Protection by Utilization

Economic Potential of Neglected Breeds and Crops in Rural Development

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The terms, “underutilized” or “promising”, have been given to those crops and breeds which either were of greater economic relevance in the past than today or, only have a limited regional significance. Several of these have been identified as having a market potential. To date, this potential is still far from being fully exploited and in addition, offers interesting opportunities for developing future partnerships with the private economy.

The Biodiversity Convention (1992), in its work programme on agro-biodiversity and the Global Plan of Action of the Food and Agricultural Organisation (FAO) on the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture (1996) are demanding a greater promotion and utilisation of neglected or endangered crops and useful wild plants and domestic breeds. Given the continuous loss of genetic diversity in this area, targeted identification of the utilisation potential and its ensuing implementation is, on the one hand, a contribution to the conservation of genetic diversity, and on the other, to income and food security, particularly among the poor.

A large number of these underutilized crops and breeds are to be found mainly under marginal conditions and have, to some extent, been developed by male and female farmers over thousands of years. If indeed low, they very often provide stable yields which under adverse conditions contribute to the survival of farming families. The background and current international state-of-the-art has been fully presented in the study, “Promising and Underutilized Species, Crops and Breeds”. (1)

With this brochure, the sector-project “Managing Agrobiodiversity in Rural Areas” which is financed by the German Federal Ministry for Economic Cooperation and Development (BMZ), would like to exemplify the economic potential of single underutilized plants and domestic breeds which are increasingly gaining in importance in the field of technical cooperation.

The selection of examples – three crops and three breeds – comprise different habitats ranging from the high-lying valleys of the Andes over the arid locations in north Africa to the tropical lowlands of south east Asia. Despite the heterogeneity of the examples chosen it becomes increasingly clear that the contribution of their genetic resources towards securing the livelihood of farmers is of great significance.

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List of Abbreviations

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<tr>
<td>ASAR</td>
<td>Asociación de Servicios Artesanales y Rurales (BOLIVIA)</td>
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<td>CITES</td>
<td>Convention on the International Trade with Endangered Species</td>
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<td>ICARDA</td>
<td>International Center for Research in the Dry Areas</td>
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<td>IDRC</td>
<td>International Development Research Centre (CANADA)</td>
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<td>IICA</td>
<td>Instituto Interamericano de Cooperación para la Agricultura</td>
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<td>ILRI</td>
<td>International Livestock Research Institute</td>
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<td>INADES</td>
<td>Institut African pour le Développement Economique et Social</td>
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<td>ISGANI</td>
<td>Asociación Regional Integral de Ganadería en Cantábricas del Norte de la Paz (BOLIVIA)</td>
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<td>NIAH</td>
<td>National Institute for Animal Health (VIETNAM)</td>
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<td>NGO</td>
<td>Non Governmental Organisations</td>
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<td>ORINACA</td>
<td>Organización Regional de Productos Agrícolas de Calentura (BOLIVIA)</td>
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<td>PCDA</td>
<td>Pejoit Conservation et Développement de l’Algérie (MOROCCO)</td>
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<td>PERTEGUI</td>
<td>Study and Research Project on Guinea’s Indigenous Technology (GUINEA)</td>
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<td>PPEAs</td>
<td>Projet Promotion de l’Elevage d’Aulacocides (BIFAN)</td>
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<td>SFDP</td>
<td>Social Forestry Development Project (Song Da) (VIETNAM)</td>
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<td>TOB</td>
<td>Trupemieselbogstals Sagtriargiz (GTZ)</td>
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<td>UCFA</td>
<td>Union des Coopératives des Femmes pour la Production et la Commercialisation de l’Huile d’Agrumes et des Produits Agricoles (MOROCCO)</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organisation</td>
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(1) 1 E.Thies (2000): Promising and Underutilized Species, Crops and Breeds. Sector project “Managing Agrobiodiversity in Rural Areas”, GTZ, Eschborn. The study can be downloaded as a PDF-file under http://www.gtz.de/agrobiodiv/pub/pub.htm
Nature Conservation through Use – the Argan Tree in Morocco

