

## ANDIROBA

### The uses and economic value of *andiroba* (*Carapa guianensis* Aubl.)

*Andiroba* trees have straight trunks that can reach 30 m in height, often with buttress roots. Growing throughout the Amazon basin, Central America and Africa, *andiroba* prefers seasonally flooded forests and the margins of rivers, but is also found in terra firme forests.

A powerful anti-inflammatory medicinal oil extracted from the seeds of *andiroba* is one of the most widely used natural remedies in the Amazon. *Andiroba* oil can mend badly sprained ankles, repel mosquitoes and is used in veterinary medicine to cure the infected cuts of animals. Indigenous groups in Brazil have traditionally painted their skin with a mixture of *andiroba* oil and the bright red pigment from the seeds of *urucum* (*Bixa orellana*). *Andiroba* is also valued for its bark and wood. The bark can be made into a tea to fight fevers, worms, bacteria and tumours. In addition to its lightness and durability, *andiroba* wood is bitter and oily, deterring attacks by termites and caterpillars. Because the deep, golden-hued wood is of superior quality, *andiroba* is considered to be on a par with mahogany. For this reason, it is increasingly difficult to find in logged areas.



### MOSQUITO REPELLENT AND DENGUE FEVER

*Andiroba* oil can be used as a repellent against gnats and mosquitoes. It also reduces inflammation caused by insect, snake and bat bites. Studies by the Research Institute of the State of Amapá (IEPA) discovered that candles made from the dry remnants of *andiroba* seeds repel the mosquito that carries dengue, *Aedes aegypti*.

### Economic value

*Andiroba* oil is one of the most widely sold natural remedies in Amazonia. The oil industry has its origins in the city of Cametá, in the Brazilian state of Pará, and its commercialization generates significant employment and income throughout Amazonia. In Cametá, children eagerly collect and sell *andiroba* seeds. Street children relate that 4 kg earns them US\$0.10 – enough to buy a packet of crackers. In Salvaterra, on Marajó Island, which lies at the mouth of the Amazon River, unemployed men, women and children comb the beach for seeds washed down from inland rivers. In 2004, they could sell 1 kg (about 55 seeds) for US\$0.07 to companies in São Paulo. In 2009, in the Belém market, 1 litre of *andiroba* oil costs on average US\$6. Stores often buy the oil during the harvest when prices are low, hold on to the oil and sell it out of season at a higher price.

The oil is also in demand internationally and is exported to Europe and the United States of America. From 1974 to 1985, between 200 and 350 tonnes of oil were exported annually, mainly from the Brazilian states of Maranhão, Pará and Amapá. In 2009, in the United States of America, an 8-oz (227-g) bottle of *andiroba* oil can be purchased over the Internet for between US\$23 and US\$40. One proof of *andiroba*'s popularity is the number of soaps, creams, oils and candles made from *andiroba* on the market in the Amazon region and throughout the world. In the supermarkets of Belém, the soaps can cost from US\$1.50 to US\$5, while body oil (50 ml) costs US\$3. A 150 g bag of *andiroba* bark costs US\$1.

Whereas supermarkets, pharmacies and corner vendors in Belém sell *andiroba*, in the western Amazonian state of Acre *andiroba* oil is hard to find on the market: few communities in Acre produce the oil, and those that do generally produce it for local consumption. (Source: FAO, 2011. *Fruit trees and useful plants in Amazonian life*.)

## ARGAN OIL

### Rare Moroccan argan oil – now made in Israel

Argan oil, rich in vitamin E and fatty acids, has become the sensation of the decade, sought after by chemists, dieticians, hair salons, chefs and cosmeticians. The only problem with argan is its availability: the argan tree takes 15 years to yield nuts and one tree can yield only a couple of litres of oil, making production costly and limited.



Until recently, argan was a rare product grown only in the Atlas Mountains and traditionally made by Moroccan tribes, as the argan tree could not flourish outside Morocco.

Today, the Israeli company Sivan is developing Argan 100 – a superstrain of argan that is tolerant of the Mediterranean climate and can produce ten times more nuts than the average tree in Morocco, the company says. Based on 25 years of field research, Sivan's agronomists found a way to produce the oil from their own groves and refuted the widespread legend associated with the production of the oil. According to this legend, argan oil can only be processed from the nut – which looks like an unripe olive – after its hard shell has been removed via a goat's digestive tract. Sivan's chief agronomist Chaim Oren says there is in fact no need for goats to perform the job of intermediaries. "I was exposed to argan trees many years ago, and we did a breeding session in Israel," Oren says. "We pollinated trees with other trees. Ours are resistant to soil disease, giving these trees a steady yield every year."

To date, about 2 500 argan trees have been planted in the Ashkelon, Arava and Negev regions in Israel.

This commercial endeavour may also be beneficial for the argan trees in Morocco, as competition with the local market could reduce the tree's chances of extinction. The UN conservation body United Nations Educational, Scientific and Cultural Organization (UNESCO) has set up reserves to protect the dwindling argan trees in Morocco.

Sivan, founded in 2007 and based in Ramat Hasharon, Israel, sells argan oil to wholesalers, with small quantities of leftovers sold online. Their eventual plan is to sell Argan 100 to other countries. (Source: NoCamels, 8 February 2012 in ENN Daily Newsletter.)


**ARTEMISIA**
**Malaria hopes rise as chemists produce cheap artemisinin**

The cost of the life-saving antimalarial drug artemisinin could be lowered by a third, with a new method that utilizes a waste product from the current plant extraction process, according to researchers.

Artemisinin is sourced from the cultivated plant *Artemisia annua* (sweet wormwood), but demand is outstripping supply because artemisinin combination therapies (ACTs) are now recommended as a frontline treatment for malaria by the World Health Organization (WHO).

The artemisinin extraction process produces around ten times as much artemisinic acid as it does artemisinin itself. But converting the artemisinic acid precursor into the chemically more complex artemisinin molecule has proved a "formidable challenge" for chemists, researchers noted. They have now found a quick and easy way of converting this acid into artemisinin. They used continuous flow chemistry, which involves passing chemicals down a tube to increase reaction times, efficiency and safety. This differs from traditional "batch" chemistry where chemicals are mixed together in a large pot, and it has allowed researchers to simplify one "crucial step" required to produce the molecule.

Peter Seeberger – director at the Max Planck Institute of Colloids and Interfaces, Germany, and co-author of the study published in *Angewandte Chemie International Edition* last week – told SciDev.Net that one refrigerator-sized

chemical reactor can produce 200 g of artemisinin per day, and unpublished results indicate potential yields of up to 800 g per day. "If we scale this up, in six months we will be at a point where 400 reactors (that run continuously) will be sufficient to produce the entire world's supply. Our reactors ... could shave the total cost of the drug by a third."

Large-scale production could start in as early as six months' time if negotiations with pharmaceutical companies are successful, Seeberger said. (Source: SciDev.Net Weekly Update, 23–29 January 2012.)

