

Andes-Himalayas Exchange and Cooperation for the Conservation and Management of Agro-biological Resources

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Although the geographical and cultural distance between the South American Andes and the Hindu Kush-Himalayas in Asia, they share many commonalities. Based on a comparative approach to the somehow similar environmental and socio-cultural challenges, I will argue about the potential benefits that could result from promoting mutual knowledge on agro-biological action-research, agricultural traditions, contemporary innovations and the sustainable development of rural environments.

Learning from each other's limitations and potentials, as well as from their experiences, could result in mutual benefits. Strengthening the interactions between both regions could result in a successful cooperation in science and technology, and particularly in issues related to conservation and sustainable development. This mutual support will contribute in identifying successful experiences worth sharing. Also, pro-active interaction between individuals of both regions will contribute in improving mountain communities livelihoods.

In addition, I will argue about how international technical cooperation between rich and poor countries is of mutual benefit for both parts. International aid may also be a good business for the supplier since technical inputs and resources provided constitute paid services. As such, these services can also contribute in the dynamism of the economy of the provider while bettering the prospects for sustainable development of the recipient. In the current liberalized world market economy and in the context of cooperation north-south, contractor companies and technicians, whose services are paid by a donor agency, provide most of the aid given to the developing countries.

Thus, shouldn't be a surprise to find a North American expert in yak breeding exploring the potential of this bovine in the heights of Bolivia and Peru. Other examples include agronomic engineers from Europe promoting the ancestral and nutritious Andean lupino crop in Africa, and New Zealanders exploring the potential for commercial use of Andean olluco (*Ollucus tuberosum*) in supermarkets in Auckland. Certainly, these cooperation services in science and technology are given to a high cost resulting in economical benefits to the suppliers. Also, these innovative ideas could bring eventual contributions to the less favored countries.

In comparison to other mountain regions in the world, the socio-economic conditions of the Andes and the Himalayas is certainly much more closer. Farmers who practice shifting cultivation in Southeast Asia and in the Eastern ridges in the Andes, share much more in socio-economical terms. Therefore, it is much more logical to transfer mountain technologies as micro hydro-power between the Andes and the Himalayas than from Austria to Bhutan. South to South cooperation, as it was so much proclaimed a decade ago, can offer a more realistic and pragmatic option to the potential beneficiaries, generating income and employment opportunities to the local mountain communities.

The Andes and the Hindu Kush-Himalayas: differences and similarities

The Andes and the Hindu Kush-Himalayas constitute the most massive and complex mountain systems in the planet. They share important similarities in several aspects. Nevertheless, they also have substantial differences that need to be highlighted. A detailed examination of the most important differences and similarities from the biogeographical and socio-cultural perspective, have been published in a previous article (Camino 2003) available in the Mountain Forum Online Library for consultation. Numerous factors that are described on that publication, explained the intense process of plant domestication in the Tropical Andes, as well as the important achievements and high agro productivity levels reached by the pre-Columbian agrarian civilizations. It is also demonstrated why in the Andes the horticultural practices based on “vegeculture¹” were dominant while in the Hindu-Kush-Himalayas seed crops were prevalent. Although the climate instability in the Tropical Andes and other restrictions for agricultural development, this area was known as the “agro-centric” civilizations (Greslou 1991). Record numbers on plant domestication (more than 120 species) were reached and the agricultural system had a surplus production. In fact, Spanish invaders of the XVI century, were much more surprised by the high quantity of food preserved and stored in the royal warehouses of the Inca Empire than by the richness and abundance of precious minerals.

Furthermore, recent research has shown that the Andean agro-pastoral systems are fully design to boost diversification at every level. This helps us to explain the immense diversity of domestic species varieties. This pattern of diversification in garden-like terrace farming of associated crops also stands in contrast with the stronger mono-crop orientation of Euro-Asia, originated in the fertile basins of Tigres and Eufates.

