



## INTEGRATING LIVESTOCK, AGROFORESTRY, ORGANIC VEGETABLE PRODUCTION, FARMER COOPERATIVES AND EXTENSION IN RWANDA



Location: Kirehe, Buesera, Nyanza, Nyamagabe,  
and Ngororero Districts, Rwanda

*To address food insecurity in Rwanda, NGOs and government bodies are collaborating on the Support Project for the Strategic Transformation of Agriculture Initiative to promote integrated garden-livestock systems to scale-up milk and vegetable production for sale and home consumption.*

### CHALLENGE

Whereas more than 80 percent of the population works in agriculture, rural poverty and food insecurity are widespread in Rwanda. Food insecurity is attributable to a set of complex factors. Farmers, farm laborers, and agro-pastoralists' low purchasing power is exacerbated by declining farm productivity. Rwanda's population density—the highest in Africa at 682 people per km<sup>2</sup> of arable land—has kept farm holdings small and fragmented. Most farms are less than one hectare, consisting of mixed production of rainfed crops, vegetables and livestock.

The 1994 genocide displaced millions of people, leaving 14 percent of the population landless, 54 percent of rural households headed by women, and many others headed by orphans. Many farmers cannot produce enough food to meet family needs.<sup>1</sup> A consequence of the genocide and of the related instability experienced by the country in the 1990s has been the decline in livestock holding. Between 1990 and 2001, cattle stocks declined by 11 percent, goats by 37 percent, and sheep by 66 percent.<sup>2</sup> This decrease has had grave consequences on households' nutrition levels and soil fertility; the former is attributable to less protein availability, the latter to decreased manure. To offset declining yields, farmers increasingly cultivate less fertile areas, such as steep slopes and marshy valleys. Cultivation periods have grown longer and fallow periods shorter. As a result, productivity is waning, and over half of Rwandan farmland is affected by erosion and nutrient losses.<sup>3</sup> Food and nutrition security mandate combating the triple threat of declining productivity, decreased livestock ownership, and limited purchasing power.

### RESPONSE

Throughout Africa, various NGOs and government programs are promoting integrated livestock systems to restore degraded soil fertility, improve local diets, and generate revenue for smallholders. These integrated systems combine livestock, gardening, and fodder production, with proven agroecological and economic benefits.

Fodder species such as *Mucuna* (velvet bean), *Cajanus cajan* (pigeon pea), and *Sesbania magrantha* fix atmospheric nitrogen in soil. When used as mulch to cover the soil, decomposing fodder branches improve soil fertility. In addition to providing much needed nutrients, the mulch also serves as a primary source of soil organic matter, which is crucial to long-term fertility. Mulch improves the soil's physical structure and boosts its ability to retain nutrients and prevent leaching.

Fodder also provides a nutrient-rich protein source for livestock. This, in turn, allows increased production of manure, which too can be used to help maintain soil fertility. Decomposed manure contains humic substances that help aggregate soil particles, improving drainage and helping withstand erosion. Manure application stimulates the biological soil activity that makes nutrients available to plants, and it also prevents the accumulation of soil borne pathogens.

Small livestock, such as goats, fed with fodder grown on farmers' land parcels also serve as an economic buffer as they reproduce quickly and can be easily transported, milked, sold, or slaughtered.<sup>4</sup>

The *Support Project for the Strategic Transformation of Agriculture* (PAPSTA) is a seven-year, \$20 million, initiative funded by the International Fund for Agricultural Development and the UK Department for International Development. Since 2006, it has focused on improving existing farming practices in Rwanda, emphasizing livestock production for food—milk and meat—and manure to sustain organic farming in kitchen gardens and small plots. Under integrated livestock systems, basic vegetable and milk needs can be met on small landholdings, and surpluses are sold on the local market. The project involves two NGOs—Heifer Project International and Send a Cow Rwanda (SACR)—and one government agency, the Rwanda Animal Resources Development Agency (RARDA), in six watersheds of the Kirehe, Buesera, Nyanza, Nyamagabe, and Ngororero districts. The NGOs are responsible for monitoring general animal husbandry—management, nutrition, forage, farmer organizations—while RARDA provides veterinary and animal health support—disease monitoring, vaccination, deworming, and breeding.

