About this booklet

This booklet is one in a set of field guides prepared by the International Institute of Tropical Agriculture (IITA) to increase the technical knowledge of extension agents and enhance the integration of plant protection and plant production practices in farmers’ efforts to grow a healthy crop of cassava. The booklet is based largely on the extension and farmer training experience of the regional project “Ecologically Sustainable Cassava Plant Protection” (ESCaPP), 1993-1997. ESCaPP was executed by IITA’s Plant Health Management Division (PHMD), in collaboration with national agricultural research and extension systems in Benin, Cameroon, Ghana, and Nigeria, and funded by the Division of Global and Interregional Programmes of the United Nations Development Programme (UNDP).

IITA is one of 16 nonprofit international agricultural research and training centers supported by the Consultative Group on International Agricultural Research (CGIAR). Their shared mission is the alleviation of hunger and poverty in tropical developing countries by generating appropriate plant production and protection technologies which benefit the poor and enhance agricultural production while preserving the natural resource base. At IITA, PHMD is dedicated to sustainable plant protection of primary food crops in Africa. The division’s research philosophy is to identify and correct the ecological imbalances in agricultural systems causing pest problems and to provide environmentally and economically appropriate options for integrated pest management (IPM).

Weed Control in Cassava Farms

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Weed Control in Cassava Farms

*IPM Field Guide for Extension Agents*

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Weed Control in Cassava Farms

Introduction

Weeds are plants growing where they are not wanted. Many different types of weeds (for example, Figures 1, 2, and 3) occur in cassava farms and cause considerable losses to the farmer. This is because weeds compete with the cassava crop for nutrients, sunlight, and space. Weeds may harbor pests and diseases or physically injure cassava plants and storage roots. Weeds may also harbor natural enemies that control pests, so certain weeds can be left on cassava farms, provided they are not many enough to compete with the crop. For these reasons close attention should be paid to weed control in the farmer’s effort to grow a healthy crop and obtain high yields of cassava.

Figure 1: Spear grass, Imperata cylindrica
Figure 2: The sedge, Mariscus alternifolius
Figure 3: Siam weed, Chromolaena odorata

What are the objectives of this guide?

This field guide has been prepared to help you to:

- identify common weeds in cassava farms,
- identify the structures with which the weeds reproduce and spread,
- specify how weed plants become problems in cassava farms, and
- combine the most appropriate cultural practices to control weeds in your cassava farm.
What are the common weeds in cassava farms?

Weeds occurring in cassava farms can be put into three main groups, namely grasses, sedges, and broadleaf weeds. Occasionally, cassava is also damaged by certain parasitic plants. Numerous kinds of weeds occur in particular places, the following is simply a selection of the most widespread species.

**Grasses:** Grasses are usually slender, erect, or creeping plants. Their stems can be oval or cylindrical in shape. The leaves of grasses are much longer than they are broad and are never subdivided into little leaves (leaflets). Grass weeds which are commonly found in cassava farms include spear grass, *Imperata cylindrica* (Figure 1); bermuda grass, *Cynodon dactylon* (Figure 4); guinea grass *Panicum maximum* (Figure 5); and the feathery *Pennisetum polystachion* (Figure 6).

**Sedges:** Sedges resemble grasses but are always erect and usually have solid and triangular shaped stems. The common sedges which cause problems in cassava farms are *Mariscus alternifolius* (Figure 2), and purple nutsedge, *Cyperus rotundus* (Figure 7).
**Broadleaf weeds:** Broadleaf weeds are herbs, creepers, climbers, and shrubs whose stems are solid and irregular in shape. Their leaves are broad, expanded, and single or subdivided into leaflets to form compound leaves. Broadleaf weeds which are commonly found in cassava farms include Siam weed, Chromolaena odorata (Figure 3); wild poinsettia, Euphorbia heterophylla (Figure 8); giant sensitive weed, Mimosa invisa (Figure 9); tridax, Tridax procumbens (Figure 10); goat weed, Ageratum conyzoides (Figure 11); waterleaf, Talinum triangulare (Figure 12); and tropical spiderwort, Commelina benghalensis (Figure 13).
How do weeds spread in cassava farms?

