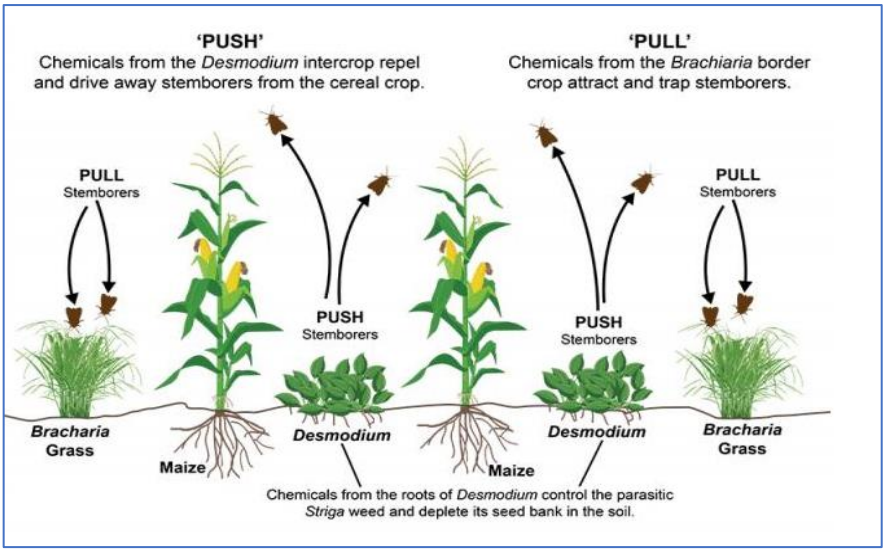
FROM KENYA THE PUSH-PULL TECHNOLOGY TO ECOLOGICALLY CONTROL PESTS AND THE FALL ARMYWORM

In April 2022, the ICIPE International Centre of Insect Physiology and Ecology published an article informing that a new study unravels the mechanisms through which the Push-Pull technology conquers the *Fall armyworm*, currently one of the most devastating and difficult pests in Africa that causes damage to over 100 plant species, including cereals and horticultural crops.



Developed in 1997 by Professor Zeyaur Khan, scientists and researchers at the *International Centre of Insect Physiology and Ecology (ICIPE)* of Nairobi (Kenya), the Push-Pull technology is an innovative integrated approach to ecologically control pests and weeds of cereal crops, without using chemicals.

Originally developed for the control of stemborer pests, the Push-Pull technology (PPT) is a mixed cropping strategy that diversifies conventional cereal cultivation by including perennial fodder plants for biological pest control and other ecosystem services. In PPT, a repellent companion plant such as the African native *Desmodium* drives pests away from principal crops (the push). In addition, a fodder grass, for instance *Brachiaria*, is planted as a border crop, and it releases chemicals that attract (pull) and trap the stemborers. *Desmodium* continuously produces defence odours, even in the absence of pest attack, and as a result the cereal crop is protected from the pests.

Furthermore, *Desmodium* suppresses the parasite Striga weed producing two sets of compounds: one that stimulates the germination of Striga seeds and another that inhibits their growth after germination. *Desmodium also* fixes nitrogen and helps retain moisture through natural mulching and prevents soil erosion. It is also a perennial crop, which enables it to exert its striga control effect even when the host crop is out of season

The Push-Pull technology improves soil fertility and reduces mycotoxins contamination, a major food safety hazard. Due to the absence of chemical pesticide or fertilizer inputs, smallholder Push-Pull cereal is de facto organic. Crops grown with PPT show yield increases of 10% to 360% compared to monocultures.

The Push-Pull technology supports biodiversity and lowers pest and weed damage, while restoring soil moisture and fertility. The technology is also well adapted to combine with traditional mixed and livestock farming, enabling small-scale farmers to venture into dairy cattle and goat keeping, as *Desmodium* and *Brachiaria* grass are

excellent fodder crops. After having rooted both plants spontaneously germinate to protect the next crop of maize and also reveal a permanent additional resource to fodder the animals or to be sold on the market, representing an additional revenue for the small producers.

