Achieving climate smart agriculture: 'push-pull' in maize

What are the challenges faced by 'climate smart agriculture? How can they be overcome for key crops like maize?

The concept of climate smart agriculture involves reducing greenhouse gas emissions from agriculture whilst enhancing food security, nutrition and productivity. It has been estimated that agriculture is responsible for 10-12% of greenhouse gas emissions. However, this figure rises as high as 24% if forestry and other land use is included, taking into account such factors as deforestation to clear land for more crops and livestock.

Maize is a good example of both the challenges faced by agriculture and the ways those challenges can be addressed. It has been estimated that yields of cereals such as need to increase by 2.4%/year to meet rising demand. However, yields must increase without contributing further to global warming, not least because maize is particularly vulnerable to more extreme weather conditions (such as drought) associated with climate change.

The 'Push-pull' cropping system is one solution to this challenge. Jointly developed by The International Centre of Insect Physiology and Ecology (ICIPE), Rothamsted Research and other partners, the system uses companion cropping (e.g. of grasses) with maize to reduce insect pests and weeds, sustainably improving maize yields whilst providing other benefits to smallholders.
Maize yields can be substantially reduced by pests such as stem borer moth larvae and the parasitic *Striga* weed, as well as by other factors such as poor soil quality. The 'push-pull' system involves:

- Planting 'push' plants like the legume *Desmodium*, which uses smell to deter stem borers, in between rows of maize.
- Planting 'pull' plants like Napier Grass, which attracts moths away from maize, around the main crop. The grass emits a glue which traps the insects.

In addition the roots of *Desmodium* emit a selective herbicide which inhibits the growth of the roots of the parasitic *Striga* weed. The plant also fixes nitrogen which contributes to improving soil fertility which can itself be a significant factor in reducing yields. It also acts
as a protective covering for the soil, retaining moisture and reducing soil erosion. Finally, both the *Desmodium* and Napier Grass can be used as forage for cattle.

The system is currently being used by almost 70,000 farmers in Africa. Levels of *Striga* and stem borer infestation have been dramatically reduced whilst maize yields have more than doubled in some cases. The most recent development is to assess the use of the system in drier areas using plants such as drought-tolerant *Brachiaria* grass so that it can adapt to future climate change.
The forthcoming Burleigh Dodds Science Publishing programme includes comprehensive reviews of these and other ways of achieving sustainable maize cultivation.

References and further reading

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