Differences in geomorphology between the two regions are important and have consequences in the agricultural processes. Despite the long-range routes of yak

¹ Vegeculture: an horticultural system based on vegetative reproduction of root and tuber crops (Sauer 1969)

and mule caravans, who characterized the Asian central highlands trade networks, exchanges between diverse ecological niches were intense. On the other hand, the llamas caravans in the Andes used to move back and forth products from the Amazonian rainforest to the Pacific coast line, facilitating the fast access to a diversity of products of different biogeographical niches.

Although my previous study showed differences between the Andes and the Himalayas and some variations in the development of subsistence systems, there are important parallelisms and similarities worth to be compared and analyzed in more detailed.

Many specificities are generic features of mountain environments (Jodha 1997; Gurung 2002) and are thus shared by both ecosystems. In both cases, plant altitude variation and life forms had a strong influence in the development of diverse subsistence strategies that evolved in them. The access to multiple altitudinal levels played a key role in the utilization of natural resources along the vertical scale. Other common elements between both regions is the fragility in terms of limitations for subsistence activities as related to lower productivity and the increased risks in securing a sustainable livelihood in such unpredictable environments. On the other hand, niche specialization - an important dimension in agro-pastoral systems in mountain regions - has played an important role in both regions.

It is when we approach socio-cultural traditions that we can identify the important differences in both regions, although some socio-cultural aspects could be similar (Camino 2003).

An untapped potential for cooperation and exchange

In recent years anthropologists, geographers and other professionals have attempted some preliminary comparisons of both regions, focusing mainly on some specific subjects like agro-systems, pastoral economies, rural development and health, among others (Camino 1976, Rhoades 1999, Denniston 1995). However, for most of the cases these have resulted only in academic discussions. Little has been done in terms of exploring the practical benefits of sharing and cooperation as a mechanism to empower mountain communities or offer development alternatives.

Since 1991 some researchers involved in rural development started identifying some areas where sharing of experiences and information, as well as human resources could offer some promising alternatives for both regions. These concerns gave birth in Peru to the HimalAndes Initiative, a program aimed to promote cooperation by identifying areas of potential benefit for both regions. In

1992 the International Center for Integrated Mountain Development (ICIMOD), headquartered in Nepal, started some preliminary experiences to explore the potential for cooperation in indigenous mountain crops (Camino and Sumar 1992; Jodha, N.S. et.al. 1992). In 1997 the CGIAR, under the lead of the International Potato Center, established the Global Mountain Program with the main object to provide a focal point for global mountain research. This program included a component aimed at promoting integrated watershed development and alternative livelihood opportunities. By then the Mountain Forum was established, consisting on a global network of networks promoting information sharing and mutual support for sustainable mountain development and conservation. More recently, the Mountain Institute has promoted information exchanges between the projects they sponsor in both regions in the areas of conservation and tourism. During 1999 HimalAndes Initiative organized the first Andes-Himalayas cooperation workshop (Kathmandu, Nov. 29 - Dec. 2, 1999), which brought together development officers from the main countries of the Andes and the Himalayas (HimalAndes Initiative 2001)

Based on these precedents and from the themes identified previously, we will evaluate some areas with a significant potential for exchange and cooperation. These include agricultural traditions, contemporary innovations, and agro-biological resources for sustainable development.

Mountain Crops and sustainable farming systems: exchange of experiences, technologies and resources.

Since the XVI century many crops coming from Europe and originally from Asia (wheat, barley, legumes, among others), were gradually included into the Andean agro-ecosystem having different results. In the Himalayas, potatoes and corn from the Americas have now been sowed for over three hundred years. There are some evidences that highlight the demographic and socio-cultural impacts caused by the introduction of the Andean tuber in the Central Asia high lands. Today, for many rural communities, potato has become a important element in the diet, and in some cases like in Bhutan, a prime product for export. This was also possible due to a research program that improved the Andean variety by manipulating the genetic material. Although the introduction and expansion of these crops, their potential use haven't been fully explored. The lack of knowledge in the benefits that these crops bring to human diet, has resulted in a limited utilization of these resources. For example, some nutritious crops native from the Andes are only use for livestock in the Himalayas. As important as the introduction of promising crops and their associated agricultural technologies, is the transference of the native knowledge regarding their culinary uses. Other limitations is the lack of diversity in the introduced material.

