Weed Control in Smallholder Conservation Agriculture

One of the principle reasons why farmers plough the soil is to control weeds. Tillage is easy and weed control can be complete. Weed control without tillage is more complicated and requires much more knowledge. A lot of farmers find controlling weeds in the first seasons of conversion from conventional agriculture to conservation agriculture (CA) to be very difficult. This can lead to a rejection of the technology.

The farmer should aim to never let weeds set seed in the f eld.

"One year's seeding means seven years weeding"

- an old farmers' saying.

What options are available to control weeds in CA?

Stopping soil tillage has an important effect on weed populations. When the soil is ploughed, weed seeds are buried, some of them deeply, and then returned to the surface in the following season. The "seed bank" in the soil is difficult to empty if the soil is continually tilled. Good weed control in CA for a few seasons will deplete the weed seed bank in the soil, and if weeds do not set seed again, weed problems will decline rapidly. There are several measures that can be taken to control the weeds:

a) Manual weed control
b) Stopping the weeds from setting seeds
c) Effective crop rotations that suppress the weeds
d) Green manure cover crops to smother the weeds
e) Crop residues to help smother the weeds and build up biological activity
f) The use of herbicides

The best practice is to use as many of these options together as possible – in most cases using a combination of weed control strategies will markedly reduce weed populations within three years.

What are the benefits and challenges of manual weed control?

Many smallholder farmers rely on manual weed control – it is a very effective weed control method when carried out properly, but must be done when weeds are small (less than 10 cm) and these should be cut with the hoe. In CA, care should be taken to move the soil as little as possible. Manual weed control is time consuming and labour intensive, but does not require extensive knowledge nor is it risky.

Photo: Patrick Wall

Manual weed control is effective but very labour intensive and gives a lot of soil movement.

Year-round weed control

Most farmers do not worry about weeds at the end of the season or during the winter because they do not affect the crop yield in the current year. However, these weeds set seed and lead to heavy weed infestation in the following season. Late season and winter weeding are vital to successful weed control in CA.

How can crop rotation and green manure cover crops help to control weeds?

Some crops grow more vigorously than others, cover the soil quickly and tend to smother the weeds. Including these crops (e.g. cowpeas) in the rotation together with the other weed control methods will reduce weed populations and make annual weed control easier.

Some green manure cover crops are very vigorous and can effectively reduce weed populations when planted as intercrops or sole crops in a rotation. Good weed control can be expected from velvet beans (M*ucuna pruriens*), lablab (*Lablab purpureus*) and sunnhemp (*Crotalaria juncea*). Velvet beans and lablab, if sown as intercrops, need to be seeded at about three (lablab) to six weeks (velvet bean) after the maize crop so that they do not compete too much and reduce maize yield.

Photo: Patrick Wall

Effective control of weeds under Sunnhemp (*Crotalaria juncea* L.).

Are crop residues useful to control weeds?

The smothering effect of residues reduces the number of weeds present in the field. The greater the amount of residues the fewer weeds can grow through the mulch. However, the residues also make hand weeding more difficult. Crop residues on the soil surface increase biological activity and insects and fungi attack weed seeds and reduce their viability.

What are the benefits and challenges of chemical weed control?

Chemical weed control is quick and effective, but herbicides have to be applied properly. The person applying the chemical needs specialised knowledge of herbicide products, the weeds they control and the crops they are used for, their toxicity and how to handle them, the conditions under which they work best and under which they do not work, application methods and rates, types of equipment and its calibration, types of nozzles, use of protective clothing etc. Furthermore, the herbicides require capital, which has to be available at the onset of season. Specialist service providers are a possibility for the use of chemical weed control in smallholder farming conditions as this simplifies the technical preparation process.

Photo: Christian Thierfelder

The use of 3-nozzle booms with knapsack sprayers gives even herbicide application and saves time.

Some facts about herbicides:

- Herbicides kill plants-crops are also plants! The user needs to understand how to control weeds and not hurt the crop, people or the environment.
- There are many herbicides with different characteristics - the user has to apply the right herbicide at the right dose and time and using the right method. Some herbicides control all plants and must be applied before the crop emerges. Others only control some plants and so can be applied when the crop is growing.
- Herbicides for one crop can kill other crops - a herbicide to control weeds in maize may kill cotton!
- Some herbicides must be applied before the weeds germinate, and others will only control weeds that have already germinated.
- Herbicides differ in their toxicity to humans and animals - some are very toxic.

Before you use herbicides, make sure you read and understand all instructions on the label!

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