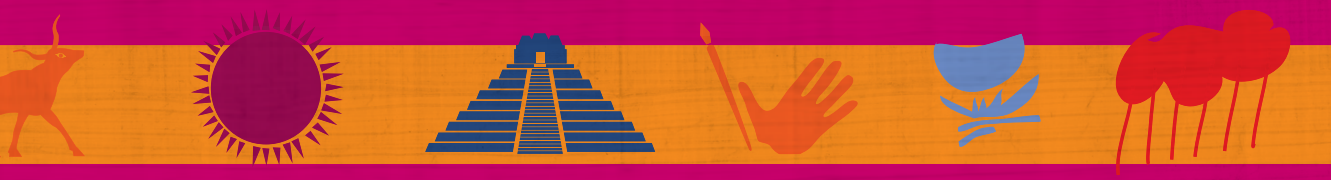
Globally Important Agricultural Heritage Systems

A Legacy for the Future

Parviz Koohafkan and Miguel A. Altieri



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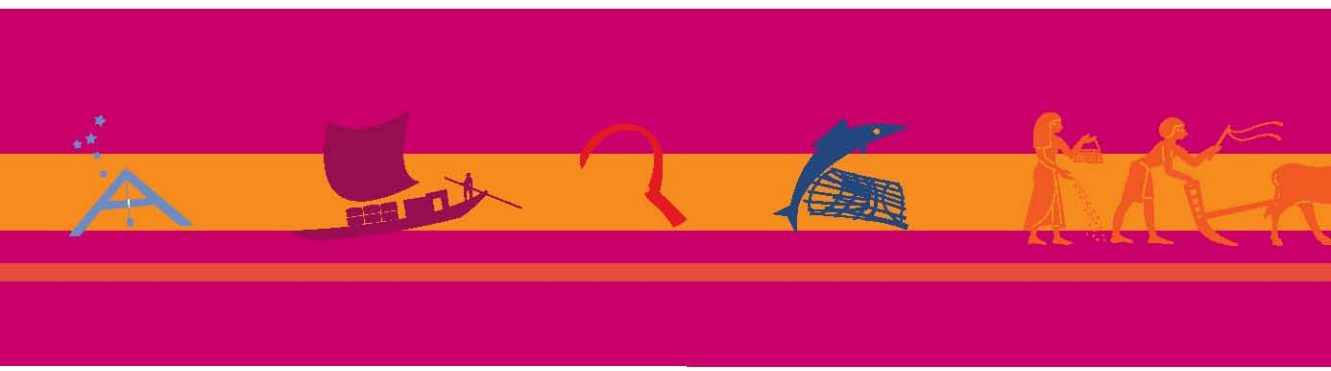

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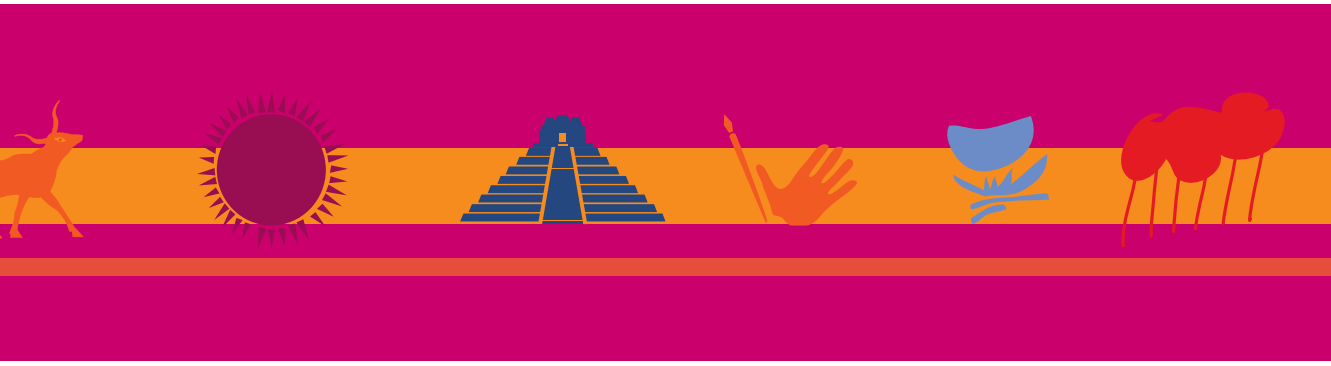

