

Research and innovation

The Global Forum on Agricultural Research (GFAR) brings together all those working to strengthen and transform agricultural research for development around the world. As part of this role, GFAR is working with New Agriculturist to showcase and raise awareness of important initiatives and their outcomes, to update and inspire others.



Agrobiodiversity value chains

Developing and improving value chains for specific neglected and underutilised species helps to improve food security and generate income and employment by linking smallholder supply capacities to market opportunities. In this edition, GFAR highlights the innovative and collaborative approaches taken in Cameroon, Peru and Zimbabwe in upgrading value chains for a variety of wild and cultivated plant species.

Treasures of the forest

Non-timber forest products provide a sustainable source of revenue for forest communities in Cameroon and are in demand in urban areas. Support has been provided to collectors and traders to develop the value chain, and increase quality and incomes.

Baobab and marula - Zimbabwe's top tips for success

Baobab seed pulp and marula oil are two products being developed by a USAID and EC funded project in Zimbabwe, which aims to position the country as a first choice supplier in global markets for unusual, natural African ingredients and products.

From the mother of all chillies

Smallholder chilli farmers in Peru and Bolivia are finding new national and international markets for their nations' rich diversity of chilli species. Genebanks have been created, housing over one thousand chilli accessions, which are being analysed for commercial traits for use by food, pharmaceutical and natural cosmetics manufacturers.

Baobab and marula - Zimbabwe's top tips for success

While Baobab trees enjoy iconic status as a symbol of Africa, their furry-skinned fruit contain a seed-covering pulp with some properties that are attracting more than just admiring looks. Containing more vitamin C than oranges, more calcium than milk and more antioxidants than Chinese 'superfruit' Goji berry, Baobab has recently been identified by researchers in Zimbabwe as one of the country's top underutilised plants, with the potential to earn significant income for families living in drought-prone areas. Now, with funding from USAID and the EC, a public-private partnership is working to commercialise production and processing of ten of the country's wild plant species, as well as a variety of high value crops, for local and global markets - food, cosmetic and pharmaceutical.



The partnership harnesses the skills and interests of three organisations. Hilfswerk Austria International (HWA) is an NGO with a mandate to improve livelihoods among Zimbabwe's rural smallholders; Bio-Innovation Zimbabwe (BIZ) is a non-profit, membership based organisation that comprises private companies and NGOs with an interest in developing the commercial potential of underutilised plants; and KAITE, a Zimbabwean company, promotes smallholder production of organic staple foods and high value crops for export. In partnership since 2011, they are now working with 3,200 wild collectors and farmers, 80 per cent of whom are women, to supply a wide range of raw materials and processed products.

Maximising marula

Memory Mukamuri is a wild collector in the southern Chivi district. Four year ago she joined a group that collects marula fruit, extracts the kernels and nuts and produces marula oil, nuts and nut butter, for sale to local companies and individuals. However, despite receiving training in harvesting, oil extraction and processing techniques, the group faced considerable challenges. With no access to international markets or certification, their sales remained very low, and they struggled with technology and product quality.



In 2012 Memory was able to earn US\$450 from her marula activities
©HWA/S Weninger

With input from the partnership, production and processing have significantly improved, and in 2012, Memory was able to earn US\$450 from her marula activities. She also dreams of improving the technology used by the group. "I went to Swaziland in 2012 on a 'look and learn' tour," she says. "It really was an eye opener. The groups we visited are using advanced machines and we hope to follow suit in the near future."

The partnership's activities begin with research, identifying the species with highest potential for commercialisation. Less than one per cent of Zimbabwe's nearly 6,000 plants are currently exploited commercially, but up to 20 per cent are likely to have some commercial potential. The process continues with the development of marketable products from the most promising species, followed by work to create a market for those products, locally, regionally and globally.

