



## NWFPS AND THEIR ROLE IN FOOD SECURITY AND HEALTH CARE

### NWFPS for food and medicine

**Foodstuffs.** In recent years, NWFPS have attracted considerable global interest because of the increasing recognition that not only can they improve rural livelihoods, household food security and nutrition, but their harvest may be more ecologically benign than that of timber.

Edible NWFPS used as food staples, supplements and additives include bushmeat, honey, edible fruits and nuts, leaves, shoots, tubers, whole plants and fungi. They are important food sources for forest-dependent communities.

### GLOBAL DISTRIBUTION OF DIFFERENT SPECIES YIELDING EDIBLE NWFPS

**Africa.** Desert date (*Balanites aegyptica*), twisted cluster or stink bean (*Parkia speciosa*), Chinese date (*Zizyphus zizyphus*), mango (*Mangifera* spp.) and the neem tree (*Melia azadirachta*).

**Asia.** Cashew (*Anacardium occidentale*), mangostein (*Garcinia mangostana*), tengkawang (*Shorea stenoptera*), milk fruit (*Chrysophyllum* spp.), gooseberry (*Ribes uva-crispa*), sea buckthorn (*Hippophae* spp.) and cardamom (*Elettaria* and *Amomum* spp.).

**Latin America.** Brazil nut (*Bertholletia excelsa*), bacuri (*Platonia insignis*), camucamu (*Myrciaria dubia*), cupuassu (*Theobroma grandiflorum*) and jatoba (*Hymenaea courbaril*).

In several African countries, wild fruits play an important role in people's diets and contribute to the economy of the rural community. A study of indigenous edible fruits carried out by the University of Malawi found the following.

- Fruits of the monkey bread tree (*Adansonia digitata*), kharub (*Bauhinia thonningii*) and chocolate berry (*Vitex* sp.) are excellent sources of vitamin C.
- Wild custard apple (*Anona senegalensis*) and Natal mahogany (*Trichilia emetica*) are rich in protein.
- Governor's plum (*Flacourtia indica*) and the snake bean tree (*Syzygium guineense*) are rich sources of iron.

- Baobab (*Adansonia digitata*), camel-foot (*Bauhinia thonningii*) and black plum (*Vitex doniana*) are excellent sources of calcium. The baobab seed kernel is also rich in protein (28.7 percent dry weight) and fat (29.5 percent). As such, it is an important source of vegetable oil for household cooking.

**Medicine.** Some 35 000 plant species have been used for medicinal purposes. An estimated 80 percent of the world's population depends largely on traditional natural medicines – mostly derived from plants. Over 25 percent of the drugs in modern pharmacopoeias are originally plant derived, either as pure phytopharmaceuticals extracted from plants, or as synthetic derivatives. Forest flora and fauna are a hidden chest of organic chemicals, including phytochemicals, aroma chemicals and agrochemicals. The anticancer compound taxol is extracted from the Pacific yew (*Taxus brevifolia*), and phytochemicals from *Pterocarpus osum* are used in treating sickle-cell disease. The origins of traditional herbal medicine predate all existing records, and the knowledge accumulated over thousands of years in different parts of the world is vast.

All the agro-ecological regions and subregions have a large number of medicinal plants that are used locally, for example: *Alstonia scholaris*, *Aconitum heterophyllum*, *Aegle marmelos*, *Cinnamomum camphora*, *Aquilaria* sp., *Embllica officinalis*, *Panax* sp. and *Tinospora crispa* in parts of Asia; *Tagetes glandulifera*, *Mauritia flexuosa*, *Pithecellobium avaremotemo*, *Chinchona* sp. and *Hyptis pectinata* in parts of Central and South America; and *Prunus africana*, *Curtisia pentata*, *Cryptocarya myrtifolia*, *Gnetum africanum* and *Catharanthus roseus* in parts of Africa.

Traditional medicines for local use involve simple preparation methods such as hot and cold water extraction, expression of juice after crushing, powdering of dried material, formulation of powder into pastes via such vehicles as water, oil or honey and even fermentation after adding a sugar source. Preparation of standard extracts and their conversion into dosage forms are activities that can be undertaken as a rural-based small industry to meet the demands of local populations. This is essential in areas where traditional medicines are the main form of treatment for illness. Additional processing with sophisticated machinery, and also with

health and safety considerations, is required to produce pure phytopharmaceuticals used in modern medicine. Moreover, as these compounds naturally occur in small quantities in a plant, large volumes of raw material have to be processed to enable economies of scale. [Source: Elaine Marshall and Cherukat Chandrasekharan. 2009. *Non-farm income from non-wood forest products*. FAO Diversification Booklet 12. Rome, FAO, Rural Infrastructure and Agro-Industries Division.]

### Honey is both a superfood and medicine

Honey is the partially digested flower nectar regurgitated from a bee's stomach. It is also one of the most diverse and delicious foods on Earth.

Honey has been used as food and medicine for perhaps 10 000 years and has been cultivated by humans for at least 3 000 years. We know it today as a substitute for white granulated sugar but, for most of history, honey was the basic source of food sweetening, and sugar only recently became more popular as a low-cost alternative. However, when the benefits of honey are considered, the cost should be irrelevant.

In addition to its many culinary uses, honey has a long and impressive résumé as a medicinal healer. In traditional medicine it has been used for treating gastric ulcers, burns, high blood pressure, sore throats and dry coughs.

Modern medicine is also now recognizing the medicinal benefits of honey. In 2007, research at Penn State College of Medicine (United States of America) concluded that a small amount of buckwheat honey before bed was more effective than over-the-counter cough suppressants for children over two years of age. Also in 2007, the FDA (United States Food and Drug Administration) approved a line of wound care dressings lined in honey. Because honey is high in sugar and low in moisture it has been traditionally used to fight bacterial growth, producing hydrogen peroxide as it draws moisture from wounds. It also contributes to reduced swelling and inflammation.

In addition, honey has been shown to aid digestion, and an Oklahoma allergist even claims that one teaspoon of raw honey every day is effective to treat 90 percent of allergies.

The best honey to buy is raw organic straight from the hive. Most honey is pasteurized and the heating process destroys some of the beneficial properties of the

honey, including some of the phytonutrients. Raw honey is a creamy solid, not liquid, and contains propolis, sometimes called "bee glue", that honeybees use to seal the hive and make it safe from bacteria. Propolis has antibacterial, antiviral and antifungal properties. Raw honey also contains other phytonutrients that have cancer-preventing and anti-tumour properties and may help prevent colon cancer.

Children under the age of 12 months should not be given honey since their immature digestive systems cannot process botulism spores that can be present in honey, maple syrup and corn syrup, but which older systems can handle.

Honeybees are in danger of disappearing from the United States of America because of colony collapse disorder and this, combined with other factors, will continue to raise the price of honey. But pay up. This is pure gold. [Source: examiner.com [United States of America], 2 September 2009.]