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Contents



Introduction

GIAHS are defined as
"Remarkable land use systems and landscapes which are rich in globally significant biological diversity evolving from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development"
(FAO 2002)

For millennia communities of farmers, herders, fishers and forest people have developed complex, diverse, and locally adapted agricultural systems. These systems have been managed with time-tested, ingenious combinations of techniques and practices that have usually led to community food security, and the conservation of natural resources and biodiversity. Agricultural heritage systems can still be found throughout the world covering about 5 million hectares, which provide a vital combination of social, cultural, ecological and economical services to humankind. These "Globally Important Agricultural Heritage Systems-GIAHS" have resulted not only in outstanding landscapes of aesthetic beauty, maintenance of globally significant agricultural biodiversity, resilient ecosystems and a valuable cultural heritage. Above all, these systems sustainably provide multiple goods and services, food and livelihood security for millions of poor and small farmers.

The existence of numerous GIAHS around the world testifies to the inventiveness and ingenuity of people in their use and management of finite resources, biodiversity, ecosystem dynamics, and ingenious use of physical attributes of the landscape, codified in traditional but evolving knowledge, practices and technologies. Whether recognized or not by the scientific community, these ancestral agricultural systems constitute the foundation for contemporary and future agricultural innovations and technologies. Their cultural, ecological and agricultural diversity is still evident in many parts of the world, maintained as unique systems of agriculture. Through a remarkable process of co-evolution of Humankind and Nature, GIAHS have emerged over centuries of cultural and biological interactions and synergies, representing the accumulated experiences of rural peoples.

Agricultural Heritage Systems

GIAHS are selected based on their importance for the provision of local food security, high levels of agro-biodiversity and associated biological diversity, store of indigenous knowledge and ingenuity of management systems. The biophysical, economic and socio-cultural resources have evolved under specific ecological and socio-cultural constraints to create outstanding landscapes. The examples of such agricultural heritage systems are in the hundreds and are home to thousands of ethnic groups, indigenous communities and local populations with a myriad of cultures, languages and social organizations. Examples of GIAHS could fall into:

1. **Mountain rice terrace agroecosystems.** These are outstanding mountain rice terrace systems with integrated forest use and/or combined agro-forestry systems, such as: the agroforestry vanilla system in Pays Betsileo, Betafo and Mananara regions in Madagascar; the Ifugao rice terraces in the Philippines; and many more. These systems also include diverse agricultural features and other elements: for example, integrated rice-based systems (e.g. rice-fish culture, rice-fish-duck, rice-fish-taro) with numerous rice and fish varieties/genotypes; and integrated forest, land and water use systems, especially found in East Asia and the Himalayas.

2. **Multiple cropping/polyculture farming systems.** These are remarkable combinations and/or plantings of numerous crop varieties with or without integration of agroforestry. They are characterized by ingenious micro-climate regulation, soil and water management schemes, and adaptive use of crops to deal with climate variability. These practices are heavily dependent on their rich resources of indigenous knowledge and associated cultural heritage e.g. *maize and root crop-based agroecosystems* developed by the Aztecs (Chinampas in Mexico); *waru-waru* systems or *suka collos* in and around Lake Titicaca in Peru and Bolivia (Incas in the Andes region).

3. **Understory farming systems.** These are agricultural systems using combined or integrated forestry, orchard or other crop systems with both overstory canopy and understory environments. Farmers use understory crops to provide earlier

returns, diversify crops/products and/or make efficient use of land and labor. These practices are common in the tropics, e.g. in taro-based or root cropping systems, planted along with other endemic plant varieties from local genetic resources. These are common in Papua New Guinea, Vanuatu, Solomon Islands and other Pacific small island developing countries.