In south-west Morocco, at the gateway to the Sahara a small success story of Moroccan-German collaboration is currently being documented. A leading figure in this story is a unique tree which is perfectly adapted to the harsh environment, i.e. poor soil and a hot climate – the argan tree, one of the oldest inhabitants of the country and the oil of its fruit is considered a delicacy. As this tree is characteristic of this region, it has been given the name, the Arganerae. However, because of over-exploitation, the argan forest is on the verge of vanishing. A project which has set its sights on establishing an environmentally sound use of the argan tree population and the environment: An improvement in families’ income has lead to a greater recognition of these rural women. These clear economic advantages are, in turn, the basis for conserving this ancient cultivated landscape.

Help for the Argan Forest

Although the argan tree plays an important role in the cultural life of the Berber and is a valuable source of income, argan woodland is, at present, seriously endangered. Extreme droughts and over-exploitation caused by poverty has resulted in the population of trees dwindling by about a third in less than a decade. Deforestation on the remaining 800,000 ha is continuing to advance. Where until recently, a hundred trees grew on a hectare of land, there are now only 30. Year after year, about 600 ha argan forest must give way to arable farming or is lost through grazing, exploited for fuel, or felled for timber. The consequences are that the ground water level is steadily falling, and both soil erosion and biological diversity loss is increasing. This process is accompanied by a decrease in the basic income of the population and the resulting deterioration in their living conditions.

Alarmed at the crisis in the Arganerae, researchers have, since the beginning of the 90s, been investigating how best to simultaneously utilise and protect local forests. Hence, besides afforestation initiatives, several projects have meanwhile introduced improved methods for processing products from the argan tree. In the course of reorientation, the region, in 1998, became part of the globally spun net of biosphere reserves belonging to the UNESCO Programme "Man and the Biosphere" (MAB). A fundamental principle is to cooperate with the local people whose needs must be balanced with protecting and maintaining the valuable ecosystem.

Participatory Planning of the Biosphere Reserve “Arganeraie”

In 1995, the GTZ initiated the Moroccan-German project “Protection and Development of the Argan Region” (PCDA). The focus is on developing sustainable use concepts for the reserve with the participation of the rural population who is a crucial partner in this process. In five pilot areas, concepts for use and marketing strategies for local products were developed. From the onset, a structural body was created to represent all those affected, i.e. the local population, authorities and co-operatives. In order to be fair in meeting the needs of the population, local authorities, and the hunting, forestry and hydraulic engineering administrative bodies, rights of use and property rights were adapted. Furthermore, in collaboration with regional research institutions, a scientific research and educational programme was established.

Marketable Products Secure Income

The argan tree with its traditional products – animal feed, oil and wood – is a source of income for around three million people. This fact is used as a motivation for the rural population to protect the tree and its ecosystem. As indeed, a better marketability of the products at home and abroad can only be of benefit to the local economy in general. Consequently, diversification into manufacturing plays an important role when establishing biosphere reserves.

The GTZ supported the founding of the “Union of women co-operatives for the production and marketing of biological argan oil and agricultural products” (UCFA). Thirteen co-operatives from the entire region currently belong to the association. The UCFA’s main task is to organise the marketing of products bearing the trade name “Tissalivine”. In 2000, UCFA acquired the right to use the European Union’s eco label for their argan oil. In addition, the products which are marketed primarily in Germany and France can bear the certificate “Produits de la Réserve de la Biosphère Arganaire”.

Besides the Moroccan-German collaboration, further co-operatives – partly supported by organisations from other countries like OXFAM (GB) and IDRC (Canada) – have been established to produce argan oil and have opened up export routes to the cosmetic and natural food markets in the North.
Minilivestock Production as an Alternative to Hunting – Grasscutters in Benin

With the rising standard of living world-wide, nutritional habits in Africa are also inevitably going to change. It is estimated that by the year 2020, the quantity of meat found in the pots and pans of the regions south of the Sahara will be three times the amount of what was consumed ten years ago. Conventional livestock production alone cannot cover the growing demand and, in fact, there is a marked increase in the hunting of wild animals. Venison meat has traditionally always been an important source of animal protein: In West Africa, 16 per cent of the animal protein requirements are covered in this way. In Benin, BMZ and GTZ are currently promoting a breeding station for grasscutters. This has encouraged small-scale farmers to undertake grasscutter farming. Which, besides its contribution to food security, is economically advantageous in creating new jobs and generating income in rural areas.