The quinine tree (*Cinchona officinalis*), a forest specie with medicinal properties and source of quinine, has been introduced into Asia (including the South-East ridges of the Himalayas) from the central-eastern Andes. This product became a very important commodity in some Andean regions since XVIII century. More recently, cardamom (*Amomum subulatum*) has been introduced in similar type of environments in the Andes.

The last couple of years, a successful experience has been developed with the Asiatic seabuckthorn (*Hippophae tibetana*), a beneficial plant that controls soil erosion and contributes to wildlife restoration. Also, this plant is suitable for grazing and the fruits have a potential use for the pharmacy and food industry. One European variety of this specie has been successfully introduced in the Southern Andes by the organization Fundación Chile.

The Andes and the Himalayas are rich in genetic diversity, endemism and biodiversity. Many wild species are use as cash crops and are considered of world importance. Both regions could be benefited by establishing cooperation strategies in order to conserve this valuable germplasm and to exchange mountain crops. For that is necessary to be environmentally concerned. This cooperation can help to improve the current nutritional and life conditions of the rural people from less favored countries.

Since 1991, the HimalAndes Initiative started promoting some preliminary trial experiences of native crops from one region to the other. Two traditional Andean crops, oca (*Oxalis tuberosa*) and quinoa (*Chenopodium quinoa*) were already being experimented in Uttar Pradesh (India). Upland rice varieties and buckwheat were sowed experimentally in Cajamarca, Peru. Nowadays, the Tibetan Academy of Agricultural and Animal Sciences continues experimenting with Andean crops in the Tibetan high plateau. Most experiences are conducted under strict control by regular monitoring to avoid any potential risks associated to the introduction of foreign species into a new environment. Thus, any initiative of this nature requires pre-assessment studies and regular monitoring to evaluate the potential agricultural, environmental and socio-cultural impacts.

In the case of agriculture, these potentials are not just limited to crops. In some cases, certain agricultural practices in mountain and highland environments may have promising prospects for these sites, as they are threatened by the introduction of new crops and non sustainable technologies. This could be the case of the ancestral Asian tradition of aquaculture where rice crops are associated with fish and shellfish farming. The ancient systems of paddy rice cultivation in Asia are usually part of a more complex strategy of diversification through cultivation of associated crops (rice, soy bean, vegetables), sometimes combined with several kinds of fish farming practices. Those labor-intensive agro-ecological systems evolved in response to growing population pressure with a limited agricultural land, as part of a trend of intensification and diversification.

The management of complex agro-ecosystems associated to aquaculture may also include, ducks and pigs breeding. These options of diversification evolved in the context of a rural economy of subsistence that was driven by centralized states that demanded surplus production. During the last decades, scientific research in South East Asia ecosystems has revalued them, promoting their potential, improving their productivity and linking these products in the dynamic of a demanding market. It has also been demonstrated that the traditional fish and rice technology increases rice productivity, makes protein available to the peasant family (it is calculated 600 kilograms of fish per hectare area produced per year), reduce the use of agrochemicals, and diversifies the production. It also contributes to decrease the lack of protein in farmer's diet and demands a higher number of human labor, generating new income opportunities. This technology is based on traditional knowledge and practices and encompasses an efficient use of energy and of bio-geochemical cycles. Rice paddy agro-ecosystem development in Asia has been a millenary process, in some cases expanding over areas formerly covered by tropical forests. At a first stage, rice expansion severely affected biological diversity and thus, intensified environmental degradation. Gradually over the centuries this agro-ecosystem reached certain level of stability and high productivity. Nowadays, the traditional Asian fish and rice farming systems are being studied and promoted in many places, enriched by new components and elements. The last 30 years, this technology have been successfully introduced in the Nepalese Himalayas.