**Multiple uses of *Artemisia* spp. in Japan and Nepal**

A recent study has investigated the multiple uses of *Artemisia* species in Japan and Nepal.

*Artemisia*, a shrubby species, is distributed widely in different geographic regions. The International Plant Names Index showed 2 058 entries for the genus *Artemisia*, reflecting the richness of the species and its varieties. *Artemisia vulgaris* and *A. montana* are widely distributed in the mountain regions of Nepal and Japan, respectively. These two species look alike in their appearance, size and overall site characteristics; however, genetic closeness cannot be claimed without further investigation.

The vernacular name for the *Artemisia* species is mugwort and the study considered that this represents both the species cited above. Mugwort is a common plant and has been a valuable species for spiritual and material uses. It is called *yomogi* in Japanese and *noya* in the Ainu language, and *pati* or *titepati* (bitter-leaf plant) in Nepal. The study listed the different uses of these plants in Japan (mainly in Hokkaido, the northernmost island of Japan) and Nepal.

Studies in Japan have confirmed that the chemical contents of mugwort are in line with indigenous practices, where certain foods and medicine are developed from the plant, clearly indicating the reliability of indigenous knowledge. Consequently, mugwort now has commercial uses in Japan whereas, because of lack of knowledge and technology, in Nepal it is still considered a weed and confined to traditional/household use. In this context, transferring Japanese knowledge and technology to Nepal could be instrumental


**MUGWORT USES IN NEPAL**

- Mugwort has a high spiritual value in Nepal; it is one of the most religious plants and is offered in almost all ritual celebrations. Mugwort and flower are synonyms. Whenever new houses are built, mugwort foliage is left on the ridge of the roof to protect the houses from evil. It is also used extensively in the spiritual treatment of patients; local healers use the foliage to chase evil away from the patient's body. The mugwort flower has a special importance during Dashain (the largest Hindu festival in September/October). Elderly people bless the young by putting mugwort flowers/foliage on their heads.
- Mugwort is the most reliable and accessible medicine for rural people in Nepal for the treatments of cuts and wounds. The fresh leaves are squeezed and applied.
- Mugwort is very effective against leeches. Those who have to walk or work in leech-prone areas rub the leaves on their skin. Mugwort foliage is kept in rooms to get rid of fleas.
- Brooms made from mugwort foliage are thought to be effective in maintaining a healthy environment by repelling insects.
- Mugwort is used as a green manure and also as an insecticide. The green foliage is used to mulch seedbeds. Stems are used as supports for young bean plants, probably presuming that they protect the young sprouts by their insecticidal element.
- Mugwort is goats' favourite fodder, and thus contributes to rural economy in the hilly regions of Nepal.

in converting the so-called weed to commercial use, hereby boosting the economy of rural people in Nepal by generating employment and income. (**Contributed by:** Krishna H. Gautam, Chieko Imakawa and Teiji Watanabe, Graduate School of Environmental Earth Science, Hokkaido University, Sapporo, Japan. Fax: + 81 11 706 2213; e-mail: khgautam@ees.hokudai.ac.jp/)

## BAMBOO

### Bamboo: a green biofuel for Africa?

Bamboo may be the key to combating soil degradation and massive deforestation in Africa as an alternative source of energy. Sub-Saharan Africa has over 2.75 million ha of bamboo forest, equivalent to roughly 4 percent of the continent's total forest cover. A partnership among African nations and communities, the International Network for Bamboo and Rattan (INBAR), and China are working to replace forest wood, on which 80 percent of the rural population in sub-Saharan Africa depends for its fuel needs, with bamboo charcoal and fuelwood.

At the 17<sup>th</sup> Conference of the Parties (COP17) to the United Nations Framework Convention on Climate Change (UNFCCC) in Durban, South Africa today, initial successes with bamboo charcoal in Ethiopia and Ghana have prompted calls across the continent for greater investment in this "green biofuel" that can fight deforestation and mitigate climate change. "Bamboo, the perfect biomass grass, grows naturally across Africa and presents a viable, cleaner and sustainable alternative to wood fuel," said Dr J. Coosje Hoogendoorn, Director General of INBAR. "Without such an alternative, wood charcoal will remain the primary household energy source for decades to come – with disastrous consequences," Dr Hoogendoorn said.

Burning wood has a significant impact on the climate, with African households releasing the equivalent of 6.7 billion tonnes of greenhouse gas into the atmosphere by 2050, according to estimates by scientists.

In terms of health, the burning of fuelwood claims the lives of an estimated two million people every year – mostly women and children – who inhale the smoke. Continued widespread indoor use of forest wood charcoal as a household fuel could cause ten million premature deaths by 2030.

While it takes 7–10 tonnes of raw wood to produce one tonne of wood charcoal, the entire bamboo plant, including the stem, branch and its rhizome, can be used to produce charcoal, making it highly resource efficient, with limited wastage. Its high heating value also makes it an efficient fuel. Furthermore, bamboo is one of the fastest-growing plants on the planet, and tropical bamboos can be harvested after just three years, rather than the two to six decades needed to generate a timber forest.

China is a global leader in the production and use of bamboo charcoal, made through the controlled burning of bamboo in kilns, whether traditional, metal or brick. The sector

is worth an estimated US\$1 billion/year and employs over 60 000 people in more than 1 000 businesses.

Together with Chinese partners, including Nanjing Forestry University and the Wenzhao Bamboo Charcoal Company, INBAR's Bamboo as Sustainable Biomass Energy initiative is

now transferring China's advanced bamboo charcoal technologies to sub-Saharan Africa. [Source: Asian Scientist Newsroom, 2 December 2011.]

### Ghana Bamboo Bikes Initiative wins German Government award

The Ghana Bamboo Bikes Initiative has been selected as a winner of the 2011 Impact Business Award, in recognition of the innovativeness of its business model and environmental responsiveness. The award, initiated by the German Government through the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), rewards enterprises that apply innovative business solutions in combating climate change.

The initiative seeks to break the status quo in the development of a bicycle industry in Ghana and train people with little or no education in the manufacturing and assembling of bamboo bikes. It is also spearheading the production of stable, cheaper and reliable bikes in Ghana to reduce the country's dependence on fossil fuels while increasing the economic activities of rural Ghanaians.

With the award, the German Government will complement the work of the Ghana Bamboo Bikes Initiative in promoting economic development in Ghana while providing substantial environmental benefits.

Co-founded by two students, Bernice Dapaah and Kwame Kyei of the Christian Service University College and Ternopil State Medical University, respectively, the initiative seeks to take advantage of the abundant raw bamboo materials in Ghana to manufacture high-quality bamboo bikes suitable for export markets as well as for the road conditions in Ghana, and affordable for the poor. The social enterprise project designs, develops and markets multipurpose bikes for the transportation of passengers, commodities or as an ambulance.

Through the provision of a sustainable and low-carbon transport solution, the Ghana Bamboo Bikes Initiative aims at raising awareness about environmentally friendly habits, while increasing the economic and employment opportunities of rural people – especially youth. [Source: JoyOnline (Ghana), 25 January 2012.]