### Medicinal and aromatic plants and their role in attaining food security in the high hills of Nepal

Medicinal and aromatic plants (MAPs) are an integral component of the rich biodiversity of every society. They are also attracting increasing attention from both development planners and environmentalists because of their multiple functions and potential contribution to improving the livelihoods of rural and marginalized communities. MAPs are an important source of income, medicine, dyes, nutraceuticals, food products and cosmeceuticals, benefiting the poor and landless in mountain and highland regions. Earnings from MAPs have predominantly been used to bring about food security by most of the people living in the high mountain areas of Nepal.

Our research focused on Baitadi and Darchula, which are located in the far western part of Nepal and, according to national indicators, the least developed districts of the country. Geographic complexity and remoteness, poverty, food scarcity, illiteracy, few economic opportunities and the absence of land transportation and communication facilities are the major challenges for development in the districts.

The study was carried out in a participatory, consultative and multiperspective (polyvocal) way, combining both qualitative and quantitative data collection methods and utilizing a disclosure and verification approach. The primary data

were collected through 16 key informant interviews, three focus group discussions, 52 household level questionnaire surveys (21 female and 31 male respondents) and direct observation.

The study found that the main sources of household production are agriculture and livestock, with MAPs contributing around 12 percent of total household production (5 percent in Baitadi and 18 percent in Darchula).

Most of the households agreed that the contribution of MAPs in household production is high; 39 percent of respondents agreed that it made a moderate change in their food security, followed by significant change (25 percent), no change (24 percent), minimum change (12 percent) and no responses for highly significant. The collection of MAPs has a significant impact on food security for poor and MAPs-dependent people. Similarly, of the ten options that MAPs provide (improved livelihood, diversified livelihood, increase in marketing access, increase in income, increase in knowledge, food security, increase in bargaining power, improved health condition, improved well-being and women's status), respondents mostly ranked food security in the first four. Overall, food security and increased incomes were ranked first.

It is obvious that the collection and sale of MAPs have a positive impact on food security for the local people dwelling in the high mountain areas of Nepal. MAPs are most important for the poor and those holding less land who, in one way or another, are dependent on MAPs for their livelihoods. Some of the major problems faced by MAPs collectors were improper prices for their collected goods, lack of proper market information, inadequate value-addition technology and inadequate physical infrastructures such as roads and warehouses. With better management of MAPs, there would be more possibilities for marginalized and poor households to improve and increase their opportunities to attain food security. (Contributed by: Ram P. Acharya, Managing Director, and Rijan Tamrakar, Programme Officer, PSPL, Nepal.)

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### Ramón nut: a little nut with big possibilities

Planted by the ancient Maya in their forest gardens and once found throughout Central America, the *ramón* tree (*Brosimum alicastrum*) towers above its neighbouring trees in Guatemala's Maya Biosphere Reserve, providing a habitat for spider and howler monkeys, retaining soils and water and helping to regulate the climate. But it is the fruit of the *ramón* that holds the greatest potential for communities within the reserve and could provide them with a key to alleviating poverty, conserving forests, improving health and nourishing their children.

Locals have long collected the chocolate-flavoured *ramón* or Maya nut, roasting it over an open flame (or drying it with heaters) before grinding it into flour that acts as the basis for an assortment of popular foods. While its nutritious properties are widely known throughout the region, until recently no clearly defined strategy existed for incorporating the nuts into the diets of Guatemala's rural and indigenous children, 49 percent of whom suffer from chronic malnutrition.

Thanks to "Healthy Kids, Healthy Forests" – a programme launched by the Rainforest Alliance, the Equilibrium Fund, the Guatemalan Ministry of Education, the Banco de Desarrollo Rural S.A., the National Forest Service of Guatemala, Alimentos Nutri-Naturales and the Association of Community Forestry Concessionaires of Petén – communities throughout the reserve will now be able to capitalize on the nut's many benefits. The world's first *ramón* nut-based school lunch programme is helping to feed more than 8 000 children from 46 rural communities, while providing jobs for women and offering a real incentive for forest conservation.

The enterprising children – and the adults who accompany them into the forest – deliver their hauls to the local bakery, where they receive one quetzal (about 12 cents) for every pound (0.45 kg) of *ramón* gathered. An all-female staff removes the skins from the nuts before roasting them. "Before, I had no job," says Lubia Flores Rodriguez, who works in the Ixlú bakery removing the nut's tender skins. "Now I come to work and I am able to make a living," she says.

Once they have been roasted, the nuts are ground into flour and distributed to teachers and school boards in nearly 50 communities throughout Petén. The flour is used to make



*Brosimum alicastrum*

wholesome food (*ramón* is a naturally complete protein, high in calcium, fibre and potassium) for school lunches.

"Worried about poverty and the struggle to feed our children adequately, we found in the *ramón* nut a nutritious food and a source of work for rural women," said Gladis Rodriguez, President of the Association for the Development of Women of Ixlú. "Thanks to the support of the Rainforest Alliance (and other organizations) that helped us start this project, we look forward to a better future for all our families." (Source: Rainforest Alliance, 28 August 2009.)

#### Mushrooms for food and medicine

Mushroom cultivation is a source of economic, nutritional and medicinal value, providing direct benefits to livelihoods. While extra caution is necessary in distinguishing between species that can be consumed as food and those that are lethal, their benefits cannot be overestimated. Trade in cultivated mushrooms can provide a readily available and important source of cash income for men and women as well as act as a valuable safety net during times of stress. For millennia, mushrooms have also been cultivated for their medicinal properties. Above all, mushrooms can make an important contribution to the diets of people in developing countries, which are often lacking in nutrients.

Today, mushrooms are increasingly considered as fair substitutes for meat, with a protein content ranging between 19 and 35 percent. Additionally, their nutritional value is comparable with many vegetables: they are a good source of vitamins B, C and D – including niacin, riboflavin, thiamine and folate – and contain various minerals such as potassium, phosphorus, calcium, magnesium, iron and copper. Mushrooms also provide energy, yet are low in fat and fibre. Moreover, the high water content of fresh mushrooms (about 90 percent) makes prolonging their shelf-life and preserving their flavour and nutrients simple (through drying).

While medicinal fungi have routinely been used in traditional Chinese medicine, only recently has commercial activity related to the medicinal properties of mushrooms increased. In fact, in addition to all essential amino acids, some mushrooms have the medicinal benefits of certain polysaccharides, believed to boost the immune system.

Today, an estimated 6 percent of edible mushrooms are known to have medicinal properties and can be found in health tonics, tinctures, teas, soups and herbal formulas. *Lentinula edodes* (*shiitake*) and *Volvariella volvacea* (Chinese or straw mushroom), both edible fungi with medicinal virtues, are widely diffused and cultivated. *Shiitake* mushrooms are said to combat tumours and possess antiviral properties; they also remove cholesterol from the bloodstream. Other species, such as *Pleurotus* (oyster), *Auricularia* (*mu-er*), *Flammulina* (*enokitake*), *Terrella* (*yin-er*) and *Grifola* (*maitake*) are known, to varying degrees, for boosting the immune system, lowering lipids, combating tumours and regulating blood pressure as well as possessing microbial and viral properties, among other therapeutic effects. (Source: Elaine Marshall and N.G. (Tan) Nair. 2009. *Make money by growing mushrooms*. FAO Diversification Booklet 7. Rome, FAO, Rural Infrastructure and Agro-Industries Division.) (Please see pages 34–35 for more information.)