Whenever an area is cleared for farming, weeds are among the first plants you see growing on the land. Because they grow and reproduce very quickly, they are able to establish themselves on farms within a short time. Weeds reproduce and spread through seeds and vegetative structures, for example, rhizomes, stolons, tubers, and stem/root basal stocks. Table 1 lists the structures by which the common weeds in cassava farms reproduce and spread.

**Spread by seeds**: A number of weeds which live for only one year (annual weeds) reproduce and spread mainly by seeds. Examples of such weeds are Siam weed, *Chromolaena odorata* (Figure 3); wild poinsettia, *Euphorbia heterophylla* (Figure 8); tridax, *Tridax procumbens* (Figure 10); and goat weed, *Ageratum conyzoides* (Figure 11). These weeds shed their seeds mostly in the dry season and die soon afterwards. The seeds survive in the soil and germinate the following season, or can remain in the soil for many years until disturbed when the soil is tilled for planting. In order to effectively control annual weeds, you need to remove them early before they start flowering. This prevents the weeds from seeding and increasing the quantity of seeds in the soil.

**Spread by rhizomes**: Rhizomes are underground stems running horizontal to the soil surface. They have thin brown papery leaves wrapped around the stem. The rhizomes have roots. Spear grass, *Imperata cylindrica*, reproduces mainly by rhizomes (Figure 14). If rhizomes are cut up into pieces, each piece is capable of growing into a new plant. You are therefore very likely to spread spear grass in this way during land and seedbed preparation for planting cassava.

**Spread by tubers**: Tubers are underground stems without leaves but with buds (“eyes”). The stems are swollen with stored food. *Cyperus* and *Mariscus* species spread by tubers. The tubers of *Cyperus* species occur as large “beads” on underground slender stems which join the individual plants together (Figure 15). If cut up into pieces each piece of the tuber with a bud (“eye”) is capable of growing into a new *Cyperus* plant.

**Spread by stolons**: A stolon is a slender stem that runs on the surface of the soil. Stolons have normal leaves and roots. The bermuda grass, *Cynodon dactylon*, reproduces by stolons which are very long (Figure 16). If stolons are cut up into pieces, each piece is capable of growing into a new plant. You are therefore very likely to spread bermuda grass in this way during land and seedbed preparation for planting cassava.

**Other vegetative structures**: In addition to rhizomes, stolons, and tubers, some weeds spread through other vegetative parts such as stem cuttings and basal shoot stocks. The waterleaf, *Talinum triangulare* (Figure 11), and tropical spiderwort, *Commelina benghalensis* (Figure 13), are propagated by both seeds and stem cuttings. In addition to the production of seeds, *Chromolaena odorata* (Figure 3) is capable of sprouting into whole plants from cut basal shoots.
## Table: Weed propagating structures and life cycles

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<th>Problem weed</th>
<th>Propagating structure</th>
<th>Life cycle</th>
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<td>Seed</td>
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<td><strong>Sedges</strong></td>
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<td><strong>Broadleaf weeds</strong></td>
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<td>Chromolaena odorata</td>
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<td>Giant sensitive weed</td>
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<td>Talinum triangulare</td>
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<td><strong>Parasitic weeds</strong></td>
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<td>Cuscuta australis</td>
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Perennial = persists for several years and present at all seasons of the year

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Figure 16: Farmer showing stolon length of bermuda grass, Cynodon dactylon
How do weeds become a problem in cassava farms?

Cassava grows poorly in weedy farms and produces fewer and smaller storage roots. However, the presence of weed plants in your farm does not always mean that they will cause severe losses in food and income from the farm. Weeds become a problem in growing cassava because of a number of reasons.

**Weeds grow abundantly:** Weeds harm cassava mainly when they are abundant in the farm. They will cover the ground almost completely and increase the time you spend on weeding. When they are abundant, they will also use up lots of nutrients and water from the soil, making these materials unavailable for cassava plant growth.

**Weeds grow vigorously:** Weeds grow more rapidly than cassava and this enables them to “choke” cassava farms very quickly. For example, the giant sensitive weed, *Mimosa invisa*, rapidly occupies the spaces between cassava plants (Figure 17); Siam weed, *Chromolaena odorata* (Figure 3), chokes cassava farms in a similar manner. By their rapid growth, weeds also shade cassava plants from sunlight.