The project donates a pregnant heifer or three goats to a farmer selected by a watershed committee made up of local authorities and farmer representatives. The farmer has then to share the first female offspring with another farmer. For six months prior to receiving the heifer or goat, recipients are trained in compost production, organic gardening, and the cultivation of leguminous fodder species. Some participating rice farmers use manure and compost in conjunction with the System of Rice Intensification (SRI). Training takes place at the Goka Organic Farming Training Centre in the Kicukiro District, located near the capital, Kigali.

PAPSTA also assists the Rwandan Ministry of Agriculture and Animal Resources to build the capacity of its extension workers and strengthen communication infrastructure, enabling farmers to receive timely information on market prices and production techniques. The initiative also supports farmers' cooperatives so that producers can market milk and produce collectively. The project's primary target population is smallholder farmers, particularly women-headed households. At selected sites, the program also prioritizes empowering young, landless people, and orphans affected by HIV/AIDS and civil war.

Farmer adoption of agroforestry techniques that improve soil fertility and provide livestock fodder has surpassed anticipated results, spreading beyond the project's six target zones.



Farmers plant trees to prevent erosion. © IFDC Photography

The value of the cooperatives cannot be overstated: they enable farmers to pool resources for transportation costs and to access markets.

#### 5 Principles of agroecology applied in the project

1. Conservation of soil, water, and other environmental resources
2. Sustainable health of soil, plants, animals, and humans
3. Working with natural systems
4. Sustainable management of soil fertility
5. Proper management of available renewable energy sources.



Woman serving milk at milk bar in Rwamagana. © eadairy

## RESULTS

- In 2007 and 2008, 2,729 farmers (47 percent were women) were trained in organic vegetable production and livestock husbandry in the six watersheds. A subsequent 2009 impact study revealed that the vast majority continued to practice compost making, manure collection, mulching, natural pesticide use, and urine collection (as a fertilizer) following training.<sup>5</sup> Farmers throughout the project zone have planted small kitchen gardens where large amounts of vegetables are produced using livestock manure. Farmers working with SACR have reported five-fold yield increases. Rice farmers applying manure to enhance SRI have reported two-fold yield increases, from 4 to 8 tons per hectare.
- Farmer adoption of agroforestry techniques that improve soil fertility and provide livestock fodder has surpassed anticipated results, spreading beyond the project's six target zones. By 2008, nearly 10,000 hectares of degraded land were rehabilitated, 15 times more land than expected in the program's original plan. Six thousand hectares of erosion-preventing hedgerows were planted. Participating farmers produced 6.7 million agroforestry plants.<sup>6</sup>
- In the six watersheds, NGOs initially provided vulnerable households with 400 cows, 400 sheep, 1,245 goats, and 69 pigs. By 2008, the 400 cows had given birth to 185 heifers, which began producing milk in 2009. That year, a new corral was constructed, facilitating additional training in sustainable farming techniques; 900 additional households also received livestock.<sup>7</sup>
- While 75 percent of farmers report milk yields ranging from 1 to 10 liters per day, 25 percent reported yields over ten liters, with some cows producing as much as 24 liters per day. Milk significantly bolsters household nutrition: one cup (244 g) of cow milk per day meets roughly ten percent of an adult's minimum daily caloric needs, and 20 and 25 percent of protein and fat requirements, respectively.
- Cooperative marketing permits an increase in milk revenue, with some farmers earning up to 200 Rwandan Francs





Dairy farmers. © eadairy

(FRW)—approximately \$0.29—per liter in the dry season for surpluses they sell to restaurants and local markets. This is 33 percent higher than the going rate of 150 FRW (\$0.22). In 2009, 1,000 liters of milk were sold daily. Vegetables sold through the cooperative have generated a 42 percent increase in revenue.

