



PROTECTING BIODIVERSITY AND TRADITIONAL AGRO-SYSTEMS IN ETHIOPIA



Location: Gamo Highlands, Southern Ethiopia

In the Gamo Highlands, traditional enset-based agriculture has been practiced for centuries, allowing farmers to cope with variable environments and making the region uniquely resistant to food insecurity. Rooted in biodiversity, Gamo Highlands' traditional agro-system is a model of sustainability and resilience.

CHALLENGE

With altitudes up to 4,000 m, the African Rift Valley is home to some of the planet's oldest agricultural systems. Southern Ethiopia's Rift Valley highlands have a relatively high annual rainfall and support one of Africa's densest groups of rural subsistence populations. The heterogeneous mountain landscape and 10,000 years of cultivation have resulted in a diversified agro ecosystem that incorporates annual and perennial cropping, agroforestry, and livestock. Agriculture revolves around enset (*Ensete ventricosum*), a perennial tree crop that serves as a staple food for seven to ten million people. Crop species evolution has occurred through millennia of natural and human selection pressures, isolation, migration, and farmer exchange. The resulting mosaic landscape of fields, homesteads, pastures, and forests is maintained by intricate traditional management systems, which sustain soil nutrient cycles from generation to generation.

The landraces are genetically diverse and adaptable, allowing farmers to cope with variable environments and making the region uniquely resistant to the food shortages and famines that devastate much of the country,¹ including nearby lowland regions.² At the same time, population growth and cultural and political pressures have posed significant threats to food security and indigenous traditions.

A MODEL OF SUSTAINABLE AGRICULTURE

Agricultural Biodiversity

- Crop diversity is important for human nutrition, fodder, construction, cultural uses, and agroecological benefits. The traditional Gamo homestead is ringed by the household's enset plantation, a mixture of tree, vegetable, root crops and agroforestry trees. Beyond this ring are crop fields, parts of which are left fallow and used as private grazing land. More than 50 crop species are present on farms in the region. Lowland crops, such as coffee, sugar cane, cassava, sweet potato, and yam extend to elevations of 2,400 m or more. Mid-altitude crops such as taro, squash, wheat, peppers, and beans are present in all but the highest communities (above 2,800 m), where enset, barley, cabbage, potato, and dere dono (*Plechtranthus edulis*) dominate the system. Within these broad zones, farmers also make crop diversity decisions based on slope, soil type, and other microclimatic factors. Crop species diversity declines with increasing elevation at both farm and community levels. Communities at low and mid elevations cultivate up to 41 crop species, averaging 19 species per farm, while communities at the highest elevations cultivate fewer than 20, averaging 9.6 species per farm.³ A number of wild species are also tolerated or encouraged on fallow fields and intercropped with cultivated species.

- Enset (*Ensete ventricosum*), the highlands' primary staple food, is a perennial crop in the *Musaceae*, or banana family. Wild enset is found throughout Asia and Africa, but domestication is unique to Ethiopia, where it is a staple for seven to ten million people.⁴ More than 100 varieties of enset have been recorded in Ethiopia, and up to 60 varieties are found in each community, with an average of 6 to 15 varieties per farm, depending on elevation.⁵ Farmers grow many varieties of enset because each plant has a unique purpose and maturation time varies from 3 to 7 years.
- More than 40 barley varieties are cultivated in the region, and the crop's diversity helps maximize field and soil productivity, while serving as an important food source.
- All families own livestock. Cattle are used for traction, manure production (particularly from sheep), dairy and meat, reducing household labor and contributing to nutrition. Animals are also a source of cash income in case of emergency. Horses, mules, and donkeys are used to transport compost to fields and goods to markets. Soil fertility is however the primary function of livestock, especially for enset, barley, and wheat production. Livestock are grazed on communally protected ridge tops and river valleys, as well as on fallow fields, private pastures, and homestead areas. During dry seasons, most families also stall-feed livestock, using enset leaves, crop residue, forage plants, and cultivated fodder grasses. Livestock are thus used to gather up mobile nutrients from across the landscape and deliver them to enset groves.

Diversity and Food Security

- Agro ecosystem diversity provides the region with stability and productivity increases, including reduced likelihood of crop failure from disease, pests, or environmental conditions and increased capacity to fully exploit limited space. This in turn helps to ensure regular food availability and nutritionally diverse diets.
- The ability to cultivate diverse crops enables Gamo farmers to produce sufficient food for households consisting of five to ten people on well under one hectare of land. Approximately 70-80 percent of food consumed by small to average homesteads in the region is grown on farm, and nearly all of the cash generated by Gamo households (approximately 1,000 birr or \$100 annually) is garnered through the sale of crops, livestock, or livestock products.⁶
- Most farmers fully utilize Gamo's steep elevation gradient to increase growing options and manage risk by trading and cultivating multiple fields. Crops can be reduced or expanded in one or more agro ecological zones, and labor patterns or resource allocation may be shifted between elevation zones. All farmers living above 2,800 m report purchasing crops from lower elevation markets, especially maize and sweet potatoes; farmers at lower elevations report obtaining enset or barley products from farmers at higher



Rainbow over fields in the Gamo Highlands. © Leah Samberg

The traditional Gamo homestead is ringed by the household's enset plantation, a mixture of tree, vegetable, root crops and agroforestry trees.