Once the market is assured, certified organic and fair trade value chains are built with local collectors like Memory and with farmers who are ready to cultivate new, high value crops. In Binga district, in the west of the country, farmers such as Isaac Mudenda are now growing rosella (*Hibiscus sabdariffa*), bought by the KAITE company for use in herbal teas and other foods. Mudenda expects to earn at least US\$400 a year from his hectare of rosella, also growing finger millet and sorghum for home consumption.

Sharing lessons - production, processing and marketing

At the NUS 2013 meeting in Ghana, the project shared lessons from its first three years in operation. These included the need to invest in innovative and sustainable harvesting and production technologies in order to improve competitiveness, the need for expert input and investment in both product and market development, and the key role of private companies in the enterprise. In terms of processing, it was found that working in groups has been highly beneficial to wild collectors, but that despite this, the quality and hygiene standards required for export markets made it very difficult for value addition to be done in the village. Meanwhile, successful targeting of international markets demanded input along the whole value chain, from collectors to end users, with certification a key requirement.

"The potential of these species will not be realised unaided," says Gus Le Breton, BIZ chief executive officer. "There is need to identify the unique selling points of each, and facilitate concentrated investment in product development, trial marketing, consumer awareness, and production and yield trials," he adds. But, he argues, given the current focus of international markets on Africa, and on 'natural' and ethical trade, the time for such investment has never been better.

Legislation needed

Le Breton also emphasises the vital need for legislation on harvesting of wild plants. In the absence of policies on benefit sharing, for example, private companies and NGOs are in danger of being accused of 'looting' natural species from the wild. Collectors need to be organised, with facilitation and encouragement from relevant government ministries, and representative platforms are needed to address a range of issues: development of legislation; coordination of research on plant properties, products and standards; and improved communication between smallholders, processors, research and government.

"In rebuilding Zimbabwe's agricultural sector," says Le Breton "we need to play to our strengths, and our biodiversity is one of them. The biggest obstacle to developing this potential is our own mindsets or simply ignorance on the part of consumers and policymakers."

Links

- Hilfswerk Austria International (<http://www.hilfswerk.at/hwa/english>)
- Bio-Innovation Zimbabwe (<http://bio-innovation.org/>)
- KAITE (<http://interim.kaite.biz/>)



Baobab fruit contain more vitamin C than oranges
©HWA

From the mother of all chillies



Cultivated and wild chilli species are being documented and conserved
©Bioversity International/MV Zonneveld

While the global appetite for exotic and spicy foods has never been greater, discerning chilli lovers can soon look forward to a much more diverse range of tastes, aromas and flavours on their supermarket and delicatessen shelves. Currently, just five species of chilli are cultivated commercially around the world. Peru is a center of diversification and probably the country with the highest diversity of cultivated chili peppers in the world; it is one of the few countries where varieties of all five cultivated species are grown and used in local diets. To ensure that this diversity finds its way into niche markets around the world, a large number of individuals and organisations have joined forces to set up value chains that increase farmer incomes and link them to high-value, high-quality markets.

As a first step, the Capsicum project, part of the CGIAR Research Program on Policies, Institutions and Markets (PIM), set out to document and conserve the diversity of cultivated and wild chilli species in Bolivia and Peru. In Peru, over 700 chilli accessions from the five species of cultivated chillies have been collected and stored in a newly established genebank at the Instituto Nacional de Innovación Agraria. In Bolivia, the Centro de Investigaciones Fitoecogenéticas Pairumani - an NGO - has assembled a unique collection

of 492 accessions of the five cultivated species and seven wild species.

Analysing the chillies for commercially valuable attributes has been a vital step in developing the value chain. Key to this has been the setting up of a sensory evaluation panel including the development of 18 flavour descriptors and the biochemical characterisation. This has included determining levels of capsaicinoids specific flavonoids and antioxidants, as well as levels of vitamin C, fat content and extractable color. The findings have helped generate new interest in the chillies for differentiated high value uses among pharmaceutical and natural cosmetics companies, as well as spice manufacturers and food processors.