**Weeds are difficult to remove:** Weeds are difficult to remove for a number of reasons. For example, if the thorns of the giant sensitive weed, *Mimosa invisa*, hook into young cassava stems, it will be difficult to remove the weed without breaking the stems. Similarly, the parasitic weed dodder, *Cuscuta australis* (Figure 18), which climbs and wraps tightly on cassava plants, causes breakage of cassava shoot tips during hand weeding. Weeds can also be difficult to remove if they injure people. For example, it is difficult to remove *Mimosa invisa* (Figures 9 and 17) by hand-weeding or hoeing because its thorns scratch and cause wounds to people. Similarly, the hairy pods of *Mucuna pruriens* var. pruriens (Figure 18), and several hairy weeds cause intense itching.

**Weeds which reproduce by rhizomes (Figure 14), stolons (Figure 15), and tubers (Figure 16) are difficult to remove from the soil. They break easily into pieces during hand or hoe weeding. The pieces remain in the soil and sprout later.** Weeds with these structures will therefore be “stubborn” in the farm. Examples of such stubborn weeds are spear grass, *Imperata cylindrica* (Figure 1), bermuda grass, *Cynodon dactylon* (Figure 4), and the purple nutsedge, *Cyperus rotundus* (Figure 7).

**Weeds grow on cassava:** Certain weeds grow and feed directly on cassava stems. For example dodder, *Cuscuta australis* (Figure 19), attaches itself tightly to cassava stems and sucks water and nutrients from the plant.

**Weeds harbor pests:** Cassava pests and diseases can multiply on weeds and later move on to cassava. For example, immature stages of the variegated grasshopper, *Zonocerus variegatus*, gather on bushes of *Chromolaena odorata* (Figure 20) and then move on to cassava plants as they become mature grasshoppers.

**Weeds injure cassava roots:** The emerging shoots of spear grass, *Imperata cylindrica*, sometimes pierce and destroy cassava storage roots.
How can I best control weeds in cassava farms?

Under traditional farming conditions and on small cassava farms, weeds are commonly controlled by slashing, or hand or hoe weeding. This can be very labor intensive. The best way to control weeds in a cassava farm is to combine different cultural practices, especially at land clearing, seedbed preparation, planting and post-planting stages of growing the crop. If herbicides are to be used, you should consult the label for guidelines on their application methods and how to avoid personal and environmental hazards associated with their use.

**IPM practices at planting**

- **Prepare your land properly:** When clearing land for planting cassava in wet areas, you can slash the bush before the rains start. Weeds will emerge on the cleared land soon after the rains. You can then remove these weeds as you plant cassava stem cuttings. This will greatly reduce the frequency and labor of weeding in the crop. When preparing seedbeds for planting cassava, remove weed rhizomes, stolons, tubers, and other structures that germinate and spread the weed in the farm. Farm tillage tools should also be checked and cleaned from time to time to make sure they are free of these weed structures, otherwise you will spread the weeds through contaminated tools.

- **Grow suitable cassava varieties:** Some cassava varieties have an early, low, and much branching habit (Figure 21). This habit allows these varieties to suppress weeds because they develop a lot of branches and leaves which form a thick canopy that shades weeds and prevents them from growing properly. Cassava varieties with a late, high and less branching habit (Figure 22) are not very good at suppressing weeds. In selecting suitable cassava varieties against weeds, you should find out if the selected variety also has other features you may want. Table 2 indicates the weed suppression ability and other features of some cassava varieties available in West and Central Africa.

**Mulch cassava seedbeds with dead plant foliage:** Mulching involves covering the soil surface with very large amounts of plant foliage. The companion IPM guide, “Starting a Cassava Farm”, presents mulching as a soil improvement practice. In addition to improving soil properties, mulching reduces weed problems. Good sources of mulch materials are foliage from alley crops, leguminous plants, rice husk, coffee hull, and general crop and weed residues. Straws of maize and guinea grass (Figure 5) are bad mulch materials because they take too long to rot. Avoid using weed residues containing weed seeds, rhizomes, stolons or tubers as mulch because these can cause weed problems on your farm.

**Use cover crops as live mulch on seedbeds:** You can use food crops such as egusi melon as cover crops, and/or plant intercrops (such as maize) to reduce weed infestation in cassava farms. Egusi melon is a good “live mulch” in cassava farms (Figure 23). If you decide to use egusi melon as live mulch you should plant it before planting the cassava. The egusi melon should be planted at very close spacing on the seed beds to enable it to spread and cover the soil very quickly.