Woman harvesting. © Leah Samberg

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elevations. This exchange system serves as a safety net, enabling farmers from any elevation to access crops they cannot produce themselves.

Seed Systems

- Farmers actively exchange seeds through social networks and local market systems. Research has found that 83 percent of farmers acquired new seeds for their different cereals, vegetables, and root crops from markets scattered through the highlands. However, obtaining seed is time consuming—farming families travel to an average of four and as many as eight markets each week, often walking several hours in each direction.
- Seed exchange is more conservative for staples like enset and barley. Most enset seed is passed between family members at the initial establishment of the farm. Farmers do, however, cultivate wild enset strains from remaining—and often sacred—forests.

Landscape and Natural Resource Management

- Both “natural” and cultivated trees are an integral part of the Gamo landscape. More than 150 tree and shrub species were observed on farms, with farmers reporting an average of a dozen on their land and some listing more than 20. Trees are managed in four main ways: planted closely around the homestead for specific uses; planted on and around fields for fertility and soil maintenance; planted and maintained in communal and private plantations; and preserved in protected native forests.
- Land use in the Gamo Highlands is defined by an intricate and well-enforced natural resource management system that dictates use, conservation, and preservation of pasture, forest, soil, and water resources. Traditionally appointed community members oversee resource management, and mismanagement is punishable by the community.

THREATS TO THE GAMO AGRICULTURAL SYSTEM

Population Growth

- Farmers identify population growth as the most serious threat to the agricultural system, which results in shrinking farm sizes, decreased fallow periods, and declining grazing.
- Population comparisons of the 1994⁷ and 2007⁸ Gamo censuses indicate a population increase of as much as 25 percent across five districts.
- Land redistribution efforts during the 1970s Derg regime broke down traditional landholding arrangements, allocating plots of land to individual families.⁹ This process has led to a rapid decrease in farm size: 87 percent of rural households operate less than two hectares.¹⁰



Meskal Fire Kalona, young boy in the Gamo Highlands.
© Leah Samberg

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Fields in the high Zute community site. © Leah Samberg

- An increasingly limited availability of land produces harmful consequences. Forty percent of farmers report decreased livestock ownership over the past 20 years due to pasture shortages; 46 percent report decreases in crop productivity over that time from continuous field cultivation and/or lack of manure; and 20 percent report abandoning specific crops entirely due to land or manure shortage.

Cultural and Political Pressures

- The Derg regime executed massive national relocation and collectivization programs. Communities were divided into peasant associations under the administration of a governmental official, which decreased the weight of traditional authority structures and institutions.
- During the last decade, government interventions have involved food-for-work programs: community members work on government-mandated soil and water conservation projects in return for aid packages. However, the conservation measures implemented are often generic country-wide “solutions”—e.g. terrace designs that can increase soil erosion on steep slopes—that are not appropriate for the southern highlands. Farmers may be required to participate, often for two or more days each week. This has led to the breakdown of many traditional communal labor institutions and communal maintenance of soils, as farmers need all remaining time to maintain their own farms. National initiatives such as the Productive Safety Net Program have not significantly increased regional food security.¹¹ The country has adopted an Agricultural Development-Led Industrialization (ADLI) strategy, which outlines a move away from traditional subsistence agriculture toward specialization and market-based agricultural production. Related government sponsored programs, including the Other Food Security Program, favor the use of chemical fertilizer by farmers.
- In the last decade, both Protestant and Ethiopian Orthodox churches have worked to effect cultural change and dismantle traditional institutional structures. In many

cases, this involves building churches on sacred areas, which double as communal grazing lands, or cutting down old and highly valued trees. Traditional agricultural communal labor institutions have also broken down as farmers are instead pressured to work in church-based groups. Churches also oppose traditional practices through which community members become “guardians” for natural resources, ensuring proper management of water, forests and pasture through traditional customs, and institutions. Such pressures have the power to disrupt century-old institutions that have evolved to manage this complex agro ecosystem.

RESILIENCY

Despite multiple threats and challenges, the Gamo Highlands have continued to sustain a high population density, without a breakdown in food supplies or ecosystems. This resilience can be attributed to a functioning, highly diverse agricultural system and adequate social and resource governance. Gamo is a sharp contrast to the adjacent plateau of Wolaita, which is predominated by destructive monocropping, annual food shortages and declining soil fertility.

The Christensen Fund and the Culture and Art Society of Ethiopia (CASE) helped establish locally based community associations in many Gamo communities to promote traditional cultural, ecological, and agricultural knowledge at a grassroots level.

There are numerous models to draw from in the design and implementation of such initiatives, including farmer payments for *in-situ* conservation of crop diversity; programs to improve and expand local markets for indigenous crop species; increasing farmer access to markets, including higher-value urban markets; farmer exchanges, field days, and seed fairs; and government extension strategies to simultaneously incorporate new or improved crops with traditional ones.¹²

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ENDNOTES

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View of Chosa village. © Leah Samberg