Animal power for weed control: experiences of MATI Mlingano, Tanga, Tanzania

by

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Abstract

The Ministry of Agriculture Training Institute (MATI) Mlingano in north-eastern Tanzania, offers courses in animal traction development to students and farmers, as well as to agricultural extension workers and professionals. Of the many farm operations which can be carried out using draft animals, weeding is practised rarely by farmers. However, animal-powered weeding can contribute to significant yield increases. It is therefore an important feature in the agromechanisation diploma and other short courses offered by MATI Mlingano.

Both pairs of oxen and single donkeys have been used sucessfully for inter-row weeding with a variety of cultivators. Rigid tines cut deeper than sprung tines and so tire donkeys quickly, but are effective with oxen. Hand weeding around the crop plants is still necessary with animal-drawn weeding. However, repeated weeding using hillers can reduce the need for hand weeding significantly. Grazing of crop plants by draft animals was not a problem if the animals were fed properly before work.

At present fewer than five farmers within 20 km of MATI Mlingano use draft animals for weeding. Therefore, the challenge to MATI Mlingano and associated organisations is to introduce draft animal power to farmers with increased vigour and commitment.

Introduction

In many countries of Eastern and Southern Africa, draft animal power is used widely for plowing and transport, but rarely for weeding (Starkey, 1988). Yet, for most crops grown in the region, one of the major causes of low yields, is poor weed control (Acland, 1971; Shetto and Kwiligwa, 1991). This is true even where good crop husbandry practices, such as use of fertilisers, high quality seed, and pest and disease control, are prevalent.

In Tanzania, only about 15% of the agricultural land is cultivated by draft animals (Kjærby, 1983; Kayumbo, 1991; Kwiligwa et al, 1991), and only about 20% of peasant farmers have adopted draft animal power technology for agricultural production. The technology is most common in Shinyanga, Singida, Tabora, Arusha, Mara, Mwanza, Rukwa, Mbeya and Kilimanjaro regions, but even here fewer than 10% of farmers use draft animals for weeding (Mshana, 1991).

The use of draft animals for weeding has been and continues to be introduced to farmers in many countries (including Tanzania) through both government-financed programmes and external donor-aid projects. In Tanzania such projects include the Mbeya Oxenization Project (MOP), aided by CIDA of Canada; Draft Animal Power (DAP) Project–Korogwe, aided by GTZ of Germany; MIFIPRO of Mwanga and COOPIBO of Mbozi, assisted by Belgium; and Maswa and Mbulu DAP Projects, assisted by The Netherlands (Mshana, 1991).

The Ministry of Agriculture Training Institute (MATI) Mlingano, is one of two institutes in Tanzania which offer a two-year specialised diploma course in agricultural mechanisation. Animal power development features prominently in the syllabus, with 20 hours of theory and 80 of practical work. In addition to the full-time diploma course, MATI Mlingano also offers other short courses for farmers, farm/workshop managers and agricultural extension workers and professionals, including one on the use of draft animal power.

This paper is intended to share ideas with others involved in draft animal power

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technology, based on experiences in using the technology for weeding.

MATI Mlingano's experiences

Growth of weeds

Weeds grow vigorously, and from emergence they compete actively with the crop for nutrients, water and light. In many cases they overwhelm the crop. Many factors contribute to the vigorous growth of weeds, including insufficient seedbed preparation and late weeding.

Poor seedbed preparation is a result of failure to till the soil soon after harvest, due to Mlingano's July–September drought and preoccupation with other post-harvest operations. Thus, plowing is not done until the start of the short rains (end September/early October), and is often done too hurriedly to work the soil properly; thus many weeds are only partly buried, and they resurface a few days later.

Late weeding may be a result of extended periods of planting and late plowing. In this case weed numbers are markedly greater, because weeds have been able to seed and germinate before they are destroyed.

Types of animal used

At MATI Mlingano only two species of animals have so far been used successfully for animal traction work – bovines (mainly castrated oxen) and donkeys. Both of these species have been used successfully for weeding.

Young oxen 1.5–2 years old, and donkeys 2–2.5 years old, preferably castrated, can be trained and used for animal traction work. Farmers around MATI Mlingano tend to own oxen and/or donkeys, so it is easy for the institute to conduct animal traction outreach programmes, short courses and demonstrations. These are held at the institute's Rural Technology and Animal Power Centre and in the neighbouring villages. The cattle used for traction are a cross between the local indigenous breed and the East African Zebu.