4. **Nomadic and semi-nomadic pastoral systems.** These are the rangeland/pastoral systems based on adaptive use of pasture, rangeland, water, salt and forest resources, through mobility and variations in herd composition in harsh non-equilibrium environments with high animal genetic diversity and outstanding cultural landscapes. These include highland, tropical and sub-tropical dryland and arctic systems such as Yak-based pastoral management in Ladakh and the high Tibetan plateau in India and China; highly extensive rangeland use in parts of Mongolia and Yemen; cattle and mixed animal based nomadic pastoral systems, such as of the Maasai in East Africa; reindeer-based management of tundra of the Saami and Nenets in the temperate forest areas of Scandinavia and Siberia. The landscapes formed by these systems often provide habitats for wild species including endangered species.

5. **Ancient irrigation, soil and water management systems.** These are the ingenious and finely tuned irrigation, soil and water management systems most common in drylands, with a high diversity of crops and animals best adapted to such environments: (i) the Qanat ancient underground water distribution systems allow specialized and diverse cropping systems in Iran, Afghanistan and other central Asian countries with associated home gardens and endemic blind fish species living in underground waterways; (ii) the oases of the Maghreb in the deserts of North Africa and the Sahara; (iii) traditional valley bottom and wetland management such as the water management systems in Lake Chad, the Niger river basin and interior delta e.g. floating and flooded rice systems; and (iv) other ingenious irrigation systems in Bamileke region, Cameroon; of Dogon tribes in Mali and Diola tribes in Senegal; as well as the village tank system in Sri Lanka and India.

6. **Complex multi-layered home gardens.** These agricultural systems feature complex multi-layered home gardens with wild and domesticated trees, shrubs and plants for multiple foods, medicines, ornamentals and other materials, possibly with integrated agro-forestry, swidden fields, hunting-

gathering or livestock, such as the home garden systems in China, India, the Caribbean, the Amazon (Kayapó) and Indonesia (e.g. East Kalimantan and Butitingui).

7. **Below sea level systems.** These agricultural systems feature soil and water management techniques for creating arable land through draining delta swamps. The systems function in a context of rising sea and river levels while continuously raising land levels, thereby providing a multifunctional use of land (for agriculture, recreation and tourism, nature conservation, culture conservation and urbanization) e.g. Polder or dyke systems in the Netherlands; Kuttanad wetlands in Kerala, India; floating gardens in Bangladesh and South Asia.

8. **Tribal agricultural heritage systems.** These systems feature various tribal agricultural practices and techniques of managing soil, water and crop cultivars in sloping lands from upper to lower valleys using mixed and/or a combination of cropping systems and integrating indigenous knowledge systems e.g. Seethampheta in Andhra Pradesh, the Apatani rice fish culture, the Zabo system, the Darjeeling system in the Himalayas, and many other systems in India.

9. **High-value crop and spice systems.** These systems feature management practices of ancient fields and high value crops and spices, devoted uniquely to specific crops or with crop rotation techniques and harvesting techniques that require acquired handling skills and extraordinary finesse e.g. Saffron systems in Iran, Afghanistan and Kashmir, India.

10. **Hunting-gathering systems.** These systems feature unique agricultural practices such as harvesting of wild rice in Chad and honey gathering by forest dwelling peoples in Central and East Africa.

There are numerous other agricultural heritage systems around the world meriting identification, assessment and dynamic conservation. One of the main tasks of the GIAHS partnership initiative is this work in collaboration with local communities, national governments and other national and international institutions.

Custodians of Our Agricultural Heritage

Many of these remarkable agricultural systems and associated landscapes, too heterogeneous for intensive agriculture, are managed by an estimated 1.4 billion people, mostly family farmers, peasants and indigenous communities. They harbor ancestral and local varieties of plant species and animal races through their own knowledge systems and with little access to external inputs, capital, or modern agricultural technologies. They produce between 30-50% of the domestic food consumed in the developing world, thereby contributing substantially to food security at local, national and regional levels.