### Bamboo use in the Pacific

Bamboo has a range of benefits that make it excellent for developing small-scale productive enterprises. It is widely used throughout the Pacific for temporary building structures, rafts, harvesting poles, fishing

### PANDAS FIND SCOTTISH BAMBOO JUST TOO HARD TO STOMACH

Two giant pandas removed from public display at Edinburgh Zoo are suffering from a Scottish form of "Delhi belly" as they adjust to eating bamboo grown outside their native China, according to a leading veterinary surgeon. The United Kingdom's only giant pandas arrived in the capital last month, but Yang Guang, the male, became ill two weeks ago with a bad bout of colic.

Mathew Brash, Vice-President of the British Veterinary Zoological Society, said last night that there was no great cause for concern and likened the pandas' medical problems to a "travel tummy bug". "Unlike some animals, pandas are complicated eaters and very particular about what they eat and need a high-fibre diet. Whatever the bamboo they were eating in China will be different from the bamboo they are eating in Scotland. In other words, their gut floor is adjusting to living in Scotland. They are getting used to Scottish bugs, which are not bad bugs, just different bugs."

It is expected that the pair will eat up to 18 000 kg of bamboo every year during their stay in the capital. In November, *The Scotsman* reported that Edinburgh Zoo will pay around £70 000 every year to import some 85 percent of that bamboo from a farm near Amsterdam in the Netherlands. The firm also provides bamboo for pandas in Vienna and Berlin. [Source: *The Scotsman*, 30 January 2012.]



rods, food and water containers, food tongs and handicrafts. Bamboo species are most often harvested from the wild, such as the secondary forests in Melanesia. In Hawai'i, wild bamboo stands are commonly harvested for fishing poles, edible shoots and some construction applications, as well as for craft work and *kadomatsu* (traditional New Year decoration). It is little used for food except to a small extent by Southeast Asian immigrants. In the highlands of Papua New Guinea, the shoots of *Neololeba atra* are sometimes consumed. *Nastus elatus* (New Guinea sweet shoot) is an outstanding edible shoot that can be eaten with minimal preparation.

**Local markets.** With the exception of minor uses in packaging and handicrafts, bamboo products are not known to be sold in local markets in the Pacific (in Fiji or Polynesia). In Hawai'i, bamboo is utilized on a small scale for building and for human consumption. **Export markets.** No export market from the Pacific islands is known to exist, but the potential is significant, with worldwide market in traded bamboo products at about US\$2.5 billion.

The worldwide consumption of bamboo shoots is in excess of two million tonnes, mostly in Asia. The main potential export market for bamboo shoots is Japan. However, the preferred species in Japan is *Phyllostachys pubescens* (or moso), a monopodial type of subtropical bamboo with a rather unique flavour that cannot be readily substituted by any other tropical bamboo. *Dendrocalamus latiflorus* shoots are popular in Taiwan Province of China and large quantities are exported to Japan. *D. asper* shoots are a major canned export from Thailand to Japan. *D. giganteus* is favoured in Viet Nam and Southeast Asia. The greatest opportunities for exports of bamboo shoots from the Pacific islands would be for fresh bamboo shoots to Asian communities on the United States mainland and to Asian countries with direct flight links and available cargo capacity.

**Economics.** Competition with China, India or other nations that already have bamboo resources, culture and industrial technology is not likely to prove economically viable for most Pacific islands. If niche markets could be identified for which well-controlled, value-added products could be found, relatively small-scale production and processing might be economically viable. Even for local markets with little or no shipping costs, locally grown and processed bamboo products might cost more than imported.

## BAMBOO SHOOTS

Bamboo shoots are usually harvested when they reach 30–60 cm and are peeled before cooking. Shoots of many of the clump-forming tropical species contain high levels of cyanogens, and must be boiled well prior to consumption.

Bamboo shoots may be consumed fresh on the day of harvest, in which case no post-harvest handling is required, beyond removing obviously damaged and below-par shoots prior to sale. In Hawai'i, fresh shoots are harvested and placed in cold water for rapid temperature reduction and stored at 4° C overnight. They are then trimmed and cleaned and packed in styrofoam boxes with an ice pack and transported to market at 10–12° C. For storage, shoots can be peeled and boiled for two to three hours, continually refreshing the water. They are then cooled as rapidly as possible to 30° C or less and stored in jars in brine (salt content of 5–8 percent of the weight of the cooked shoots).

Commercially, shoots are mainly canned, a complicated process involving drying the shoots, removing the sheaths, rinsing, dressing, classifying according to shape, grading, weighing, placing in cans, sterilizing, adding water, adjusting the pH, cooling, heat preservation, inspection and packing.

## Nutritional content of bamboo shoots (per 100 g)

Water	89–93 g
Fat	0.3–0.4 g
Fibre	0.5–0.77 g
Ca	81–96 mg
Fe	0.5–1.7 mg
Vitamin C	3.2–5.7 mg
Protein	1.3–2.3 g
Carbohydrates	4.2–6.1 g
Ash	0.8–1.3 g
P	42–59 mg
Vitamin B <sub>1</sub>	0.07–0.14 mg
Glucose	1.8–4.1 g

Marketing studies would be needed to define potential products with viable markets.

(Source: A. Benton, L. Thomson, P. Berg and S. Ruskin. Bamboo (various species). In C.R. Elevitch (ed.). 2011. *Specialty crops for Pacific islands*. Permanent Agriculture Resources, Holualoa, Hawaii.)



## French maritime pine bark extract hailed as new beauty product

A new wonder cream containing tree bark extract may have just brought us one step closer to finding the secret to eternal youth. The extract, from French maritime pine, could slow down the signs of ageing, researchers say. It has shown to improve skin elasticity by 25 percent and hydration by 8 percent.

In tests reported in the journal *Skin Pharmacology and Physiology*, 20 healthy women aged 55 to 68 were treated with Pycnogenol®, a branded supplement containing the antioxidant. They were monitored for skin hydration, skin elasticity and skin fatigue by the Leibniz Research Institute in Dusseldorf over 12 weeks. At the end of the study, a biopsy was carried out to see the levels of hyaluronic acid, which is known to be beneficial to the skin. (Source: MailOnline, 27 January 2012.)



## Bushmeat – every man's protein until the forest is empty

Some call it the "African silence" when a forest is rendered silent by poaching and the bushmeat trade. Others call this phenomenon "dead zones" that have no birds, no monkeys, no small mammals, no snakes ... These places have been stripped bare by local communities that are struggling to feed their families and access medical care.

The Mbuti pygmy encampments photographed in the early 1980s depict a wire- and nylon-free lifestyle that saw them capture forest animals on a daily basis for local consumption. Today, most of the bushmeat is exported to distant markets by bicycle, 4x4 vehicles and on foot. No-one has the right to judge these people when they focus on bushmeat as their only source of protein. We must, however, restrict use of forest products, as far as possible, to people with heritage rights to

the land, as they are the custodians of these forests.

