

Good Companions

The science behind companion planting



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Companion planting (certain combinations of species planted close together for mutual benefit) is a traditional way for gardeners to protect their plants or improve yields. In many cases, it is not known why such partnerships work. Scientists at Rothamsted Research are investigating these interactions and their discoveries are being used to enhance the effectiveness of such systems for the protection of crops on a field scale, particularly in developing countries.

Companion planting on an African shamba (small-holding)

“Push-pull” is a companion planting strategy for the control of stem borer moths and striga weeds. These pests attack cereal crops in Eastern Africa; stem borers annually cause 15-40% crop losses and striga can cause losses of up to 100%. Push-pull has had a major impact on the livelihoods of over 3000 resource-poor farmers in this area. The approach was developed by Rothamsted Research, the International Centre of Insect Physiology and Ecology (ICIPE), the Kenya Agricultural Research Institute (KARI) and the Kenya Ministry of Agriculture.

Intercrop plants such as silver leaf desmodium (*Desmodium uncinatum*) are planted between the rows of cereals, e.g. maize or sorghum. They emit an odour which repels stem borer pests from the crop (the “push”). At the same time, a highly attractive trap crop such as Napier grass (*Pennisetum purpureum*) is planted around the plot to lure stem borers away from the crop (the “pull”). Stem borer larvae growing in the Napier grass then fail to develop to maturity. Desmodium also releases chemicals from its roots which inhibit the growth of striga. Both the intercrop and the trap crop have added value as fodder for livestock.

Scientists at Rothamsted Research have determined the nature of the ecological interactions behind this and similar intercropping systems. Only by fully understanding such systems, and identifying the chemicals involved, can they prevent them “drifting” from effectiveness, for example when new sources of seed are used.



The curse of the witchweed

Striga (*Striga hermonthica*) is a rare example of a parasitic flowering plant (mistletoe is another example). Its roots invade the root system of the host plant and rob it of water and nutrients. It attacks cereals such as sorghum, maize and millet, causing average yield losses across Africa of 40%. In Eastern Africa, however, total crops losses are often reported. Once the beautiful pink flowers can be seen, it is too late to save the crop. One witchweed plant produces thousands of seeds that can remain viable for many years, so eradication is very difficult. Intercropping with desmodium controls this pernicious weed.

Success stories with the push-pull system

Consolata James.

Consolata is a mother of four and owner of 3.5 acres of land. After her farm was chosen as a push-pull demonstration plot, maize yields went up by around five-fold. This was big news for all her farming neighbours and she has received many visitors wanting to know how it works. Asked what push-pull means to her, she replies "I don't have to buy maize from the market to feed my family any more".



Lawrence and Joseph Odek.

For as long as these brothers can remember, stem borers and striga have decimated their crops, often forcing them to turn to charities for food. After three years with the push-pull system, maize yields have increased from 5 to 35 bags and they have been able to feed their family and re-roof their house. On the first day of term, Joseph's son arrived at secondary school with two bags of maize as part of his school fees.



The Wang'ombe family.

Lillian and John Wang'ombe adopted push-pull even though they only had 2 acres of land and no cows or goats. They gave the Napier grass from the trap crop to Lillian's mother. She used it to feed her cow and gave them milk in return. Increased crop returns under push-pull have enabled them to build up their own herd of five cows. "Those who laughed at us when we first planted Napier grass without cows now come to us for advice on how to establish push-pull", says John.



This approach was developed by Rothamsted Research, the International Centre of Insect Physiology and Ecology (ICiPE), the Kenya Agricultural Research Institute (KARI) and the Kenya Ministry of Agriculture. Funding was provided by the Gatsby Charitable Foundation, BBSRC, the Royal Society, the Department for International Development (DFID), the Rockefeller Foundation and Farm Africa.

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