



# Push–pull and gender:

## improving livelihoods and social equity

The agricultural landscape of Africa's Lake Victoria region is dominated by family smallholder farms, where women provide the majority of agricultural labour but seldom own the land they farm. Women often lack some or all of the resources that are needed to grow enough food to ensure household food security – whether seeds, tools, fertilizers, knowledge or the power to make strategic decisions about the farm.

In this region, grain is at the heart of the household economy, grown for both consumption and sale. But cereal production is constrained by insect pests, invasive weeds, degraded soils and increasingly erratic seasonal rainfall. Getting enough to eat is a constant worry for too many households. The need for adaptive agricultural practices that can cope with increasingly variable climatic conditions and still produce adequate food has never been greater; but neither has the need to ensure that these practices work for and are extended to female as well as male farmers.

Push–pull, developed by Dr Zeyaur Khan and his team of scientists at the International Centre of Insect Physiology and Ecology (*icipe*), in collaboration with Rothamsted Research (UK) and national partners, is a novel conservation

agriculture technology that tackles the two greatest limitations of the African cereal farmer: the stemborer, an insect pest, and striga, a parasitic weed. This results in significant grain yield increases.

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**68,689 farmers have  
adopted push–pull since 1998.  
Of these, 51% are women.**

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Targeting women and men equally has always been a basic principle in the dissemination of push–pull, which has particular benefits for women farmers. Adopting the technology usually means producing more grain using less labour, reducing the time women must spend digging and weeding, and increasing the time they can invest in other productive activities. It also often increases women's income.

Push–pull dissemination has been built on respect for farmers' knowledge, their capacity to learn basic agroecological science, and their potential as peer educators. As a result, as well as benefiting food security, education, health and income poverty, the dissemination of the technology has also built the skills, confidence and networks of many female farmers.



Consolata James adopted push–pull in 2002, and thanks to the improved yields and diversified income the technology has brought, her family is now food secure. As a result of her success in farming, her stature in the community grew. She became a farmer-teacher, and in 2006 she was ordained as a pastor. She is now happy to combine farming, teaching and pastoral duties. "Although I schooled only up to Form One," she says, "many people have learned from me."

## What is push-pull?

Invented in 1997 by Dr Zeyaur Khan, Principal Scientist at *icipe*, push-pull technology is a novel cropping system designed to integrate pest, weed and soil management in cereal-based farming systems. It involves driving cereal stemborers away from the crop by using a repellent intercrop plant, desmodium (the 'push'), while at the same time attracting stemborers with a border crop of Napier or Brachiaria grass trap plants (the 'pull'). Chemicals released by the desmodium roots also result in very effective control of the troublesome parasitic weed striga.

When farmers adopt push-pull they not only achieve a dramatic and sustainable increase in cereal yields, they also benefit from enhanced soil fertility and obtain year-round fodder for their animals.

Since they began work on push-pull nearly two decades ago, Dr Khan and his team of scientists at *icipe*

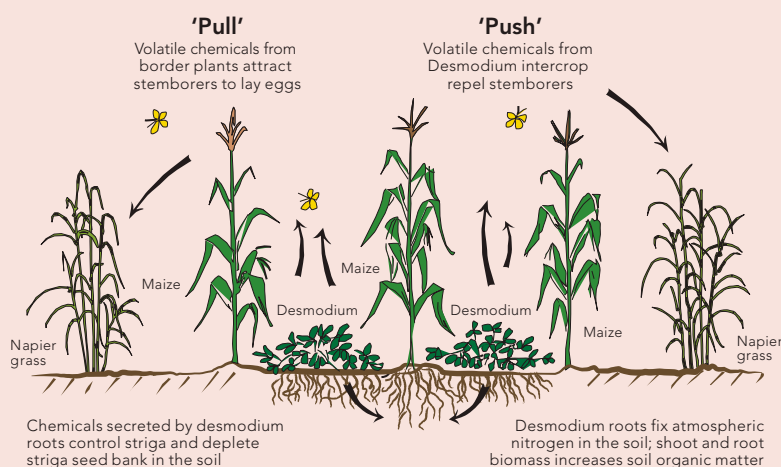
have consulted farmers at every stage of the development and adaptation of the technology and encouraged adopters to educate other farmers. This approach means that the spread of push-pull is rooted in a set of farmer-centred and inclusive extension practices.

