing cost as minimum as possible so that purchasing of vehicle will be economical.
5. Saving in electricity and fossil fuels.
6. Pollution free and environment friendly.
7. Simplification in design and handling is easy.
8. Less maintenance required.
9. Dle the fertilizer of particular.

6. FUTURE SCOPE

The agriculture multipurpose vehicle is such type of vehicle which is having a large future scope .We just tries to prepare one basic model which is always required in the agriculture field. By doing, the basic analysis the farmer always wants such type of vehicle in the field of agriculture. It is not possible at each & every farmer to purchase other highly developed equipment because of cost. So this vehicle always meets the requirement of farmer. As agriculture is the most important field so, we introduce this vehicle. In future, as the population is increases very fastly, day by day, so it is very important to increase the crops production also to fulfill the requirement of food.

By using this vehicle, we are able to satisfy the requirement in future .So these are having a large scope in future. If we try to develop this model in the next step, i.e.by using sensor & actuator we are able to improve model working speed with more accurate. This sensor senses the signal of distance between two crops & at the exact point of root we are able to improve the accuracy.

In case of spray vehicle, if we use rotary actuators continuously then nozzle are able to rotate according to the situation of crop & because of this one the speed of working is very high. So, we cover more area of the crops spraying.

7. CONCLUSIONS

The main conclusion we occurred during testing and analysis, these are as follows

1. With the help of this technique, we are able to reduce the time during spraying and fertilizer insertion.
2. The project gives safety or can reduce the pain of farmers.3.If farmer operate at velocity 0.5 to 1 m/s then pump will give discharge up to 2.08lit/min.4.In 1 lit., the area influenced by spraying is 31.25m²
3. From this we make conclusion that with the help of this vehicle we are able to meet the requirement of agriculture field, so that farmer get satisfied for their work. This vehicle always gives more comfort to farmer. Also with the help of this vehicle farmer are able to improve the crop efficiency & the overall result of the quality of crop in to the Indian market. From this we may conclude that the overall result of the agriculture field is increases.

REFERENCES

[1] Design of Machine Element, Prof.V.B.Bhandari, Tata Mc-Graw-Hill Publishing Company Ltd.2007 Edition

[2] Strength of Machine Element, Prof.R.K.Rajput S.Chand Publication edition 2008.

[3]Fluid mechanics and hydraulic mechanism, R.K.BANSAL,Ninth edition

[4] Prof. Swati D.Kale, Swati V. Khandagale, Shweta S. Gaikwad, “Agriculture Drone for Spraying fertilizer and pesticides”, “International journal of advance research in computer science and software Engineering”, volume 5,Issue 12,(Dec-2015)

[5] S.R.Kulkarni, Harish Nayak, Mohan Futane, “Fabrication of portable foot operated Agricultural Fertilizer and pesticides spraying pump”, “International journal of Engineering Research and technology”, ISSN:2278-0181,volume 4 ,Issue 07(July-2015)

[6] Saharawat, Y.S., Singh, B., Malik, R.K., Ladha, J.K., Gathala, M., Jat, M.L. and Kumar, V. 2010. Evaluation of alternative tillage and crop establishment methods in a ricewheat rotation in north-western IGP. *Field Crops Res.* **116**: 260–267.

[7] Kalay khan, S.C. Moses, Ashok kumar “A Survey on the Design, Fabrication and Utilization of Different Crops Planter” *European Academic Research* - vol. iii, July 2015.

Group of Project

