Study and Evaluation of Agriculture Sprayer and Cutter

V. D. Paliwal[1], Krunal V. Raut[2], Kunal M. Rahangdale[3], Jayant A. Giradkar[4]
[1]*Assistant Professor Of Mechanical Department, Dr. Babasaheb Ambedkar College Of Engineering & Research, Nagpur.*
[2,3,4] *Students of Mechanical Engineer, Dr. Babasaheb Ambedkar College Of Engineering & Research, Wanadongri, Nagpur*

***Abstract*- This project is to study and evaluation of cutter & pesticide pump sprayer cart. As India is agriculture based country and 70% people do farming and related work. Agriculture is required to be boomed to enhance the Gross Domestic Product (GDP) of the country by improving the productivity. The productivity of the crops can be increased with the help of pest control. Pesticide spraying is the necessary procedure in cultivation of the crops. The present idea deals with the study of a cutter and pesticide sprayer which will be useful and affordable to the farmers which will assist to increase the productivity of crops. Though this project an attempt has been done to improve the method of spraying the pesticide that will enhance the productivity and increase the farmer's income. So we have studied a cutter and pesticide spraying machine which will not only increase productivity but also will reduce the effort of the farmers. The machine will save the time of the farmer as well as efficiency in weeding and in spraying. This model carries 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. It also carry a cutting blade which will runs at solar energy for weeding process.**

INTRODUCTION

The crop cutting is also an important stage in an agriculture field. Currently in India farmer used conventional method for the crop cutting i.e. the conventional method for crop cutting is as manually cutting using labor but this method is lengthy and time consuming. This project aim is to design and fabricate a small field crop cutter machine for small height crop. The machine consists of motor having a sharp blade to cut the crop. As compare to manual crop cutting and the machine ,it has a capacity to cut the crop in faster way. This machine is helpful for both the small as well as big farm.

One of the most common forms of pesticides application, especially in conventional agriculture, is the use of mechanical sprayers. 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, of one 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 conditions are required.

The project aim is to remove the backpack and foot spraying techniques, eliminate the human efforts, to decrease labor cost by advancing the spraying method and constant flow of droplets and using non-conventional sources for charging the batteries.

MACHINE PARTS

Power supplier: Solar panel is used to generate the power required for drive the motor and pump.

Motor: An electric DC motor is used to drive a cutter with required rpm and torque.

Pump: A pump is used to spray pesticide over a field/ on crop with constant pressure.

Battery: Battery is used as a power storage device. Which supply the required power to motor and pump.

*Wheels***:** The tricycle wheels are used in cart due to its light weight and low cost.
*Storage tank***:** It is a closed vessel reservoir used to store pesticide.

OBJECTIVES

- The objective of this project is to study and evaluate a low cost multi crop cutting machine based on the need of farmers.
- To minimize time of harvesting
- To minimize the human effort.

Present state of the art of multi crop cutting process and their shortcomings
The present state of art of multi crop cutter described below
There are two ways of crop cutting process
1. Manual process or with help of sickle.
2. Mechanized motor process.
In a manual process the crop cutting is done with the blade hampering on the crop or sack containing the crop or with the help of rotary equipment which is very tedious work. While in the motorized process the motor is used to cut the crop with the help of cutter blade. To cut the crop power transfer and power done with the help of motor through suitable mechanism. If one carefully observes the first process then he could find the following limitations which are given below,

1. This process renders fatigue to the hand; it produces damages to the hands.
2. As it is continuous process it requires monotonous work.
3. It is time consuming and laborious process so no one wants to do in today era. On the other side, in the second process following limitations have been found out which are discussed below,
4. The requirement of electricity is prerequisite for this process. As today's main problem is the power crises and load shading and the machine becomes idle in that case.
5. The cost of the machine is quite high and the rural people could not afford it to buy.

Proposed Solution Over The Present State Of Art
A proposed solution over the present state of art is being explained through this article. A solution is the evolution of the unique machine, which would run with the help of solar energy. A schematic diagram is shown in the figure. It is a special type of harvester which is powered by the 0.75Kwatt, 1400 rpm electric motor. With the help of shaft, drive power is transmitted to gearbox. For the required rpm at cutter a spur gearbox and a bevel gearbox is used. Here bevel gear is used to change the direction of drive in the gear system by 90˚.

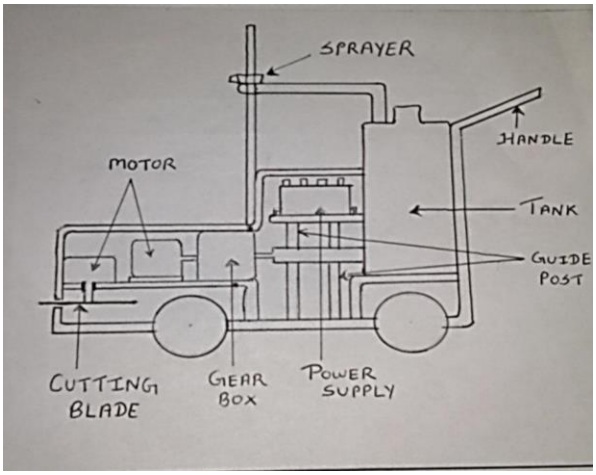

Fig: Line Diagram of Agriculture Sprayer & Cutter

An Approach to Develop The Crop cutting electric motor.
A proposed machine can be developed by using following procedure.
Firstly the cutting strength of different crops will be estimated by performing test on apparatus, which is made especially for this work. The estimated cutting force will be used for finding the cutting force .The weight of the process unit the kinematic entities of different links the reaction force offered due to cutting force will be used for the estimation of load torque, in fact this load torque becomes useful for the estimation of demand power. This demand power will be useful in to ascertain the dimension of various components associated with the machine by obtaining design dimensions of components' fabrication will be done at last trials will be taken to ascertain viability.

