



With their high levels of agrobiodiversity, Latin American countries are implementing innovative research programmes and policies to conserve native and wild crop and animal species. Their work is helping to both promote diversity and facilitate climate change adaptation.

STRENGTHENING AGROBIODIVERSITY: A KEY ADAPTATION STRATEGY FOR LATIN AMERICA'S MOUNTAIN ECOSYSTEMS

SUMMARY

Latin America is home to many areas with a high concentration of agrobiodiversity, especially in its mountain ecosystems. Increasing frequency and intensity of extreme weather events, such as droughts and frosts, is reducing agrobiodiversity in mountain regions due to the inability of plants, animals and entire ecosystems to adapt to unprecedented climatic variability. In turn, this is having negative impacts on agricultural production and food security. This Brief begins by describing the impacts of climate change on biodiversity and food production in Latin America's mountainous areas. It then provides examples of how Latin Americans are capitalising on traditional and scientific knowledge to develop locally-appropriate initiatives aimed at strengthening agrobiodiversity and facilitating adaptation. Finally, this Brief identifies ongoing challenges for Latin America and describes key contextual factors that have facilitated development of climate change adaptation strategies that preserve and promote agrobiodiversity.

AGROBIODIVERSITY: FACING CLIMATE CHANGE AND IMPROVING FOOD SECURITY

Climate change is a key driver of biodiversity losses.¹ Furthermore, the ability of plants, animals and micro-organisms to naturally adapt to gradual changes in the climate is likely to be severely reduced over the next century due to unprecedented events such as severe flooding and drought, ocean acidification, and the emergence of new pests.²

As Figure 1 shows, the world's mountainous regions are the centres of origin and domestication of many major crops, including tubers, vegetables, grains and legumes. These centres are also home to a high diversity of wild crop relatives. However, mountains are fragile environments where agrobiodiversity is coming under particular pressure from the impacts of climate change.

Not generally suitable for large-scale commercial agriculture, mountain regions in Latin America, Africa and Asia are predominately cultivated by rural peasant farmers for household food consumption or for sale at local markets. The variety of traditional farming systems found in Latin America's mountain regions typically have high agrobiodiversity levels. However, agrobiodiversity losses due to climate change are lowering the production levels of these farming systems. Preserving and promoting agrobiodiversity therefore represents a key climate change adaptation strategy for improving food security in mountain regions.

¹ Convention on Biological Diversity, [What is Agricultural Biodiversity](#) website, accessed March 2012.



Focus on Agrobiodiversity

Agrobiodiversity refers to the genetic diversity and variety of all of the elements within the agricultural ecosystem, including food crops, animals, plants and micro-organisms. An agricultural ecosystem, or agroecosystem, is a controlled unit designed and managed by humans for production of food, fuel and fibre. The sustainable productivity of agricultural ecosystems is dependent on a balance between the range of species, organisms and non-living matter. Conserving biodiversity within agricultural ecosystems is therefore indispensable for sustaining crop production, food security and livelihoods.

Sources: Convention on Biological Diversity, [What is Agricultural Biodiversity](#) website, accessed March 2012; Ensor, J. 2009. [Biodiverse Agriculture for a Changing Climate](#). Practical Action, Rugby.

LATIN AMERICA: A RICH SOURCE OF TRADITIONAL AND SCIENTIFIC KNOWLEDGE ABOUT AGROBIODIVERSITY

Latin America is a home to 28–43 million indigenous people³. Over millennia, communities living in mountain zones, such as the Aztecs, Inka, Maya, Wari and Tiwanaku, developed and refined agricultural practices, many of which are still in use today in modified forms. Traditional knowledge is typically passed on from generation to generation with adaptations taking place according to changes in local conditions. This has enabled rural communities in the Andean and Central American mountain ranges to preserve high levels of agrobiodiversity and maintain food production over centuries of climate variability and natural disasters. In recognition of the value of this knowledge, there is an increasing tendency towards incorporating traditional knowledge into climate change adaptation programmes⁴.