Close relationships with farmers mean that scientists have been able to respond to changing needs and circumstances by adapting the technology. In recent years, farmers have begun to report that the original push-pull companion plants cannot always withstand the long seasonal dry spells that are becoming both hotter and more frequent. As a result, Dr Khan's group at *icipe*, in collaboration with Rothamsted Research, carried out new research. In 2011 they developed 'climate-smart' push-pull, which includes two drought-tolerant companion plants.

## How does push-pull work?

Push-pull prevents stemborers attacking cereals by intercropping with a 'push' plant, such as desmodium, and

planting around this intercrop a border of a stemborer-attractive, 'pull' plant, such as Napier grass.



In addition to repelling or pushing the stemborers away from the crop, desmodium also suppresses the parasitic weed, striga. It stimulates germination of the striga seeds, then inhibits growth of their roots, thereby preventing their attachment to host plants.

On top of dealing with stemborer and striga, the leguminous desmodium intercrop fixes atmospheric nitrogen, adds organic matter to the soil, conserves soil moisture and enhances soil biodiversity, thereby improving soil health and fertility. It provides ground cover and, together with the surrounding grass trap crop, protects the soil against erosion.

See [www.push-pull.net](http://www.push-pull.net) for more information.



A conventional push-pull plot planted with a maize crop. Push-pull was developed in 1997 and introduced to farmers in 1998 and uses silverleaf desmodium (*Desmodium uncinatum*) as an intercrop and Napier grass (*Pennisetum purpureum*) as a border crop.



A climate-smart push-pull field planted with sorghum. Climate-smart push-pull was developed in 2011 to withstand long droughts and high temperatures. Introduced to farmers in 2012, it uses two drought-tolerant species: greenleaf desmodium (*Desmodium intortum*) as an intercrop and Brachiaria grass (*Brachiaria cv mulato II*) as a border crop.



## Gender inequalities in smallholder agriculture...

In this region of Africa, ancestral land has been passed from father to son for generations. On a traditional smallholder family farm, while the entire household works together on the same field, it is men who have title to the farmland, decision-making power, and control over the sale of farm produce. The distribution of the tasks of agricultural labour throughout the seasonal cycle is also gendered: men traditionally clear bushes and work with ox-drawn ploughs, while women and children dig and weed by hand, and harvest and process the crops.

This context limits the rights and potentials of many women farmers. Their social and economic position is further constrained by many other structural imbalances, particularly in access to education. Although there is now gender parity in primary education, less than half of Kenya's girls enrol in secondary school, and even fewer access higher education.

HIV/AIDS has had a profound effect on gender relations. High mortality rates, primarily among men, mean that most households include several orphans, that more women are taking on even heavier responsibilities, and that there are many more female-headed households. One outcome of these changes is that the role of women as primary breadwinners has become more socially acceptable.

The need to care for those bereaved by AIDS or living with HIV has also caused shifts in the household and



In smallholder African farming systems, weeding crops is women's work. Hand-weeding striga, which attaches itself to the roots of the cereal crop, is a particularly physically demanding task. Helen Ndede, pictured in the push-pull plot she planted six years ago, says "Before, this field was full of purple flowers. When I tried to pull the striga weed, it was so strong I would fall over."

kinship networks that provide a basic social safety net for most rural Africans. On the eastern shores of Lake Victoria, co-operative groups – particularly women's groups – have always formed an important part of social and economic life. But in recent decades they have also gradually become the principal social mechanism for the delivery of services and programmes, ranging from healthcare to agricultural extension and small enterprise development, a process which has accelerated since the pandemic.

The St. Mary's Women's Group, pictured here during a visit from Dr Zeyaur Khan, adopted push-pull in 2013. Groups like these are an important source of mutual support for women farmers, and activities often include micro-credit and rotational savings as well as joint learning of agricultural technologies.



### ...and aiming for gender equity in the spread of push-pull

Jimmy Pittchar, *icipe*'s Social Scientist, explains that "*icipe*'s development philosophy is guided by the premise that ownership of a productivity-enhancing agricultural technology by its beneficiaries is the key to sustainable uptake." Because of this, he continues, "we pursued a deliberate policy of working equally with male and female farmers, because women provide most of the labour on farms, and through them the greatest impact of the push-pull innovation on farm households could be realized." But in order to reach women with the vital information they need to improve food production, it is necessary to work directly with them where possible, but also to work with men, and to encourage men and women to work together.

To achieve the objective of gender parity in extension, *icipe* has relied on three interlinked and overlapping pathways:

- Working with those women farmers, many of them widows, who have access to land and the necessary power within their households to adopt new farming practices.

