

AGRICULTURAL MINI CULTIVATOR

¹Mr. K. Rahul, ²P. Sundar, ³B. Sathik Ameen, ⁴K. Venkata Sai Teja, ⁵S. Sudheer Kumar Reddy

¹ Assistant Professor, Department of ME, Narayana Engineering College, Gudur, AP, 524101

²UG Student, Department of ME, Narayana Engineering College, Gudur, AP, 524101

Abstract: *Agriculture is the primary source of the India population. It plays a crucial role in the economic growth of our country. In olden days plows are used to stir or tillage the soil. Nowadays tractors are used for different cultivations. The tractor is an engineering vehicle specially designed for agriculture purposes. Many cultivators or farming equipment are attached to the tractor for tillage and stir the soil. Using the tractor is more expensive for small farmers. Design and manufacturing of multifunctional agricultural machines by using worm and worm wheel gearbox mainly used for inter agricultural purposes. As a worm wheel gearbox is utilized for producing less speed and more torque, hence introduced in machine further speed reduction is carried out by chain drive. It is nothing but a two-wheeled tractor popularly known as power tiller. The conventional power tiller is having many drawbacks. As like fails to deliver high torque and fails to absorb shocks during agricultural operation. The project relates to developing more torque and design different attachments to it. Plough implement is firstly introduced to power tiller via this project. As per the name multifunctional, machine utilized for pump sets, material handling, pesticide spraying, etc.*

Keyword: *Design, Fabrication, Agriculture, Cultivator, Productivity*

1. INTRODUCTION

A cultivator is any of several types of farm implement used for secondary tillage. One sense of the name refers to frames with teeth (also called shanks) that pierce the soil as they are dragged through it linearly. Another sense refers to machines that use rotary motion of disks or teeth to accomplish a similar result. Cultivators of the toothed type are often similar in form to chisel plows. Consequently, cultivating also takes much less power per shank than does chisel Agriculture includes cultivation of crops as tending of livestock for the production of food and fiber for humans. Mankind began to cultivate food crops about 10,000 years ago. Before that time, hunter-gatherers secured their food as they traveled in the nearby environment. When they observed some of the grains left behind at their campsites sprouting and growing to harvest, they began to cultivate these grains. From these humble beginnings, agriculture began. Slash and burn, an early type of crop culture, remains today truly sustainable agriculture, one that is independent of fossil fuel energy. Two-wheel tractor or walking tractor are generic terms understood in India and in parts of Europe to represent a single-axle tractor, which is a tractor with one axle, self-powered and self-propelled, which can pull and power various farm implements such as a trailer, cultivator or harrow, a plough, or various seeders and harvesters. The operator usually walks behind it or rides the implement being towed. Similar terms are mistakenly applied to the rotary tiller or power tiller although these may be wheeled or self-propelled. A two-wheeled tractor specializes in pulling any of numerous types of implements, whereas rotary tillers specialize in soil tillage with their dedicated digging tools. The power tillers are less costly and it engages less labor per unit of land than bullock farms and is particularly useful in the intensive cultivation of crops. It is felt that various financial institutions and borrowers are taking interest in promoting power tillers especially because the

majority of farmers are small with landholding below 2 hectares who can hardly afford costlier tractors.

2. MOTIVATION AND OBJECTIVES

2.1. Motivation

The primary capacity of the field cultivator is to set up an appropriate seedbed for the yield to be planted into, to cover crop buildup in the dirt (assisting with warming the dirt before planting), to control weeds, and to blend and consolidate the dirt to guarantee the developing harvest has enough water and nutrients. A Front prong turner separates previously developed ground prepared for planting or to make a fine tilth, while a Rear Tine Tiller can do the above in addition to separate non-developed, or non-sowable land, a yard may be, to make soil beds. The name Rotavator is a trademark of the Howard group. The main role of furrowing is to turn over the upper layer of the dirt, carrying new supplements to the surface, while covering weeds and the remaining parts of past harvests, permitting them to separate. It likewise circulates air through the dirt and permits it to hold dampness better. A rancher's principle objective is to create a decent harvest or potentially sound animals to get by and to take care of the populace. Ranchers are liable for all yields and domesticated animals that are required for us to endure.