#### NWFPs and food security

NWFPs can provide important community needs to improve rural livelihoods, contribute to household food security and nutrition, help to generate additional employment and income, offer opportunities for processing enterprises, contribute to foreign exchange earnings and support biodiversity conservation and other environmental objectives.

NWFPs contribute in many ways to combating malnutrition and improving diets in local communities and rural households. Not only do they directly provide food and medicines, but they also indirectly increase income and improve agricultural production, thereby improving access to food. Hunger and malnutrition would be significantly worse if it were not for the contribution of trees and forests to household food security.

Many rural households in developing countries, and a proportion of urban households, depend on plant and animal products from forests to meet some part of

#### ONE-SIXTH OF HUMANITY IS HUNGRY

- **How many?** FAO estimates that 1.02 billion people are undernourished worldwide. This is the highest number since 1970.
- **Where do the hungry live?** Sub-Saharan Africa: 265 million; Asia and the Pacific: 642 million; Latin America and the Caribbean: 53 million; Near East and North Africa: 42 million; developed countries: 15 million. Asia and the Pacific, the world's most populous region, is home to the largest number of hungry people. Yet sub-Saharan Africa has the largest prevalence of undernourishment relative to its population size (32 percent).
- **Why?** The current global economic slowdown – following soaring food prices in 2006–2008 – lies behind the sharp increase in world hunger. It has reduced incomes and employment opportunities of the poor and significantly lowered their access to food. Yet longer-term chronic hunger symptomatic of poverty is at the core of the problem.
- **What are the options?** The number of hungry people has remained above 800 million for the past 40 years. This reveals the fragility of the present food system. In order to fight hunger, a twin-track approach remains key, involving both measures for immediate relief and more fundamental structural changes.

(Source: [www.fao.org/hunger/en/](http://www.fao.org/hunger/en/))

their nutritional, cooking and/or health needs. Trees and forests contribute to improving the well-being of local populations by providing the right variety of food, flavourings, medicines and beverages.

Furthermore, NWFPs can offer vital insurance against malnutrition or famine during times of seasonal food shortage or emergencies such as droughts, floods or wars. It is common for rural households to depend on forest foods between harvests, when harvested stocks have been consumed but before new crops are mature. Women, in particular, count on these resources for supplementary

nutrition, emergency food, and many other important products they need to ensure the nutritional well-being of their families.

NWFPs also contribute indirectly to household food security through the generation of income and employment from their sale and exchange. Marketable forest products provide the opportunity to supplement household income, as well as constituting a relief source in times of shortages.

NWFP-earned income is used to purchase foods; in other cases it may be invested in agricultural land or agricultural inputs, such as seeds or livestock. Thus the link between generated income and food security must be assumed, while keeping in mind that income also contributes to other "securities", such as housing, education or clothing.

The contribution of NWFPs to food security in developing countries, therefore, is significant, diversified and valuable; it ranges from direct production of food to provision of jobs and income, with wild food plants complementing food intake and being consumed throughout the year.

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Agnese Bazzucchi is working as a volunteer with the NWFP Programme and using this experience as part of her Master's degree in food security.

### Major wild edible plants in India

The Nilgiri Biosphere Reserve (NBR) in the southern Western Ghats, India, hosts a wide variety of wild edible plants. Local tribes have a wealth of knowledge about these forest resources, consuming flowers, roots, fibres, tubers, leaves and so on for food. Women and children in particular have long collected wild foods, although today the practice is declining. The loss of interest on the part of younger generations – who prefer foods from local markets – is a major threat to the local knowledge base.

Among the foods collected are the following.

***Dioscorea tomentosa* L.** (Dioscoreaceae): Nooral Kangu, Irula. A sparsely prickly, tuberous climber common on forest slopes and borders of many districts. These tubers are harvested during the summer season and eaten boiled (with salt) or deep-fried.

***Cycas circinalis* L.** (Cycadaceae): Irula, Kurumba. A short palm-like tree found in some isolated pockets of the NBR. Its



*Cycas circinalis*

seeds are filtered and the kernels ground into a paste (often with salt and chilli).

***Acacia pennata* (L.) Willd.** (Mimosaceae): Seengai dagu, Irula, Kurumba. An extensive armed straggler found along forest borders and scrub jungles. Its young leaves are harvested during pre-monsoon periods, cooked with lentils, and eaten with millet.

***Scutia myrtina* (Burm.f.) Kurz** (Rhamnaceae): Kokkimullu, Sodali, Irula, Kurumba. A straggling thorny shrub found commonly in forest borders and scrub jungles from plains to 1 200 m. Its ripened fruits are edible.

***Dioscorea oppositifolia* L.** (Dioscoreaceae): Rhea Kangu, Irula. An extensive climber found on thickets and in secondary forest patches above 750 m. The plant's tuber is the main food source for the Kurumba community. The tubers are harvested from January to April and eaten boiled (with salt) or deep-fried.

***Bambusa arundinacea* (Retz.) Roxb.** (Poaceae): Dodda biddur, Kurumba, Billia moonga, Irula. A tall, erect green bamboo with spines found in moist deciduous to semi-evergreen forests. The young shoots are harvested and cooked with tamarind and other ingredients; they are often eaten with millet.

***Solanum nigrum* L.** (Solanaceae): Kakkadagu, Irula. A small shrub found along riverbanks, in agricultural fields and wastelands from plains to 1 500 m. The leaves are cooked with lentils and often eaten with rice or millet. The shrub also boasts medicinal properties and is used by locals to treat stomach aches, chest pains and mouth ulcers.

***Cissus quadrangularis* L.** (Vitaceae): Naralaikkodi, Irula, Kurumba. A rambling shrub with a quadrangular stem found along forest paths and scrub jungles of deciduous forests. The young stem and leaves are combined with tamarind to make chutney.

***Cereus pterogonus* Lemaire** (Cactaceae): Bella Kalli, Irula. A profusely branched columnar shrub found alongside roads and fences. The flowers are harvested from March to June and cooked with salt; they are commonly eaten with rice.

***Syzygium cuminii* (L.) Skeels** (Myrtaceae): Naaval, Irula, Kurumba. This evergreen tree is found in a variety of habitats – from plains to 1 400 m. Its ripened fruits are dark blue and eaten raw. Large quantities of these fruits are collected between June and July and sold locally in markets. (Source: extracted from: "Major wild edible plants of the Nilgiri Biosphere Reserve in India" in *Voices from the Forest*, Edition No.17, September 2009.)

### Edible insects "rediscovered" in Central Africa

Many edible insects, such as caterpillars and grubs, are important sources of protein and should be considered an alternative in efforts to increase food security in Central African countries, nutritionists said today. While this is common knowledge to many of the peoples of the Central African region, the importance of edible insects has only now been rediscovered by nutritionists.

According to a study published by FAO, edible insects must be reconsidered as an important source of protein in Central Africa. These widely eaten insects are not only nutritious, but also potentially income generating and a manner of biological pest control.