Harnessing, working programmes and comparative weeding work rates

The 150-cm double-neck yoke is now used for bovines in weeding at MATI Mlingano (instead of the 180-cm one used previously) to match the 75-cm inter-row spacing used for maize in the area. Collar harnesses are used for the donkeys.

Bovines, mostly oxen, harnessed in pairs, are used to pull an inter-row cultivator, guided by two people, one leading the animals and the other controlling the cultivator. The animals work for four hours in the mornings (0600–1000) and two hours in the evenings (1600–1800), with a work rate of 0.5 ha per pair per day (see Table 1). When not working the animals are allowed to graze and rest.

A single donkey harnessed with a collar works for five hours per day – three in the morning and two in the evening – with an average output of 0.25 ha weeded per day. No attempts have been made so far to pair up donkeys, whether side-by-side or one behind the other, but trials of such arrangements are planned.

The animals are not usually given supplementary feeds (concentrates), so availability of sufficient pasture is essential.

Cultivator types and tines

The cultivators used at MATI Mlingano include the ox-drawn Zimbabwean, Indian and Ariana implements, and the donkey-pulled Unibar. These cultivators are fitted with either rigid or spring tines. Sharp tines are used for breaking up encrusted topsoil, duckfeet for shallow tillage and weeding, and sweeps for slicing the topmost soil layer and weed roots and exposing the roots for drying.

Rigid-tined cultivators tend to operate deeper than spring tines, and, therefore, with donkeys the animals tend to tire quickly. These tines are, therefore, more suitable for use with oxen than with donkeys.

The spring tines, on the other hand, when used with either oxen or donkeys, tend to flex backwards and sideways due to variations in soil resistance, thus vibrating all the time. They

Table 1: Typical daily working programme for draft animals at MATI Mlingano

	Time					*Average output per day (ha)*
Animal	*0600*	*0900*	*1000*	*1600*	*1800*	
Oxen (pair)	Working		Grazing and resting	Working		0.5
Single donkey	Working		Grazing and resting	Working		0.25

therefore have the disadvantage of constantly varying the working depth as the cultivator operates, and being less effective in hard and/or compacted soils. However, they have some advantages in that their flexing backwards may save the implement and the animal from damage against stones, roots or stumps, and also vibration enhances soil crumbling, exposing weed roots on the surface for faster desiccation.

Problems and possible solutions

The following are some of the common problems likely to be experienced in using animals for weeding and the solutions recommended by MATI Mlingano.

Grazing of young crop plants

Using muzzles on the animals to stop them eating the crop plants would involve additional training to get the animals used to wearing them. However, this may be only a potential, and not a real, problem: experience shows that if animals are fed properly before work, they do not try to eat the crop; and a donkey wearing a collar harness cannot graze the crop plants.

Need for supplementary hand weeding and/or use of herbicides

The weeders presently available are only able to weed between rows and do not weed the spaces between plants. This means that hand weeding is needed to complete the operation. No satisfactory solution to this problem has been found, but early weeding (ie, when weeds are still young and small) coupled with the use of hillers on the tine attachment to cover and suppress weed growth, reduces the problem substantially. Early weeding should take place preferably two weeks after germination, instead of the three weeks usually adopted with hand weeding, and a second, and possibly a third, weeding should then be carried out with hillers attached to the cultivator tines, until the crop has reached the knee-high stage.

Crop damage from poorly trained animals

Animals should be well trained, possibly with dummy crops, before being used for real weeding work. At MATI Mlingano, the animals are drilled through the rows of young-plant-size sticks, sometimes inter-staked ('inter-planted') with small plant twigs along the rows, until they get used to working (weeding) through such rows; the animals are then driven to weed up and down rows of maize, sorghum and sunflowers. This should be routine until the animals are fully used to the operation.

Conclusions

Although weeding is a very important operation in crop husbandry, and is a major factor influencing yields, many farmers, including some already using draft animal power, have not explored the use of the technology for weeding.

In spite of all the outreach efforts by MATI Mlingano, fewer than five farmers living in villages near to the institute use draft animals for weeding. It seems certain, therefore, that draft animal power needs to be introduced to farmers with increased vigour and commitment. This is the challenge faced by MATI Mlingano and associated organisations.

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