2.2. Objectives

A two-wheeled tractor has some expertise in pulling any of various sorts of executes, while rotational turners represent considerable authority in soil culturing with their committed burrowing devices. Basic and discretionary soil control is the key activity required for the advancement of any kind of item. Soil working instruments, for the model, form board wrinkles, plate wrinkles, and ridges has for quite a while been recognized and viably used by farmers under typical field conditions. The primary objectives of the present project work are listed below.

- To develop a proper-seedbed for the crops to be planted into, to bury crop residue in the soil.
- To control weeds, and to mix and incorporate the soil to ensure the growing crop has enough water and nutrients
- The primary purpose of ploughing is to turn over the upper layer of the soil, bringing fresh **nutrients** to the surface.

3. LITERATURE REVIEW

Most models of the lightweight power turner being made in India have been furnished with a front or back mounted fueled rotating unit for progress ahead just as for culturing activity. There is scope for these force turners to be utilized as seedbed arrangement and entomb culture activity in wide separated column crops like cotton and sugarcane. To evaluate the exhibition of lightweight force turner, one such model was assessed at Central Mechanical Engineering [1]. Their performance results were analyzed in terms of machine performance parameters. The effect of treatments on machine parameters like fuel consumption and field efficiency was evaluated. Also, the cost of operation was worked out. The average values of field efficiency and fuel consumption were found at 78.89%, 12.94 l/ha respectively [2]. The regular power turner is having numerous disadvantages. Like neglects to convey high torque and neglects to retain stuns during horticultural activity. The task relates to creating more torque and structure

various connections to it. Furrow actualize is right off the bat acquainted with power turner employing this venture [3]. Data are introduced on the measure of soybean seed harm and the precision of seed dividing when different grower meters were utilized. Different factors include soybean assortment and seed dampness. Both huge and little seed assortments were utilized. The machine is used for mechanical weed control and hoeing. It was observed that the worm gear used in its transmission often failed due to surface wear of gear teeth. Worm gears made from three different copper alloys were tested against soil resistance in sandy loam soil bin [4]. Five business grower meters were analyzed: A fluted roller meter, an air plate meter, a solitary run feed cup meter, an air drum meter and a level plate meter [5]. The food and agriculture sector needs to achieve higher productivity and sustainability to respond to increasing and changing global demand for food, feed, fuel, and fiber without damaging natural resources. Environmental sustainability and energy efficiency factors are key factors for the better utilization of the resources. The review the literature and suggest the alternate green dielectrics and the environment for improved operational safety, less environmental impact [6]. In the field of agricultural also we had seen remarkable development, big farmers are now a day's using cultivator, harvester, tractor, advance machine tools and advance farm pieces of equipment, but in the country like India where more than 80% of farmers are small and marginal and they are still doing farming by traditional method only they are also in need of improved agricultural tools that may be hand driven or bullock driven [7]. The precision geometry, optimum energy utilization, multi-operational design, easy transport, and flexible attachments are some of the features which result in achieving some of the important parameters such as the width of cut Max.18cm &Min. 8cm, depth of cut Max.17cm and Min.8cm, Speed of operation 4.2km/hr. Field capacity 0.42ha/hr. and Field efficiency of 78%. Theoretical field capacity 0.33ha/hr. Theoretical draft 6.5kN.Cost of operation \$12//ha [8]. On-the-row mechanical cultivation however is still problematic mainly because of the risks of damaging the crop that is associated with this cultural practice. The objective of this study was to determine the optimum operational requirements for the aspecific type of rotary tillage tool used for on-the-row cultivation that would result in an appropriate control of weeds and minimal damage to the corn plants [9]. Agricultural productivity is measured as the ratio of agricultural outputs to agricultural inputs. While individual products are usually measured by weight, their varying densities make measuring overall agricultural output difficult [10]. Such material and technological conversion should enable a longer life of these elements without an increase in production costs, and as a result, it should increase the competitiveness of the produced elements [11]. Novelty production strengthens the transformation of (potentially) available resources into territorially specific resources; it supports territorial distinctiveness. Novelty production creates capacity to perform better and in that way increases the competitiveness [12]. Creative design seems more to be a matter of developing and refining together both the formulation of a problem and ideas for a solution, with constant iteration of analysis, synthesis and evaluation processes between the two notional design 'spaces'— problem space and solution space [13]. Now the creative industry is no longer merely a concept. Instead it boasts immense potential for economic benefits and is considered a new growth point for global economy [14]. The creative life is everywhere in agriculture. The earth creates new things, man gives them shape. He trains plants, intervenes, puts his mark on them. With respect and creativity. New farmers are utilizing a variety of creative innovations to ensure the success and profitability of their farms. Creativity and Innovative Business Ideas are requirements of the future in agriculture and farming. It can create monopoly in market. In subsequent decades,

people overcame this initial imbalance and came to realize that herbicidal weed control has limitations and externalities, and it must be managed intelligently.

