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How to control *Striga* and stemborer in maize



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Maize production in Eastern Africa

Maize is the most important staple food in Eastern Africa. But yields on smallholder farms are often very low, typically just one quarter of what could be achieved. In a good year, using improved varieties with good management, recommended amounts of fertilizer and effective control of pests and diseases could increase yields from 10 to 50 bags per plot.

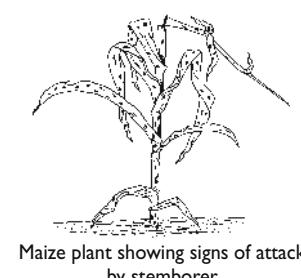
Farmers report that three main problems limit their maize yields: low soil fertility, stemborer and particularly *Striga* (also called witchweed). A range of simple and appropriate technologies have been developed to help overcome these problems. This leaflet explains how you can control *Striga* and stemborer at the same time, without using expensive chemicals.

About *Striga*

- It is a parasitic weed that affects cereal crops, especially maize and sorghum, in many parts of Africa.
- It can also affect other grass-like plants, such as finger millet, rice, sugar cane, Sudan grass and Napier grass.
- Two types of *Striga* are found in Africa: *Striga hermonthica* grows up to one metre tall, with pinkish flowers. *Striga asiatica* is shorter, growing to just 30 cm tall, with reddish flowers.
- Striga* seeds can lie in the soil for a long time – up to 15 years – germinating only when a cereal crop is planted.
- Striga* can only grow by attaching itself to the roots of a grass-like plant, most commonly maize and sorghum.
- It steals nutrients from your maize or sorghum, making the plants smaller and weaker.
- It can reduce the yield of your maize by more than half and even cause complete crop failure.

What are stemborers?

- Stemborers are worm-like pests (the young stages of a flying insect – a moth).
- At first the young stemborers feed on the surface of maize leaves but soon they make a hole in the stem and feed inside the plant. They can kill the growing tip of the maize plant and also weaken the stem causing it to break.
- If your maize is attacked by stemborers your yield will be reduced and in some cases the crop may fail completely.



Alternative ways of controlling *Striga* and stemborer

	Method of control	Advantage	Disadvantage
Striga control	Uprooting <i>Striga</i> plants before they flower and burning them	Reduces number of <i>Striga</i> seeds	Needs a lot of labour Must be done before flowering <i>Striga</i> will grow again from seeds already in soil
	Weed killers (herbicides)	Can be effective in the current season Needs less labour than hand weeding	Expensive Needs sprayer and protective clothing Not effective against <i>Striga</i> seeds in soil Can be poisonous to people Can kill useful plants growing nearby Can contaminate water and soil
	<i>Striga</i> -tolerant varieties of maize	Increases yield even when <i>Striga</i> is present Simple, acceptable technology	Tolerant maize seeds may not be available and are more expensive than normal maize <i>Striga</i> will grow again from seeds in soil
	Use of a lot of manure or fertilizer so the maize grows strong and resists <i>Striga</i> attack	Increases plant's tolerance of <i>Striga</i> and boosts yield	Needs a lot of labour Manure may not be available Fertilizer is expensive and may not be available Use of a lot of manure or fertilizer is not cost-effective
Stemborer control	Insecticide spray	Effective against young stemborer feeding on leaves Needs little labour	Most sprays only control stemborers on leaves, not in the stem Expensive Needs sprayer and protective clothing Can be poisonous to people Can kill useful insects like bees Can contaminate water and soil
	Natural preparations: ash, neem extract, pyrethrum, chilli	Cheap Available Safe	Not as effective as the other options

	Use of natural enemies, such as small wasps that kill young stemborers	Can be effective Very low labour requirement	Not widely available Needs expert assistance
	Crop rotation: growing crops other than maize such as beans, cowpeas	Simple technology Maintains soil fertility when nitrogen-fixing crops are grown Reduces number of stemborers in area Beans and cowpeas are high value crops	Maize is most important crop and the staple food for most people in the region
Combined <i>Striga</i> and stemborer control – ‘push-pull’	Intercrop maize with Desmodium and surround plot with Napier grass	Controls <i>Striga</i> and stemborer at the same time Where both <i>Striga</i> and stemborer are a problem, you can double your maize yields Natural method needing no chemicals Increases soil fertility by using nitrogen-fixing Desmodium, so you save on fertilizer costs Protects soil from erosion, as Desmodium acts as a cover crop Plot can be used for 5 years without replacing Desmodium and Napier grass Can earn extra money from sale of Desmodium seed (1 kg of seed can sell for around US\$10) Can make some money from increased milk production or sales of Napier grass and Desmodium fodder to neighbours with cattle	Desmodium seed may not be available and is quite expensive

Of all the ways of controlling *Striga* and stemborer, the ‘push-pull’ method is the most suitable for small-scale farmers and – as the table above shows – it has many attractive advantages.