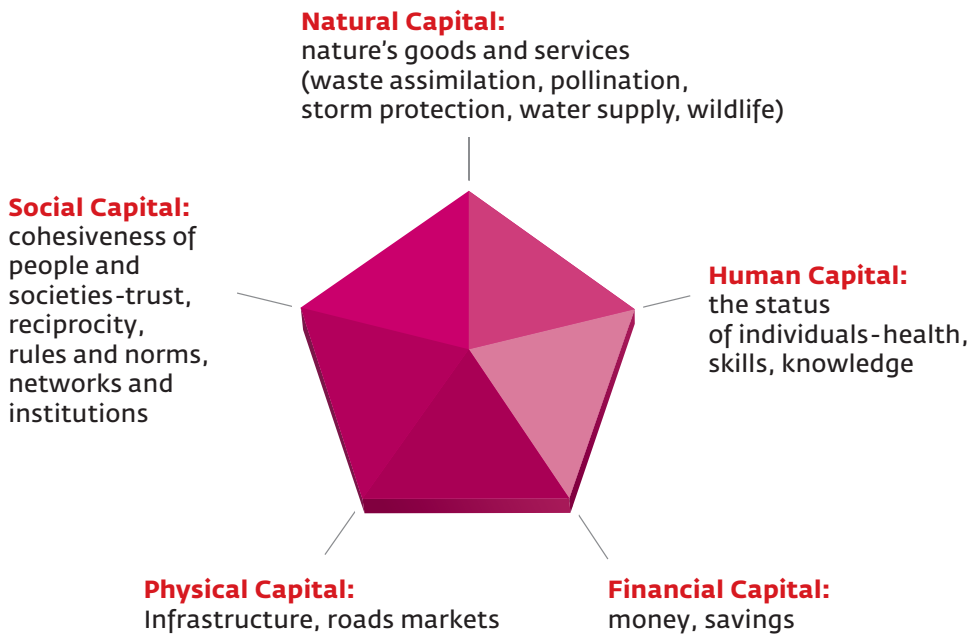
Despite the fact that market penetration, migration, population growth, political reform, introduction of new technology and other factors have accelerated the pace of change in rural areas, many of these traditional systems have stood the test of time testifying to successful and resilient indigenous agricultural strategies, representing models of sustainability. They promote biodiversity, thrive without agrochemicals, and sustain year-round yields in the midst of socioeconomic upheavals and environmental variability. In fact, many scientists acknowledge that traditional agro-ecosystems have the potential to provide solutions to the unforeseeable changes and transformations facing humanity in an era of climate change, energy and financial crisis.

However, GIAHS are rapidly shrinking, victims to modernization and unsustainable technological and economic changes. Challenges and issues such as the lack of promotion of diversified and environmentally friendly farming and integrated management practices, as well as the neglect of research and development and rural services for the indigenous and ingenious agricultural systems, threatens the foundation of agricultural "culture" and associated biodiversity. Other challenges and threats that need to be addressed include erosion of rural values closely linked with out-migration and loss of youth, overexploitation of resources and declining productivity, and imports of exotic domesticated cultivars leading to severe genetic erosion and loss of local knowledge systems. In some areas, there are spillover effects from marginalization and increasing poverty in productive landscapes onto wild biodiversity. The penetration of global commodity driven markets often creates situations in which local producers or communities in GIAHS have to compete with agricultural produce from intensive and often subsidized

agriculture in other areas of the world. All of these threats and issues contribute to the risk of loss of unique and globally significant agricultural biodiversity and associated knowledge, land degradation, poverty, and thereby threats to the livelihood security and food sovereignty of many rural and traditional farming communities.

As poverty alleviation and food security remain elusive for nearly a billion of the world's population, and with climate change threatening major disruptions with particularly strong effects on the poorest and most marginalized, it is clear humanity will need new models of agriculture in the immediate future that should include forms of farming that are more *biodiverse, local, resilient, sustainable* and *socially just*. Inevitably, modern farming will have to be rooted in the ecological rationale of traditional farming systems since the future of the world's population will undoubtedly depend on key components of biodiversity and ecosystem services that are still found in these cradles of agricultural diversity. Promising pathways shaped on traditional farming systems can help in increasing on-farm food production and improving rural livelihoods thus substantially contributing to the Millennium Development Goals of combating hunger and poverty. This is is at the heart of the global development agenda.

Figure 1. Five Assets of Rural Systems (livelihoods, communities, economies)



A Global Partnership Initiative

In response to the global trends that undermine family agriculture and traditional agricultural systems, in 2002, during the World Summit on Sustainable Development (WSSD, Johannesburg, South Africa), the Food and Agriculture Organization (FAO) of the United Nations launched a Global Partnership Initiative on conservation and adaptive management of "Globally Important Agricultural Heritage Systems".