- Working with male farmers with the primary objective of improving household food security, but also ensuring that information about push-pull reaches the women in their households.
- Working through groups, often in partnership with other implementing organizations and donor agencies, many of which specifically target support to women.

In particular, this third pathway has proved fruitful for reaching very vulnerable women who lack access to agricultural resources, but who are already working together to improve their food security or increase their income, and are often able to add push-pull to their portfolio of collective activities. But it has also been a useful way of reaching and encouraging men and women who are working in partnership.

Through following these pathways, push-pull extension has not only delivered knowledge and benefits directly to women, but also created a positive enabling environment for them to have more power in making decisions that affect their lives and to have more control of household resources.



The Yenga Push-pull Farmers Group in Kisumu district was started in 2008 and now has 50 members, 22 women and 38 men. "It has united us at the village level," says Chairman Boniface Ongondo Ahono. "It is most important that we include young widows and other women." Here, group members proudly display the One World Award which their Treasurer Rachel Agola (fifth from left) accepted in 2010.



## Women and positive outcomes of push-pull

### Improving household and community food security

One of the most attractive outcomes of adopting push-pull for women farmers is that they can produce a reliable crop that is free of pests and weeds with relatively little labour. Among the many benefits associated with this outcome is improved household food security. But there are also many examples of women farmers who are the driving force behind local initiatives to improve the food security of the very poorest in their communities.

In Uganda's Bugiri district, Juliet Mwondha adopted push-pull on her family farm in 2008. She and her husband are active members of the Muterere Catholic Church Group, which has taken on the responsibility of feeding and paying school fees for one hundred orphans. The group members achieve this by working together in the group garden, five acres of land that are borrowed from Juliet and her family.

The group members work together to grow a range of crops, but at the centre of their efforts are three push-pull plots overseen by Juliet. The maize harvested from them is either consumed by the orphans, taken directly to the schools where some of them are boarders, or sold to pay their school fees in cash. The fodder goes to a flock of ten local goats which Juliet keeps for the group as a form of savings.



Before she adopted push-pull on her own farm, Juliet Mwondha says that striga was a very bad problem and soil fertility was low. Afterwards, the plots were cleared of striga. With less labour needed to produce food for her own family, Juliet was freed to dedicate more time to the Muterere Catholic Church Group garden.

### Enabling the education of girls and young women

Whether in Kenya, Uganda or Tanzania, when push-pull farmers are asked what they did with any extra income gained from adopting the technology, they almost invariably reply "we paid school fees." Meeting the costs of education – which increase steeply from the books and uniforms required by most primary schools to fees for secondary and college education – is a preoccupation for many, especially when families are large and often include one or more orphans.



In Busia district, Uganda, proceeds from the push-pull plot where Annette Taaka is pictured have funded the secondary education of six girls, including four orphans.

When faced with financial constraints, most families still tend to give priority to educating boys. In the majority of cases, adopting push-pull increases household income through improved production of either grain or milk or both. In many push-pull families, this means that girls are less likely to be excluded from education through lack of resources.

Many schools in the region accept payment in kind, with milk and maize being the most common form of currency. For Maureen Ambubi, a widow in Kenya's Vihiga district, sending her youngest girl to school with two litres of milk was the start of a journey which ended with both her daughters and a son attending university, all funded from the proceeds of her push-pull plots.



Margaret Anyango is very happy that her communication talents, fostered by the Participatory Video Initiative, are helping other farmers learn more productive agricultural techniques.

### Building women's knowledge and skills

Education is about more than ensuring that children attend school; it is also about life-long learning. Push-pull extension, with its strong emphasis on teaching farmers about how the technology works and fostering peer education, has contributed to building the knowledge, skills and self-belief of many women farmers. For some, it has also earned them greater respect from their husbands, allowing them more decision-making power within the household.

Push-pull has created a network of farmer-teachers across the region, who support *icipe* technicians in training other farmers in the technology, travelling from farm to farm to support implementation. For many women farmer-teachers, the experience is transformational, building their social confidence and networks. One such is Rispa Ouso: after adopting the technology in 1998, she went on to plant a total of four plots on her family farm, and built up strong friendships with other adopting farmers and *icipe* field staff. A natural mobilizer, Rispa was elected as a farmer-teacher by her fellow farmers in 2005, going on to participate in numerous trainings and field days. The self-confidence she gained helped her decide to become a community health worker.

Since 2012, *icipe* has been pilot-testing participatory video as a learning tool for non-literate farmers. Margaret Anyango, who has been a member of the Yenga Push-pull

Farmers group since 2009, has learned how to use a video camera and computer to record farmers' own narratives of their experiences with the technology to encourage uptake and teach agronomic best practices.

