

Design requirements for animal-drawn weeders

by

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Abstract

Unlike hand weeding, where the eye of the farmer locates plants and weeds, mechanical weeding requires careful preparation of the seedbed and accurate planting in straight and parallel rows. The weeding implement should be simple and efficient. It is a great advantage if the weeding implement is part of a multipurpose toolbar system, because this reduces the costs to the farmer. The Rumptstad multipurpose toolbar is designed and built to meet the needs of the farmer.

Introduction

In many parts of the world, weed control by animal-drawn weeders is not yet generally accepted, even though plowing and planting with the use of animals is common practice. Many and varying constraints hamper the use of animal-drawn technology in weed control.

Hand weeding is a human-eye controlled operation. It is not very important whether or not the surface is flat and whether or not the plants are in a row; the eye locates the plants and the weeds and controls the operation.

Weed control with animal- or tractor-drawn weeders is possible only if the plants are sown in straight and parallel rows, as weeding is done between the rows. In order to obtain favourable results it is important that the field is well-prepared before planting.

Preparing for animal-powered weeding

Preparing a field for animal-powered weeding involves good plowing and seedbed preparation, and correct planting.

Good plowing leaves the field flat and even, with all weeds covered. Successful seedbed preparation is usually carried out with a harrow. It is difficult to prepare a seedbed using animals, because animals walk slowly, and consequently the impact of the tines on the

clods is rather low; also there is little transport of soil forwards or sideways. In practice the harrow cannot correct any faults made during plowing. Good timing is essential for successful seedbed preparation. Harrowing under conditions which are too dry or too wet can do more harm than good to a field.

After correct seedbed preparation it is very important to plant the crop in straight and parallel rows, because a weeding implement has a fixed working width and requires a fixed distance between the rows.

Design requirements for weeding implements

A weeding implement should be easy to handle, light, strong, durable, cheap, adjustable for different crops, and easy to manufacture locally. Faced with these contradictory demands Rumptstad has attempted to design a weeder incorporating as many of these features as possible.

To reduce costs for design and development, Rumptstad chose the frame of its multipurpose toolbar as the basis for the weeder. This simple frame can be manufactured cheaply in large numbers. A simple toolcarrier was added to this frame to support the tines. The tines (with chisels) are also used as cultivator tines. The only specific weeder parts are the duckfeet. In order to reduce weight, Rumptstad chose to use three tines only to give an effective maximum cutting width of 44 cm.

The normal inter-row spacing for maize is 75–80 cm. A working width of 44 cm gives a maximum distance of 18 cm to the centre of the plant and about 9 cm to the roots.

There is a complete duckfoot in the centre, and half duckfeet to its left and right. In this way one can see where the duckfoot ends—where the tine is. This prevents plant roots being cut by the outer wing of the duckfoot that cannot be seen while working.

The penetration angle of the duckfoot is chosen so that the soil is disturbed just enough to break on its natural fracture lines. The angle of attack is designed for low draft power requirement. There is no transport of soil either sideways or forwards, so even very young crop plants are not covered by soil.

The depth of the implement is easily adjusted by means of a simple vertical regulator.

The large 28 cm diameter stabilising wheel ensures the stability and manoeuvrability of the implement. The low weight of the implement and its stability reduce operator fatigue.

Thanks to local manufacturing facilities (Rumtstad Kenya is established in Nairobi),

the price of the implements is competitive, and supply of spare parts assured. Because the weeder is based on the multipurpose toolbar, the implement also can be used as a plow, a ridger or a cultivator. The different attachments can be bought separately to make investment easier for the farmer by spreading it over a longer period of time.

A farmer who purchases a complete set and who wants to expand further can buy another chassis/wheel combination and split up his/her set of attachments over two frames. The possibility of using the same implement as a ridger can be especially useful in certain crops, where the ridger is used to earth-up the crop plants, eliminating weeds at the same time.