



AGROFORESTRY FOR FOOD SECURITY



Location: Malawi

Malawi faces myriad of environmental, social, and human health challenges, including food insecurity, land degradation and deforestation. An agroforestry program promotes tree planting to increase crop yields in previously depleted soils, reverse deforestation, and empower women.

CHALLENGE

Malawi is one of the most densely populated and least developed countries in Africa. Its population has increased from 5.3 million in 1975 to over 17 million people in 2014. Ninety percent of the population depends on agriculture for their livelihood.¹ Most Malawians rely on wood and charcoal for their energy needs. As a result, forests have been chopped down for fuel and converted for agriculture. Consequently, the country has one of the highest deforestation rates in sub-Saharan Africa.²

With the loss of native forests and vegetation, soil health has deteriorated, and fuel and food have become scarce. Twenty to forty percent of the population is food insecure, with many Malawians, particularly children, suffering from protein and vitamin deficiencies. Malawi has experienced serious food crises following production deficits in 2002 and 2005. In 2005, the government, with the help of donors, reintroduced a fertilizer and seed-subsidy program that resulted in a record maize harvest in 2006. But such short-term fixes are unsustainable, environmentally as well as economically: continuous cropping with inorganic fertilizers fails to improve soil structure and texture and actually contributes to environmental degradation and soil fertility decline.

Furthermore, increasing national maize production—and exporting large quantities of maize—does not mean that the majority of Malawians is adequately fed or enjoys a diverse diet. For example, milk protein is crucial to children's health, but consumption remains limited because there is not enough high-quality animal fodder to raise cows. Many rural Malawians are familiar with wild fruits, but villagers face serious constraints in obtaining consistent supplies of preferred indigenous varieties. Daily fruit consumption is thus very low, at less than 30 grams per capita—approximately one-seventh the level recommended by the World Health Organization. Vitamin A deficiency from insufficient fruit and vegetable consumption causes blindness and diseases—measles and diarrheal diseases—that kill 17,500 children in Malawi each year, and may increase mother-to-child HIV/AIDS transmission.

Environmental degradation is a highly gendered problem in Malawi, with women and girls serving as the primary fuel providers. Wood scarcity means they must travel farther and spend more time and energy gathering dwindling amounts of this precious commodity. While collecting wood, women and girls are under the threat of rape or sexual abuse, sometimes by guards of private forestlands. This sexual violence has dire consequences, including possible exposure to HIV/AIDS, further undermining health and livelihoods.³

RESPONSE

Agroforestry offers a safe and environmentally sound approach to address rural communities' food and fuel needs. Growing trees increases soil fertility, fuel sources, and the production of nutritious fruits.

The Agroforestry Food Security Project (AFSP) was initiated in 2007 by the World Agroforestry Center (ICRAF) and involved partners from farmer organizations, non-governmental organizations, community-based organizations, and government departments in an effort to promote agroforestry practices (planting of fertilizer trees, fruit trees, fodder trees and fuel-wood trees).

In this partnership to improve food security and livelihoods of Malawian farmers, the Department of Agricultural Extension Services and the Land Resources Conservation Department of the Malawi Ministry of Agriculture and Food Security served as key service-delivery organizations. ICRAF served as coordinator and scientific advisor and provided training, as well as tree seeds and seedlings along with the Forestry Research Institute and Malawi's Ministry of Agriculture. The universities of Malawi and Mzuzu provided additional technical assistance. The National Smallholder Farmers Association also participated in this ambitious program, conducting outreach to its 30,000 members.