The Grasscutter – a Popular Delicacy

Of all West Africa’s wild animals, the grasscutter is from a culinary point of view the most popular. In 1996, of the 120,000 t of wildlife killed in the Ivory Coast, around 17 percent (20,800 t) of these alone were from this herbivorous rodent. This appreciated meat is not subject to any taboos with regard to consumption and is very popular in restaurants offering venison dishes. In fact, stock cubes with smoked grasscutter flavour have recently come onto the market in several West African countries. In some regions, however, increased hunting is invariably decimating the stock.

Domesticating a Wild Animal

Due to the attractive price which can be obtained for grasscutter meat, at urban markets as well, small-scale farmers in Benin have begun breeding grasscutters in captivity over the last decades. Particularly in the south of the country where around 30 percent of the farmers’ livelihoods are at risk because of land tenure problems, domesticating wild animals offers a promising supplementary income. The Ministry for Rural Development started a project to promote grasscutter production (PPEAu) which was aimed at developing animal breeding and production on small farms. BMZ has been supporting this project since 1985. During an initial project phase until 1986, a stock of wild animals was built up in the breeding station in Godomey, near the capital Cotonou. Accompanied by basic research, the required know-how was developed for farming the rodents in captivity.

From the Breeding Station to Minilivestock Farming

Under GTZ leadership, the project was able to stabilise the performance of the breeding animal population in the station through targeted selection. Correspondingly, pilot projects supplied the initial data for reviewing the feasibility of grasscutter husbandry under farming production conditions. On the basis of these operational data, it was then possible, by setting up a monitoring and evaluation system (M&E) on the pilot farms, to determine how and when animal production is profitable. This was accompanied by the working out of a broad-effective extension service concept.

Extension Services Strategy

First, the extension services for the pilot farms were carried out by the central breeding station. Extension and training tasks were then gradually handed over to farmers’ self help organisations in order to promote their autonomous development. Furthermore, among the group of producers and breeders, exchanging experience and members’ guidance of newcomers is ensured not only on a long-term basis, but also outside the breeding station. In the meantime, 75 percent of newcomers – increasingly business people and functionaries – are being trained by producers and breeders.

Perspectives in Benin

The breeding station is currently concentrating its efforts on providing marketable services, for example, breeding animal production and the required extension services, training co-ordination, extension support and research. The aim is to secure both grasscutter farming and its long-term expansion in Benin thus, lessening the pressure of hunting on the wild animal population. Various international non-governmental organisations (NGOs), like the US Peace Corps and Bornefonden (Denmark) have committed themselves to extending grasscutter farming. The International Livestock Research Institute (ILRI) in Kenya and the Institut Africain pour le Développement Economique et Social (INADES) (Côte d’Ivoire) have voiced their interest in collaborating on its regional expansion in West and Central Africa.

Secretariat for Breeding in Africa

Queries on grasscutter production are received weekly at the breeding station in Godomey, many of these coming from neighbouring countries. In order to provide qualified answers to these inquiries, the GTZ intends to support the setting up of a regional grasscutter secretariat. Grasscutter farming is in the process of developing from a niche production to a highly competitive farm activity which is rapidly extending across and beyond southern Benin. This is helping to ease the rapidly sinking population of this most popular game animal among West African consumers. In addition, profitable meat production is not only guaranteed but at the same time, small farmers are being provided with an annual income.
The cultivation of indigo-bearing plants and utilisation of the blue dye, indigo (Spanish: Añil) stretches back to pre-colonial Central America. The Mayas were already producing indigo, and the plant was not only used at that time to dye textiles and ceramics, but also its leaves were used as a natural medicine. In El Salvador as well, the plant has a long tradition in the countries economic and cultural life. The use of the dye indigotin was a significant economic factor in the pre-colonial period and during Spanish rule right up to independen-