- The value of the cooperatives cannot be overstated: they enable farmers to pool resources for transportation costs and to access markets. In Mugunga, COOPAEMU, a cooperative with 112 members, helped farmers maintain purchase and sale records. It also established a veterinary pharmacy to provide animal medication and nutritional supplements and organized milk transportation to Kigali. Many farmers have grouped into savings and credit associations that provide micro-loans and organize funding pools that enable groups to cooperatively rent or purchase land or restaurant space in town.
- Agricultural extension provides farmers in the PAPSTA zones with vital information on organic farming techniques, livestock husbandry, and agroforestry; it also offers capacity-building trainings in financial management, cooperative organization, and conflict resolution. Exchanges between government agricultural research stations and farmers from the different watersheds have facilitated

shared learning on low input farming techniques and fostered innovation. In Kirehe, a weekly agricultural extension radio program broadcast on a community radio station features farmers, extension workers, and local government officials, who provide vital information on farming techniques, share personal experiences with agroforestry, livestock integration, and organic farming, and offer price and marketing information.

- The PAPSTA program illustrates the vast benefits of integrating livestock and agroforestry into farming systems—everything from increasing household nutritional intake and surplus sales revenue to producing manure for soil fertility restoration and erosion prevention with hedgerows. Because these techniques are low-input, they are particularly attractive to the most vulnerable populations, including those with the least purchasing power, land, and education level, such as women and orphans. The program also addresses the importance of developing institutional support and infrastructure for successful marketing and farmer education. Cooperatives and extension programs are essential to scaling up programs' ability to improve food security. The PAPSTA model of agroecological development is applicable to much of sub-Saharan Africa but needs broad infrastructural support to reach millions of vulnerable people.

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](http://www.oaklandinstitute.org) and [www.afsafrica.org](http://www.afsafrica.org).

#### FOR MORE INFORMATION

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[www.afsafrica.org](http://www.afsafrica.org)

## ENDNOTES

- 1 Vinck, P. Rwanda. *Comprehensive Food Security and Vulnerability Analysis (CFSVA)*. World Food Programme/National Institute of Statistics of Rwanda, 2006. <http://www.rwandapedia.rw/archive/girinka> (accessed November 10, 2014).
- 2 *Ibid.*
- 3 Clay, Daniel *et al.* *Promoting Food Security in Rwanda Through Sustainable Agricultural Productivity: Meeting the Challenges of Population Pressure, Land Degradation, and Poverty*. MSU International Development Paper n°17, Michigan State University, 1995. <http://ageconsearch.umn.edu/bitstream/54054/2/idp17.pdf> (accessed November 10, 2010); Clay, Daniel, Reardon, Thomas and Jaakko Kangasniemi. "Sustainable Intensification in the Highland Tropics: Rwandan Farmers' Investments in Land Conservation and Soil Fertility." *Economic Development and Cultural Change* 46 (1998): 351-377.
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- 5 Alford R., Taylor, S. and K. Uganda. *Going Organic: Supporting African Farmers to Feed Themselves*. Send a Cow, 2009. [http://www.sendacow.org.uk/assets/files/Related-downloads/Foundation\\_Series\\_Organic.pdf](http://www.sendacow.org.uk/assets/files/Related-downloads/Foundation_Series_Organic.pdf) (accessed October 12, 2014).
- 6 *Ibid.*
- 7 Ndabikunze, M.S. and R. Venuste. *Evaluation of the Performance of Service Providers for the Project d'Appui au Plan Stratégique pour la Transformation de l'Agriculture, PAPSTA, Final Report*. Republic of Rwanda, Ministry of Agriculture and Animal Resources, 2008.

## FRONT PAGE PHOTO:

Man milking cow. © eadairy