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**Figure 21:** Cassava variety with early, low, and much branching habit

**Figure 22:** Cassava variety with late, high, and less branching habit

**Figure 23:** Cassava in a live mulch of egusi melon intercropped with maize
In this way it suppresses many types of weeds, especially annual weeds. However, egusi melon is not very effective against stubborn grasses like spear grass, Imperata cylindrica.

**Plant cassava in association with other crops:** You can also reduce weed problems in cassava farms by intercropping (mixing) cassava with other crops at planting. Crops that are commonly intercropped with cassava are maize (Figure 23), rice, grain legumes, and vegetables. It is helpful to intercrop cassava with grain legumes such as cowpea and groundnuts, which manufacture and release nutrients into the soil.

**IPM practices after planting**

It is important that you weed at the right time to prevent weeds from competing with cassava storage root formation and bulking (the filling of storage roots with food/starch) and reduce other damage the weeds may cause to cassava. When cassava is planted alone (as a sole crop), it is best to weed three times before harvest: at 3–4 weeks after planting, 7–8 weeks after planting, and 12 weeks after planting. After this you can slash any weed regrowth to make it easy to work between the plants and also to discourage rodents.

The frequency and labor required to hand weed will be greatly reduced if you:

- cleaned cassava seedbeds of rhizomes, stolons, and tubers,
- planted cassava varieties that are capable of suppressing weeds,
- adopted suitable intercrops, and
- mulched where necessary.

If herbicides are required to kill weeds, you should consult the label for guidelines on their application methods and how to avoid personal and environmental hazards associated with their use.

The companion field guide “Pest Control in Cassava Farms” explains that certain weeds provide shelter for natural enemies of pests, and thereby play useful roles in pest control. Natural enemies are commonly insects and mites which feed on pests. For example, certain natural enemies of the cassava green mite (Figure 24) live on the weeds Euphorbia heterophylla (Figure 8) and Mallotus oppositifolius (Figure 25). Such weeds are therefore useful in the control of the pest. During weeding you can leave the weeds to grow along the margins or in other parts of cassava farms to attract the natural enemies. This cultural practice will be especially useful at sites where cassava is grown continuously with little or no fallow.

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**Figure 24:** Cassava green mites (as seen enlarged under the microscope)

**Figure 25:** Shoot of Mallotus oppositifolius
Improved fallow practices

Non-food crops can be used as the mulch. Cassava varieties are therefore good as a short duration fallow, but these are normally grown as improved fallow in areas where farmers cannot afford to leave the land fallow. You can grow these intermediary varieties early in the first and second wet seasons.

Canavalia ensiformis is therefore good as a short duration fallow crop and largely useful in areas where farmers cannot afford to leave the land fallow. You can grow these intermediary varieties early in the first and second wet seasons.

Improved fallow practices include using non-food crops as "live mulches", but these are normally grown as improved fallow in areas where farmers cannot afford to leave the land fallow. You can grow these intermediary varieties early in the first and second wet seasons.

Table 2: Some features of common cassava varieties in West and Central Africa

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield potential</th>
<th>Dry matter</th>
<th>Cyanogenic potential</th>
<th>Ground storability</th>
<th>Weed suppression</th>
<th>Tolerance to CGM</th>
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CGM = Cassava green mite
CMD = Cassava mosaic disease
CBB = Cassava bacterial blight

Source: IITA, INRAB-Benin, MoFA-CSD Ghana, IRA-Cameroon, and NRCRI-Nigeria
Weed Control in Cassava Farms

Summary

- Remove weed rhizomes, stolons, and tubers from cassava seed beds to reduce weed problems.
- Mulch cassava seed beds with live or dead mulch materials to reduce weed problems and improve soils.
- Grow cassava varieties with early, low, and much branching habit; these will suppress weed growth better than varieties with late, high, or no branching habits.
- Intercrop cassava with appropriate crops to reduce weed problems and improve soils.
- Use improved fallow plant as “live mulch” on land for planting cassava.
- Hand weed three times within 3 months after planting cassava; this will reduce weed competition with cassava for nutrients.
- Combine the most appropriate weed control practices for more effective control of the weeds.

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