The recent article published by of ICIPE informs that in 2016 the *Fall armyworm*, a destructive moth devastating over 100 plant species, was reported for the first time in Africa. Initially confirmed in Nigeria, the pest has spread rapidly across the continent, defying most control attempts and leaving farmers, governments and other involved stakeholders helpless. By 2020, the *Fall armyworm* had caused an average annual loss of 36 percent in maize production alone; and a total economic loss of USD 200 million, in Africa.

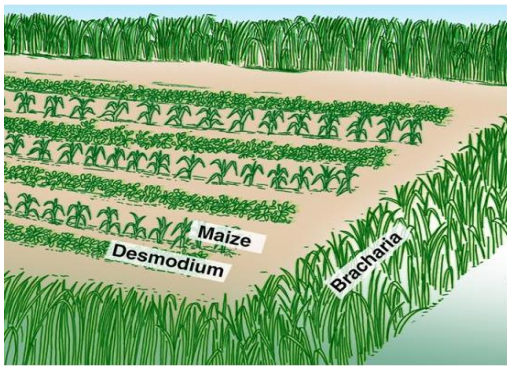
In 2017, ICIPE in collaboration with the Rothamsted Research (United Kingdom) and partners in East Africa, documented the capacity of the Push-Pull technology to efficiently manage the *Fall armyworm* in an environmentally friendly and cost-effective manner. Push-pull's capacity to control the *Fall armyworm* was originally based on observations by farmers. These reports were confirmed through field evaluations and socio-economic assessments by ICIPE researchers, which showed *Fall armyworm* infestation to be 80 percent lower in plots where the Push-Pull technology was being used, compared to mono-cropped maize plots.

The study published in Frontiers in Ecology and Evolution has established the scientific mechanisms through which the Push-Pull technology conquers the *Fall armyworm*. The study showed that, just like in stemborer control, *Desmodium* acts as a push plant against the *Fall armyworm*. It releases chemical scents that ward off the pest's moths, preventing them from laying eggs on the cereal crop. Thus, the chances of the pest's populations to build up are reduced. The research also showed that unlike in the previous case where it serves as a 'pull', the border plant *Brachiaria* functions as a 'push' plant that also repels the *Fall armyworm* pests. Both *Desmodium* and *Brachiaria* emit chemicals that attract natural enemies of the *Fall armyworm*.

The ability of Push-Pull to manage such a devastating and difficult pest as the *Fall armyworm* clearly demonstrates the utility of the technology as a platform in addressing the multitude of challenges that affect cereal-livestock farming systems in Africa. The Push-Pull technology does not use synthetic deterrents or toxins, it purely exploits plant-drived natural stimuli to manipulate pests.

ICIPE continues disseminating the Push-Pull technology across Africa, collaborating with many institutions, organizations and farmers' associations from different countries. On the ICIPE web page, in the Publications section, several manuals and brochures produced over the years that illustrate the use of Push-Pull technology to manage different pests parasitizing different cultivations can be freely downloaded.

According to the studies of the ICIPE scientists and researchers, the Push-Pull system can potentially be applied to other cultivations representing an important source of food in Africa, making an important contribution to a new ecological and sustainable agriculture.



To know more

New study in ICIPE International Centre of Insect Physiology and Ecology website

[Study published in Frontiers in Ecology and Evolution]

[A climate-adapted push-pull system controls fall armyworm in East Africa - ScienceDirect]

[Push-Pull technology halts fall armyworm rampage in ICIPE website]

[Push-Pull Technology in ICIPE website]

[Push-Pull IPM Technology in ICIPE website]

[Manuals PPT in ICIPE website]

[Brochures and Pamphlets PPT in ICIPE website]

[Push Pull Net website]

[SlideShare on Push Pull Technology]

[Push Pull technology in Wikipedia]

[Scaling up fight against Fall Armyworm in FAO website]