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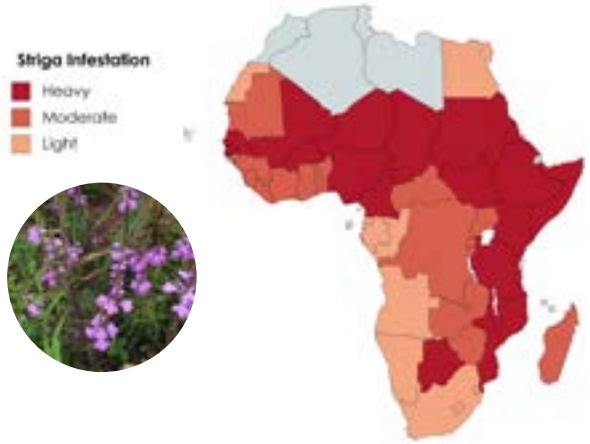
For a world without hunger

THE TOOTHPICK PROJECT

Improving Food Security through Biocontrol Innovation

Striga: The #1 Pest Threat in African Food Security

What if your livelihood, health, and future were thwarted by a little purple flower? This is the case for 40 million farmers across Sub-Saharan Africa. *Striga* (witchweed) is an increasingly **destructive invasive parasitic weed**, attacking the roots of crops like maize, sorghum, millet, cowpea and upland rice. ***Striga* depletes crop yield by up to 100%**, resulting in a lack of sustenance and income for farmers and their families. Up to 50 million hectares of African croplands show *Striga* infestation, causing $9 billion in crop loss annually. *Striga* management is a priority, yet there are no safe, effective, and accessible solutions that restore crop yield and attack the *Striga* seed bank in the soil. In most African countries, the majority of smallholder farmers are women, making *Striga* a gender-sensitive food security issue.



Map based on image published in: Ejeta, G. & Gressel J. (eds) (2007): Integrating New Technologies for *Striga* Control. Towards Ending the Witch-hunt. World Scientific Publishing Co Pte Ltd.

A Dual Approach for Sustainable Change

The goal of the **Toothpick Project** is to provide farmers with **a safe and effective biological technology** that allows them to restore their crop yield, thereby improving their **food security** and **economic outlook**. Originally developed at Montana State University by Professor David Sands, our **innovative bioherbicide technology** has been piloted in western Kenya. It uses selected fungal strains (virulence-enhanced *Fusarium* fungus, also called FoxyT14) to fight *Striga*. Foxy specifically attacks the weed, rather than the crop, allowing farmers to treat *Striga*-infested fields without using chemical herbicides.

Our **solution strategy** consists of two components:

1) expanding our capacity through a **bioherbicide technology network** and
2) building a **sustainable distribution system** to bring our solution to the farmers across sub-Saharan Africa.

FROM LAB TO FARMER'S FIELD

In a manufacturing lab, Toothpick Project scientists select, isolate and culture a *Fusarium* strain local to Kenya called FOXY T14.

FOXY T14 is grown into pieces of wood (toothpicks were the genesis of this project) that are then sealed in sterile canisters and delivered to the village-level Producers.

The trained Producers (farmers) cook a pot of rice, transfer it to a sterilized plastic container together with the fungus-bearing wood, and seal the lid. Shaken twice daily, the FOXY T14 grows onto all the rice, creating the secondary inoculum.

After three days of growth, the farmers place a pinch of the secondary inoculum (the rice) next to the seed into each seed hole.

From there, the crop grows regularly, protected from *Striga*. Based on our trials, fields freed from *Striga* can yield around 50% more.

Through a highly trained **network of African biocontrol scientists**, we will **transfer the bioherbicide technology** from our pilot project in Kenya to 17 *Striga*-diseased countries. Through local public-private partnerships, we will install a **last-mile distribution system** from lab-to-field to achieve **easy and cost-effective technology** access for the farmers: In each country, we will train and support **village-entrepreneurs** to become community-based inoculum producers who sell the local *Fusarium* inoculum to the farmers at an affordable price.

Potential Impact and Sustainability

By 2019, we had over 400 demonstration plots in western Kenya to show farmers our technology and its impact. Using our game-changing method, trials have consistently seen an **increase in crop yield from 35-85%** - this could provide up to **three months more of food** for smallholder families.

As *Striga* devastation gets worse annually (aggravated by climate change), the need **to scale up our approach** is more urgent every day. Our science team represents research organizations from 12 African countries. **Capacity building** will expand the science base in this new area of pest management technology, promoting our vision of global bioherbicide development, starting with *Striga*. This involves **continued training** on virulence enhancement, amino acids, and *Fusarium* - **expanding the technology** to new geographies, crops and *Striga* varieties; and in the long-term, other weeds.

Our Kenya model is a **social enterprise**, designed to be financially self-reliant through sales revenue once we reach scale. Farmers will buy the product through **local distribution units** (village producers), coordinated through NGOs, CBOs, and farmer groups. Farmers get a **solid return** on their investment, particularly considering fungal persistence in the soil and its long-term reduction of *Striga*. Our distribution model can be modified to fit village-level needs in each target country.

Be Part of the Change

We are working with urgency: If our vision came true, it would mean food security and better nutrition for 40 million African farmers. Additional investments will provide valuable resources to extend the technology and distribution to other countries, expediting our ability to reach more farmers more quickly. Funding opportunities include:

- **$1 million** will allow us to develop an alternative **seed coating technology**, which could significantly simplify and reduce the costs of application to the field. While the current method of using the wet rice as medium for activating the fungal spores is highly effective, it is rather costly and time-consuming.
- **$5 million** will enable us to **build the scientific capacity** in half of our 12 lead partner countries in West and East Africa. This includes mobilizing the science teams, selecting local fungi strains for commercialization, equipping the labs, and working through each country's regulatory processes for product registration (field trials) *.
- **$10 million** will help us **increase our reach to farmers** in *Striga*-infested countries (approximately $3-10 million/country depending on the extent of *Striga* devastation). **Deep partnership development** with government extension agencies, non-governmental and community-based organizations, and private agriculture businesses, will enable us to **tailor distribution systems to local organizations and conditions**. Through the training and certification of local inoculum producers, we will **maximize the reach and impact** of our technology while supporting local economies.

"If my fields were free from Striga, it would better my children's lives. Not only could I put more food on the table, but by selling the surpluses of my harvest, I could cover their school fees and basic needs."
– Ms Gaudencia Teiye, farmer in Kakamega, Kenya

"I'm excited to be a part of the team that is making a complex biotechnology process work efficiently for farmers in the last mile. By using a village-based inoculum production system, we can deliver a cost-effective, accessible solution that boosts food security and local economic development."
– Dr. Juliet Akello, Plant Pathologist, Zambia

*Due to the Nagoya Protocol that restricts the transfer of pathogens across country borders, our estimates are per country. However, as we move forward, we are seeking harmonization in the regulatory processes for biocontrol technology which would expedite registration and distribution.

Welthungerhilfe (WHH), founded in 1962, is one of the largest internationally operating NGOs in Germany, dedicated to fighting for a world without hunger - with all its facets and causes. Within the Toothpick Project, WHH maintains networks of international scientists as well as local and multinational organizations. For further information, please contact: toothpick@welthungerhilfe.de

www.welthungerhilfe.org/our-work/countries/kenya/the-toothpick-project