Caterpillars are already an important food intake for many in Central Africa, according to the FAO study. About 85 percent of participants in a survey in the Central African Republic consume caterpillars; 70 percent in Congo Kinshasa (the Democratic Republic of the Congo) and 91 percent in Botswana. "Edible insects from forests are an important source of protein and, unlike those from agricultural land, they are free of pesticides," said Paul Vantomme, an FAO forestry expert.

For every 100 g of dried caterpillars, there are about 53 g of protein, about 15 percent of fat and about 17 percent of carbohydrates. Their energy value amounts to around 430 kilocalories per 100 g. The insects are also believed to have a higher proportion of protein and fat than beef and fish with a high energy value.

Depending on the species, caterpillars are rich in important minerals such as

potassium, calcium, magnesium, zinc, phosphorus and iron, as well as various vitamins, the FAO study revealed. Research shows that 100 g of insects provide more than 100 percent of the daily requirements of the respective minerals and vitamins.

Because of caterpillars' high nutritional value, in some regions flour made from caterpillars is mixed to prepare pulp given to children to counter malnutrition, said Mr Vantomme. "Contrary to what many may think, caterpillars are not considered an emergency food, but are an integral part of the diet in many regions, according to seasonal availability. They are consumed as a delicacy," he added.

The collection of edible insects is also a good source of income, especially for women, as they require little capital input if gathered by hand. Insects are widely offered in local village markets, while some of the preferred species, such as Sapelli caterpillars, reach urban markets and restaurants.

Transborder trade in edible insects is significant not only within Central African countries, but also with the Sudan and Nigeria. On a smaller scale, they are even exported to France and Belgium, two countries that according to the study import about 5 tonnes and 3 tonnes respectively of a dried caterpillar species annually from Congo Kinshasa. The annual export to Belgium is valued at US\$41 500.

Many caterpillar species nourish on fresh leaves. Although trees usually respond by producing a second growth of leaves, after several attacks trees may lose vitality, according to FAO. "Harvesting caterpillars thus contributes to maintaining the natural reproduction of trees and serves as a biological pest control," the United Nations agency said.

According to Mr Vantomme, Central Africa's edible insects need to be rediscovered by Western scientists and food security researchers. "The nutritional and economic value of edible insects is often neglected and we should further encourage their collection and commercialization, given the benefits to the environment and human health," Mr Vantomme said. (Source: afrol News, 8 November 2009.)

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### SNAILS PROVIDE A TASTY SOURCE OF IRON, STUDY FINDS

Snail meat could be a cheap, tasty and nutritious food, and help reduce anaemia caused by a lack of iron in the diet, according to a Nigerian researcher.

Ukpong Udofia, a nutritionist at the University of Uyo, analysed the nutritional value of the meat of the giant West African land snail (*Archachatina marginata*).

She found it to have a higher protein and iron content, and lower fat content, than beef, as well as containing many essential nutrients such as calcium, magnesium and vitamin A.

The snail is native to forests and areas of moist vegetation in West African countries such as Cameroon, Côte d'Ivoire, Ghana and Nigeria.

Udofia tested the tastiness and acceptability of the meat by asking a group of mothers and their school-age children whether they preferred a pie made from snail or beef. Most preferred the appearance, texture and flavour of the snail pie.

Iron-deficiency anaemia is common in children and women across Africa and the developing world. Caused by a lack of iron, it is exacerbated by diseases such



as malaria and contributes to a fifth of maternal deaths, according to the World Health Organization (WHO).

Snail meat has figured in the diet of Asian countries, and of African people living in forested areas, for thousands of years. Pa Tamba Ngom, a researcher in

the nutrition programme at the Gambia's Medical Research Council, added: "Here in the West African subregion, especially Senegal and the Gambia, it is very famous and included in one of our main rice dishes, known as *benachin*". Ngom

said that small-scale snail farming systems should be expanded to protect wild snail stocks from becoming further endangered by overgathering.

Sonya Begg, an Australian snail farming expert, said the snail could pose a public health threat if eaten raw and infected with the rat lungworm parasite (*Angiostrongylus cantonensis*), which can cause a rare form of meningitis in humans. She added that people should eat only farmed snails to ensure the snails had eaten only non-poisonous foods.

Udofia's study has been published in the *International Journal of Food Safety, Nutrition and Public Health*. (Source: ScienceDaily, 2 December 2009.)

### Food from the forests of tropical Asia

The importance of forest foods in providing food security is often underestimated. For many indigenous communities especially, foods gathered from forests are vital, particularly during times of famine or seasonal scarcity. Their nutritional value – in terms of proteins and micronutrients – cannot be overestimated. Leafy vegetables, mushrooms, herbs, fruits, nuts, tubers, honey and insects are only some of the foods that forests produce.

The destruction of forest habitats, however, has severely threatened this vital food base. Together with the introduction of "modern", processed and comparatively nutrient-poor food items into the diets of indigenous communities and cultural erosion, local knowledge of these valuable foods is dissipating.

Below is a taste of some forest foods – whose nutritional value often goes unrecognized – found in wide use in tropical Asia.

#### **Beska-kenil chutney**

*Kenil*, a species of red ants of the genus *Crematogaster*, are found in many parts of tropical Asia, including the Durwa and Koitoor tracts of Bastar and Malkangiri districts in eastern and central India, where they are widely used in local diets. These ants make small nests in the leaves of trees, especially sal (*Shorea robusta*) trees; they have eggs and larvae that are available all year. Being rich in ascorbic acid, the ants are useful in treating common colds.

*Beska* refers to the plant as well as the root of *Costus speciosus*, a herb of the ginger family that sprouts after the first showers of the monsoon in many parts of

tropical Asia. Its leaves are spirally arranged on the stem, with white flowers and a bright red calyx. Its ginger-like rhizomes are slightly stringy and not so strong as ginger. For this reason, it can be eaten raw in large quantities. It is also a popular ingredient in many types of chutney. Combined, *beska-kenil* makes chutney, often used in tropical Asian diets.

#### Sago worm

The larvae of the sago weevil (*Rhynchophorus bilineatus*) are extremely efficient transformers of *Eugeissona utilis* sago starch into more nourishing fat and protein. Locally, they are known as "baby fat" and are viewed as important for the growth of young children. [Source: Jenne de Beer. Extracted from: "Food from the forest" in *Voices from the Forest*, Edition No.17, September 2009.]

#### Evaluating underexploited indigenous fruits to improve food security

The African continent is home to some 3 000 species of wild fruit trees. In Cameroon alone, fruits and seeds from over 300 indigenous trees are eaten, according to a study carried out by Cameroon's University of Dschang. A similar study conducted by FAO in rural Ethiopia found that wild foods, also known as "famine foods", can cover an estimated 80 percent of the food needs for some families, particularly in times of stress. Chocolate berries, star apples, gingerbread plums, monkey oranges, tree grapes and a host of other unexploited African plant resources might soon help broaden and secure the continent's food supply, says a study published by the United States National Research Council.

