

Weed control by smallholder farmers in Ciskei, Eastern Cape Province, South Africa

by

A B D Joubert

Department of Agronomy, University of Fort Hare, Private Bag X 1314, Alice 5700, South Africa

Abstract

A literature study was undertaken on the weeding of maize on smallholder farms in Ciskei, South Africa. Most weeding under these conditions is carried out by hand pulling or hand hoeing. Only limited use is made of animal traction, and large-scale development of this method will not be possible until the conventional broadcast method of planting maize has been replaced by row planting.

Introduction

Inadequate weed control is one of the major causes of poor yields on smallholder farms in Ciskei in the Eastern Cape Province of South Africa. According to Marais (1992), "If any cultural limitation has to be singled out as the major cause of poor yields on small farms then it is poor weed control". Most peasant farmers are aware of the detrimental effects of weeds but do not have the time or the means to control them, especially where the tractorised mechanisation of plowing activities has resulted in an increased area of land being plowed (Steyn, 1988): under such circumstances weeds can rapidly get out of control. This paper reports the results of a short literature survey into current weed control practices on the maize lands of smallholder farmers in Ciskei.

Ciskei and its Xhosa people

Ciskei is an elongated area fronting onto the south-east coast of South Africa. Its geographical position is between latitudes 32° and 32°51' south and longitudes 26°20' and 27°48' east. Its western boundary is marked by the Great Fish and Kat rivers, and the north and north-east borders by the Black Kei and Klipplaat rivers, respectively; the eastern border is a winding artificial line reaching the coast south-west of the city of East London (BENSO, 1981).

Ciskei has a mainly dry or semiarid climate with small areas of high rainfall in the central mountain region. From studies of the 'Derived Climatic Zones' and 'Pedosystems of Ciskei' (after Hensley and Laker, 1975a, b) it would appear that most of the land area is not suited to rainfed cropping. Average rainfall is generally low, and varies from year to year, and the predominant soil types and general topography are not suited to this method of agriculture. Nevertheless, rainfed cropping is practised in most areas by smallholder farmers.

Ciskei is inhabited by the Cape Nguni who are mainly Xhosa and Mfengu (Steyn, 1988). These are a pastoral and agricultural people: by customary law each householder is entitled to a residential site as well as an allotment of arable land, and the use of the commonage where there is no restriction on the numbers of stock which may be grazed. Grain sorghum was the most important cereal crop at the beginning of this century but this has largely been superseded by maize. Vegetables, in particular cabbage, carrots, pumpkin, beetroot, spinach, potatoes, watermelons and onions, are also widely grown.

Among the Xhosa people there has been a traditional division of labour based on gender. The men reared and attended the cattle and the women looked after household affairs and cultivated the ground (Barrow, 1801; Steyn, 1988). With the advent of the ox plow men took to tilling the land. However, in recent decades men have often been away from the farms, working as contract labour in the large cities of South Africa, and in their absence women have largely taken over the handling of the cattle and small stock, and now even do most of the plowing.

Ciskei crop production practices

Arable land is allotted to members of the community by the chief. Today the plowing, planting, weeding and harvesting of the crop

are carried out by the women. Cultivation normally begins in September, but can begin in August if early rain falls. Agricultural work does not follow a fixed timetable. Rather, the progress of the season, as indicated by natural phenomena, is traditionally used to decide when each activity should commence (Steyn, 1988). Thus plowing may begin when the call of the red chested cuckoo (*Phezu-komKhono*) is first heard; when the broad leafed ragwort (*Indwara*) is flowering, it is time to plant maize; when the lilac blossom of the wild chestnut (*Umbaba*) is in profusion, it is time to start weeding; and finally, when the star Canopus is visible in the southern sky (May), it is time to harvest.

Plowing

Plowing in Ciskei is carried out using tractors (government and privately owned) and with oxen. In areas where moisture and plant nutrients are limiting factors, it is desirable to plow as soon as possible after harvesting (Martin, Leonard and Stampe, 1976), and this practice is advocated by the Ciskei Department of Agriculture (Bembridge, Steyn and Tuswa, 1982). However, few farmers actually plow this early: most plowing is not done until after the first spring rains, in August and September.

Planting

In Ciskei, where moisture conditions are a limiting factor, Marais (1981) has recommended that plant populations for rainfed maize should be between 10 000 and 15 000 plants per hectare. He has also recommended planting between October and the end of December so as to increase the likelihood of the crop reaching its critical stage of development when environmental conditions are most likely to be favourable.