**The Re-introduction of Indigo**

The greatest obstacle to El Salvador’s achieving a successful place on this market, is its present out-dated cultivation, harvesting and processing methods. These produce high costs and fail to secure a regular standard of quality. Several institutions joined together in 1999 to promote the cultivation of indigo, among these are BMZ/GTZ who are supporting a project to “revive the cultivation and processing of indigo in El Salvador.”

**Actors and Instruments**

Project actors include individuals, cooperatives and private firms of varying interests. On the whole, however, all components of the net product chain are represented: Cultivation and processing of the dye, its application in arts and crafts as well as its export to industrial countries. Considerations are being made on integrating the production and processing of indigo into an eco-tourism project.

India, where it is impossible to compete with the local wages, is El Salvador’s main competitor in indigo production. Therefore, there is a need for El Salvador to develop other comparative advantages. This would include, first and foremost, exploring means of improving the quality of the dye and increasing the indigo content of the plant. The BMZ/GTZ project also promotes the application of improved varieties, gives advice on cultivation and harvesting, improved extraction technology, training and education, supporting international marketing, and quality assurance. Special credits are available for financing the required investments.

**Marketing**

There are also plans to introduce a national trade name to assist El Salvador in its international marketing efforts. While this requires a central marketing system, it will also be necessary, at the same time, to have decentralised structures for the cultivation and the extraction of the dye. There are currently preparations underway to establish a company in which existing initiatives will participate as corporate members. Furthermore, a non-profit association is to be founded with these very groups, which would undertake research and training for its members. A charitable status is essential in order to be able to successfully raise funds.

**Technology Development and Economic Opportunities**

An analysis of the processing techniques of indigo in El Salvador has shown that there is little potential for development in traditional technologies. Moreover, they do not meet the quality criteria standards required for successful commercialisation. In cooperation, therefore, with the University of El Salvador, methods for producing dye which have been developed in other parts of the world should be examined as to their applicability under Salvadorian conditions.

To gain access to the international market it is essential that the dye maintains its level of quality and that the plant has a higher indigo content. If El Salvador can achieve this, sales should be obtained at correspondingly high prices. Improved indigo crops and a high-quality supply of natural indigo dye should result in the opening of new market segments. In Japan, for example, there is an interest in dyed textiles which could mean another new outlet for El Salvador. The discovery of indigo plant substances which could possibly be utilised in the battle against cancer, shows prospects of a growing demand for dried leaves.
government, conservation projects for 19 domestic animal breeds are presently running. The leading organisation is the National Institute of Animal Husbandry (NIAH) in Hanoi. What is special here is the fact that many of the conservation projects are implemented with farmer participation. The target group are producers with small resources who cannot afford to purchase and raise high-performance breeds and therefore depend on local breeds.

One of these projects is dedicated to preserving the L-pig. Apart from conserving the breed, it is the project’s objective to improve the economic situation of pig owners who are smallholders belonging to the Kinh ethnic group in Thanh Hoa province, located in the Vietnamese lowland. The Kinh are the largest ethnic group in Vietnam and account for approximately 90 per cent of the total population. They are specialised rice cultivators. As little farm land is available for arable crops, opportunities for feed production are marginal. Nevertheless, they supply the country’s markets with agricultural products. In general, small producers possess a few breeding sows whose offspring are sold. Occasionally, fattening pigs are kept in place of, or in addition to the sows.

The I-pig

The I-pig (Vietnamese: Lo I) is found mainly in the Red River Delta of North Vietnam. It is well adapted to the local environmental conditions of high humidity and frequent inundation. Moreover, the breed is characterised by its high degree of disease resistance and its modest feed demands. The pot-bellied pigs grow to approximately 35 cm shoulder height and attain a weight of 50 to 60 kg. I-pigs have black skin and a sunken back. They are considered placid and provide good quality meat, associated with a high proportion of fat. Farmers think highly of this breed because of their early sexual maturity at the age of three to four months, their motherliness and their longevity.