4. MATERIALS AND METHODS

For the design of the frame, the length of the frame and row to row spacing between tines were considered according to the crop to be sown and row to row spacing for intercultural operation. The mounting of tines on the frame was kept simple as well as rigid so that they were easy to shift to achieve desired row spacing and on other hand, enough to bear vibration and shocks during operation. The two beams in which tines are attached can be checked for failure (bending and twisting failure both). 35 kg force is required to cultivate the soil at an angle of 23.7° . The cultivator beam was tested as per the standard procedure. The twisting moment due to force at the beam was found 14182.4 kg-cm. Bending moment acting on the front and back beam was calculated as 725.08 kg-cm and 356.08 kg-cm. Bending stress for front and back beam was calculated 7214.75 Pa and 6648 Pa. Shear stress for the front beam and back beam was calculated as 47320.72 Pa and 45396.32 Pa. Principal stress for front beam 51065.12 Pa and -43850.95 Pa for back beam 48841.85 Pa and -42193.85 Pa. The results show that the beam was safe and not fail in any condition.

The main objective of this project is to develop a solar-powered agriculture sprayer. This innovation targets some of the objectives listed below.

- To spray Fertilizer or pesticides aerially on Crops.
- To decrease the operational cost by further introducing new mechanisms.
- To consume zero electricity.
- It should able to spray both fertilizer and pesticide
- To eliminate environmental pollution by using a natural energy source.
- To complete the work with solar energy

The academic goal of this project is to develop an innovative, renewable energy source, reduced electricity bills, diverse applications, low maintenance costs, technology advancement.