Although simple and relatively cheap ox-drawn and tractor-drawn planters are available, they are not widely used in Ciskei and the old conventional system of broadcasting seed is still used by most smallholder farmers. Some farmers plant behind the plow and a few plant by hand, using hoes.

Use of fertiliser and insect control

Increasing use is being made of kraal manure and fertiliser on smallholder farms in Ciskei (Steyn, 1988). In his studies near Peddie, Steyn (1988) found that control of cutworm and stalk borer on maize lands, although recommended, is rarely practised.

Weed control

Hoeing and hand weeding are the most commonly used methods of weed control in Ciskei.

Harvesting

Most smallholder farmers harvest their grain crops by hand in June and early July. The grain is then dried and stored before threshing.

Control of weeds

Effective, safe and economic control of weeds is essential in any crop production system. In Ciskei, at present, hoeing and hand weeding are the two methods generally used by smallholder farmers. Herbicides are widely used by commercial farmers elsewhere in South Africa, and Steyn (1988) recommends that their use, and the economics involved, should be investigated as a possible option for smallholder agriculture as well. There is also some limited use of animal traction for weeding in Ciskei.

Weed density and time of control

Weed density is a major factor affecting the yield of maize in Ciskei, especially as the plant population is normally below 15 000 plants per hectare. The number of weed seeds in the soil varies from area to area and from season to season, and the extent to which they are buried depends on the quality of plowing.

The critical period for weed competition varies with crop. Marais (1983) found that the difference in maize yield between weedy and clean plots increased as the fertility level was raised. Field production was proportional to the amount of dry matter produced by the weeds. Weeds compete for nutrients more effectively than maize and apart from the direct competition they also affect yields by temporarily immobilising nutrients and by drying out the plow layer. Marais (1983) calculated that smallholder farmers could lose up to 55% of their crop when weeding is delayed until 40 days after emergence, which is normally the case. He based his calculations on the order of yield suppression found in his research and on estimates of conditions of weed infestation and the availability of labour in Ciskei. According to Harper (1983), crops should generally be kept weed-free for 30–60 days after planting.

In Ciskei certain weeds are used as herbs and vegetables. The control of weeds under these

conditions, which mainly apply to subsistence production systems, tends to complicate the weed control problem further (Steyn, 1988).

Hand weeding

Hand weeding (pulling or hoeing) is the most common means of weed control in Ciskei. Both methods are efficient and practical, little capital investment is required and family and local labour can be used. However, both methods are backbreaking activities and so weeding is generally postponed until weeds are well established, which inevitably results in severe yield reductions.

The use of a 'hand wheel hoe' has been studied on the Fort Hare University Research Farm. This implement, comprising a wheel, a frame and a tine, with a wide sweep attached, can be pushed along between two rows of maize, when the sweep cuts the weed stems just below ground surface. The trash is left to form a mulch on the surface. This implement is quite effective where weed infestations are light.

The main problem with hand hoeing is that labour requirements are high and effectiveness is limited to small areas of 1.5 ha or less (Steyn, 1988). The use of a pair of oxen and a Safim cultivator for weed control will increase the area of effectiveness of a single family to as much as 4 ha (Crossley and Kilgour, 1983).

Animal-drawn weed control

The major constraint to the use of animals as a power source for weeding is the fact that row planting of maize is not commonly practised in Ciskei and so inter-row weeding is seldom possible. Steyn (1988) found a small number of farmers controlling weeds with a pair of yoked oxen pulling a Safim tined cultivator with wide sweeps. Almost all farmers surveyed owned and used hand hoes, and some farmers used a combination of ox-drawn cultivation assisted by hand hoe weeding.

In Ciskei generally, low levels of weed control are the norm because of the heavy reliance on hand weeding. If row planting of maize were adopted it would be possible to consider the use of animal draft to control weeds extensively.

Oxen are the main source of draft power in Ciskei. Donkeys are used for transport and could also be adapted to pull weed control equipment. From personal discussion with extension officers in Ciskei it would appear that the use of draft animals as a source of

agricultural power is generally regarded as outdated. Animal traction has not, until recently, been recommended or encouraged.

Crop rotation

One of the major reasons for rotating crops in Ciskei is to disrupt the life-cycle of persistent pests and diseases by not growing susceptible crops for a number of years (Steyn, 1988). Another advantage of this practice is that it prevents the build-up of weeds, which may have adapted to a particular crop. Multiple cropping systems often include management practices which discourage weed growth, partly due to the different dates of crop maturity and harvest, and partly due to a tendency to provide a canopy over a longer period.

