

Design, Analysis and Optimization of Single Pass Seedbed Preparation Attachment for Low Power Tractors

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Abstract— The proportional sized cultivator can make short work of preparing soil ready for new plantings and for the mixing of leftovers, compost manure and fertilizers. They are also great for getting the soil in shape of perennial trees like orange, mango etc. The unit will be the combination in series as first Duckfoot Cultivator, next will be Hopper with mixer and aftermost will be Rotavator which will have rotating tines or blades that are driven by small gear mechanism.

Key words: Cultivator, Fertilizers, Rotavator, Mechanism

I. INTRODUCTION

Farming is the main and growing business of our country. Presently we are using conventional instruments for it, which is of low efficiency and resulting in low yielding from farms. Mostly due to the adverse weather conditions, it is observed that the preparation of seedbed prior monsoon is very difficult. The other issue is cost. For small-scale farming, to get manpower with reasonable cost is very difficult. To get optimum cost effective yield from the farm is today's priority need.

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, but their goals are different. Cultivator teeth work near the surface, usually for weed control, whereas chisel plow shanks work deep beneath the surface, breaking up hardpan. Consequently, cultivating also takes much less power per shank than does chisel plowing. Small toothed cultivators pushed or pulled by a single person are used as garden tools for small-scale gardening, such as for the household's own use or for small market gardens. Similarly sized rotary tillers combine the functions of harrow and cultivator into one multipurpose machine.

Cultivators are usually either self-propelled or drawn as an attachment behind tractor. They are usually attached by means of a three-point hitch and driven by a power take-off (PTO). Drawbar hookup is also still commonly used worldwide.



Fig. 1: Duck Leg Cultivator



Fig. 2: Hopper for Compose Manure / Fertiliser



Fig. 3: Rotavator

II. LITERATURE REVIEW

Akhtar Ali Rizvi. [1] The soil tiller and weeder is one of the many farm mechanization in promoting soil tiller and weeders especially considering the fact that the majority of farmers are having small land. It reduces human effort. The implements are mostly self-guided. Working of the project is based on engine and chain sprocket mechanism which moves the cutter or tiller. It is a great saver of time and expenses on field operations. Thus it will have very effective uses on the farm field either for tiling as well as for weeding. Development of high capacity energy efficient versatile machines and combination machinery for increased labor productivity, reduced unit cost of operation, improved timeliness of operation and suitable for custom hiring.

Robert Grisso Virginia Polytechnic Institute and State University[2] Cultivation, a proven weed control method, should be used primarily to control weeds, rebuild ridges, or aerate poorly drained or crusted soils. Cultivating just to stir the soil usually dries the soil and can result in lower yields during drier cropping conditions. For example, cultivating during warm and windy conditions can result in 1/4 to 3/4 inches of soil moisture loss. The main difference between a conservation tillage cultivator and a conventional cultivator is the ability to handle residue and penetrate the soil. By definition, conservation tillage should leave at least 30 percent of the soil surface covered with crop residue after planting. Conservation tillage includes several tillage systems

that have preplan! Tillage operations to loosen the soil as well as no-till and ridge plant systems.

III. IDENTIFIED GAPS IN THE LITERATURE

The single pass seed bed preparation unit is available in the market are very large and expensive and do not have arrangement for dozing fertilizer and compost manure. These expensive cultivators are unaffordable for ordinary farmers.

IV. PROBLEM FORMULATION

Keeping in view these considerations, it is proposed to design and develop a machine with following objectives:

- 1) To design a single pass seed bed preparation unit.
- 2) Optimization of design using the Finite Element Analysis technique.

V. CONCLUSIONS

The existing system does not possess the arrangements for dozing of fertilizer and compost manure. Secondly, the present rotavators are not suitable for hard soil. Thus can't do proper soil preparations. These expensive cultivators are unaffordable for ordinary farmers.

REFERENCES

- [1] Akhtar Ali Rizvi., "Design, Development and Fabrication of Soil Tiller and Weeder" IJIEET, Vol. 2 Issue 2 April 2013, ISSN 2319-1058.
- [2] Robert Grisso Virginia Polytechnic Institute and State University, "Cultivators For Conservation Tillage" G92-1098-A
- [3] Fielke, J. M, T. W. Reiley; M. G. Slattery and R. W. Fitzpatt.(1993). "Comparison of tillage forces and wear rates of pressed and cast cultivator shares". Soil and Tillage Research, 25; 317-328.
- [4] Ghosh, B.N. (1967). "The Power Requirement of a Rotary Cultivator". J. Agric. Engg. Res., 12 (1): 5-12.
- [5] Gill, W. R., and G. E. Vanden Berg. (1996). "Design of tillage tool In soil dynamics in tillage and traction". 211-294. Washington, D.C., U.S.GPO
- [6] Bernacki H, Haman J, Kanafojski CZ. Agricultural Machines, Theory and Construction, US Department of Agriculture and National Science Foundation, Washington, D.C. 1972.
- [7] Garg B K and Devnani R S, 1982, Performance evaluation of multipurpose tool carrier. p.21 in: Annual report
- [8] Biswas H S, 1990. Soil Tool Interactions for Mechanical Control of Weeds in Black Soils. PhD Thesis, Indian Institute of Technology, Kharagpur, India. 283p.
- [9] Biswas H S, 1980. Weeding Tools and Tmplements of India. Technical Bulletin CIAE/78/3. Central Institute of Agricultural Engineering (CIAE), Bhopal, India.pp. 45-69.
- [10] CIAE, 1980. Bakhar blade and patella harrow. pp. 26-28in: Annual report 1976-79, Central Institute of Agricultural Engineering (CIAE), Bhopal, India. wear rates of pressed and cast cultivator shares". Soil and Tillage Research, 25; 317-328.