According to the study, a vast array of African wild fruits is ripe for domestication. Tree domestication is not new to the continent. During the mid-1990s, researchers from the World Agroforestry Centre surveyed local people across West Africa, southern Africa and the Sahel to understand which indigenous trees they valued most. "We were expecting people to point to commercially important timber species, but what they valued most were indigenous fruit trees," says Zachary Tchoundjeu, a botanist at the World Agroforestry Centre's regional office in the Cameroonian capital, Yaoundé. Except for their biological names, many specialists at the Centre knew next to nothing about these fruits; in contrast, locals had long been utilizing them in their diets.

In response, the World Agroforestry Centre launched a tree domestication

programme in 1998. Unlike traditional programmes that involve the development of new varieties by agribusiness companies, which are then grown in monoculture plantations, local farmers play a central role in developing, testing and selecting new varieties. Additionally, farmers receive training in horticulture techniques. At the time there were just two farmer-run nurseries in Cameroon; today there are several hundred. Many farmers have seen their incomes increase threefold.

"The last great round of crop domestication took place during the green revolution [in the mid-twentieth century], which developed high-yielding varieties of starchy staples such as rice, maize and wheat," says Roger Leaky, a former director of research at the World Agroforestry Centre. "This new round could scarcely be more different." Leaky calls these fruits of the forest "Cinderella species," because they have long gone unexploited. It is time, he says, that these indigenous fruits step into the limelight. [Source: extracted from: "Cinderella fruit: wild delicacies become cash crops" by Charlie Pye-Smith in *New Scientist*, issue 2733, 10 November 2009.]

#### A vegetable fern, *Diplazium esculentum* – potential for food security and socio-economic development in the Himalayas

Belonging to the tropical eastern hemisphere and distributed in Southeast Asia, China and Japan, *Diplazium esculentum* Retz. Swartz (Athyriaceae) is one of the top preferred edible ferns in the Himalayas. In many parts of eastern Southeast Asia, people use this mineral- and energy-rich edible species by cooking the upper shoots/fronds as vegetables.

In the Indian Himalayas, the species is known by different names – *ningru* in Sikkim, *lingri* in Himachal Pradesh (HP), *lingra* in Uttarakhand and *dheki* in other northeastern states. In Bangladesh, the plant is commonly called *dheki shak*, *palo shak* and, in tribal areas, *teria shak*. Distributed worldwide, the genus *Diplazium* represents 474 species and eight hybrids. Tropical America alone is known to have 100 species.

The stout caudex in *D. esculentum* may reach 1.5 m in height; fronds are bipinnate or tripinnate with sori on both leaf surfaces along the veins. Available literature indicates that the edible fronds are rich in iron, phosphorus, potassium and protein, richer

#### SUPERFRUIT GOJI BERRY (*LYCIUM BARBARUM*)

Superfruits are a relatively new addition to contemporary diets. They are, for the most part, small fruits with some amazing claims as to their health benefits and nutritional content. Since they are relatively new, there have been few clinical trials on which to base these claims.

The bright orange to red goji berry is grown mainly in Tibet (Autonomous Region). There is some debate linking the goji berry to the wolfberry which, although the same species, may come from two different places. China and Mongolia are thought to be home to the wolfberry, while goji has been specifically linked to the berry in Tibet. The Tibetan goji alone is thought to have over 40 species. The inside of this colourful berry is laden with seeds. Berries are not picked but shaken from the trees on to mats where they are left to dry before packaging. Touching the berries before packaging and/or drying is said to cause oxidation, turning the goji black.

According to goji legend, use of the berry stretches back over 3 000 years. It is said that Tibetan monks who drank from a well surrounding goji berry vines found longevity by drinking the water into which goji berries fell at random. The monks then spread the word through travellers, creating a conspicuous amount of interest about the new anti-ageing miracle.

Goji berries seem to explode with nutritional value. They have at least 18 amino acids, 21 trace minerals, protein, and are a truly rich source of carotenoids. Of the 21 trace minerals one, germanium, is of particular interest for fighting cancer. It contains vitamins B, C and E, and essential fatty acids.

Aside from their anti-ageing uses, goji berries are used to protect the liver and kidneys, help eyesight, improve circulation, bolster immunity, soothe skin problems and help with anxiety and sleeplessness. Although not all of these uses have been proven via clinical studies, there are some studies that seem to have a positive bearing on the use of goji berries overall. (Source: examiner.com, 10 August 2009.)

than that of many conventional vegetables and many wild edibles. The mineral content has also been reported to be several times greater than that present in many commercial fruits.

The most common recipe using *D. esculentum* involves cooking the dried fronds in oil or butter; using them in a vegetable curry is less preferred. In the northeast, especially in Sikkim, and in the central and northwestern Himalayan states (HP and Uttarakhand), the local folk relish both vegetables and pickles from *D. esculentum*. Natives consider these recipes effective both to counteract constipation and as an appetizer, especially as a pickle.

In literature, the plant is used ethnomedicinally to cure skin ailments. A peoples' perception study by the author covering a dozen villages in the Parvati valley (HP) revealed that, of 50 consumed wild edibles, *D. esculentum* is used as a vegetable/pickle by an average of 66 percent of the respondents. In many Himalayan areas, including the study area, the dried leaves are used as cattle bedding.

Besides its edible use, in Bali *D. esculentum* (locally called *pakis*) is used in traditional ceremonies. The young shoots are used as a vegetable (*paku* shoot) and eaten as *ulam* (green leaves) in Malaysia. Studies have found total antioxidant activity in the fresh plant part over boiled *D. esculentum*.

*D. esculentum* is marketed in major parts of the Indian Himalayas, neighbouring Nepal and many other countries. A bunch of stout shoots with fronds is sold locally at 8–12 rupees in Sikkim and HP. The pickle eaten with meals or at breakfast is very popular among the native people throughout the Himalayan states where the plant is available, with local market rates of *lingri/ningru* pickle, in both Kullu district (HP) as well as Sikkim, ranging from 60 to 100 rupees, depending upon location and bargaining power. The market season is limited from March/April to July in HP, but this season is extended in the rainy state of Sikkim, where plants are available throughout the year, with a reduced supply during the winter months. In Sikkim, of over 40 wild edible plants being marketed, *D. esculentum* is one of the top species sold in terms of both quantity and number of retailers, together with *Spondias axillaris*, *Urtica dioica*, bamboos, *Baccaurea sapida*, etc. Highlighting the species as very rare, marketing bids are found on Web sites and advertisements are appearing for the

purchase of spores, leading to pressure on the species in the wild.

Very little interest has been shown in assessing the cultivation potential of *D. esculentum*. The author had tried planting rhizomatous parts along garden ponds and shady well-nourished soil beds, but discovered that the best growth is in wild habitats; perhaps the species has special microhabitat requirements that are not easy to obtain in *ex situ* conditions.

At present, the sustainable harvesting and simultaneous habitat conservation of *D. esculentum* may boost the cash income of marginal people and their food security with this nutritive source, especially in rural areas.

