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Review on Cultivator Tines

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Abstract - *Agriculture is the backbone of Indian economy. India is highly dependent on agriculture as a huge amount of land is used for it. There is no doubt that agriculture plays a crucial role in the overall growth of country and so it is necessary to ensure its development. In India about 70% of the total population depends on the agriculture and is one of the sources of livelihood for the people especially in the rural areas. Agriculture plays important part of almost every economy in the world, today some developing nations depends on agriculture for over 50% of their annual revenue. So there is a need in the development in agricultural practices, as soil is considered as the major effecting part in the agriculture to maintain the quality of soil and to make it suitable for farming cultivators tines are used before sowing of seeds. Cultivators stir and pulverize the soil, before planting to aerate the soil and prepare a smooth, loose bed or after the crop has begun growing to kill weeds, cultivators are designed to disturb the soil in careful patterns, sparing the crop plants but disrupting the weeds. The objective of this paper is to explain about the cultivator tines, its role in the agriculture and about its history, types and advantages.*

Keywords - *Cultivator tines, history of tines, types of tines*

I. INTRODUCTION

India is an agricultural country and about 80% people in India are farmers and uses agricultural equipment like cultivator etc. In each and every sector development is done but as compare to other sector in farm equipment development is not done. A cultivator is a type of farm implement used for secondary tillage. One sense of the name refers to frames with teeth also called shank or shovels that pierce the soil as they are dragged through it linearly. The tools cultivator which they are required mostly manufactured in small scale industries or by local artisans like carpenter and blacksmiths. The present technique of manufacturing of agricultural tools by all these people is like design by evolution. The design is evaluate long span of time. Cultivator is a mechanical implement for breaking up the ground and uprooting weeds. Cultivators are called "secondary tilling implements." In basic terms, that means that farmers use cultivators after land is initially plowed. The initial process mixes up dirt, gets up roots, and does the heavy lifting of equipment farming. Cultivators do more of the fine tuning of small farms [1]. A cultivator is any of several types of farm implement used for secondary tillage. One sense of the name refers to frames with the 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. The rotary tiller is a principle example.Cultivators stir and pulverize the soil, either before planting (to aerate the soil and prepare a smooth, loose seedbed) or after the crop has begun growing (to kill weeds controlled disturbance of the topsoil close to the crop plants kills the surrounding weeds by uprooting them, burying their leaves to disrupt their photosynthesis, or a combination of both). Unlike a harrow, which disturbs the entire surface of the soil, cultivators are designed to disturb the soil in careful patterns, sparing the crop plants but disrupting the weeds. 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 either a two wheel tractor or four-wheel tractor. For two wheel tractors they are usually rigidly fixed and powered via couplings to the tractors transmission. For four wheel tractors 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. Draft-animal power is sometimes still used today, being somewhat common in developing nations although rare in more industrialized economies.

II. HISTORY OF TINES

The basic idea of soil scratching for weed control is ancient and was done with hoes or mattocks for millennia before cultivators were developed. Cultivators were originally drawn by draft animals (such as horses, mules, or oxen) or were pushed or drawn by people. In modern commercial agriculture, the amount of cultivating done for weed control has been

greatly reduced via use of herbicides instead. However, herbicides are not always desirable for example, in organic farming. The powered rotary hoe was invented by Arthur Clifford Howard who, in 1912, began experimenting with rotary tillage on his father's farm at Gilgandra, New South Wales, Australia. Initially using his father's steam tractor engine as a power source, he found that ground could be mechanically tilled without soil-packing occurring, as was the case with normal ploughing. His earliest designs threw the tilled soil sideways, until he improved his invention by designing an L-shaped blade mounted on widely spaced flanges fixed to a small-diameter rotor. With fellow apprentice Everard McCleary, he established a company to make his machine, but plans were interrupted by World War I. In 1919 Howard returned to Australia and resumed his design work, patenting a design with 5 rotary hoe cultivator blades and an internal combustion engine in 1920 [3]. In March 1922, Howard formed the company Austral Auto Cultivators Pty Ltd, which later became known as Howard Auto Cultivators. It was based in Northmead, a suburb of Sydney, from 1927.[4] Meanwhile, in North America during the 1910s, tractors were evolving away from traction engine-sized monsters toward smaller, lighter, more affordable machines. The Fordson tractor especially had made tractors affordable and practical for small and medium family farms for the first time in history. Cultivating was somewhat of an afterthought in the Fordson's design, which reflected the fact that even just bringing practical motorized tractive power alone to this market segment was in itself a milestone. This left an opportunity for others to pursue better motorized cultivating. Between 1915 and 1920, various inventors and farm implement companies experimented with a class of machines referred to as *motor cultivators*, which were simply modified horse-drawn shank-type cultivators with motors added for self-propulsion. This class of machines found limited market success. But by 1921 International Harvester had combined motorized cultivating with the other tasks of tractors (tractive power and belt work) to create the Farmall, the general-purpose tractor tailored to cultivating that basically invented the category of row-crop tractors. In Australia, by the 1930s, Howard was finding it increasingly difficult to meet a growing worldwide demand for exports of his machines. He travelled to the United Kingdom, founding the company Rotary Hoes Ltd in East Horndon, Essex, in July 1938.[5] Branches of this new company subsequently opened in the United States of America, South Africa, Germany, France, Italy, Spain, Brazil, Malaysia, Australia and New Zealand. It later became the holding company for Howard Rotavator Co. Ltd.[4] The Howard Group of companies was acquired by the Danish Thrige Agro Group in 1985, and in December 2000 the Howard Group became a member of Kongskilde Industries of Soroe, Denmark.[6] When herbicidal weed control was first widely commercialized in the 1950s and 1960s, it played into that era's optimistic worldview in which sciences such as chemistry would usher in a new age of modernity that would leave old-fashioned practices (such as weed control via cultivators) in the dustbin of history. Thus herbicidal weed control was adopted very widely, and in some cases too heavily and hastily. 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.