Strongerlinks

Partnerships have been at the heart of the project. Fifteen studies on value chain, markets and consumer preferences have been conducted to identify bottlenecks and market opportunities, both nationally (Bolivia and Peru) and internationally (European Union and USA). Multi-stakeholder platforms have been created including farmers' organisations, universities, development agencies, national and international research institutes, regional government officials, small and medium processing and exporting enterprises and restaurant owners. Through participatory assessments, constraints in each chain segment have been identified and links between value chain actors are being strengthened, with smallholder farmers, for example, signing contracts with buyers to supply national and international markets.



Studies on value chain, markets and consumer preferences have been conducted
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Esau Hidalgo del Aguila is one such smallholder. He is president of APE-Pimental, an association of Peruvian ecological producers in the Amazon region, which grows organic chilli as part of an agroforestry system. Working with Bioversity International for over two years, he now has 20 hectares of environmentally sound chilli production, which he grows under contract with an export company. He is now encouraging other farmers to follow suit. "We are working with our children's generation in mind," he says, proud of the agroforestry system that has led to the reforestation of his formerly degraded land. "Not many people around here think like this, so we have travelled to get ideas from elsewhere. Slowly we hope to spread these ideas about sustainable farming to others."

Culturalexports

Positive changes are also occurring further along the value chain. Agro Export Topará is a Peruvian company that produces, processes and exports organic certified chilli products to the EU and USA. Chief executive officer, Stefan Bederski recalls how 20 years ago he was stumped when asked by clients about the attributes of the chilli varieties he offered. Research is now providing the answers, and having always sold commercial varieties, the company has started offering various native chillies. Two major international spice companies, Bart Spices in the UK and Wholesome Foods, USA, have recently introduced processed premium organic Peruvian chilli into their product ranges.



Links between value chain actors are being strengthened, with smallholder farmers signing contracts to supply national and international markets
©Bioversity International/X Scheldeman

Over the border in Bolivia, farmers are working with the Fundación Instituto de Tecnología de Alimentos, which is developing new chilli products using native wild and cultivated species. So far, chillies have been bottled, canned, dried, and used in a range of specialty and gourmet products, from jams, pastes and cheeses to sausages, salsa and chocolate, many of them based on traditional recipes. By stimulating a demand for the unique pungencies, aromas and flavours of these little known chillies, farmers have accessed niche markets and discovered an economic incentive to conserve their rich heritage of native species, which staff from Bioversity had warned was under threat of extinction.

As well as protecting biodiversity and raising income, the promotion of native chillies also promises to make farming livelihoods more resilient, with farmers better able to respond to future challenges, including climate change. And whilst the project has focused on a specific region and crop, the work on chilli in Peru demonstrates approaches and technologies that can be used by farmers growing mangoes in India or sweet potatoes in Uganda who are also struggling with declining commodity prices. By effectively harnessing agricultural diversity, they too could access high-value niche markets.

Treasures of the forest



Collection of NTFPs is undertaken predominantly by women
©Judith van Eijnatten

In the forests of Cameroon, development activities are heavily focused on timber, a resource managed almost exclusively by men. But intensive extraction has led to many species being over-exploited, putting fragile ecosystems at risk. This in turn threatens many non-timber forest products (NTFPs) - important sources of food and medicine - including leaves, seeds, fruits and barks, mushrooms, snails and insects. NTFPs are also in demand in urban areas, and provide a sustainable source of revenue for forest communities. However, the NTFP value chain is underdeveloped and fragmented, transparency is low and exploitation of collectors is high.