Crop rotation is not strictly practised in Ciskei, although farmers are aware of the benefits that it offers. The reason for this is that mixed or intercropping is the more common cropping system practised locally (Steyn, 1988). In a sense, however, mixed cropping is a form of crop rotation.

Weed control by intercropping

Marais (1987) has shown that yield reduction in maize due to competition from weeds is almost linearly related to the biomass of weeds growing in association with the maize, ie, under conditions of severe weed infestation the total biomass of crops plus weeds tends to be constant. This indicates that where weeds cannot be controlled by conventional methods, attempts could be made to replace the weeds with a companion crop. The ideal is for the intercrop to have an economic value, and for it not only to replace the weeds completely, but also to compete less with the main crop than the weeds.

Marais (1983) found that maize was most sensitive to weed competition during the second month after planting. When weeds were controlled for the first two months after planting only, the yields obtained amounted to approximately 90% of those of weed-free maize crops. This suggests that in applying Marais' findings to intercropping, the intercrop should be established between the maize rows one month after planting, because the tillage required to establish the interplanted crops acts as a weed control measure.

The type of intercrop selected should be one that will act as a smother crop. Two crops,

which might be considered are the traditional African watermelon, *Citrullis vulgaris* and sweet potato. Both these crops are relatively drought resistant and will often produce well even when the maize has succumbed to drought.

Although intercropping is often discouraged by extension officers, it is fairly widely practised in Ciskei (Steyn, 1988). Cropping maize with beans, pumpkins and melons are the most common intercropping practices at present.

Conclusion

Timely weed control is essential if smallholder farmers in Ciskei are to realise the full yield potential of their maize. Hand pulling and hoeing of weeds are well established practices, which will continue to play an important role on these farms.

The fact that women are today playing the major role in the agriculture of Ciskei, and that they are burdened with many other responsibilities, means that smallholder farming communities will derive great benefit from the development of less arduous and more effective methods of weed control.

It is clear from the literature study that further investigation into the use of draft animals for weed control is necessary. If animal-powered weed control is to be successful, farmers need to be convinced to plant their maize in rows, and the generally poor image that animal traction currently enjoys in Ciskei needs to be improved.

References

- Barrow J, 1801. *An account of travels in the interior of Southern Africa*. A Strahan (Printers) for T Cadell Junior and W Davies, The Strand, London. p205.
- Bembridge T J, Steyn G J and Tuswa V, 1982. *Present land utilization: field crops in the Amatola Basin*. University of Fort Hare, Alice, South Africa. p134.
- BENSO, 1981. The Republic of Ciskei: a nation in transition. *Journal of the Bureau of Economic Research Cooperation and Development* (BENSO), Pretoria, South Africa. p45.
- Crossley P and Kilgour J, 1983. *Small farm mechanisation for developing countries*. John Wiley and Sons, Chichester, UK. p61.
- Harper F, 1983. *Principles of arable crop production*. Granada Publishing Ltd, London, UK. p208.
- Hensley H and Laker M C, 1975a. *Land resources of the consolidated Ciskei*. University of Fort Hare, Alice, South Africa. p102.
- Hensley H and Laker M C, 1975b. *Agricultural potential of Ciskei*. Amended Report. University of Fort Hare, Alice, South Africa. p102.
- Marais J N, 1981. *Direction for Agronomy. An inaugural lecture given at the University on 9th June 1981*. University of Fort Hare, Alice, South Africa. p 6.
- Marais J N, 1983. Weed competition in maize with reference to peasant farming. *Fort Hare Papers*. University of Fort Hare, Alice, South Africa. pp 63, 72, 208.
- Marais J N, 1987. *Handbook for crop production in Ciskei*. University of Fort Hare, Alice, South Africa.
- Marais J N, 1992. *FSR-E Newsletter No. 4*, November 1992. Southern African Association for Farming Systems Research- Extension, Development Bank of Southern Africa, Halfway House, South Africa. p8.
- Martin J H, Leonard W H and Stampe, 1976. *Principles of field crop production*. MacMillan, New York, USA. p 121.
- Steyn G J, 1988. *A farming systems study of two rural areas in the Peddie district of Ciskei*. PhD Thesis, University of Fort Hare, Alice, South Africa. pp 35, 264, 277-282, 285.