Quality Meat from Endangered Breeds – Vietnam’s Markets

The Systematic Revival

The building up and production of the I-pig population by Kinh farmers are systematically supported by the NIAH. A contract is settled with the farmers involved and can be extended annually or terminated only by mutual agreement. For the contract period, the I-pig becomes the property of the respective farmer. The guidelines for production are contractually determined and production handed over to the farmers, who within the framework of the programme receive a financial allowance. This should provide a loss compensation for the smaller incomes earned because of the lower performance of the I-pigs. Furthermore, the money should also be used for purchasing feed, mineral feed or medicines for the animals.

It is planned to set up a sperm bank in the future at NIAH where in the long term, embryos of endangered breeds will also be produced. Blood samples of I-pigs have already been stored as the basis for a planned gene mapping project. In order to lower the degree of inbreeding within the small population of this breed, the NIAH is presently looking for I-pigs in remote regions of Thanh Hoa province as well as in zoological gardens abroad.

Sustaining the Stock

Promoted by the GTZ sector project “Managing Agrobiodiversity” and the Tropical Ecological Support Programme, a University of Hohenheim team examined and evaluated the conservation programme for I-pigs in 1999/2000.

Recommendations point towards two directions:

- In order to secure the programme’s sustainability, in the long-term a way from subsidised to market-oriented production should be sought. Considering the superior quality of their meat, I-pigs should be able to attain higher prices from urban consumers who have greater purchasing power. At present, however, Kinh farmers lack access to these urban consumers. Hence, a marketing strategy has to be developed.

- In order to reduce the degree of inbreeding, herds should be kept as an open nucleus stock. A prerequisite for this is the keeping of a centralised herd-book. Experiences in other countries show that presenting good breeding animals in shows and auctions combined with professional information promote sales and spread the basis for conservation.
A Plant for the Environment and Income – the Purging Nut

During the Colonial Period, Portuguese and Dutch seamen brought the purging nut from Central America to Africa and Asia. This plant of the family Jatropha, not well-known in our part of the world, grows in developing countries on poor soil where other crops barely flourish. Owing to its versatility, it is greatly valued in many places by women to make medicine and soap and has over the last few years increasingly been utilised as an inexpensive renewable energy raw material for small engines. Despite, however, its very wide range of distribution, the potential of the strongly oleiferous purging nut which is closely related to the Rhizinus has, to date, not been tapped very much in agriculture. Thus, within the framework of technical cooperation programmes, a system named the Jatropha System was developed.

This is an integrated concept in rural development in the areas of energy production, environmental protection and income security. The multifarious use of the purging nut is based on farmers’ know-how in combination with new techniques which maybe better open up the economic and ecological potentials of this natural resource.

**Multi-talent Purging Nut**

- Owing to their dense surface-near root system, the shrubs, trees and hedges protect soil from being washed away during heavy rainfall. Their seeds are toxic and inedible for cattle and goats which makes the purging nut especially suitable for hedges. In Guinea, Mali, Burkina Faso (West Africa), many farmers plant purging nut as a living fence surrounding their fields to keep out hungry domestic animals, and stray herds.
- In traditional human and animal medicine, women use the seeds, leaves and oil of the Jatropha plants as a remedy for many types of illnesses. In Mali, it is used as a purgative, wound disinfectant, or for treating skin diseases and rheumatic pains. In Nigeria, the juice from its stems is used for healing wounds. Traditional remedies made from Jatropha have been recorded in numerous countries and in the meantime, their effectiveness in many cases have been scientifically proven.
- As presumably with the neem tree, extracts from the purging nut can be used as a biological pesticide. In a series of trials, oil and oil extracts had toxic effects on numerous pests of cotton, pulses, maize and sorghum. During laboratory tests, extracts from seeds and leaves proved effective against the intermediate hosts of several parasites (liver flukes and bilharziosis).
- Traditionally, as in West Africa, women use the seed oil to make soap. The production process is, however, costly and the quality of the soap, inferior. Tests made at the Tata Oil Mills Company in Bombay (India) showed that with modern production methods, high quality soap can be produced. In addition, the press-cakes from the sediments can be utilised as fertiliser, its high amount of nitrogen content being similar to that of chicken manure. Oil from the purging nut can be used as a fuel but even more, its utilisation should imitate an activity in the socioeconomic cycle which should link ecological, economic and income generating effects with one another. The Jatropha System contains 4 core aspects of sustainable development in rural areas:
  - Utilisation of renewable energy (as oil for lamps and fuel in stationary engines)
  - Erosion control and soil improvement (e.g. by planting hedges)
  - Promotion of women (through local soap production)
  - Poverty reduction (through offering possibilities for income generation e.g. sales of seeds or soap)