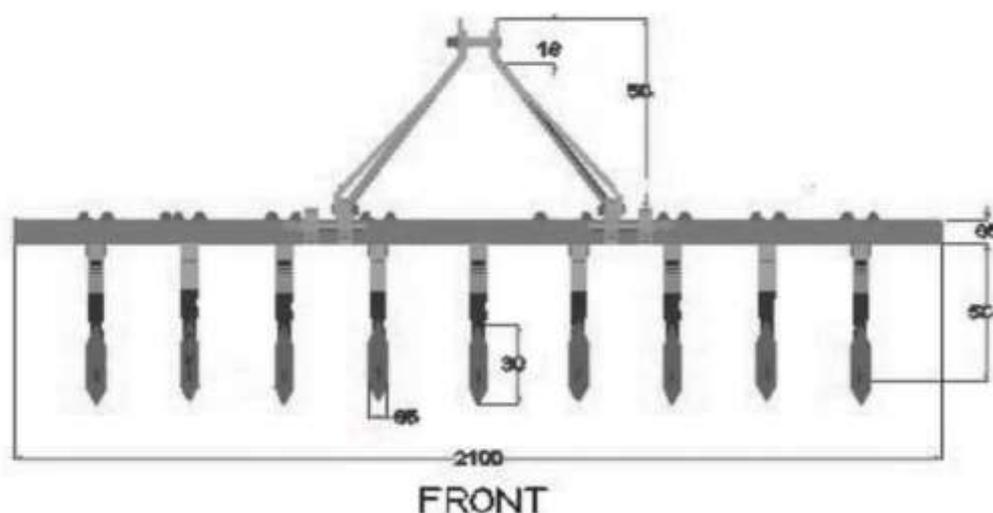


Fig. 1. Design of Agriculture Cultivator

5. RESULTS AND DISCUSSION

The tractor-drawn prototype cultivator-cum-seed drill and conventional seed drills were evaluated in the laboratory. Firstly both machines were calibrated in the laboratory for the desired seed rate by adjusting the exposed length of the fluted rollers. Both machines were tested for different hopper filling one fourth, half, three fourth, and found that hopper filling does not affect the seed rate at a 5 % level of significance. The seed rate close to the recommended seed rate for cultivator mounted seed drill was found 80.87 kg/ha with fluted exposure was 15 mm. Same was found 80.26 kg/ha. The main function of the mini cultivator is to prepare a proper seedbed. For the crop to be planted and to control weeds (A weed may also be defined as any plant growing where it is not wanted. And to mix and incorporate the soil to ensure the growing crop has enough water and nutrients to grow well. In this we are using one-row type cultivator By attaching a one-row type cultivator you will have the ability to quickly and easily till each side of the row in your farms. A cultivator is a great tool for removing unwanted weeds and grass while also breaking up the soil crust. This makes it easier for the garden to absorb nutrients and moisture. And this type of cultivator is run manually by pushed or pulled by a single person. For small-scale farming, such as for the household's use or small market gardens e.t.c.

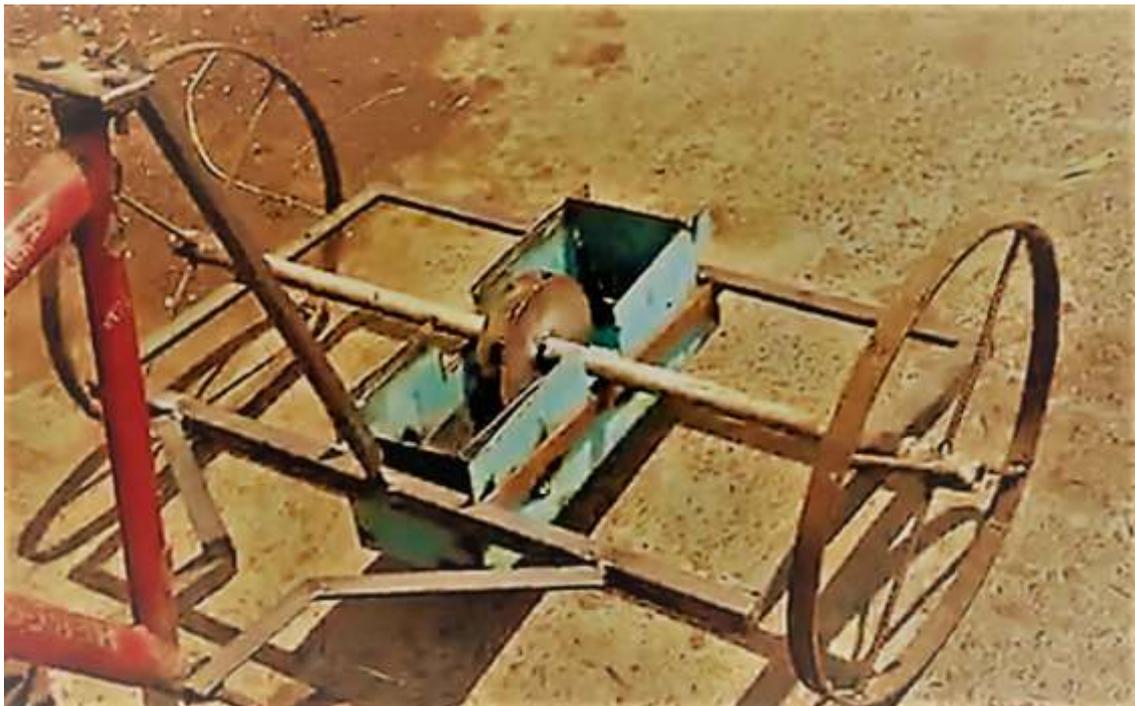


Fig. 2. The fabricated Machine

6. CONCLUSIONS

The present research brought out some important findings which have got a direct bearing on those involved in the transfer of technology and the making of policies. They are detailed below.

- A major number of the respondent belonged to a medium level of knowledge regarding farm mechanization practices by sericulture cultivation.
- Especially in sericulture chopping, harvesting equipment, its operation, specific requirements like mulberry portable pruner, multi-crop chaff cutter, silkworm separating machine, motor-operated cocoon harvesters. Therefore, the researcher and extension personnel of the developmental departments should be guided and advised the farmers about its advantages or even difficulties very clearly.
- The study indicated that though the sericulture activities are practicing by all most all irrigated farmers in the study area, their scientific knowledge about the farm mechanization in sericulture crop and scientific adoption of the farm implements was up to the mark in certain implements.
- The government should ensure that the subsidy or loan is available to the farmers at an adequate level before the season starts at a nearby place to improve the adoption level of the farm mechanization.