### Exposure and respect

Many of the female push-pull farmers whose skills and talents have been nurtured by the programme's activities have become leaders in their communities and role models for other women. A key part of their growth and development is exposure to new experiences and ideas. For some, this has meant participation in farmers' forums and media appearances, while for others – like Yenga Push-pull Group Treasurer Rachel Agola, who travelled to Germany to receive her One World Award – it has resulted in the chance to travel within their own countries and even overseas.

Mary Rabilo and her husband feed 13 people from the 3.5 acres of land that they farm in Mbita district, Kenya. She adopted push-pull in 2000. Although Mary herself only attended school to Standard 7, the profits from her push-pull plots have helped five of her daughters into college and university. These young women are all now working and give financial support to their parents.

When Mary received a dairy cow from the government's Livestock Development Programme, she was advised to use commercial dairy meal to feed the animal, which



incurred high costs. So she developed her own alternative dairy meal from maize, desmodium leaves and ground fish, a cheap and locally available ingredient. When she became a farmer-teacher, she taught this innovation to other farmers alongside their training in push-pull.

In 2005, *icipe* and the Ministry of Agriculture were invited to select a farmer to attend the world-famous Chelsea Flower Show in London, UK, with the objective of raising awareness of the importance of striga for African farmers. Following a rigorous selection process, with support from her community, Mary was elected as emissary. During her ten-day visit she learned a great deal about organic farming, and was surprised at how much could be produced from a small farm. She also demonstrated her recipe for home-made dairy meal to the delight of the many thousands of visitors to the show.

### A powerful force for change

Transforming gender relations to allow the women who labour on African smallholder farms the resources they need to increase agricultural productivity, and thereby improve food security, can only happen gradually. But incremental steps forward, taken by farmers themselves and the scientists and extensionists who support them, can steadily build into a powerful force for change.

It is crucial to ensure that as many women farmers as possible can access new agricultural technologies. But it is also important to support women – not only in farming, but also within the agricultural sciences and extension – as role models and leaders. While the push-pull team have achieved their goal of gender parity in extension, barriers to African women entering careers in agricultural science are very high, and the majority of the team are men.



"With Mary Rabilo representing East African farmers at the Chelsea Flower Show, we were really able to raise awareness about striga and to demonstrate the immense value of push-pull farming for small-scale food production in the region," says Professor John Pickett, Chairman of *icipe*'s Governing Council and one of the scientists whose research on the chemical ecology of plant-insect relationships contributed to the development of push-pull.

One of several exceptions is Matilda Ouma, a home economist who worked with push-pull farmers for nine years before going on to a career in the Ministry of Agriculture. Not only has she extended the technology to many thousands of women, she has also acted as mentor to five World Food Prize interns, several of whom have gone on to be advocates for gender empowerment in international arenas.



"I like working with communities," says Matilda Ouma (centre). "Being a woman and empowering fellow women is very important to me."

One former intern, Bian Li, is now Director of Planning at the World Food Prize Foundation, as well as being an Oxfam Sisters on the Planet Ambassador. Her internship research with push-pull farmers, undertaken in 2000 when she was just 18 years old, examined the influence of gender on food security. She concluded that “cultural barriers must be broken in order to allow women more freedom to produce,” and that this could only happen by working with men and women together.



Supporting women like Rita Ochwo, a farmer-teacher from Uganda's Tororo district, is essential to ensuring that the continued spread of push-pull contributes to more equitable gender relations. Rita says that her experience with the technology has brought her respect in the community, lifted her children out of malnutrition, and given her the assets and self-confidence to start a small poultry business.

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***“The gender and empowerment conversation is not just about women. It needs to include men.”***

**Bian Li**  
Director of Planning, World Food Prize Foundation and  
2000 Borlaug-Ruan Intern at the Push-pull Programme

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Lessons from the first 15 years of push-pull dissemination can be summarized into an agenda for interlinked changes in agricultural practices and gender relations.

- Continue to ensure that women have the necessary inputs to take up push-pull – land, tools, knowledge, seeds and decision-making power – and are supported as peer educators, advocates and role models, enabling more women like them to adopt the technology and strengthening their position in society and within their households.
- Improving access for women who lack one or more of the necessary inputs to take up push-pull, through working in partnership with other structures and interventions that exist to support them, particularly through work on communal group plots.
- Continue with ongoing direct efforts to get more women into scientific and agricultural careers, in Africa and overseas.

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