Terese and John Hart are committed to witnessing, studying, conserving and combating the atrocities of the bushmeat trade in the Democratic Republic of the Congo. Over the next few weeks, I will post a series of summary posts linking back to the blogs on their Web site: [www.bonoboincongo.com/](http://www.bonoboincongo.com/) (Source: Steve Boyes, Explorer's Journal, National Geographic, 9 February 2012.)

#### **Game reveals complex links between poverty and threats to apes**

There were 50 ape experts in the room and a quick game ensued to break the ice. "If you agree with the statement, go to the left side of the room," said the facilitator. "If you disagree, go to the right." She then unveiled eight simple words that split the room in two: "Local poverty is the main threat to apes".

On the right, speakers said that the primary problem for orangutans in Malaysia and Indonesia is not local people – hunters tend to target other species there. It is the private sector that destroys the forests on which both orangutans and local people depend, added a third speaker, and this deforestation itself creates poverty. Someone else added that it was the wealthier people from local populations, not the poor, who were encroaching on the national park he worked at in Indonesian Borneo.

A speaker from the Democratic Republic of the Congo said that it was rich people in urban areas – not poor communities near forests – who fuelled the market for ape meat. Another from Cameroon said that in some places local people do hunt chimpanzees for meat, but at such low levels that it is not a major threat; logging and mining activities that destroy ape habitat were bigger concerns.

The ape experts had gathered at the Center for International Forestry Research (CIFOR) in Bogor, Indonesia for a three-day workshop on the links between great ape conservation and poverty, because it just so happens that all of the world's great apes – gorillas, chimpanzees, bonobos and orangutans – live near people who are poor.

The workshop, organized by the International Institute for Environment and Development (IIED) (where I work) and hosted by CIFOR from 11 to 13 January 2012, was designed to share lessons learned in Africa and Asia and to identify

practices that benefit both apes and local communities. And while the people on the right side of the room felt that local poverty was not the main threat to these apes, those on the left – mostly from Africa – disagreed.

People kill apes because they are poor, said one. Conservation creates costs for local people and this is an issue of justice, said another. If you solve local poverty, you solve a lot of problems for great apes, added a third.

Of course, the statement itself was flawed, as the workshop organizers designed it to be. In reality, the situation varies from location to location and the many threats apes face are all interconnected.

My favourite answer, though, came from one of the Indonesian experts. He said that if the "poverty" in the statement referred to a lack of money then the answer was no, but that if it referred to the mind and a lack of information, then the answer was yes.

As an ice-breaker, the contentious statement did its job well. It made me wonder ... if every poor person who lives near an endangered ape was suddenly ten times richer, would the apes be safer or would they just face new threats that affluence and indifference can bring?

The workshop was organized as part of IIED's Poverty and Conservation Learning Group initiative, with support from the Arcus Foundation, the United States Fish and Wildlife Service and the Great Apes Survival Partnership. (Source: Mike Shanahan blog, IIED, 13 January 2012.)

probably have to be disguised for European audiences, so that insect "food" could be used as an additive in burgers and other fast food.

The Food Standards Agency says of the research: "While insects have not traditionally been used for food in the United Kingdom or elsewhere in the European Union, it is estimated that about 2.5 billion people across the world have diets that routinely include insects. While many insects are regarded as pests, FAO is interested in promoting edible insects as a highly sustainable source of nutrition". Some worms contain three times as much protein as beef per ounce (28 g), while four crickets have as much calcium as a glass of milk.

Eighty percent of countries worldwide already eat insects, and more than 1 000 insect species are often eaten by human beings. Unlike conventional livestock, insects and bugs need little space and can be bred in sealed buildings under natural light where they live off waste, paper and algae. The idea has previously been backed by the United Nations and EU as a way to tackle food shortages. Some academics believe that the expense and environmental cost of raising livestock means that insect-eating will be inevitable – and it has been claimed that by the end of this decade, insect-eating will be widespread. (Source: MailOnline, 31 January 2012.)

#### ***Hebo – yellow-jacket baby wasps – a specialty in Japan***

All manner of insects have been eaten down the ages to the present day, and in all regions of the world. Many insects are eaten in Japan, including two species of *Vespula* and three species of *Vespa*. In particular, yellow-jacket larvae and pupae, known locally as *hachi-no-ko* (literally, "baby wasps") are eaten. People are often surprised at how dangerous, stinging insects such as wasps can be caught and eaten safely. However, in Nagan, Gifu, Aichi, Shizuoka and Yamanashi prefectures, the mountainous areas at the heart of the central region of Japan, these yellow-jackets are treasured as autumn's seasonal delicacies. Men enjoy going out in groups to catch them. It is also common for people to raise them near their homes. Every household prepares *hachi-no-ko* dishes in different ways, each bringing its own unique flavour to the autumn dinner table. Whole communities have been built, centred on these yellow-jackets – surely unique to this part of the world.



#### **EDIBLE INSECTS**

##### **EU to spend €3 million to promote eating insects as "alternative source of protein"**

The European Union (EU) will spend €3 million to research "the potential of insects as an alternative source of protein". Research projects will be selected this year. Food experts agree that insects would

### EATING WASPS: A RELATIONSHIP BETWEEN NATURE AND SOCIETY

The habit of wasp eating in Japan consists of a nature-society relationship, as shown in the illustration. The eagerness to eat wasps helps promote and makes people aware of both the wasp environment and indigenous knowledge on wasps. It is complicated, but the mutual relationship makes the cultural habit continue. Moreover, commercial use encourages people who have fewer economic opportunities to promote socio-economic activities with proper use. Wasps are thus regarded as an essential food resource for the sustainable development of rural mountain villages.



**Catching *hebo*.** *Hebo* nests are found below ground in fields and mountains. The wasps are attracted with bait and then given small pieces of meat, with tiny ribbons attached, to carry back to the nest. The ribbons make it easier subsequently to follow the wasps and locate the nest. Catching *hebo* requires teamwork – someone is needed to set the bait, someone to follow the wasps, and someone to dig out the nest. Seeing groups of like-minded friends, frantically chasing after *hebo* is like watching young boys totally absorbed in an exciting game. **Raising *hebo*.** Some people even raise *hebo* at the bottom of their gardens. They are careful to place the nest where it will be sheltered from the elements. The wasps are protected from predators and given food. Raising *hebo* requires a certain combination of tender loving care, originality and ingenuity. **Eating *hebo*.** The whole family gets together to remove the live larvae from the combs, taking great care not to squash the larvae in

the process. It takes much time and effort, but this provides an opportunity for the family to enjoy chatting together. The larvae are boiled with soy, sugar and *sake*. The cooked wasp larvae are then mixed with rice. Various dishes use *Vespula* spp. Simple boiled wasp with soy sauce goes well with rice, accompanied by *sake*. Recipes for wasp larvae dishes vary greatly from household to household, bringing an autumn feast to the dinner table.