At the other side of the world, during the last decades rice monoculture has extensively expanded in the formerly forested tropical slopes of the Central Andes. This has happened at the cost of affecting biodiversity, creating vulnerable ecosystems and producing environmental and social problems. Many Andean farmers, with an old and rich mountain farming tradition but ignorant of rice agricultural options, have abandoned their higher farmlands moving into the cloud mountain tropical rain forest of the Eastern Andes slopes. The forest has been devastated and in the unstable hills peasants have started sowing rice as the only crop. In the predominantly unstable eastern Andean slopes. The lack of a rice farming tradition has accelerated erosive processes and increased soil loss. This mainly due to the lack of knowledge on sloping agriculture land technology (SALT) that has been developed in Asia. In the richer valley bottoms of the Eastern Andes, rice plantations with high-tech mono cropping and intensive use of agrochemicals predominate. Concentration on rice has transformed traditional diversified peasant into farmers dependant on a single crop, exposing their fragile economies to market fluctuations and increased land degradation. Most of the people that migrated and settled in these valleys became small-scale farmers who depend, in spite of their poor production and low productivity, on rice as their major source of food and income. This has resulted in impoverishment, malnutrition and environmental degradation. Moreover, valleys are now facing mounting plagues, particularly rodents, and the predominance of a narrow genetic basis of rice species has exposed the crop to

innumerable threats. Clear examples of this process can be seen in many Eastern Andean valleys.

The social and environmental problems caused by this exotic and promising crop in the eastern slopes of the Central Andes are well known but have not been faced in the correct manner. Due to the importance of rice in the country's economy, agricultural extension agencies have attempted to improve and extend the cultivation of this crop. Those programs have mostly focused on purely conventional agro-economical issues: introduction of new varieties, fertilization techniques, agrochemicals utilization, mechanization, etc. They have never attempted an integral approach in order to develop a productive and diversified rice dominated agro-ecosystem. No one has focused on soil loss control or innovative technologies of multilayered forms of fish and rice farming. In those circumstances, an alternative to increase stability and productivity of those areas is using soils correctly and diversifying the agro-ecosystems. The transference of Asian traditional technologies of rice and fish farming in terraces to similar type of environments in the Andes, could help to conserve and protect the Amazonian tropical forest acts as nutrient sink and lagoon for retaining the top soils eroded from the hills and mountains.. Rice and fish farming could also improve the food production for self-consumption as well as increase cash incomes. The intensification of land use could help to inhibit the colonization on the tropical forest and thus its deforestation. Furthermore, considering that this technology has been used ancestrally on areas with similar social and environmental conditions, it could perfectly be tested in this new context.

In the case of livestock, in several opportunities the potential of yaks in the Andes has been mentioned as an alternative to the introduced cattle from Europe more than 4 centuries ago. Still today, this lowland cattle is not well adapted to high altitude areas. On the other hand, HimalAndes Initiative and ICIMOD have addressed the potential of South American camelids for Central Asia. The llama in particular could be use for transportation of rural goods in remote areas and its valuable wool could be use superbly for carpet manufacturing (RONAST, 2003; Camino, A., J. Sumar: 1992). Similarly experience with the introduction of improved western breeds of sheep for wool production in the harsh mountain region of HKH has not been successful. Introduction of new camelideae from the Andes may have better options in the high mountain areas of HKH region.

Beyond the potential of information exchange on agricultural and livestock practices, the community and lease hold forestry experience of Nepal has provided guidelines to many other mountain countries where rural communities play a key role in natural resources conservation and poverty reduction. Sharing experiences in reforestation and forestry management is quite relevant, taking into account the extreme conditions of this type of environments.