During its first 2007-2011 phase, AFSP targeted 11 districts and focused on capacity building in a wide range of institutions to support sustainable and local agroforestry practices in Malawi. Farmers' participation in the project was voluntary, and participation of both men and women was encouraged. This allowed reaching gender parity among farmers involved with the project at village-level. However, a slightly lower participation of women was noted in field-day trainings and demonstrations.⁵

ICRAF conducted consultations with villagers to determine which wild trees should be domesticated. Locally preferred tree species were subsequently distributed, and nurseries were established. The nurseries showcased agroforestry's benefits and ensured future seed propagation, thereby facilitating food and fuel sovereignty. Nitrogen-fixing trees were selected because they were fast-growing, produced high levels of biomass, fixed atmospheric nitrogen, captured large amounts of nutrients, and had an ability to survive under water stress during the off-season. "We decided to go for species which provide multiple benefits," explains Josiah Kahara,

Chairman of the village committee. "Within a few years, we will have poles for our tobacco barns, building timber and sufficient firewood for the whole village." This will save the women lengthy walks to a distant forest reserve, where they are currently allowed to collect firewood just one day a week.

Planting the leguminous tree *Gliricidia sepium* with maize crops can contribute to tripled or even quadrupled maize yields. In one 10-year study, the *Gliricidia* intercrop system produced more than 5 tons per hectare of maize in a good year, and averaged 3.7 tons per hectare. Fields without the "fertilizer tree" averaged at most 1 ton per hectare. The tree can be regularly pruned so the leaf litter and other parts of the tree that fall to the ground are incorporated into the soil, adding important nutrients like nitrogen. Two nitrogen fixing shrubs, *Sesbania sesban* and *Tephrosia vogelii* also show promise. Over two years, the shrubs can provide 100-250 kg of nitrogen per hectare. The World Agroforestry Center estimates that if half-a-million farmers, each with about half an acre, were to buy sufficient chemical fertilizer to add 200 kg of nitrogen to the soil, these external inputs would cost them \$5.8 million a year. In contrast, the trees and shrubs offer a more efficient, environmentally friendly and cost effective alternative that simultaneously provides more food. Also, species like the *Sesbania seban* provide high quality fodder, which allow villagers to raise livestock for dairy production, provide children with a protein source, and earn additional income.



Weeding seedlings in one of the many nurseries set up by a community based organization. © Charlie Pye-Smith, Agroforestry Food Security Programme (AFSP) in Malawi

Finally, fruit trees, which comprise a key program component, provide highly nutritious food rich in vitamins, antioxidants, minerals, and fatty acids. Some of the indigenous fruits domesticated by the program are high in Vitamin A and can help counter the adverse effects of poor diet. They also help feed farmers' families, during the January and February 'hungry months' when granaries are exhausted and people are waiting for the next harvest.

RESULTS⁶

AFSP reached a total of 184,463 households between 2007 and 2011, and distributed over 120 tons of seed and 366,810 fruit seedlings (see table 1).

Table 1: Reach and results of AFSP activities (2007-2011)

	2007/8	2008/9	2009/10	2010/11	Total
Number of farmers reached	42,419	65,522	91,022	37,656	184,463
Number of farmers trained	1,322	17,141	28,622	33,723	80,828
Number of extension staff trained	658	191	255	1,227	2,331
Amount of seeds distributed (tons)	22.3	17.5	9.6	73.4	122.8
Fruit seedlings distributed	27,000	137,000	173,790	29,000	366,810

All AFSP participating households chose to plant fertilizer trees. The seed distribution included a large majority of improved *Tephrosia vogelli* and *Sesbania sesban* (93 percent) and less *Gliricidia sepium* and *Faidherbia albida*. Additionally, 24 percent of farmers chose to plant fruit trees with a preference for papaya (*Carica papaya*), which is simpler to grow and doesn't need grafting. Mango fruit seedlings (*Mangifera indica*) came in second position, as mango is a popular fruit for home consumption and local sale. Finally, a small portion of households planted firewood and fodder trees. If they are left to grow for two seasons or more, fertilizer trees also provide firewood for harvesting, which might explain lower adoption of mere firewood trees.

Agroforestry practices promoted by AFSP increased maize yields, and consequently improved households' food security and nutrition. Training of farmers and extension staff, combined with the development of partnerships among AFSP stakeholders, prioritized organizational capacity building through which the program is fostering longevity. Investing in community nurseries ensures that villagers can produce the desired seedlings instead of relying on collecting wild fruits. Several research stations have been established across the country to produce large quantities of high quality rootstock, which will become available for distribution.⁷ This, in turn, means that community nurseries can graft locally desirable wild plant material. Furthermore, new university curriculums in agroforestry increase chances to sustainably develop agroforestry practices adapted to the country's specific conditions.



