

A scheme for training extension workers on animal power for weed control

prepared by

Palabana Animal Draught Power Programme, Zambia

Palabana Animal Draught Power Development Programme
Private Bag 173, Woodlands, Lusaka, Zambia

Abstract

There will always be numerous weeds in the field. The main problem with weeds is that they compete with the crop for light, nutrients, water and air and hence lower the yields of the main crop. Additionally, tall weeds can make it difficult to harvest the crop, while others may be poisonous or harbour pests.

To avoid these effects, either prevention of the establishment of weeds, or destruction of the existing weeds is required. The control or destruction of weeds with mechanical means is only possible once the weeds have emerged and can be visually distinguished from the crop.

There are three mechanical methods of destroying or reducing the growth of weeds: pulling the weeds out of the soil, cutting the weed plants from their roots and covering the weeds with soil.

When preparing a cultivator for a certain task, it is necessary to select suitable tines and tine holders. Possible adjustments include the depth setting, the support wheel, the length of chain and the angle of attack of the tines.

Weeds and weed control

The maintenance of optimum growing conditions for successful, sustainable crop production involves:

- maintenance of proper soil and water conditions, through tillage, for example
- maintenance of the competitiveness of the crop for water, light, air and nutrients through prevention and control of weeds
- maintenance of the health of the crop through the prevention and control of pests and diseases
- maintenance of adequate nutrient levels in the soil for the growth of the crop through organic and inorganic fertilisation.

The main problem with weeds is that they compete with the crop for light, nutrients, water and air and hence lower the yields of the main crop. Additionally, tall weeds can make it difficult to harvest the crop, while others may be poisonous or harbour pests.

To avoid these effects, either the prevention of establishment of weeds, or the destruction of existing weeds is required. The control or destruction of weeds with mechanical means is only possible once the weeds have germinated and emerged and can be visually distinguished from the crop.

It is also necessary that the crop is planted in rows since this allows for easy weeding practices.

It is of crucial importance that early weeding is done so that the weeds have less chance to compete with the crop. Farmers often wait too long before weeding their fields.

Several tools and implements for weeding have been developed and are being used in several African countries. These tools are either hand-operated, or pulled by animal draft or mechanical power.

Mechanical weed control techniques

The mechanical destruction of weeds must be done as soon as the weeds have emerged and can be distinguished from the crop so as to avoid doing damage to the crop. Weed control by mechanical means also disturbs the soil and, therefore, has a positive side effect on the soil condition.

There are three mechanical methods of destroying or reducing the growth of weeds:

- pulling the weeds out of the soil
- cutting the weed plants from their roots
- covering the weeds with soil.

Pulling

This is effective for all weeds whether annual or perennial. This method consists of uprooting the weeds and subsequent removal from the field or leaving them on the surface to dry out. If left in the field to dry out it is important to avoid possible regrowth of weeds by:

- removing all soil from the roots (by hand)
- operating when the soil is relatively dry and no rain is expected for the next few days.

Cutting

This method consists of cutting the stem from the roots just under the soil.

The cut off plants are left on the soil surface and die automatically when there is no root/soil contact. The roots of annual weeds will also die in the soil but those of perennial weeds will grow again. This method is mainly recommended for fields which are flat or where the field is heavily infested with weeds. For cutting the weeds in and between the rows hand-tools can be used. When a crop is planted on flat land, the animal-drawn cultivator with duckfoot shares can be used for cutting weeds between the rows. This has to be repeated until the crop canopy is grown enough, so that there is too little light for the weeds.

Covering

This method is most effective in fields where small annual weeds grow. By this method soil is moved on to the plants (weeds) covering them. This deprives them of light so that they eventually die off.

The animal-drawn cultivator

Besides its use in seedbed preparation and in soil cultivation, the animal-drawn cultivator is used for mechanical weed control between crop rows (Figure 1). When the field is not too short for the operation with animals (not less than 30 m) the cultivator will weed a larger area in the same time than when hand weeding is practised. However, hand-weeding is still required for weeding within rows.

A cultivator, equipped with duckfoot shares, is suitable for cutting the weeds, and has only a slight effect on pulling out or covering the weeds. Cutting should only be done in fields which are flat or in fields which are heavily infested with weeds in order to avoid erosion of the loosened top layer of the soil.

A cultivator equipped with reversible point shares, is more suitable and effective in pulling out or covering the weeds than in cutting off the weeds.

Covering the weeds with soil can be improved if the tines of the cultivator are flexible because of the slight soil shattering effect of the tines during operation. Flexible tines will also shake off the weeds.

Setting a cultivator

When preparing a cultivator for a certain task, we have to consider the following points:

- selecting suitable tine holders
- selecting suitable number and type of tines
- depth setting
- support wheel
- length of chain
- angle of attack

The working depth of the cultivator may be altered in the following ways:

Deeper	Shallower
Raise the support wheel	Lower the support wheel
Lengthen the chain	Shorten the chain
Steepen angle of attack	Reduce angle of attack

Figure 1: Weeding using a cultivator drawn by a pair of oxen



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Handling and operation

Use a 'cultivator yoke' of appropriate length. Set the cultivator for the required task and working depth, which should be 5 cm deeper than the crop planting depth.

Loosening of soil is best done across the slope to reduce erosion. The cultivator must be fitted with reversible tines, and set for deeper penetration. To ensure that the whole field is loosened adequately, it is easier and faster to use a cultivator with as many tines as possible.

Destruction of regrowth and weeds

For the destruction of regrowth and weeds, fit the cultivator with duckfoot sweeps. This will enable the cultivator to cut the plant roots below the soil surface.

Breaking of clods

To break down large clods and furrow slices, fit the cultivator with reversible tines and attack the clods while the soil is still moist.

Cultivator maintenance

The parts which wear out on a cultivator are the wheel and axle, the sweep, the hillers and the tines. The wear limits and maintenance of the wheel and axle are the same as in a single mouldboard plow. Wear limits can be checked as follows:

- For both standard sweeps and the duckfoot sweeps, when the cultivator is placed on a flat surface, and the tine arms touch the ground, then the sweeps must be replaced.
- If the hillier/tine arms touch the ground when the cultivator is placed on a flat

surface then the hillers or tines can be turned the other way up. When they wear down again they must be replaced.

Pattern of cultivation with animal-drawn cultivator

The pattern of operation should avoid sharp turns on the headlands and should allow time for cultivated rows to dry out a certain extent before the draft animals trample the soil on the subsequent runs. A recommended pattern is to move along alternate sets of five rows, starting at one side of the field and continuing to the other side.

The animal-drawn ridger

Although ridging or re-ridging is usually considered a primary tillage operation, it is also widely used for weed control. The ridger destroys weeds mainly by covering them with soil. It also has a pulling effect at the place where the share cuts the soil in the furrow.

When the ridger is being used for weeding it should operate at a shallower depth than when it is being used for primary tillage. If the crop is still small, the ridger has to operate at a very shallow depth to avoid covering the plants.

When using a ridger, the same pattern of operation as for the cultivator can be followed.

Although it is quite rare, a farmer who has no ridger and no cultivator could use a plow for weeding. Then the cultivator yoke should be used. In this case one has to go twice along the same furrow as you can only cover (weed) on one plant row.

Figure 2: Weeding using a ridger drawn by a pair of oxen