After manufacturing the performance of a multifunctional agricultural machine was evaluated to find maximum field efficiency along with other parameters. The objectives specified are satisfied at the end of this project. Cultivator creates a perfectly formed bed of soil ready to embrace the roots of flowers and vegetables require tools and techniques suited to the task. The agricultural machine was designed and developed with an aim to Working on machines at a different speed and soil conditions, the machine can sustain and faces frequently changing conditions.

7. REFERENCES

- [1]. Mandal, S. K., & Maity, A. (2011). Development and Performance Evaluation of a Light Weight Power Tiller. In *Proc. of National Conference on Machines and Mechanism, NaCoMM 2011. IIT Madras, India* (Vol. 35, pp. 319-325).
- [2]. Parmar, R. P., & Gupta, R. A. (2016). Development and Performance Evaluation of Powered Pulverizing Unit with Cultivator. *Agricultural Engineering Today*, 40(2), 3-9.
- [3]. Raut, A. S., Akshay, T.A., Sanket, S.K., Rahul, B.M., Ravindra, R. S. (2016). Design and Fabrication of Single Axle, Self-Propelled Multi Attachment Agricultural Machine. *International Journal for Scientific Research & Development*. 4(02), 859-861.
- [4]. Rahman, M., Mahmood, Z., Ali, T., Mufti, M. A. I., Seyal, J. K., & Ahmad, M. (2015). Effect of gear composition and soil interaction on surface wear of worm gear of self-propelled rotary hoe. *Sarhad Journal of Agriculture*, 31(1), 22-29.
- [5]. Nave, W. R., & Paulsen, M. R. (1979). Soybean seed quality as affected by planter meters. *Transactions of the ASAE*, 22(4), 739-0745.
- [6]. Viswanth, V. S., Ramanujam, R., & Rajyalakshmi, G. (2018). A review of research scope on sustainable and eco-friendly electrical discharge machining (E-EDM). *Materials Today: Proceedings*, 5(5), 12525-12533.
- [7]. Raut, M. P. M., Thakre, G. V., Thakre, R. D., & Gulhane, U. D. (2014). FEM analysis of nine tyne medium-duty cultivators. *IORD Journal of Science & Technology*, 1(5), 58-65.
- [8]. Galat, U. N., & Ingale, A. N. (2016). Failure Investigation & Analysis of Agricultural 9 Tyne Cultivator Used In Various Soil Condition. *International Journal on Recent and Innovation Trends in Computing and Communication ISSN*, 2321-8169.
- [9]. Yahia, S. B., Lague, C., & Khelifi, M. (1999). Optimum settings for rotary tools used for on-the-row mechanical cultivation in corn. *Applied Engineering in Agriculture*, 15(6), 615.
- [10]. Viswanth, V. S., Ramanujam, R., & Rajyalakshmi, G. (2020). Performance study of eco-friendly dielectric in EDM of AISI 2507 super duplex steel using Taguchi-fuzzy TOPSIS approach. *International Journal of Productivity and Quality Management*, 29(4), 518-541.

- [11]. Gadgil, M. V. (1986). Agricultural credit in India: A review of performance and policies. *Indian Journal of Agricultural Economics*, 41(902-2018-2457), 282-309.
- [12]. Viswanth, V. S., Ramanujam, R., & Rajyalakshmi, G. (2020). A Novel MCDM Approach for Process Parameters Optimization in Eco-Friendly EDM of AISI 2507 Super Duplex Stainless Steel. *Journal of Advanced Research in Dynamical and Control Systems*, 10(7), 54-64.
- [13]. Singh, J. (2005). Scope, progress and constraints of farm mechanization in India. *Status of Farm Mechanization in India. New Delhi: Indian Agricultural Statistics Research Institute*, 48-56.
- [14]. Intarachaimas, W. (2013). Teaching agricultural students to be creativity. *Naresuan University Journal: Science and Technology (NUJST)*, 20(1), 99-103.