**Gathering around *hebo*.** The *Hebo* Festival is held every year, with people competing for the biggest nest, whether raised at home, or collected in the fields and mountains. People gather together for all manner of festivities celebrating *hebo*. Food products made from wasp larvae are popular delicacies, and make great souvenirs. (**Contributed by:** Kenichi Nonaka, Department of Geography, Rikkyo University, 3-34-1 Nishi-Ikebukuro Toshima, Tokyo 171-8501, Japan.  
E-mail: k-nonaka@za2.so-net.ne.jp/)

**Researchers conduct studies on edible insects to fight food insecurity in Uganda**  
Edible insects such as white ants and crickets could have a permanent presence on dinner tables in Uganda if research being carried out by a group of researchers from Makerere University proves successful. The research project now under way in Lango subregion is focusing on the potential of edible insects in alleviating household food insecurity and fighting malnutrition.

In an interview with Uganda Radio Network, the research project's principal investigator Dr Jacob Agea said that they chose edible insects because they are currently disappearing from menus, but used to be valuable food alternatives. He said they want first to find out why edible insects such as white ants and crickets are fast disappearing, and then understand their breeding habits and explore how to breed them throughout the year.

Dr Agea said that the two-year study, costing 110 million Ugandan shillings, will examine the insect-eating culture of the people and document existing knowledge on insect harvesting, processing and marketing. The study also aims to assess the proportional contribution of edible insects consumed as household food and in calorie intake. This will determine the nutritional value of the insects. A number of students have been trained to help in the study, which will be extended to include other subregions such as West Nile, Acholi and Karamoja,

### INSECTS ARE FOOD WEB SITE

The following Web site includes recipes, a full list of edible insects worldwide, and much more.  
<http://insectsarefood.com/faq.html/>

### FIELD CRICKETS

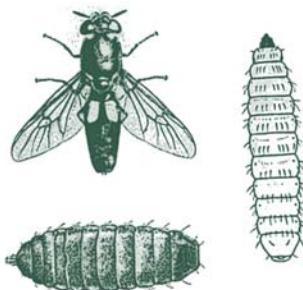
This is our first post in what we hope will be an ongoing series on insect foraging. While not a normal foraging food, insects could very well be one of the few foods available in a deep woods survival or famine situation. One of the easiest and most popular edible insects is the cricket. Cricket eating is gaining popularity these days in the United States of America.

For the record, 100 g of cricket has 121 calories, 12.9 g protein, 5.5 g fat, 5.1 g carbohydrates, 75.8 mg calcium, 185.3 mg phosphorus, 9.5 mg iron, 0.36 mg thiamin, 1.09 mg riboflavin, 3.10 mg niacin and 0.05 percent fat.

Finding field crickets is not a problem; the best places to catch them are under logs, rocks and in tall weeds that border fences and buildings. When we were kids, we commonly left pieces of plywood on the ground to make "cricket shelters" so we would have a quick and easy way to collect fishing bait.

Be sure that you know what you are eating! Always make a positive identification before eating any insect or plant. You never know how healthy the crickets are or if they are carrying any bacteria, so I highly recommend that they be cooked like any other meat before they are eaten. They can be oven roasted, sautéed or deep fried. Also, I've seen the indigenous cultures that eat crickets keep them in a container for a day or so to be sure that the crickets "poop" before they are cooked. Wings and legs are removed before cooking. Always rinse them with clean water. Some folks will throw them in the freezer for awhile if there's one available.

Dry roasted crickets have a nutty flavour and are very good eaten plain with a sprinkling of salt. They are also very tasty as a substitute for nuts in dessert and cookie recipes. Dry roasted crickets can be blended into flour to be added to bread flours. (Source: Foragers Digest Web site, <http://foragersdigest.com/>)



where edible insects have long been a delicacy. The study, if successful, will be used to formulate nutritional policies and be shared with local governments, food processors and institutions that would then be expected to apply it in practice. This research is being conducted by the same group of Makerere scientists who are exploring the possibility of breeding and rearing grasshoppers en masse. (Source: Uganda Radio Network Web site, 1 February 2012.)

#### Insect proteins for animal feed

**Animal feed market pressure.** In 2050, the planet will number approximately nine billion people. At the same time, a growing middle class will result in higher demand for fish and meat. In order to meet this demand sustainably, since current animal feed stocks are being overexploited or grown unsustainably, the livestock and fishery sectors will be forced to look for feed alternatives.

**Land and forest depletion.** The global consumption of meat will grow 173 percent by 2050 mainly as a result of the explosive growth of 209 percent in developing countries. In addition, feed production will need to grow by 180 percent by 2050 in order to feed all livestock. At present, 30 percent of land use is for livestock feed production. Greater and more intensive crop production results in deforestation and soil degradation and the subsequent use of fertilizers and pesticides leads to water pollution.

**Fish depletion.** Aquaculture – probably the fastest growing food-producing sector – now accounts for nearly 50 percent of the world's food fish. According to FAO's Fisheries and Aquaculture Department, commercial fish feed for aquaculture has increased by 400 percent over the past 25 years. The biggest aquaculture feed producers are from Asia; in Viet Nam, for example, fish feed production has increased by 700 percent over the last 25 years. Fishmeal as well as several grains (mainly maize) and soybean are nowadays traded unsustainably.

**Insects as feed for aquaculture.** The summary report of the Technical Consultation Meeting "Assessing the potential of insects as food and feed in assuring food security", which took place in Rome in January 2012 [see pages 66 and 70 for more information], states that the urgency to find alternative protein sources for feed has resulted in high market acceptance and market recognition for insects. For fish and poultry, insects are already a natural feed. In China, for example, silkworm pupae powder is used as feed. Costs, reliability of supply and the quality of the insect protein product will determine market demand. Costs include the possibility of using organic waste streams, labour involved, yield, investment needed and economies of scale.

**Possibilities of edible insects.** Researchers have been looking into the possibilities of edible insects for many years; today, the

private sector is also investigating and undertaking research and development. The black soldier fly (*Hermetia illucens*) and the yellow mealworm (*Tenebrio molitor*) are considered to be optimal species for industrial mass production. There is a certain belief among new companies that production capacity is comparable with, or in some cases even more powerful than, other alternative resources such as soybean, sunflower and fishmeal. Although the use of insect proteins has many opportunities, it is still facing difficulties – legal issues on biodiversity and alien species, food safety in particular pathogen transfers, production capacity, and processing methods all need more investigation.