III. TYPES OF CULTIVATOR

There are different types of cultivator following are the classification depending upon the use, Geometrical feature, and power required.

3.1. Depending Upon Type of Use

Small Cultivators It is used for gardening, powered by small motors, and controlled by an operator walking behind. Garden cultivators can be used to mix soils with manures and fertilizers in preparation for planting.

Farm Cultivators A tractor-mounted tiller Cultivators are pulled by tractors and can vary greatly in size and shape, from 10 feet (3 m) to 80 feet (24 m) wide. Many are equipped with hydraulic wings that fold up to make road travel easier and safer.

Field Cultivator Field cultivators are used to complete tillage operations in many types of arable crops fields. The main function of the field cultivator is to prepare a proper seedbed for the crop to be plantinto, to bury crop residue in the soil (helping to warm the soil before planting), to control weeds, and to mix and incorporate the soil to ensure the growing crop has enough water and nutrients to grow well during the growing season.

Row Crop Cultivator The main function of the row crop cultivator is weed control between the rows of an established crop.

3.2. Depending Upon Type of Geometrical Features

Disc Cultivator It is cultivator fitted with disc.

Tyne Cultivator It is a type fitted with tines having blades.

Rotary Cultivator: It is a cultivator with tines or blades mounted on a power driven horizontal shaft. It is a cultivator with tines or blades mounted on a power driven-horizontal shaft. Depending upon type of power available for the implements, the cultivator can be classified as:

(a) Tractor drawn
(b) Animal drawn.

3.3. Depending upon Type of Power Available for the Implements [1,2]

Trailed type cultivator It consists of a main frame which carries a number of cross members to which tines are fitted. A pair of wheel is provided in the cultivator. The lift is operated by both wheels simultaneously so that draft remains even and uniform.

Mounted cultivator Tractors fitted with hydraulic lift operate the mounted type cultivators.

Cultivator with spring loaded tines A tine hinged to the frame and loaded with a spring so that it swings back when an obstacle is encountered, is called spring loaded tine.

Cultivator with rigid tines Rigid tines of the cultivator are those tines which do not deflect during the work in the field.

Duck foot cultivator It is type of rigid cultivator which is used mostly for shallow ploughing, destruction of weed and retention of moisture.

Animal drawn cultivator Depending upon local conditions, soil and climate, different types of cultivators have been designed and are being used extensively throughout country. Three tined cultivators with seeding attachment are popular in some part of the country.

IV. ADVANTAGES OF TINES

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. Cultivators are mainly used to prepare soil for the plants that will grow there, but they can also remove weeds, sculpt the soil into rows and beds or improve its structure to allow air and water to penetrate more easily to the roots of plants.

Improving Soil Structure
Over time, foot traffic and rainfall cause the soil near the surface of a garden bed to compact. Compacted soil prevents water and air from reaching the roots of plants and prevents water that penetrates the surface from draining away. Cultivators loosen the soil with tines or disks and break it up into smaller pieces. This allows air and water to penetrate deeply into the soil and allows it to drain more effectively, preventing the soil from becoming flooded.

Pulling Weeds
The tines of a hand cultivator are especially effective at removing broad-leaf weeds from the soil. A cultivator applied to the soil around the base of a weed loosens the soil around it, making it easier to pull the entire plant out of the ground with its roots intact. Shovels or garden hoes used to remove weeds often sever portions of the root system, which allows the weed a chance to regrow. Shovels are also prone to glazing the soil; spade shovels and trowels leave a section of compacted soil behind when the bottom of the shovel is pressed down into the soil.

Burying Weeds
Walk-behind cultivators equipped with rotating tines are designed to turn the soil within a few inches of the surface to aerate the soil and bury weeds. Using a cultivator with this type of attachment between rows controls weeds and incorporates them back into the soil where they add nutrients to the garden. Cultivating more than a few inches into the soil or too close to desirable plants can damage their roots.

Building Rows
Cultivators designed to plow the soil into rows use a wedge-shaped blade in place of metal prongs or disks. This type of cultivating attachment creates a shallow trench in the soil ready to accept a line of seeds. Once the seeds are in place, the furrowed soil next to the trench is ready to be pushed over them.

When to Cultivate
Cultivators work best when the soil is slightly moist to the touch; soil that is too dry or wet is significantly more difficult to cultivate. Cultivating clay soils saturated with water causes it to form clumps that will restrict the development of plant roots. Although cultivating between plant rows is an effective way to control weeds, regularly working soils heavy in clay destroys its structure, leading to compaction that inhibits plant growth. Heavy soils should only be cultivated to prepare a seedbed for planting or to mix compost or organic fertilizer into the soil.

- Cultivator cultivates the soil properly as compare to ox driven cultivator.
- It requires less time for preparing a seed bed of the soil.
- Cultivator is use before ploughing and after ploughing.
- Cultivator cost is low as compare to rotavator and other agricultural implement [1].

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