Crystallizing and operationalizing cooperation

As argued and substantiated in this paper, the areas for potential and mutual beneficial cooperation between the Andes and the Hindu-Kush-Himalaya are many and the prospects are promising. However, as with any innovative initiative and particularly one attempting to bridge almost un-contacted worlds, the task is going to be arduous. To start with, countries from both regions are distant, speak different languages and have little or no cultural relations. Secondly, the dominant pattern of international cooperation is dominated by a north-south direction, a fact that is linked to the trends of financial aid. Promoting cooperation between the Andes and the Himalayas defies the dominant "technical" cooperation providers' paradigm, and, moreover, the bilateral and multilateral funding in this direction.

It is most unlikely that governments from the less developed countries in mountain regions, trapped in their bureaucratic tangles and their obsequiousness to international aid, will challenge the dominant concepts. At this level, individuals may bring in new and interesting ideas and initiatives, most likely to end up clashing with the establishment of the international cooperation parameters.

On the other hand, the NGO community may be freer to think independently and creatively. Nevertheless, they are also quite dependant on the financial support from donors of the north, though some of these are open to innovative ideas. Most development workers in the NGO community have a rather narrow view and their know-how was built on local experiences with little or no chance to contrast these in the perspective of what happens in distant but similar environments. However, it is perhaps in this platform where chances of introducing new concepts may have the best repercussions.

We should not expect much from either universities or national research centers focused on conventional studies, whose paradigms are usually dictated by a purely academic concern. However, when brought into a new perspective they could turn into a powerful tool. The science and technology environment in our countries has become increasingly committed with finding solutions to the daily problems of the rural communities, as part of their growing awareness of their countries needs. The private corporate sector of developing countries may eventually be an ally in this endeavor, particularly if through these connections and exchanges business opportunities open up. It could for example be to the

advantage of the many producers of solar heaters in Nepal to find a new market for their products in the Andes, as much as it will be for the llama herders to sell their wool to carpet manufacturers in Asia.

At this point the best way to go about is on a case-by-case strategy, where once identified the areas of potential mutual benefit, interested partners are then provided with the basic tools to further explore the prospects for cooperation and exchange. Mountain-to-mountain cooperation will come out naturally from increased information exchange and proactive networking using the expanding information and communication technologies. For this, it can be use electronic communication facilities related to sustainable mountain development that are now provided by the Mountain Forum (www.mtnforum.org).

A second step should be getting involved in the design and implementation of conservation and sustainable development projects based on mountain-to-mountain cooperation and exchange. Some organizations are in the capacity to help in this process and provide some tools and connections in one and other area: the International Center for Integrated Mountain Development (<http://www.icimod.org/index.htm>) the HimalAndes Initiative (Web Page under construction) , The Mountain Institute (www.mountain.org), the Global Mountain Program hosted at the International Potato Center (<http://www.cipotato.org/market/Brochure99/world5.htm>), and the Sustainable Development and Environment Program of the United Nations University (mbox@hq.unu.edu), among others.

Proposals and projects should involve several sectors: community based organizations, NGOs, governments, universities and the private corporate sector. In the HKH region government institutions are important as they are the only institutions functioning even during the period of armed conflicts. Therefore it is important to work and collaborate with them. This will assure the increased dissemination of the concept that mountain-to-mountain cooperation is worth pursuing.

Donors should be able to open their conceptual schemes and paradigms supporting and investing in innovative projects. South - South cooperation has been voiced so many times, but so little has been done.

Finally, think creatively, challenge your mind frame and explore further into what we could learn from each other. The challenge is as big as mountain summits. However, time and again committed individuals and institutions have been able to move them well beyond their dreams.

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Note: There is a Spanish version of this presentation untitled “La cooperación en Ciencia y tecnología entre los Andes y los Himalayas, un potencial aún inexplorado y desaprovechado” / “ Science and technology cooperation between the Andes and the Himalayas, an unexplored and unexploited potential” presented at the International Workshop on Mountain Ecosystems: A Future Vision. April 25 – 27 2001. Cusco, Perú.