The overall goal of the partnership is to identify and safeguard Globally Important Agricultural Heritage Systems and their associated landscapes, agricultural biodiversity and knowledge systems through catalyzing and establishing a long-term programme to support such systems and enhance global, national and local benefits derived through their dynamic conservation, sustainable management and enhanced viability.

To achieve this goal, the main objectives are to:

1) Leverage global and national recognition of the importance of agricultural heritage systems and institutional support for their safeguard:

- global recognition through the creation of the Agricultural Heritage Systems category with support of governments, FAO governing bodies, UNESCO, World Heritage Centre and other partners;
- national recognition, awareness and improved understanding of threats that such agricultural systems face, of their global importance and of the benefits that they provide at all levels.

2) Capacity building of local farming communities and local and national institutions to conserve and manage GIAHS, generate income and add economic value to goods and services of such systems in a sustainable fashion:

- identify ways to mitigate risks of erosion of biodiversity and traditional knowledge, land

degradation and threats posed by globalization processes, and skewed policies and incentives;

- strengthen conservation and sustainable use of biodiversity and natural resources, reducing vulnerability to climate change, enhancing sustainable agriculture and rural development and as a result contributing to food security and poverty alleviation;
- enhancing the benefits derived by local populations from conservation and sustainable use of their resources and their ingenious systems and rewarding them through payment for Environmental Services, Eco-labeling, Eco-tourism and other incentive mechanisms and market opportunities.

3) Promote enabling policies, regulatory and incentive environments to support the conservation, evolutionary adaptation and viability of GIAHS:

- assessment of existing policies and incentive mechanisms and identification of modalities to provide support for sustainable agricultural practices;
- promotion of national and international processes leading to improved policies and incentive mechanisms.

A major outcome of the GIAHS initiative is the contribution to the implementation of the Convention on Biological Diversity (CBD) Article 10c: "protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements", specifically within agricultural systems; and Article 8j: "respect, preserve and maintain knowledge, innovations and practices of indigenous communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity".

Remarkable characteristics of GIAHS

By fostering an ongoing, dynamic conservation of selected agricultural systems and sites that display unique agricultural landscapes around the world, a process will emerge which offers tangible global services, while providing important support to rural communities through enhancing food security, conservation and sustainable use of biodiversity, and maintenance of cultural identity. The unique traditional farming systems prevalent at the GIAHS sites represent systems that simultaneously exhibit remarkable features of global and local significance:

1 **HIGH LEVELS OF BIODIVERSITY THAT PLAY KEY ROLES IN REGULATING ECOSYSTEM FUNCTIONING AND ALSO IN PROVIDING ECOSYSTEM SERVICES OF LOCAL AND GLOBAL SIGNIFICANCE.**

GIAHS systems often reflect rich and globally unique agricultural biodiversity displayed at the field and also at the landscape level forming the basis for food production systems. A salient feature of GIAHS is their high degree of plant diversity in the form of rotations, polycultures and/or agroforestry patterns.

This strategy of minimizing risk by planting several species and varieties of crops stabilizes yields over the long term, promotes diet diversity and maximizes returns even with low levels of technology and limited resources. Genetic diversity provides security to farmers against diseases, pests, droughts and other stresses.

It also improves stability of the cropping systems, enables farmers to exploit different soil types and microclimates and derive multiple nutritional benefits and other uses from genetic variation among the species. At the landscape scale, diversification occurs by integrating multiple production systems.

2 **AGROECOSYSTEMS NURTURED BY TRADITIONAL KNOWLEDGE SYSTEMS AND FARMERS' INNOVATIONS AND TECHNOLOGIES.**

Indigenous peoples living in GIAHS sites often possess a broad knowledge base of the intricacies of local and complex ecological systems. This knowledge about plants,

animals, soils and the general environment has accumulated through a long series of observations transmitted from generation to generation. Indigenous farmers are aware that biological diversity is a crucial factor in generating ecological services, and in the conservation of the resource base and foods on which they depend. Women, in particular, are holders of much more traditional knowledge and thus play a critical role in the conservation and utilization of biodiversity.