#### Is industrial mass production the future?

Mass rearing of arthropods today is mainly performed for biocontrol of insect pests. Using

#### BLACK SOLDIER FLY (*HERMETIA ILLUCENS*)

**Production.** The innovative company Organic Nutrition in Florida, United States of America, focuses on black soldier fly rearing for use as an alternative protein – Ento-Protein™ – in fish feed. Ento-Protein could serve as a replacement for fishmeal on the aquaculture market. The business should operate on zero waste by using manure as feed for the insect. The company has already carried out economic and environmental feasibility studies in order to be both competitive and sustainable. As such, they ensure that their operations, processes and products are environmentally responsible. Future capacity perspectives are 6 000 tonnes of Ento-Proteins per year and a factory setup that enables capacity increase. The British entrepreneur, David Drew, has also set up a small pilot plant on black soldier fly rearing in South Africa. He predicts his Agri-Protein production will be around 7 300 tonnes per year. His "magmeal" would serve as a substitute for fishmeal both on the aquaculture market and to fatten chickens and pigs. **Current research.** Manure management is a growing concern in intensive livestock facilities. The black soldier fly has been investigated for its manure bioconversion capabilities into high-

quality proteins and fats. Scientists at the Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland are looking into the efficient conversion of organic material by black soldier fly larvae. Based on their study, a waste processing unit could yield a daily prepupal biomass of 145 g (dry mass) per m<sup>2</sup>. They concluded that larvae of the black soldier fly are potentially capable of converting large amounts of organic waste into protein-rich biomass to substitute fishmeal, thereby contributing to sustainable aquaculture.

#### Black soldier fly in rainbow trout diet.

Research on fishmeal and fish oil replacements has identified a variety of potential ingredients that when used in appropriate mixtures can promote good growth results for rainbow trout (*Oncorhynchus mykiss*). A study conducted in 2011 at the University of Idaho in the United States of America indicates that black soldier fly reared on dairy cattle manure and trout offal can be used to replace up to 50 percent of the fishmeal portion of a practical trout diet for eight weeks without significantly affecting fish growth or the sensory quality of rainbow trout fillets. However, the reduced growth observed in the current study indicates that additional research is needed to identify further the nutritional limitations of this ingredient.

 FRUITS

**YELLOW MEALWORM (*TENEBRIOS MOLITOR*)**

**Production in China.** In Hunan province in Changsa, the biggest insect manufacturer – Changshasaibang Lives Science and Technology Co. Ltd – produces 280 tonnes of yellow mealworms each year. For technical support, the company collaborates with Hunan Agricultural University, Hunan Institute of Entomology and the Hunan Food Institute. The company sells the yellow mealworms for feed for poultry, fish, turtles, frogs, birds, scorpions, centipedes and snakes.

Sixty km south of Changsa in Xiangtan, the Haocheng Mealworm Inc. company mass rears mealworms mainly for animal feed. In addition, the company also sells insect protein in a powdered form for supplementary use in human food products. The company is unique in their multipurpose marketing. "Mealworm as a source of high protein can be added to bread, flour, instant noodles, pastry, biscuits, sweets and condiments, as well as adding it directly to dishes on the dining table or processing it into health care nourishment. It is also a direct feed for birds, dogs, cats, frogs, turtles, shrimps,

scorpions, chilopods, ants, goldfish, wild animals and other animals and livestock." (Source: [www.hcmealworm.com/](http://www.hcmealworm.com/))

**Production in the Netherlands.** Yellow mealworms are also reared in temperate regions for pet feed for reptiles, birds and fish. For example, the Kreca farmer company produces yellow mealworms as a feed for exotic animals. Since 2006, the company has also begun to produce mealworms for human consumption. Researchers from the Department of Entomology of Wageningen University have provided technical support and scientific knowledge to develop the production process. They are still collaborating, and undertaking research and development to identify new uses. (Source: [www.kreca.com/](http://www.kreca.com/))

Many pet feed companies have the capacity to rear mealworms and other edible insects. Farming good practices and technical equipment can be used to extend edible insects for feed to the livestock and fishery feed sector and even the entire food industry. Therefore, the animal feed sector should be convinced of the nutritional and environmental benefits of introducing insects into animal diets.

sterilized predators that are not pests, pests can be kept under control in a biologically friendly way. Mass rearing for biocontrol uses the same techniques and technical equipment as those necessary to produce edible insects for feed and food. According to Karel Bolckmans, director of Koppert, one of the leading companies in biocontrol, good practices and expertise should be shared and practical cooperation encouraged. For instance, research and development lines on edible insects can be set up in existing mass-rearing factories for biocontrol.

**Examples of informal integrated pest management carried out today**

- Weaver ant (*Oecophylla smaragdina*). Weaver ant collectors in Indonesia carry out biocontrol by collecting ants on fruit fields and, as such, they are the inventors of a new agricultural system of pest control and provide protein food sources such as queen weaver ant bread to the community and their animals.
- Melon bug (*Agonoscelis pubescens*). An

integrated pest management programme was designed by Elobied Agricultural Research Station (in the Northern Kordofan state of the Sudan) to control the melon bug. The community participated in a "handpicking of melon bug adults" campaign in four different areas of the state for two seasons. During these seasons, 15 tonnes of melon bug adults were collected in the first season, and 226 tonnes in the second. Melon bugs are edible and, in the last nymph stage, which is a relatively soft stage, the bugs are cooked and eaten. (**Contributed by:** Esther Mertens, Intern, Edible Insect Programme, Forestry Department, FAO.)

**FOR MORE INFORMATION, PLEASE CONTACT:**

**Paul Vantomme**, Senior Forestry Officer, Non-Wood Forest Products, Forest Products and Industries Division, Forestry Department, FAO, Viale delle Terme di Caracalla, 00153 Rome.  
E-mail: [paul.vantomme@fao.org](mailto:paul.vantomme@fao.org); [www.fao.org/forestry/65422/en/](http://www.fao.org/forestry/65422/en/)

**Five amazing fruits from the jungle**

The Amazon rain forest is said to host half of the world's plant and animal species. While local indigenous people had a diet including thousands of jungle fruits, modern societies eat just a fraction of them, so there is plenty of room for growth. Here are five fruits that come from the jungle and could end up in supermarkets around the world.

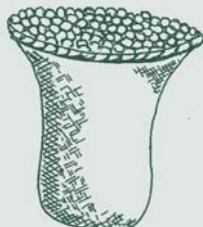
**Açaí.** The açaíberry comes from the palm tree *Euterpe oleracea*, which grows abundantly in the Brazilian Amazon, but which can also be found in Peru. In the early 2000s, it was marketed as a miracle fruit, with incredible antioxidant properties. Health food companies sold the juice for upwards of US\$40/bottle (see Box on page 34).

**Aguaje.** The aguaje fruit, and powders and extracts derived from it, is high in vitamin A content (five times greater than that of carrots). The fruit itself comes from the aguaje palm *Mauritia flexuosa*, a major component of the ecosystem in and around Amazonian wetlands, and tastes much like a carrot. **Arazá.** Arazá is hard to find outside the jungle, because no-one has found a good way to ship it without spoiling the fruit. Its acidity makes it undesirable for eating off the tree (*Eugenia stipitata*), but it is delicious when converted into a juice, jam or dessert. Even better, arazá has more than twice as much vitamin C as an orange.

**Camu camu.** The camu camu berry is similar to açaí in actual nutritional value. Camu camu is being marketed around the world as the cure for everything from the common cold to arthritis. While such claims are probably overblown, the berry of the *Myrciaria dubia* tree does have the second-highest concentration of vitamin C of any known fruit in the world. A small-scale study in Japan showed that it reduced the risk of hardened arteries. (See page 58 for more information.)