The experiences gathered in GTZ projects – as in Mali and Zambia – clearly indicate that the Jatropha System is then successful when local conditions are supportive. For the technical support, as well as training and upholding contacts to local suppliers and organisations, the following factors should also be included:
- When planting new Jatropha plants it is essential to choose plants which are adapted to the site and are available in sufficient numbers.
- For soap production, caustic soda must be available in the villages.
- For oil production in the villages, simple mechanical oil mills are required.
- Local engines must be able to run on plant oil.

**The Purging Nut**

The purging nut (Jatropha curcas) belongs to the family of Euphorbiaceae (spurge) comprising 175 species, and originates in Central America. Nowadays, the plant is found throughout the tropical world. As a succulent plant, the purging nut rarely needs more than 500 mm of rainfall in order to flourish. Thus, it is well adapted to marginal sites with poor soil and low rainfall and can occupy an ecological niche without competing with important food plants. The plants, too, are tolerant of light frost and, in addition, be cultivated in areas of high rainfall. Propagation takes place through seeds and cuttings.

**The Jatropha System**

Generations of people have recognised the many potentials for utilising the purging nut. In order to further develop this knowledge, the GTZ has, over the last 10 years, set up projects in Africa and South Asia to investigate ways to combine this potential within an integrated approach to rural development, the so-called Jatropha System. The oil is not only used here as a fuel but even more, its utilisation should imitate an activity in the socioeconomic cycle which should link ecological, economic and income generating effects with one another. The Jatropha System contains 4 core aspects of sustainable development in rural areas:
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Traditionally, lamas play an important role in the lives of the people and in the ecosystem on the high plains of the Andes Mountains. The animals are very well adapted to the extreme climatic conditions and the sensitive natural environment. At the same time, they provide people with wool, meat and dung and are also a means of transport. In Bolivia, their meat which is low in cholesterol and rich in protein is not generally marketed but directly consumed by farmers.

In the partly remote areas though, genetic diversity in the lama population has been preserved and can be used for breeding and economic purposes. This has been verified by a joint study of the sector project “Managing Agrobiodiversity” and the Tropical Ecology Support Programme of GTZ, in collaboration with the University of Hohenheim, from the year 2000 on the prospects of long-term conservation and utilisation of lamas. According to the study, the remarkable fibre quality of the wool in the area of research provides Bolivia’s textile industry with the right prerequisites for quality production.

Controlled Wool Production

Crucial for the revival and improvement of lama breeding in the project area, the remote high Andes to the north of the city of Cochabamba, was the establishment of the regional Breeders’ Association, ORPACA (Organización Regional de Productos Agropecuarios de Calientes) in 1999. A project area. The positive experience made in the project area should also benefit other farmers in Bolivia. This is why currently, in technical cooperation programmes, measures to impart quality awareness among producers are under consideration.

Bolivian worsted and textiles are still rarely found on the European market. At the moment, with the support of GTZ’s Private Public Partnership Programmes (PPP) and through the German textile industry, investigations are being carried out on how to improve market access, internationally too, of this qualitatively superior wool.