However, global climate change is posing a threat to some traditional practices related to agrobiodiversity that are ceasing to function in unprecedented conditions. Consequently, research institutes in countries such as Mexico ([UNAM](#), [UNACH](#)), Costa Rica ([CATIE](#)), Colombia ([CIAT](#)),

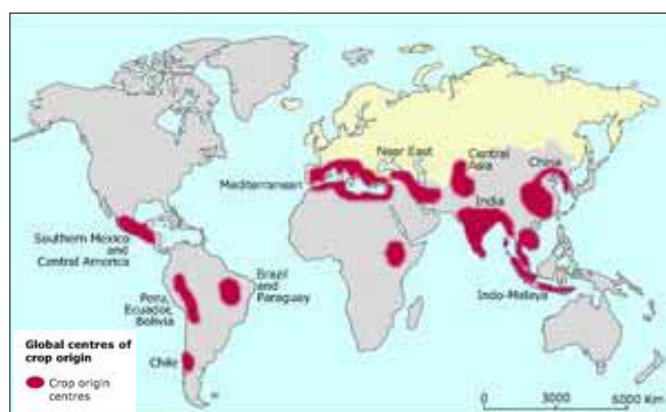
Peru ([International Potato Center](#), [UNALM](#)) and Bolivia ([PROINPA](#)) are playing a key role in developing innovative adaptation strategies, some of which we describe below.

TECHNOLOGIES FOR AGROBIODIVERSITY AND CLIMATE CHANGE ADAPTATION

Latin America is implementing a range of strategies and technologies to conserve agrobiodiversity and facilitate adaptation to climate change in mountain ecosystems.

Development of new and improved crop varieties: In the Andes, the International Potato Center’s [Highland Potato Program](#) is introducing more nutritious potato varieties that also carry resistance to stresses caused by climate change. The programme incorporates farmer testing and builds farmer capacity to manage crop disease.

Selective livestock breeding via controlled mating: Selective breeding is a technology to improve the value of animal genetic diversity. As a result of a [controlled alpaca breeding project](#) implemented by Practical Action Latin America in partnership with communities living in the Peruvian Andes, alpaca fertility rates increased by more than 20%, mortality rates reduced by 20%, and both the quality of the fibre and the yield per alpaca improved. Consequently, farmers increased their income by more than 100%.



Source: Damania, A.B. et al. (eds.) 1998. *The Origins of Agriculture and Crop Domestication*. ICARDA, Aleppo.

² Parry, M.L. et al. (eds.) 2007. *Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the IPCC on Climate Change*. Cambridge University Press, Cambridge.

³ Hall, G., Patrinos, H. A. 2005. [Latin America's Indigenous Peoples](#). *Finance and Development* 42(4).

⁴ To learn more about Latin America’s indigenous knowledge in areas other than agrobiodiversity, read the [ELLA Brief: Indigenous Knowledge for Climate Change in Latin America's Mountains](#).





Agroforestry: Agroforestry is a farming system aimed at diversifying agricultural production and conserving local biodiversity, and is an important climate change adaptation strategy in mountain forests throughout Central and Southern America. For example, the coffee company CafeDirect and GTZ collaborated on a project to facilitate adaptation to climate change among coffee producers in Mexico, Nicaragua and Peru. In collaboration with MasCafe, a small-scale producer’s cooperative, the project trained farmers to develop adaptation strategies on their own farms. These strategies included a reforestation programme, organic compost production and application of biological pest and disease control measures.

Community-Based Rural Extension Agents: In Latin America, the community-based rural extension model has been used to improve access to information and technical support services to rural farming communities in the region’s mountainous zones. As a result of a six-year agricultural extension project in Nicaragua, farmers developed technical skills to diversify crops, achieve higher yields and improve crop quality⁵.

LATIN AMERICA’S CHALLENGES

Despite having some interesting policies and practices in place, Latin American countries are still facing some significant challenges.

Developing appropriate political and legal frameworks to

promote and protect agrobiodiversity and reduce extractions of native species from mountain ecosystems is important to support development of adaptation strategies, improve access to finance and achieve scaling-up. However, integrating climate change dimensions into relevant policies and legal frameworks is still a challenge Latin American countries face.

Despite some regional collaboration, much work on agrobiodiversity and adaptation is being carried out in isolation. Improved information sharing and joint initiatives between Central American and Andean countries, as well as with other mountainous regions of the world, would increase technical and institutional capacity for adaptation programming.

Finally, while advances in biotechnology have led to techniques for producing new and improved varieties of crops and animals, these technologies are relatively new and there are concerns about potential long-term impacts and safety for the region’s agrobiodiversity. There is also worry these technologies could increase agro-industrial companies’ power in traditional seed markets. Government policies on biotechnology, including genetically modified seeds, vary across Latin America. Although many governments have signed international agreements declaring their opposition to genetically modified crops, a lack of appropriate policy leaves the door open for commercial interests.

