

# Weeding with draft animal power in Kaoma District, Zambia

by

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## Abstract

*This paper draws on three years of experience promoting animal-drawn weeding technology in the Kaoma District of Zambia. About 10% of farmers own oxen and a further 25% borrow draft animals for plowing. Only 4% of owners of work oxen possess weeding implements. On-farm demonstrations of weeding have stimulated much interest, with farmers tending to prefer ridgers to cultivators.*

*The results of a survey of farmers using animal-drawn cultivators or ridgers are presented. Weeders were mainly used for maize. Some implements were not used because of lack of knowledge or experience.*

*It is concluded that animal-powered weeding has been adopted quite slowly and mainly by relatively old men. Farmers considered that animal-drawn implements speeded weeding, but that this did not lead to an increase in area planted.*

## Introduction

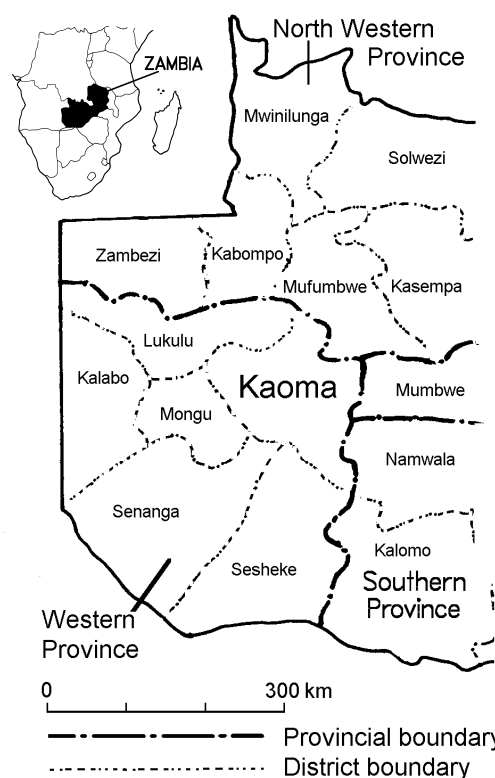
Kaoma District is located in the Western Province of Zambia (Figure 1). It is described as 'the grain basket' of the province, as better soils and rainfall (between 800 and 1000 mm) allow more intensive agricultural production than elsewhere. Kaoma District produces more than 90% of the surplus production of maize, soya beans and groundnuts of the province. Maize is produced on 60% of the cultivated area. Total maize production has increased 50-fold over the past 30 years, associated with greater use of fertiliser, for which credit has been available. Maize yields average 2 t/ha. The average farm size of the 12 000 farmers is 2.1 ha. Cassava (on 27% of the cultivated area), sorghum and millet (each 5%) are relatively more important in the western, sandy part of Kaoma (DoA, 1993a).

About 60% of the rural population live within 15 km of the four main roads, where the population density varies between 10 and 50 persons/km<sup>2</sup> (CBS, 1990).

## Animal power in Kaoma District

It is estimated that 10% of the farmers actually own oxen, and another 25% hire or borrow oxen for land preparation. Sledges are still the most common means of animal-drawn transport, as only 1% of farmers own usable ox carts. Although farmers rank (timely) access to animal draft power, together with access to fertiliser, as the main conditions for increased agricultural production, animal draft power is being adopted only slowly, at an annual rate of less than 1% of the total farmers without oxen. The provision of credit for animal draft power during the past 10 years has contributed only marginally to this growth (WP-ADPP, 1993a). Low producer prices and an unstable input and supply market due to changing government policy are considered the main reasons behind this slow adoption (Starkey, Dibbits and Mwenya, 1991; van Agt, 1992).

Figure 1: Western Zambia showing district and provincial boundaries (Top left: Southern Africa)



## Western Province Animal Draught Power Programme

The Western Province Animal Draught Power Programme (WP-ADPP) supports the Agricultural Engineering Section of the Department of Agriculture (DoA), and has focused its activities on Kaoma District since 1990.

Apart from trials and demonstrations on weeding and groundnut lifting, WP-ADPP contributes to the improvement of ox training and plowing skills of farmers by providing mobile courses. Moreover, WP-ADPP facilitates the timely supply of implements, spares and tools for traders and blacksmiths in Kaoma, by exploratory market research, training and short-term credit. Together with local lending institutions, WP-ADPP has initiated a loan-cum-savings service to farmers' groups, for acquisition of (individual) ownership of animal draft power components. Experimental assistance to special target groups such as female-headed households and community workers within the primary health care system of the District is being developed. WP-ADPP contributes to staff training and further research into specific practical questions related to animal draft power.

### Weeding technologies

Hand weeding is dominant and mainly carried out by children and women. Labour for weeding is frequently hired and payment is per line. Weed infestation in maize increases with successive croppings on the same field, but a single weeding within a month of emergence is considered sufficient to eliminate any yield reduction due to weeds (ARPT, 1987).

About 40 farmers in Kaoma District own a cultivator or ridger (WP-ADPP, 1993b), and efforts have been made by the DoA to increase interest in the use of animal draft power for weeding. The department, supported by WP-ADPP and the national Animal Draft Power Research and Development Programme, has distributed about 10 weeding implements during the past three years. Farmers were challenged to test and comment on experiences with the implements during field days (five a year were held on average). The field days attracted a considerable attendance, with 40–50 farmers per demonstration. About half of the trial farmers purchased the implements at the end of the season (for 80% of the market price).