Arazá

**AÇAÍ (EUTERPE OLERACEA MART.)**

In the darkness before dawn, thousands of Amazonian river dwellers fill their large woven baskets with purple, pebble-sized açai fruit and make the trip in small canoes or large boats to the scattered outdoor markets of the city of Belém, Brazil. As the boats near Ver-o-Peso, the largest market at the mouth of the Amazon River, a seller shouts, "blood of the cow!". Buyers run to the boat, pressing their nails into the fruits to see if they are of good quality. "Blood of the cow" is a local reference to the meaty açai fruit with its wine-coloured pulp. From the age of six months, children in the eastern Amazon drink açai juice. And with great benefits – açai is being touted as a "superfruit" for its anti-inflammatory, antioxidant and anticancer effects. Because of its growing reputation, demand for açai is expanding around the world.

In some Amazonian *caboclo* communities, açai was found to make up to 42 percent of a person's daily intake by weight. Some people in Belém drink up to 3 litres of açai/day. In the 1990s, an average person from Belém consumed 60 litres of açai/year. An estimated 180 000 tonnes of açai are consumed each year in the city.

The fruit is being marketed in the United States of America and Europe as a "superfood". In 2006, a study found that extracts from açai berries initiated a self-destruct response in up to 86 percent of the leukaemia cancer cells tested in the laboratory. These effects have not yet been demonstrated on cancer in humans. Açai is rich in flavonoids, which give it its dark purple colour and provide a high dose of antioxidants.

Açaí pulp has become a fad in gyms in the south of Brazil. Athletes enjoy açai mixed with guaraná fruit and oats to give them a burst of energy. (Source: FAO, 2011. *Fruit trees and useful plants in Amazonian life.*)

**Mocambo.** Think of the *mocambo* (*Theobroma bicolor*) seed as a less-famous sibling of the fruit world. It shares the genus of the famous *Theobroma cacao* tree and grows principally in the western Amazon, its homeland. It has a sweet pulp. Most vendors stick to just selling the fruit's seeds, which reportedly taste like peanuts when roasted. (Source: Peru this Week, 3 December 2011.)

**Fruits that are helping to end hunger**  
No single fruit can put an end to hunger. But worldwide there are many different fruits and vegetables that are helping to improve nutrition and diets, while increasing incomes and improving livelihoods. Among these are the following.

**Ackee.** The ackee tree (*Blighia sapida*) is indigenous to the tropical forests of West Africa. Ackee fruit has a creamy texture and a mild flavour. It is commonly eaten with meat dishes as a side vegetable. It is very nutritious, high in fatty acids and rich in protein, potassium, iron and vitamin C. However, both the skin and seeds of ackee are poisonous; they contain toxic hypoglycin levels and can even be fatal. Care must be taken in harvesting the fruit at the right time and in the preparation of ackee dishes. In tropical West Africa – where ackee trees are indigenous, well adapted and utilized for other purposes – the safe preparation and nutritious value of ackee arils support food security and rural incomes. The tree is cultivated in the region for several non-food uses: immature fruits are used to make soap; the wood from the tree is termite resistant and used for building; extracts from the poisonous seeds are taken to treat parasites and are sometimes used as a fish poison; and a topical ointment made from crushed ackee leaves is applied to the skin to treat headaches and ulcers. Ackee leaves are also good as fodder for goats.

**Monkey oranges.** Similar in shape and size to apple, pear and orange trees, monkey oranges (*Strychnos spinosa*) come from a highly coveted African wild fruit tree, which farmers will often leave standing when clearing land for cultivation of field crops. The grapefruit-sized fruit is traditionally eaten raw, or made into jam, juice or fruit wine. It is usually yellow, orange or brown, and emits a sweet scent with a touch of clove. Monkey oranges are known for their delicious sweet and sour flavour and are rich in vitamins B and C. They are an important indigenous African resource that

supports farmers in times of crop failure, providing a supplementary food in rural areas. By adding the trees to crop fields, gardens, parks, fence lines and street sides, monkey oranges can boost food security and nutrition.

**Safou.** Native to the humid, tropical forests of West and Central Africa, *safou* (*Dacryodes edulis*) is also known as "butterfruit" for its rich, oily pulp. People in West and Central Africa have been eating *safou* for centuries as a fresh fruit between meals, or cooked as a main course. When roasted or quickly boiled in salted water, the pulp separates from the skin and seed and takes on a buttery texture. In Nigeria, the cooked pulp is combined with starchy foods such as maize to make a main course. The World Agroforestry Centre (ICRAF) promotes *safou* as a key tree species in agroforestry systems that can be intercropped with food crops to provide shade and biomass while also producing edible fruit. And the United Kingdom-based International Centre for Underutilized Crops has been searching for varieties that combine high-quality taste, nutrition and resistance to disease. (Source: Worldwatch Institute, 4 October 2011.)

**Wild edible fruits of sacred groves, Kodagu, Western Ghats, India**

Sacred groves are one of the oldest forms of nature conservation. These forests are easily distinguished from other forest types by the presence of deity symbols or temples, and are mostly managed by local temple committees. The Western Ghats of India – one of the mega diversity centres – is dotted with sacred groves, with some of the highest concentrations located in the Kodagu district, Karnataka, central Western Ghats. A recent study assessed the species composition of the sacred groves of Kodagu and explored whether they shelter wild edible fruit species.

Edible wild fruits are found in different forest tracts of India and botanically come from widely different families. In all, about 600 kinds are known, of which 100 or so are promising. The majority of the fruits are eaten raw when ripe or after processing. However, certain unripe fruits are used either as vegetables or in making pickles. Some fruits are used under starvation or famine conditions.

Results from the study indicated that sacred groves are rich in wild edible fruit species. In fact, the authors report that the sacred groves of Kodagu harbour about

51 wild edible fruit species (23 percent) and shelter species that are absent in reserve forests. Even though the groves appear small, they are rich in biodiversity and are thus really worthy of conservation. Not much is known about the nutritive value of the wild edible fruits, but available information suggests that they are rich in proteins, minerals and carbohydrates, and thus can be used as a source of nutrition. Consequently, the authors conclude that there is a need to assess the nutritive value of available wild edible fruit species and to use them to improve the lives of people living adjacent to the forests. (Source: B. Tambat and G.N. Chaithra. 2011. Wild edible fruits of sacred groves, Kodagu, Western Ghats. In *MFP News*, XXI (4).)

#### FOR MORE INFORMATION, PLEASE CONTACT:

**B. Tambat, Agricultural College campus, University of Agricultural Sciences (B), Hassan-573 225, Karnataka, India. E-mail: btambat@yahoo.com/**



#### An unlikely root of China's prized cure

It was once worth its weight in gold and reserved for emperors in ancient times, but today the use of ginseng (*renshen* in Chinese) as a cure for minor ailments is flourishing among China's booming middle class. The luxury herb, and China's lust for it, is also bringing wealth to an unlikely location in the heart of the United States of America.