3 INGENIOUS SYSTEMS AND TECHNOLOGIES OF BIODIVERSITY, LAND AND WATER RESOURCE MANAGEMENT AND CONSERVATION THAT CAN BE USED TO IMPROVE MANAGEMENT OF MODERN AGROECOSYSTEMS.

By studying traditional systems, scientists can learn more about the dynamics of complex systems, especially about the links between agricultural biodiversity and ecosystem function and thereby contribute to the enrichment of the ecological theory and derive principles for practical application in the design of modern sustainable farming systems.

For example, in deciphering how intercropping practice works, farmers can take advantage of the ability of cropping systems to reuse their own stored nutrients. This information can be gleaned to improve the ways in which farmers can manage soil fertility. Similarly, there could be much progress in pest management schemes if the biological mechanisms within the complex structure of traditional agroecosystems can be determined, and thus minimize crop losses due to insect pests, diseases and weeds.

4 DIVERSIFIED AGRICULTURAL SYSTEMS THAT CONTRIBUTE TO LOCAL AND NATIONAL FOOD AND LIVELIHOOD SECURITY.

Most small farming systems are productive, efficient and sustainable compared to larger farms despite their low use of chemical inputs. As the only resource-base available for small farmers is their natural resources and their human capital, they do all they can to maintain it. Therefore they diversify their genetic resources, they diversify their production systems and their sources of income, and all this builds resilience.

This contributes to food production, but also to environmental health, to the sustainability of the natural resource-base and thus to the sustainability of livelihoods. Small farms which produce grains, fruits, vegetables, fodder, and animal products in the same field are more productive than large farms if the total output is considered rather than yield from a single crop.

The yield advantages of diversified farming systems can range from 20 percent to 60 percent higher than monocultures. Polycultures usually reduce losses due to weeds,

insects, and diseases and make more efficient use of the available resources of water, light, and nutrients. Furthermore, traditional multiple cropping systems provide as much as 20 percent to 40 percent of the world's food supply.

5 FARMING SYSTEMS THAT EXHIBIT RESILIENCY AND ROBUSTNESS TO COPE WITH DISTURBANCE AND CHANGE (HUMAN AND CLIMATIC-ENVIRONMENTAL) MINIMIZING RISK IN THE MIDST OF VARIABILITY.

Many GIAHS farmers cope and even prepare for climate change, minimizing crop failure through increased use of drought-tolerant local varieties, water harvesting, extensive planting, mixed cropping, agroforestry, wild plant gathering and a series of other traditional farming system techniques. Observations of agricultural performance after extreme climatic events in the last two decades have revealed that resiliency to climate disasters is closely linked to levels of farm biodiversity.

Many indigenous management practices that buffer agroecosystems from climate variation include incorporation of wild and local varieties into the agricultural system and increasing the temporal and spatial diversity of crops both at the field and landscape level. This points out the need to re-evaluate indigenous technology as a key source of information on adaptive capacity centred on the selective, experimental and resilient capabilities of traditional farmers in dealing with climate change and other external changes.