Incorporating Traditional Agrobiodiversity Knowledge Into Adaptation Strategies

Here are just two examples of how Latin American actors have successfully capitalised on indigenous knowledge and transformed it into adaptation practice:

[Development of Alternative Sustainable Uses of Native Vegetal Agrobiodiversity in Traditional High Andean Communities in Peru:](#)

Implemented by the NGO *Coordinadora de Ciencia y Tecnología en los Andes* (Science and Technology Coordinator in the Andes - CCTA) with participation from 11 Andean communities, the project promoted technological innovations to reduce the vulnerability of local agricultural production to climate change, in particular incorporating traditional knowledge and practices about native vegetal agrobiodiversity into agricultural production practices.

[Growing Resilience: Seeds, Knowledge and Diversity in Honduras:](#)

This initiative was implemented by USC Canada/Seeds of Survival and the local NGO Foundation for Participatory Research with Honduran Farmers (FIPAH). Based on indigenous technologies for reducing uncertainty and risk, community-based agricultural research teams were organised to diversify plant genetic resources and to develop hardier plant varieties that grow well in the mountainous Yoro region.

⁵ Trouche, G., et al. 2009. *Agricultores, Sorgo y Cambio Climático en el Norte de Nicaragua* ([Farmers, Sorghum and Climate Change in the North of Nicaragua](#)). *Leisa Revista de Agroecología* 24(4): 12-13.

CONTEXTUAL FACTORS

ENABLING AGROBIODIVERSITY STRENGTHENING IN LATIN AMERICA



In Latin America, several contextual factors have facilitated the development of climate change adaptation strategies that preserve and promote agrobiodiversity. Firstly, the cultural heritage, biodiversity and variety of farming systems found within Latin America's mountain regions provide a wealth of existing knowledge for preserving agrobiodiversity that are being integrated into climate change adaptation strategies. Latin America is also home to high calibre research institutes possessing technical and institutional capacity to carry out research into innovative adaptation strategies, such as improving plant genetics.

Traditional communities in Latin America are generally well-organised into farmers' associations and other civil society groups that advocate for preserving agrobiodiversity, traditional farming practices and farmers' rights. Examples include [Via Campesina](#), [Union of Farming and Indigenous Organisations of Cotacachi, Ecuador](#), and [Andean Coordinator of Indigenous Organisations](#)

[\(CAOI\)](#). These groups provide an important platform for information sharing and policy influence related to agrobiodiversity and climate change adaptation.

In various Latin American countries, such as Colombia and Mexico, national policies have been developed that affirm the importance of preserving agrobiodiversity in the context of climate change. In fact, a shared appreciation amongst Latin American countries for the value of cultural and biological diversity has facilitated regional adaptation programmes that focus on mountain ecosystems and cultures, rather than political and administrative divisions. These include: [Adaptation to the Impact of Rapid Glacier Retreat in the Tropical Andes Project \(CARE\)](#), [Design and Implementation of Pilot Climate Change Adaptation Measures in the Andean Region \(GEF\)](#), [Assistance to Andean countries to reduce risks and disasters in the farming sector \(FAO\)](#) and [Tropical Forest and Climate Change Adaptation Project \(TroFCCA\) \(CIFOR\)](#).

LESSONS LEARNED

- 1 Preserving and promoting agrobiodiversity is a key climate change adaptation strategy in mountain ecosystems across Latin America, where it has improved food security amongst vulnerable populations.
- 2 Traditional mountain cultures of Latin America provide an essential source of knowledge on local agrobiodiversity and biodiverse farming practices that can facilitate adaptation to climate change.
- 3 At the same time, due to the unprecedented nature of climatic change impacts in mountain regions across Latin America, scientific research and development has played a key role in generating innovative adaptation strategies to face this challenge.
- 4 National policy and legal frameworks should provide adequate protection for traditional cultures and agrobiodiversity as well as define regulations for the use of biotechnology.
- 5 Technical and institutional capacity for integrating agrobiodiversity into climate change adaptation strategies for mountain ecosystems can be built by strengthening information flows and implementing regional programmes.

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To learn more about climate change adaptation in Latin America's mountain environments, read the [ELLA Guide](#), which has a full list of knowledge materials on this theme. To learn more about other ELLA development issues, browse other [ELLA Themes](#).



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