Research on population biology, habitat dynamics and propagation and cultivation prospects of *D. esculentum* is a prerequisite – especially considering the emerging threats from global warming and climate change – as the species prefers wet/shady locations along springs, which are often susceptible to both global warming and environmental degradation. (Contributed by: Dr Hemant K Badola, G.B. Pant Institute of Himalayan Environment & Development, Sikkim Unit, PO Box 40, Gangtok (Campus: Pangthang), Sikkim 737 101, India. E-mail: badolahk@yahoo.co.in or hkbadola@rediffmail.com)

#### Biodiversity for human health

"Just as nutrition, access to health care and clean water, biodiversity is a fundamental determinant of health." With these words, Dr Aaron Bernstein, MD, Professor at Harvard Medical School and its Center for Health and the Global Environment, opened the keynote speech at the Southeast Asian Nations Conference on Biodiversity, held from 21 to 23 October 2009 in Singapore. Over 300 delegates from ASEAN (Association of Southeast Asian Nations) countries convened to discuss emerging trends and issues on biodiversity conservation and management. The conference assessed the status of biodiversity, in light of the 2010 Convention on Biological Diversity target to achieve "a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth".

Dr Bernstein discussed the importance of biodiversity in human health, citing the example of bushmeat consumption and the emergence of HIV. The increase in hunting and consumption of bushmeat in western

At least 40 percent of the world's economy and 80 percent of the needs of the poor are derived from biological resources. Holger Standertskjöld, Ambassador, Head of the Delegation of the European Commission to Singapore at the conference.

Equatorial Africa, he says, has been implicated with the emergence of HIV/AIDS. According to Bernstein, people began consuming bushmeat because of dwindling fish stocks. Other reasons include expanding populations and new access to parts of forests previously inaccessible.

Preserving these wildlife populations is crucial for studying and understanding human infections. At present, says Bernstein, the current rate of extinction of species was last seen 65 million years ago. Climate change might accelerate this trend, bringing a third of current species to extinction by 2050. Bernstein, who has dedicated a large part of his professional career to examining the health dimensions of a changing environment (e.g. biodiversity loss and climate change), also explained the importance of natural products as sources of medicine.

"We must consider whether or not to deal with what is necessary to prevent the ailments that we can foresee on the horizon. In making this deliberation to act or not, to consider biodiversity loss is more than a matter of ethics, is more than a matter of spirituality, it is more than a matter of how much it is worth. It is perhaps, without fear, a matter of health. Ultimately, we have no choice when it comes to protecting biodiversity. We must protect the natural world if we are to protect ourselves," Bernstein concluded. (Source: *Manila Bulletin*, 26 October 2009.) (Please see page 69 for more information.)





## BAMBOO: ITS POTENTIAL ROLE IN CLIMATE CHANGE

### Bamboo in climate change and poverty alleviation

Bamboos have been overlooked in the current climate change regime. They are missing in the forest definitions of the Marrakech Accords (MA) and the Clean Development Mechanism (CDM). They have been disregarded in Intergovernmental Panel on Climate Change (IPCC) Assessment Reports and in current IPCC guidelines for Greenhouse Gas Emission Inventories. The fact that bamboos are botanically not trees but grasses, and that they have traditionally been considered "the poor man's timber" may help to explain these omissions. Other global forest definitions, such as those of FAO, include bamboos.

A recent study (NWFP Working Document 8) provides arguments for considering bamboos as forests under the CDM, under REDD (reducing emissions from deforestation and forest degradation) and in National Communications. The Executive Board of the CDM has recently concurred to allow bamboo in afforestation/reforestation (A/R) projects, but has left the final decision to individual countries. Up to now, only two Designated National Authorities (DNAs) have accepted bamboos. These decisions apply to the CDM only.

Bamboo distribution overlaps with prominent CDM host countries in Asia and Latin America, which can also build on considerable experience with bamboo. In contrast, most potential host nations in Africa lack practical exposure to the CDM, but many are at least familiar with management of natural and planted bamboo. Here, bamboo A/R projects might eventually spawn a proactive administrative structure and CDM projects in other sectors.

Not considering tree-like bamboo stands as forests in the REDD process neglects significant carbon stores, highly effective carbon sinks and proven pillars of rural livelihoods. It invites destruction of bamboo forests. New bamboo plantations may curb the pressure for deforestation by serving as wood substitutes, as woody components of permanent agroforestry systems, and as a means to curb the spread of slash-and-burn agriculture. Thus, incentives for bamboo plantations could become an important component of a REDD strategy.



The current CDM has essentially bypassed the forest sector which, up to now, harbours only eight CDM projects from over 1 800 worldwide. In spite of its explicit goal, the CDM has largely failed to reduce poverty, improve livelihoods or foster development in rural neighbourhoods. Sequestering carbon in bamboo A/R projects might correct this deficit by circumventing many of the current impediments for forestry projects. Bamboos combine many attributes that predestine them for a sizeable niche in the CDM, particularly in small-scale A/R projects.

Advancing climate change will not spare bamboo. Northerly range shifts have already occurred. Missing are more reliable forecasts of how bamboos will cope with projected extreme temperatures, droughts, floods, late or early frosts, or more intense storms. In any case, short growing cycles and a rich palette of species should allow for hedging and flexibility in adapting stands to climatic changes.

Their characteristics also predispose bamboos for a prime role in adapting human societies to climate change. Reducing poverty and boosting rural livelihoods are prime measures for adaptation. Moreover, bamboos may be integrated rapidly into many agroforestry, shifting cultivation and urban systems. Beneficial environmental effects of bamboo, which range from reclamation of severely degraded sites to providing shelter during floods, tsunamis and earthquakes, may foster project developments. However, not all environmental effects of bamboo are beneficial.

Moreover, bamboo projects in the CDM and REDD face their own, specific hurdles. In particular, sampling designs, carbon assessment methods and default parameters devised for timber trees rarely

apply to bamboo. However, the many advantages of bamboos, the current extent of bamboo forests, and a much larger area of potential distribution, would justify amending the IPCC guidelines and/or adding specific methodology tools for bamboo. Regional studies on bamboo carbon assessment, perhaps linked to regional bamboo pilot projects, could reduce these hurdles, support bamboo as the "poor man's timber" and establish a sizeable niche for bamboo. The poor man's timber could become the poor people's carbon sink. (Source: *The poor man's carbon sink: bamboo in climate change and poverty alleviation*. NWFP Working Document 8, FAO.)

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*(Please see page 72 for more information on this publication.)*

### Bamboo to help house tsunami-struck Samoans

For years, Mr Durnford Dart has run his bamboo farm at Belli Park, Queensland, Australia. On 13 October he is flying to Samoa to help to emergency-house as many Samoans as he can, after the devastating tsunami which has left thousands homeless. It is not the first time he has been there but this time it is a voluntary mission to "do what I can" to ease the plight of Samoans, with emergency shelter.

Mr Dart first established his commercial bamboo farm, Bamboo Australia, 20 years ago, growing edible shoots as a vegetable crop, which was subsequently followed by an industry for bamboo poles for building structures. "Then 15 years ago I built my first geodesic dome, a type of emergency shelter." Five years ago, Mr Dart began to trade with Samoa, using bamboo as a viable alternative to importing timbers for structures. "It started with nothing, then importing plants to propagate," Mr Dart said. "On my second visit three years ago I erected a dome for the forestry department; they loved it."