6 SYSTEMS THAT PROVIDE LOCAL, REGIONAL AND GLOBAL ECOSYSTEM SERVICES.

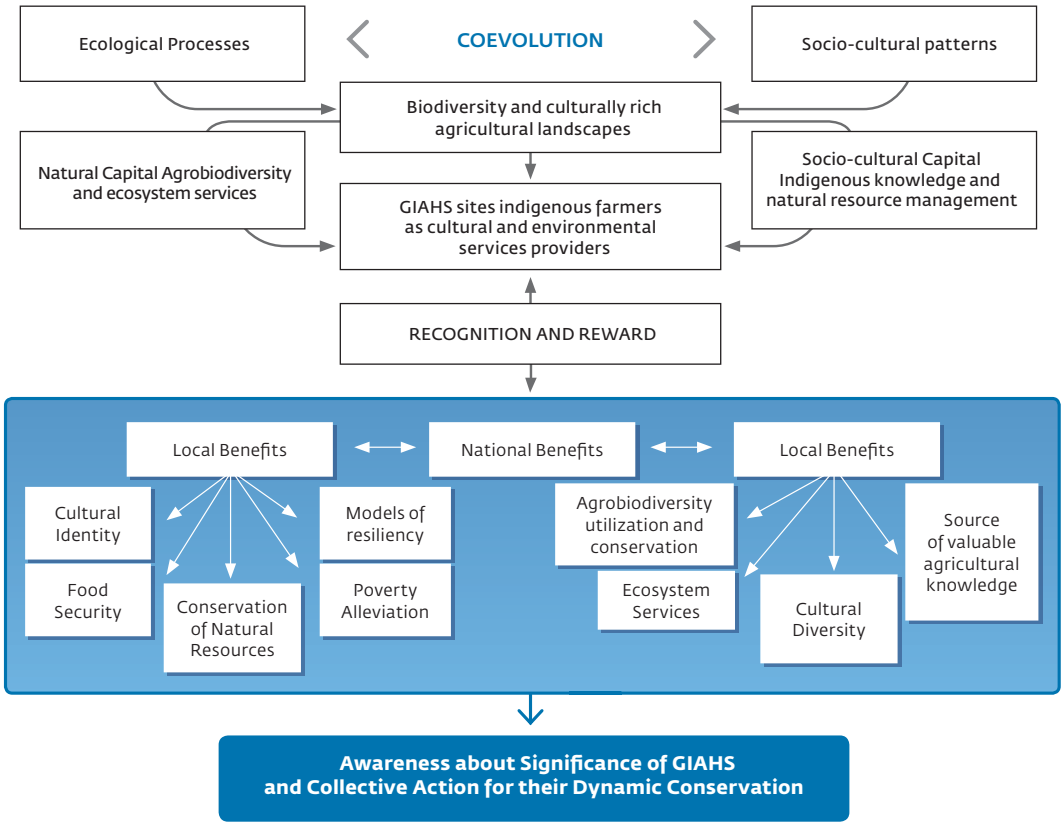
The maintenance of high biodiversity levels at GIAHS sites contributes to agricultural productivity and sustainability through the ecosystem services that biodiversity provides. Agroecosystem function is optimized via complementary interactions that emerge from added species in an agroecosystem, i.e. by mixing specific genotypes of crops for disease resistance, including for example a legume species that increases nitrogen inputs and cycling or by intercropping to support more insect enemies with specific roles in controlling pests.

In many GIAHS sites agroforestry systems are part of a multifunctional working landscape, offering a number of ecosystem services and environmental benefits such as carbon sequestration, biodiversity conservation, soil enrichment, etc. In many regions, the management of diverse agriculture within landscapes provides critical watershed functions, such as maintaining water quality, regulating water flow, recharging underground aquifers, mitigating flood risks, moderating sediment flows, and sustaining freshwater species and ecosystems.

7 SYSTEMS REGULATED BY STRONG CULTURAL VALUES AND COLLECTIVE FORMS OF SOCIAL ORGANIZATION INCLUDING CUSTOMARY INSTITUTIONS FOR AGROECOLOGICAL MANAGEMENT, NORMATIVE ARRANGEMENTS FOR RESOURCE ACCESS AND BENEFIT SHARING, VALUE SYSTEMS, RITUALS, ETC.

The stability and capacity of ecological systems to provide goods and services critically depend upon rural communities having and sustaining diverse and complex forms of social organization (kinship, territoriality, settlement, group membership and identity, gender relations, leadership and political organization), culture (worldviews, languages, values, rights, knowledge, aesthetics), modes of production, labor allocation, and technologies and practices. These reflect adaptation to and management of complex social-ecological systems.

Figure 2. Local, national and global benefits of GIAHS as the basis for their recognition and dynamic conservation.



Climate Change and Agricultural Heritage Systems

In the course of human history and civilizations, a number of farming practices and knowledge systems have evolved and adapted to harsh environments, some documented while others not. These are repositories of intergenerational wisdom that exist because of their capacity to deal with change. Agricultural and associated crops, under traditional systems, intensively or lightly managed, are largely buffered against negative events such as environmental perturbations through embedded, rich biodiversity maintained with human care. Perennial tree species, as part of a range of agroforestry systems, have strong stabilizing influences on land use practices, modulating nutrient cycling processes.