To increase the benefits from NTFPs and develop the local value chain, SNV in collaboration with the federation of community forests, REFOCOD, has been supporting both collectors and traders in the East Region of Cameroon. Collection of NTFPs is undertaken predominantly by women, who often camp in the forest for several days and trek with heavy loads. Processing - opening fruits, extracting seeds, boiling, drying, etc. - is also extremely labour intensive and time consuming. To increase efficiency in collecting and processing, SNV organised women into groups and provided training in improved processing methods, leading to higher quality products. "In the past we used to collect on our own or with our children," says Lydie Adjele, NTFP collector from Kongo village. "Now we work in groups to collect our Njansang or bush mango."

After processing, the women retain what they need for household consumption and pass the remainder to a nominated group storekeeper, who records the type, quantity and quality of product contributed. Once the stockpile is sufficient, the products are sold and the women receive the appropriate remuneration. To improve quality and potential income, training was provided on grading and using standard units of sale, as middlemen commonly use the variability in the sizes of containers to exploit collectors.

Supporting trade and traders

At the other end of the value chain, SNV has also worked to improve the functioning of traders' organisations, by building capacity in leadership, stock management and negotiation. The latter was necessary as their own customers - national and international traders - frequently use early cash advances to tie local traders into advantageous deals, another form of exploitation. "SNV's support really benefited us: it has given us self-confidence that we are capable of doing business," says Pierre Choudjem a NTFP trader in Ebolowa in the South Region.

At the same time, a public market information system (MIS) was facilitated. Community radio stations broadcasted weekly information provided by both collectors (on the type, quantity and quality of product on sale, plus the sale location, timing of supply and contact details) and traders (on the type, quantity and quality in demand and contact details). Through the MIS, which ensured more equitable access to market information, traders and collectors were better able to link up with each other.



SNV organised women into groups and provided training in improved processing methods
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With greater reliability in supply, the collectors have better negotiating power and traders are ready to pay higher prices because they no longer have to travel randomly in search of NTFPs. However, while the MIS has succeeded in creating market transparency and catalysing business, the fact that it was a free service meant that it was unsustainable. In time, as the NTFP market emerges from obscurity and the coverage of mobile networks and internet increases, a transformed and much cheaper MIS should emerge. For now collectors and traders continue to develop their networks on the basis of the contacts established during the pilot operation of the MIS.

Multiple gains

Both collectors and traders have seen benefits. For collectors, household food security has improved: on average eight per cent of NTFPs collected are kept for home consumption and nine per cent of revenue is used to buy extra food. Incomes have also significantly increased, with each of the 308 collectors earning an average of US\$300 in the 2012 season. Previously, incomes were as good as negligible.

For traders, business has flourished, allowing them to better support their families as well as invest in their communities. "I have established small bush mango stores in more than 200 villages," says Abdou Nji, an NTFP trader in Mbalmayo, Centre Region. "Having established all this, I employed people and gave them motorcycles, to collect bush mango, njansang, kola and black pepper - in fact any product that comes out of the forest! With the NTFP profit from 2012, I built modern rooms for rent, which stabilises my capital and helps my community." Direct contact between collectors and traders has also helped to build trust, essential for sustainable commercial relationships.



Collectors earned an average of US\$300 in the 2012 season
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To further increase food security of forest dwellers and collectors, the next step would be to focus more strongly on nutrition, including nutritional studies of NTFPs, domestication of key species, preservation methods, and development of women-friendly processing technologies and equipment. This would also benefit traders, giving them access to a range of new, improved and nutritious NTFP products, which they could promote to their urban customers.

Links

- Treasures of the forest: Changes in the lives of women collectors (<http://www.youtube.com/watch?v=Kaf4lu4ufhU>)
- Treasures of the forest: Changes in the lives of community members (<http://www.youtube.com/watch?v=l1aE0Y6z0hw>)
- Treasures of the forest: Changes in the lives of traders (<http://www.youtube.com/watch?v=PqwvFaUtGM>)
- Treasures of the forest: Vision of a council (http://www.youtube.com/watch?v=2BnT_0b9Fw8)
- Treasures of the forest: Traditional production of moabi oil (<http://www.youtube.com/watch?v=d3w1kPUB-TQ>)

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