That was the introduction, which Mr Dart says has now gone full circle with the tsunami impacting heavily on the island's 160 000 population. "You can put the domes up in two hours, but in the meantime the company making connector plates for them



went out of business," he said. "Fortunately, a technical college based in the Samoan capital, Apia, had the tools to make the plates; it got clearance, and they're coming off the line."

There is one more problem: the bamboo planted three years ago takes four years to mature, despite 4–7 m of rainfall and volcanic soil. It is unknown how many shelters can be built in a short time, but Mr Dart estimates 20 to 50 to start with. (*Source: Sunshine Coast Daily [Australia], 11 October 2009.*)

### **Engaging rural bamboo growers in northwest Viet Nam with carbon finance: a joint mission to northwest Viet Nam**

Viet Nam is one of the top five most affected countries in the world as a result of climate change. In July 2009, FAO and INBAR (the International Network for Bamboo and Rattan), supported by a carbon trade consultant and Prosperity Initiative, a non-profit organization based in Hanoi, carried out a fact-finding mission on carbon finance opportunities in rural activities centred around bamboo forests and value chains in Thanh Hoa province of Viet Nam. Visits were made to rural communities assisted by the LDP (the Luong Bamboo Development project), which operated under the leadership of the CRD (Cooperative for Rural Development) in Quan Hoa district and has hands-on activities in one of the potential target areas. Local bamboo processing plants were also visited to review their potential for carbon emission offsets from waste piles (avoiding methane) and turning processing waste into renewable energy (briquettes).

#### **From poor man's timber to poor man's carbon credits?**

Bamboo forests in Viet Nam support mostly meagre rural incomes. Often the poorest households and smallest-scale farmers are most dependent on bamboo. According to Prosperity Initiative operating in Thanh Hoa province, around 52 percent of the individuals with bamboo incomes live below the poverty line, 63 percent of bamboo sector jobs are on-farm family work, and 31 percent are carried out by female workers.

Supply chains of saleable bamboo products are long and the numerous intermediaries leave only a small fraction of the value of bamboo to farmers. Bamboo is often labelled as "poor man's timber" because of its versatile local uses. It grows in forest-like natural formations either in

monocultures or mixed stands with trees, and can support agroforestry and mixed cropping systems. Bamboo forest is also included in the relevant United Nations Framework Convention on Climate Change (UNFCCC) definitions, meaning that it can yield "poor man's carbon credits" as well.

Some recent studies suggest that bamboos are more effective plants than trees in increasing carbon stocks through sequestration of CO<sub>2</sub>. A wide range of estimates are provided by researchers, putting the CO<sub>2</sub> sequestering potential between 12–40 tonnes/ha/year (above ground). Additionally, the extensive root system of bamboo builds up the carbon sink faster than bamboo culms or trees.

But not all bamboo planting will be eligible for carbon finance, as certain lands may fail to comply with the criteria set forth in the carbon project rulebooks. The CDM (Clean Development Mechanism) requires that land must not have been cleared after 1990, and the Voluntary Carbon Standard (VCS) requires land not to have been cleared in the previous ten years. Project developers should also be aware that the provisions of CDM post-2012 are yet undecided, so a sizeable risk for non-compliance exists.

#### **Preconditions have to be met**

A real breakthrough remains to be made in commercializing carbon offset credits from bamboo forests. Making the transformation from poor rural communities using bamboo for subsistence into carbon offset suppliers is a development challenge that requires, for example:

- good grassroots-level organization of communities and their sensitizing to carbon income;
- pooling of bamboo smallholdings into large enough blocks to reach critical scale;
- clear land tenure and benefit-sharing rules;
- firm commitment to the decided planting targets and management plans of bamboo forests;
- knowledge of the past deforestation and land-use changes in the area;
- applicable methodologies on carbon accounting, data collection, monitoring/auditing;
- proving of additionality and registering of the carbon offset project activity; and
- certification against a suitable carbon standard, followed by verification, issuance and putting carbon commodities for sale.

#### **Conclusions**

1. Bamboo's ability to sequester carbon during its fast growth, both into above-ground biomass and into its extensive root system, was well demonstrated in the field visit and by the back-of-the-envelope calculations made.
2. On newly established bamboo plantations, a minimum scale of 4 000 ha would provide an opportunity to generate carbon revenue on a significant scale from the sales of credits.
3. On this scale, a potential project would repay the investments into carbon development costs within the first four years. Moreover, the activity would generate sizeable net revenues during the later years, which is a precondition for any economically sustainable carbon project development.
4. The replanting of degraded and barren forest lands is a government objective, supported by funding programmes that are often not performing according to their stated goals.
5. If large-scale bamboo planting initiatives are promoted for carbon finance for the Viet Nam Government, carbon finance would need to be integrated from the very beginning in the planning process and significant efforts be made to identify eligible lands, and to set up the required technical and organizational infrastructure.
6. In Viet Nam, any planting activity on the scale of various thousands of hectares will usually be structured as a government programme. In this context it is important to recognize that relabelling existing government programmes for the planting of bamboo (e.g. the Government's 661 Programme) as carbon activities does not qualify for passing the additionality test that is inherent to project-based carbon finance. Only newly designed programmes with distinct funding sources would be approved and become eligible for carbon finance.
7. The contribution of carbon revenues to cover planting costs will always be minor or negligible. This is not only because of the small size of attainable carbon revenues and the typically high planting costs, but also because of the time lag in accrual. It is therefore crucial to be aware that financing for the actual establishment of plantations will always need to draw on other sources, unrelated to carbon.

8. The issuance of carbon offset credits can be requested on an annual basis, with bridge funding for the first two to three years, which makes a Payment for Environmental Services (PES) attractive to smallholders. It means that there is a continuous flow of carbon offsets for sale. This helps farmers understand carbon as a perennial income without lengthy gestation periods.

#### Way forward

Additional income generation through bamboo carbon offsets is clearly a potential rural development innovation. Carbon financing has a clear upside potential to lift farmers out of poverty, especially in northwest Viet Nam. A PES is perceived as a potential mechanism to construct a system for accruing bamboo-related carbon income and distribute it to alleviate rural poverty.

Any such project will have to accommodate specific financing needs in order to run the PES scheme and meet the payouts that are agreed with farmers. The carbon credits sales strategy will be geared towards replenishing a PES fund. The fund could also function as a mechanism to balance liabilities among farmers.

It will need to be decided how farmers will be rewarded for compliance with the commitments they assume in establishing and tending bamboo plantations. For instance, there could be constant payouts on a per area unit basis or payouts could be tied to actual carbon removals achieved in individual plantations. It will also be necessary to set aside a fraction of income in order to cover non-complying farmers.

FAO can take leadership in alleviating supply-side constraints, developing carbon financing and marketing competencies, and supporting knowledge and technology transfer to work for the rural poor around bamboo forests. FAO's role is critical in creating a carbon trade platform, and leading the deployment of PES.

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#### Bamboo huts on stilts win climate award

Building flood-resistant, elevated bamboo houses in Ecuador, and exchanging climate information via "interactive" radio in Nigeria, are among the ideas that have won funding in a competition for developing

countries. Twenty-six projects were selected for "100 Ideas to Save the Planet", this year's Global Development Marketplace competition, which sought ideas for protecting developing countries from climate change.