How does a ‘push-pull’ system work?

‘Push-pull’ involves planting Desmodium and Napier grass together with your maize to control *Striga* and stemborer.

- Desmodium produces a smell that drives away stemborer adults and also a chemical that prevents *Striga* from attaching to maize roots.
- Napier grass attracts stemborer adults - they lay their eggs on the Napier grass, not the maize. When the eggs hatch, the Napier grass produces a sticky glue that kills young stemborers.

Establishing a ‘push-pull’ plot

What you need:

- A plot no bigger than 50 metres by 50 metres and no smaller than 10 metres by 10 metres. In bigger plots, the Napier grass would be too far away from the maize. In smaller plots, there would not be enough room to grow Napier grass, Desmodium and maize.
- If you have more land available, make several such plots side by side.
- Maize seeds, Desmodium seeds or cuttings and healthy Napier grass canes or root splits.
- Ideally, fertilizer.

What to do:

- Plant three rows of Napier grass all around your plot. Allow 75 cm between rows and 50 cm between plants.
- Plant rows of maize inside the Napier grass hedge. Allow 75 cm between maize rows and 30 cm between seeds in a row. Ensure that the first row of maize is about one metre away from the Napier grass.
- Using a pointed stick, make shallow furrows, about 2 cm deep, in the middle of the space between maize rows.
- For a 50- by 50-metre plot you will need about 600 grammes of Desmodium seed. Mix one handful of Desmodium seed with two handfuls of fertilizer. If you do not have fertilizer, mix Desmodium seed with fine sand or soil. This helps ensure even sowing of the tiny seeds.
- Sow the seed-fertilizer or seed-sand mixture thinly in the shallow furrows between the maize and cover with a thin layer of soil.
- If Desmodium seeds are not available, you can also use root splits or cuttings. These should have at least two internodes.
- Plant Desmodium splits or cuttings during the rains to ensure good establishment.
- Weed done about 3 weeks after sowing the maize and again after five weeks.
- Trim the Desmodium so that it does not overgrow your maize plants (about 6 weeks after sowing and then whenever necessary) and feed it to your livestock.

Stop the spread of *Striga*

Striga seeds are very small, like dust, and can easily be carried between fields. Avoid spreading *Striga* by taking these precautions:

Striga spread by	Action
Maize or sorghum seed contaminated with <i>Striga</i> seeds	Collect maize cobs or sorghum heads to save seed directly from the growing plant Do not drop the cobs or seed heads on the soil or thresh them in fields infested with <i>Striga</i>
Farm machinery and tools	Wash mud off tools after working in infested fields
Animals grazing in infested fields	If possible, avoid grazing livestock in infested fields
People working in infested fields	Wash mud off feet or shoes
Runoff water from infested fields carrying <i>Striga</i> seeds	Burn all uprooted <i>Striga</i> in a deep hole to avoid spread of seeds

Case study

We are in western Kenya not far from Lake Victoria. The small maize field in front of us looks dreadful: the plants are only one metre high, the leaves yellow and full of holes, there are almost no cobs but there are plenty of plants with beautiful pinkish-purple flowers. Close by, Mrs Ouzo, the owner of this field, shows us another maize field. Here the plants are over two metres high, with dark green leaves, healthy cobs and there are very few of the pink-flowered plants. She explains that it is the same maize variety in both fields, planted on exactly the same day.

The difference between the two fields is striking. The first maize field was destroyed by stemborer and *Striga*, the two worst pests of maize and sorghum in East Africa. But what was different in the second field?

Around the second field, Mrs Ouzo had planted three rows of Napier grass. "The beauty of this grass is that its odour is attractive to stemborer", says ICIPE (International Centre of Insect Physiology and Ecology) scientist Zeyaur R. Khan. "The grass then produces a gummy substance that traps the pests. Only about 10% of the stemborer larvae survive in the end". Between the maize rows, Mrs Ouzo planted the legume *Desmodium*, a ground-covering plant whose odour repels stemborer. The stemborer is attracted to the Napier grass growing around the field and repelled by *Desmodium* from the inside of the field. This "push-pull" system was originally developed by ICIPE. What's more, *Desmodium* binds (fixes) nitrogen from the air and so enriches the soil. As it covers the ground, it also helps keep the soil moist and protects it from erosion. But that's not all: *Desmodium* is also very effective against *Striga*. With *Desmodium* inter-cropped with the maize, very little *Striga* grows.

"Last year, I sold the Napier grass and *Desmodium* from my push-pull plot as fodder for about US\$100. With this money, I could afford to pay school fees for my kids. This year, I am planning to produce *Desmodium* seed as well because all of my neighbours want to go for this push-pull system. Maybe, I can afford a cow then", says Mrs Ouzo.