The great majority of farmers in Latin America, Africa and Asia are subsistence producers who farm small plots of land, often in marginal areas with harsh environments, utilizing indigenous agricultural techniques. One of the salient features of these traditional farming systems is their high degree of biodiversity. Polycultures are prevalent among subsistence farmers and cover at least 80 percent of the cultivated area of West Africa and Latin America, where more than 40 percent of the cassava, 60 percent of the maize, and 80 percent of the beans are inter-cropped with other crops. This persistence of millions of hectares under traditional agriculture in the form of raised fields, terraces, polycultures, agroforestry systems, etc., documents a successful indigenous agricultural adaptation strategy to difficult environments and offers a tribute to the creativity of rural subsistence producers throughout the developing world. A key challenge has involved the translation of such principles into practical strategies for natural resource management. The ecological constraints on human adaptation in these systems are understood and well documented.

In a world that has abundant resources and can produce sufficient food to feed everybody, if the role of biodiversity can be at the heart of adaptation and mitigation, the extent of hunger will be minimized. It is important to note that three-quarters of those living in extreme poverty, about 900 million people, live in rural areas and depend on agriculture and related activities for their livelihoods.

In most developing countries, the agricultural sector is the main employer, job creator and even export earner. Historically in many parts of the world, agriculture has been the engine that has driven economic growth.

GIAHS worldwide continue to provide their custodians with food and livelihood security, while providing globally important values for climate adaptation and sustainable management of natural resources. These areas generally support high levels of (agricultural) biodiversity.

They are managed through traditional knowledge systems and cultural practices that promote sustainability, resilience to climate change and social equity, often finely tuned to fragile and challenging environments. In addition to the environmental and social importance of these areas themselves, they are repositories of valuable resources for climate adaptation e.g. genetic resources, traditional knowledge and management systems for natural resources.

Heritage for the Future

Traditional systems of agriculture constitute a cumulative legacy of humankind initiated since the Neolithic of fundamental importance. Modern agriculture constantly threatens the sustainability of this inheritance. Because of their ecological and cultural significance and the wealth and breadth of accumulated knowledge and experience in the management and use of resources that these systems represent, it is imperative that they be considered globally significant resources to be protected and conserved, as well as allowed to evolve. Policy support and actions at international, national and local levels are needed to allow GIAHS to evolve while providing continued goods and services in their totality and integrity.

Inherent to the concept of GIAHS is an acknowledgement that indigenous knowledge has intrinsic merit, and holds development potentials. Fortunately in many parts of the developing world, there still exists a diversity of local and traditional practices of ecosystem management, including systems of biodiversity management, and soil and water conservation. Many rural peoples, who are resource-poor farmers, are inventively self-

reliant, and continuously experiment, adapt and innovate. The rural communities living in traditional agricultural landscapes and GIAHS sites may hold many of the potential answers to the challenges of agricultural production and natural resources management in an era of climate change. The GIAHS framework acknowledges that there are real opportunities for building on ecosystem and livelihood diversity and investing in local communities and their resources, indigenous knowledge and institutions, to solve hunger and poverty in rural areas, rather than relying on excessive external inputs and often inappropriate and unsustainable technologies from outside.

To sustain and capitalize GIAHS it is necessary to improve understanding of the threats that they face, and identify ways to mitigate risks of land degradation, and the perverse impacts of globalization and global change. In this sense, to prevent further degradation of GIAHS, their dynamic nature must first be recognized. Their resilience depends on the capacity to adapt to new challenges without losing their biological and cultural wealth, and productive capacity. Trying to conserve GIAHS by "freezing them in time" would surely lead to their degradation and condemn their communities to poverty. The initiative emphasizes that "*GIAHS is not about the past but it is about the future*", referring to the approach centred on people, human management and knowledge systems. This encompasses their socio-organization, economic and cultural features that underpin the conservation and adaptation processes of agricultural heritage, providing support without compromising their resilience, sustainability and integrity.

Globally Important Agricultural Heritage Systems (GIAHS)