The US\$5 million competition was cosponsored by the World Bank and the Global Environment Facility (GEF), among other institutions. Winning ideas receive up to US\$200 000 in seed money, and technical support and guidance on putting the ideas into practice.

In Ecuador, INBAR will build 500 elevated houses that should be resistant to flooding as water flows underneath them. "With the funds we will provide an innovative technology to improve the design, durability and resistance of houses traditionally built with bamboo in the area of Guayaquil," Álvaro Cabrera, regional coordinator of INBAR for Latin America and the Caribbean, told SciDev.Net. For example, roofs will be built from resin and bamboo instead of zinc, and concrete stilts will be used to extend the life of the houses from the current three to five years to around 30 years. (Source: SciDev.Net, 2 December 2009.)

#### Bamboo as carbon sink – fact or fiction?

Bamboo is often considered as a plant with an extraordinary potential for carbon sequestration and therefore for mitigating climatic change. A recent paper by Prof. Liese presented at the VIII World Bamboo Congress (see page 66 for more information) argues that bamboo is not likely to be significantly better than trees, and that much more research is needed to establish the true potential of bamboo for carbon sequestration.

For example, the assumption of bamboo's high sequestration potential is derived mainly from the fast growth of the individual culm during its expansion phase. However, the impressive biomass of such a young culm does not originate from its own photosynthesis, but derives from the energy produced by older culms in previous years and stored as carbohydrates in their culms and rhizome system. At the beginning of the growth season this energy will be mobilized and transported to the growing culm.

The individual culm has a limited lifetime of seven to ten years, and thereafter its biomass and the carbon contained will be deteriorated biologically into its origins, among them also CO<sub>2</sub>, released into the atmosphere.

Furthermore, the gregarious flowering of some species, often worldwide and followed by their death, can constitute massive CO<sub>2</sub> production. On the other hand, prolonged sequestration of carbon is provided through the great variety of bamboo products that range from the manifold constructions to pulp; many of these uses serve the daily needs of over 1.5 billion people.

Although the carbon sequestration of bamboo forests is not likely to influence the mitigation of global warming as much as some protagonists have been arguing, the importance of bamboo forests and plantations for an environmentally friendly and sustainable production of food, fibre and energy, and their environmental services, including soil stability and wastewater management, important for adaptation to climate change, are undisputed.

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We have not yet reached the goal but ... we shall soon, with the help of God, be in sight of the day when poverty shall be banished from this nation.

Herbert Clark Hoover

"Non-Wood Forest Products (NWFPs) consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests."

«Les produits forestiers non ligneux sont des biens d'origine biologique autres que le bois, dérivés des forêts, des autres terres boisées, et des arbres hors forêts.»

«Productos forestales no madereros son los bienes de origen biológico distintos de la madera derivados de los bosques, de otras tierras boscosas y de los árboles fuera de los bosques.»

(FAO's working definition)

## ACACIA TREE CAN BOOST CROPS ACROSS AFRICA

Nairobi. African farmers could triple yields by planting a type of acacia tree that sheds its nitrogen-rich leaves in time for the growing season alongside their crops.

The fast-growing, hardy species, *Faidherbia albida*, which has common names including apple-ring acacia and *ana* tree, also has a wide range of other benefits, according to Dennis Garrity, Director General of the World Agroforestry Centre in Nairobi, Kenya. "Besides organic fertilizer and livestock fodder for farmers, it also acts as a windbreak, provides wood for fuel and construction and cuts erosion by loosening the soil to absorb water during the rainy season," he said at the 2nd World Congress of Agroforestry in Nairobi this week (24 August). "The tree becomes dormant and sheds its leaves during the early rainy season at the time when seeds need fertilizer and regrows them at the beginning of the dry season, so not competing with crops for light," Garrity told SciDev.Net. Planting the trees can nearly triple yields, he says. In Malawi, maize yields under the acacia canopy are 280 percent higher than outside it.

The acacia variety is already grown on farms in western Africa, as well as in Ethiopia, Malawi and the United Republic of Tanzania. But uptake has been minimal in other parts of Africa. Despite 60 years of research and more than 700 scientific publications on *F. albida*, few farmers – especially in parts of eastern and Central Africa – know of its potential.

As Garrity notes, the tree can thrive in a wide range of conditions and is suitable for planting across the continent. He says the lack of knowledge about the acacia highlights a need for research agencies to find more effective ways to reach farmers. Governments must also invest in generating and communicating research, he adds.

Nobel Peace Prize winner Wangari Maathai, founder of the Green Belt Movement in Kenya, says that the lack of extension services that tap into agroforestry science from research institutions and universities and then pass information to smallholders is a great disservice to the quest for food security in Africa. There is a pressing need to communicate research findings to farmers in languages they can understand, Maathai says. (Source: AllAfrica.com, 27 August 2009.)



## AFRICAADAPT LAUNCHES NEW FUND FOR INNOVATIVE KNOWLEDGE SHARING

Africa's poor and vulnerable communities rarely have the opportunity to share their valuable experience and learn from others in broader or more formal exchanges of knowledge on climate change adaptation. AfricaAdapt is launching its new Knowledge Sharing Innovation Fund promoting new ways of sharing knowledge that can help address this problem.

The Fund will offer grants of up to US\$10 000 to projects that seek to overcome barriers to share knowledge with "hard to reach" or marginalized African communities. These barriers may be related to language, access to information and marginalization through gender or disability.

Ensuring that vulnerable communities are active in the exchange of African knowledge, best practices and expertise on climate change adaptation is a high priority for AfricaAdapt. These communities are the most directly threatened by climatic impacts yet they also have a wealth of

experience in adapting to past changes that could benefit other communities.

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## ARE NTFPS A WAY OUT OF POVERTY?

Over the last 30 years, policy-makers and conservation NGOs have focused on the sustainable production and commercialization of NTFPs. Is this a way forward in tropical forested areas for successful conservation and rural development?

Development strategies try to include local people in the management and governance of natural resources such as forests, so that they receive more of the benefits. This contrasts with preservationist environmental policies, which excluded people from forests. Strategies that support the collection and commercialization of NTFPs by local people have the potential to provide an increased source of income for people living in or near forests.

NTFPs also have important subsistence uses, for example by providing a "free" source of food, medicines, fuel and construction materials. And, if properly managed, NTFPs can be an incentive for forest communities to protect existing forests and restore degraded areas, to ensure their source of income is sustainable.

However, forests are being cleared as the global demand for timber rises and as ranching and large-scale agricultural activities expand. Many species fundamental to forest livelihoods are vulnerable and forest resources are declining.

This has alarming consequences for subsistence use and local trade. For example, between 1970 and 1990, the number of species extracted by the timber industry in the eastern Brazilian Amazonia rose from fewer than 20 to over 300. At least one-third of the 300 also had value for local people as food, medicine or fuel.

While dramatic landscape change takes place across many developing countries, the sustainable production of many NTFPs is under threat. Policy-makers and development practitioners need a better understanding of the changing role of forest resources for local livelihoods.