*On-farm demonstration of a weeder  
Kaoma District, Zambia*

Farmers nearly always favoured the ridger for weeding, for the following reasons:

- it can be used even when weeding is done late
- it is less susceptible to breakdowns and wear (unlike the tines and light wheels of the cultivator)
- it can be used for covering fertiliser and a secondary ridging.

Farmers appeared critical of the option of direct ridging. Direct ridging three weeks after the onset of the rains results in too many weeds on top of the ridges. Many farmers plant maize on ridges, but others complain about the drought stress to the maize on ridges during a dry period; this results in irregular distribution of the crop on the side of the ridges, whereafter ridging becomes difficult.

In an attempt to improve project impact, trials and demonstrations were organised with groups of six farmers instead of with individuals. The result has been that more farmers have experimented with the equipment, and all group members appeared to have benefited. As is the case with ox-training courses, trial groups attract non-ox-owners looking for contact with ox-owners to increase their chance of timely hiring for plowing (Kamphuis, 1992).

### Animal power potential

The effect of area expansion following the introduction of animal draft power, well documented in animal draft power literature (Pingali, Bigot and Binswanger, 1987), has not

been so marked everywhere in Africa (Barrett et al, 1982; Mack, 1984). A slight area effect, especially towards cash (maize) cropping, can be seen in Kaoma (WP-ADPP, 1993a), accompanied by moderate use of oxen, whereby an average span plows 4.3 ha (van Agt, 1992). Weeding with animal draft power would be expected to increase the utilisation rate and increase the return to labour, land and capital (Jaeger and Matlon, 1990). In Kaoma District ox owners with access to fertiliser indicated that weeding was the first constraint for area expansion. Thus, the fact that a meagre 4% of the owners of draft animals possess weeding equipment poses a question: is the adoption of animal draft power weeding constrained by economic, technological or market-technical reasons? In other words, is it the cost, the knowledge or the supply, that is constraining further adoption?

### **Animal draft power weeding survey**

In an attempt to answer these questions in order to develop major guidelines to focus DoA policy, WP-ADPP conducted a survey among one third of all farmers with animal draft power weeding equipment. The survey aimed at establishing the main characteristics of the farmers, the intensity of use of the equipment, the costs/benefits of the technology in practice, and finally the main constraints to further intensification.

#### ***Farm characteristics***

The average age of farmers with animal draft power weeding equipment is about 54 years. Of these farmers, 55% acquired their equipment (mostly cultivators) during the past two years. A minority of farmers (47%) derived the equipment from demonstrations and cooperative supply. The Northland cultivator was the implement used most frequently.

The average family size of these farmers was above average (12.4) with 6.5 persons contributing to daily work on the farm.

Two-thirds of the farmers who owned animal draft weeding equipment used hired labour, especially for staking and stumping.

The average cultivated area in 1993 was 4.9 ha of maize with 1.6 ha of cassava. In all cases groundnuts appeared to be cultivated for home consumption only. Maize yielded an average of 2.6 t/ha (28.3 bags/ha) as all farmers were able to use fertiliser (40% did not depend on seasonal loans for fertiliser). Farmers using

animal draft power for weeding owned 4.5 oxen on average and the majority of them owned other livestock.

#### ***Utilisation***

The average intensity of utilisation of weeding equipment appeared to be rather low: 55% of the cultivated maize area was weeded with animal draft power. Only 15% of the farmers used the equipment for their total maize area. The equipment appeared to have been used for maize only.

Farmers gave two main reasons for the low utilisation. The first important reason was lack of know-how (40% of the farmers did not use the weeding implements at all). In many cases farmers appeared to have been sent the implements by their children working away in urban areas, without any explanation on how to use them. The second reason was the lack of essential spares to repair wheels and tines and to replace bolts and nuts.

#### ***Economics***

The main advantage of the weeding equipment as perceived by the farmers was accelerated and cheaper weeding. (There was no difference in response between active users and owners of weeders who do not use the equipment at all.)

Only 15% of the farmers favoured weeders as the answer to the lack of labour for weeding.

The cost of hand weeding appeared to vary considerably from area to area. Weeding in the row, after animal draft power weeding, would cost 0.5–1.5 bags of maize/ha, and hand weeding 2–3.5 bags of maize/ha. Ridgers cost the equivalent of 14–16 bags of maize in 1993.

Regarding the technology, some survey comments differed from those heard after demonstrations. Farmers in favour of ridgers were satisfied that ridgers cover the roots and appear more durable; cultivators were praised for their ability to loosen the soil and leave a better soil structure for sowing.

### **Conclusions**

The main impression of the 40 early adopters of animal draft power weeding equipment in Kaoma District does not appear very encouraging. This contrasts with the high sales of equipment after demonstrations. The group of early adopters in Kaoma consists of many retired government personnel, who only partly rely on agriculture for their livelihood.

The survey results do not indicate an expanded cropping area due to animal draft power weeding in Kaoma District. Animal draft power weeding is appreciated, because it 'increases the speed of the weeding process' and direct economic factors appeared to play a minor role in adoption so far.

The survey showed that knowledge of how to use the equipment is important, and showed the value of a follow-up programme after field days and demonstrations.

Animal draft power weeding in Kaoma has been adopted rather slowly and by relatively old men. Adoption could be increased by proper follow-up through extension, but dramatic increases are unlikely. Some of the main reasons for this doubt are economic. Acquisition of fertiliser is late (van Agt, 1992) and the price ratio between maize and fertiliser has been declining in recent years.

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