Nelson Mkwaila, farmer, has no more trouble feeding his family since he introduced fertilizer trees like *Gliricidia* in his maize and fruit fields. © Charlie Pye-Smith, Agroforestry Food Security Programme (AFSP) in Malawi

“My soil is now very rich and much better at retaining water than it used to be.”

– Mariko Majoni, farmer in the village of Jiya



A Malawian farmer in his farm. © Charlie Pye-Smith, Agroforestry Food Security Programme (AFSP) in Malawi

“I used to be one of the women who went to the estates looking for fuelwood, and many of my friends perished as they were forced to negotiate with their bodies... but for the past three years I haven't had to go there, as I now get enough fuelwood from the trees we've planted.”

–Esnat Grem, farmer

AFSP encountered some implementation difficulties, with a major problem around seed transportation at the beginning of the program. After the first year, transport of seeds and seedlings from the nurseries to the farmers in districts was transferred from ICRAF to agricultural extension services personal, which helped reduce delays in delivery and increased availability of vehicles and personnel for this task. Finally, the project encouraged and trained individual farmers in local tree seed production and marketing to overcome this challenge and provide seeds at village level.

Building on the successes and lessons learned from the program, a second phase was started in 2012 and will be completed by 2015. In this second phase, farmers will be looking at ways to improve the organic matter in the soil in order to retain more water and vital nutrients through a program called Conservation Agriculture with Trees (CAwT). Early evaluations of CAwT have already shown higher and more stable maize yields.⁸

This case study was produced by the Oakland Institute. It is copublished by the Oakland Institute and the Alliance for Food Sovereignty in Africa (AFSA). A full set of case studies can be found at www.oaklandinstitute.org and www.afsafrica.org.

“We immediately saw that this new way of farming with trees was a brilliant idea.”

– Lawrence Zuze, director of Mapanga Community Based Organization

FOR MORE INFORMATION

www.oaklandinstitute.org

www.afsafrica.org

ENDNOTES

- 1 CIA. *The World Fact Book-Malawi*. <https://www.cia.gov/library/publications/the-world-factbook/geos/mi.html> (accessed October 10, 2014).
- 2 Wines, Michael. Malawi is Burning, and Deforestation Erodes Economy.” *New York Times*, November 1, 2005. <http://www.nytimes.com/2005/11/01/international/africa/01malawi.html> (accessed October 10, 2014).
- 3 Pye-Smith, Charlie. *Farming Trees, Banishing Hunger: How an Agroforestry Program is Helping Small-Holders in Malawi to grow more food and improve their livelihoods*. World Agroforestry Center, 2008. <http://www.worldagroforestry.org/downloads/publications/PDFs/B15589.PDF> (accessed October 10, 2014).
- 4 Unless otherwise indicated, all information in “Response” section is from Pye-Smith, Charlie. *Op. Cit.*
- 5 Beedy, T.L. *et al.* “Scaling up Agroforestry to Achieve Food Security and Environmental protection among Smallholder Farmers in Malawi.” *Field Actions Science Reports*. 7 (2012): 1-6.
- 6 Unless otherwise indicated, all information in “Results” section is from Beedy, T.L. *et al.* *Op. Cit.*
- 7 Pye-Smith, Charlie. *Op. Cit.*
- 8 Ndipita, Mark. “Combating climate change effects through agroforestry and evergreen agriculture: World Agroforestry Centre achievements in Malawi.” World Agroforestry Centre (undated). <http://www.bleansa.net/index.php/what-is-new/122-combating-climate-change-effects-through-agroforestry-and-evergreen-agriculture-world-agroforestry-centre-achievements-in-malawi> (accessed October 10, 2014).

FRONT PAGE PHOTO:

A maize field intercropped with Gliricidia, a fertilizer tree. © Charlie Pye-Smith, Agroforestry Food Security Programme (AFSP) in Malawi