REFFERANCES

[1] Anonymous, (2003). Indian Agriculture. Ministry of Agriculture, India: 180-182. Bisht, D.S., S.K. Dasdupta and P.M. Menon (2006).

Agricultural Research station Development and Management, ICRISAT. 156-157.

[2] State of Indian Agriculture 2012-13, Indian Government Analysis.

[3] "Design and fabrication of small scale Sugarcane Harvesting Machine" Adarsh J Jain, ShashankKarne, Srinivas Ratod, Vinay N1 Toted and Karan ISSN 2278 – 0149 .ijmerr Vol. 2, No. 3, July 2013.

[4] http://india.gov.in/topics/agriculture.

[5] http:en.wikipedia.org/wiki/Agriculture_in_India.

[6] Laukik P.Raut, Smith B.Jaiswal, NitinY.Mohite, "Design, development and fabrication of agricultural pesticides sprayer with weeder","International journal of applied Research and studies",ISSN:2278-9480 volume2,Issue 11(Nov-2013)

[7] 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)

[8] 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)

[9] Journal of arboriculture weed control in landscape plantings1 by J.F. Ahrens April 1981 vol. 7, no. 4.

[10] Backpack Sprayer-Modified for small farm Crop Protection-Rutgers Snyder Research & Extension Farm Staff–Edited by John Grande and Jack Rabin.

[11] To Spray or Not to Spray: Pesticides, Banana Exports, and Food Safety John S. Wilson Tsunehiro Otsuki*,b a b Development Research Group (DECRG), World Bank, 1818 H Street NW, Washington, D.C. 20433, USA March 2002.

[12] Farmers understanding of pesticides safety labels and field spraying practices. By Oluyede Clifford Ajayi and Festus K. Akinnifesi_Scentific Research and Essay Vol (2), pp.204-210, June 2007 ISSN 1992-2248@2007 Academic Journals. Praveen Kiran Mali, Dr. C. N. Sakhale, S. D. Shelare. "A Literature Review on Design and Development of Maize Thresher" Ijpret, 2015; Volume 3 (9): 9-14Issn: 2319-507.

[13] "Fabrication and performance test of an Ultraportable Crop cutter" Mr. G Maruthi Prasad Yadav, GMD JaveedBasha IJRSET Volume 2

[14] Relationship between Stalk Shear Strength and Morphological Traits of Stalk Crops, by Li Liang and YumingGuo.

[15] Farm power sources, their availability and future requirements to sustain agricultural production, by N. S. L. Srivastava.

[16] State of Indian Agriculture 2012-13, Indian Government Analysis.

[17] "Design and fabrication of small scale Sugarcane Harvesting Machine" Adarsh J Jain, ShashankKarne, SrinivasRatod, Vinay N1 Toted and Karan ISSN 2278 – 0149 .ijmerr Vol. 2, No. 3, July 2013.

[18] State of Indian Agriculture 2012-13, Indian Government Analysis.2. "Design and Development of manually. Operated Reaper" Mr. P. B. Chavan, Mr. D. K. Patil, Mr. D. S. Dhondg, Volume 12, Issue 3 Ver. I (May. - Jun.2015), PP 15-22.

[19] http://india.gov.in/topics/agriculture

[20] http:en.wikipedia.org/wiki/Agriculture_in_India

[21] Pressure on farmland The Hindu. 4 February 2014. Retrieved 4 February 2014.

[22] State of Indian Agriculture 2012-13, Indian Government Analysis.2.

[23] "Design and Development of manually Operated Reaper" Mr. P. B. Chavan, Mr. D. K. Patil, Mr. D. S. Dhondg.(IOSR-JMCE) Journal of Mechanical and Civil Engineeringe-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 3 Ver. I (May. - Jun. 2015), PP 15-22.

[24] "Fabrication and performance test of an Ultraportable Crop cutter" Mr. G Maruthi Prasad Yadav, GMD Javeed Basha IJRSET Volume 2, Issue 2 Pages: 13-253."Design and fabrication of small scale Sugarcane Harvesting Machine" Adarsh J Jain, Shashank Karne, Srinivas Ratod, Vinay N1 Toted and Karan ISSN 2278 0149 .ijmerr Vol. 2, No. 3, July 2013© 2013 IJMERR.

[25] "Deign of tractor front mounted Pigeon pea stem cutter" Atul R. Dange, S. K. Thakare, I. Bhaskarrao and Umarfarooq momin. Journal of Agricultural Technology 2012 Vol. 8(2): 417-433ISSSN 1686-9141

[26] Design, Development and Fabrication of a Compact Harvester Laukik P. Raut1 Vishal Dhandare2 Pratik Jain3 Vinit Ghike4 Vineet Mishra5 IJSRD - International Journal for Scientific Research & Development| Vol. 2, Issue 10, 2014 | ISSN (online): 2321-0613

[27] Application technology: Problems and opportunities with Knapsack sprayer, Including the cf valves or Constant Flow Valves.- David McAuliffe and Vanessa P. Gray

[28] Journal of arboriculture weed control in landscape plantings1 by J.F. ahrens april 1981 vol. 7, no. 4.

[29] Backpack Sprayer-Modified for small farm Crop Protection-Rutgers Snyder Research & Extension Farm Staff–Edited by John Grande and Jack Rabin.

[30] To Spray or Not to Spray: Pesticides, Banana Exports, and Food Safety John S. Wilsona Tsunehiro Otsuki*,b a b Development Research Group (DECRG), World Bank, 1818 H Street NW, Washington, D.C. 20433, USA March 2002.