Discovered more than 5 000 years ago in the mountains of China, ginseng is a multimillion-dollar business and is the golden crop in the fields of Wisconsin. Many tonnes of ginseng are shipped back to China, the Middle Kingdom, each year.

As stores across China fill with shoppers rushing to buy Spring Festival gifts, few realize the most popular brands have roots in the Midwest of the United States of America. Recently, in the basement of a Beijing department store near China's National Stadium, swarms of Chinese shoppers lined up around a pharmacy display of American ginseng stamped with a red, white and blue crest bearing an American eagle and the words "Ginseng Board of Wisconsin" in bold type.

"Every year I give the best I can find to my father for Spring Festival," said Gao Feng, who was eyeing a container of large ginseng roots selling for about 150 yuan (US\$23.80).

He said his father, who is in his late 60s, usually mixes the bitter-tasting root into a tea to help keep him active during the cold winter. When asked if he knew what the crest meant, the 37-year-old real estate agent said he thought it was the brand name and chose Wisconsin ginseng because he was told by a sales clerk it was among the best. Asked if he knew where Wisconsin was, Gao simply replied "no".

Creating brand awareness in a potential consumer market of more than 1.3 billion is one in a long list of challenges facing Wisconsin farmers, who produce more than 90 percent of America's ginseng, or *Panax quinquefolius*, as they push to reassert the Wisconsin strain in the Chinese market.

An unexpected winter storm in 2010 destroyed more than 50 percent of the ginseng crops, which take three to four years to mature fully, making their recovery a slow-going process, says Joe Heil, President of the Ginseng Board of Wisconsin. Heil, who started growing ginseng 20 years ago after converting his family's dairy farm to grow the normally wild root, says that unlike other agriculture in Wisconsin, ginseng can only be grown once on a plot of land before the land becomes unusable for at least 100 years, which made the storm's impact more than particularly troublesome.

Producing about 60 000 lb (27 215 kg) annually on his farm, Heil is one of the largest of about 130 different ginseng farms in the state. While Heil says the storm has taken its toll, he maintains an optimistic view that the drop in Wisconsin crops is actually a turning-point for production. After suffering losses of more than half of their annual produce, the price of the crop has shot up to a record US\$40–60 per pound (0.45 kg).

To help farmers get back on their feet, they have received help from one of China's biggest traditional Chinese medicine (TCM) distributors. In late 2010, the Ginseng Board of Wisconsin signed a five-year contract that guarantees one of China's oldest and most respected apothecaries, Tongrentang, exclusive distribution rights. The 360-year-old apothecary, which once served the highest echelons of Chinese society, now deals with Wisconsin farmers directly to help reduce the hefty price tag of the highly sought-after root.

Recently, Tongrentang imported about 400 000 lb (181 437 kg) of Wisconsin ginseng just in time for the Spring Festival rush when shoppers, such as Gao Feng, are

buying gifts before making their annual trek home to see their families. The haul will bring in more than US\$16 million in profits for Wisconsin farmers who are welcoming Tongrentang's help with open arms as they try to recover from the travails of the past two years.

Tong Song, director of internal risk management at Tongrentang, says the biggest draw among TCM practitioners in China for Wisconsin ginseng is the medicinal versatility of the North American strain. "Compared with Chinese and Korean ginseng, Wisconsin is milder in Chinese traditional medicine theory, so it can be applied to a broader number of people," she says.

With more than 1 000 outlets dotted throughout China selling the Western root, Tong says the company is pushing to establish the Wisconsin strain as a superior root, making vast efforts to inform China's consumers on the benefits while taking it on the road to TCM trade fairs. "We want to let the Chinese consumers know the effectiveness of this imported product," she says. (Source: *China Daily*, 20 January 2012.)



Ginseng

#### China to start equity trading of wild ginseng

Beijing. China's only online equity exchange portal, Jinmajia ([jinmajia.com](http://jinmajia.com)), will soon launch the trading of wild ginseng, the company said on Wednesday. Fan Dongping, president of Beijing Jinmajia Equity Exchange Online Service Inc., said that the trading may start in March or April, and the benchmark subscription price is likely to be set at around 10 000 yuan (US\$1 588). He said that ginseng plants to be subscribed for trading are those that have been grown by Bishui Forestry Company in the mountains of northeast China's Jilin province for more than five years.

According to the Chinese national standard for regulating ginseng quality, plants grown in natural forests for several years can be regarded as wild ginseng. The forestry company in Jilin has planted 70 million of these wild ginseng plants in a natural environment.

Fan said subscribers can either sell the equity of the ginseng products via the Web site, or pay an annual fee of 50 yuan to Jinmajia to keep the equity for added value. Jinmajia is jointly funded by over 20 equity exchange firms, including China Beijing Equity Exchange and Guangzhou Enterprises Mergers and Acquisitions Services. Fan said wild ginseng has great potential to increase in market value, adding that the older the ginseng grows, the more valuable it becomes. He added that equity trading will help build up the domestic brand of high-quality wild ginseng and increase its price.

China produces annually 60–70 percent of the world's ginseng products on average and exports 70–80 percent of its annual production. However, its annual output value on the products accounts for only less than 4 percent of the world's total, as the exports are priced very low, according to the Beijing-based *Guangming Daily*.

Dubbed the "King of Herbs" in China, ginseng has been used as a traditional medicine and health care product for more than 4 000 years. (*Source: Bernama [Malaysia], 15 February 2012.*)

## HONEY AND HONEYBEES

### EU: pollen warning on honey jars

Under new European Union regulations, jars of honey will have to be marked "contains pollen" – a move that experts have branded ludicrous, and say could put some British beekeepers out of business. Honey will also have to undergo expensive tests to prove it does not contain unauthorized genetically modified pollen.

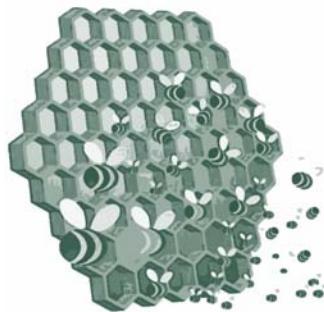
Until now, honey had always been considered an entirely unadulterated product for the purposes of food labelling. But the European Court of Justice has decreed that pollen is an ingredient of honey rather than an intrinsic component. It means that products will, for the first time, have to carry a list of ingredients such as "honey [contains pollen]".

Britain's largest supplier of retail honey, Rowse, said that the bill for relabelling and testing its entire range will run into hundreds of thousands of pounds. John Howat, secretary of the Bee Farmers' Association,

which represents the United Kingdom's 300 commercial beekeepers, said the ruling was a nuisance. "The idea that pollen is an ingredient of honey is nonsense. Pollen is integral to honey. Bees collect nectar and pollen. When they are storing it away, pollen gets into the nectar and hence into the honey."

The ruling came after a German amateur beekeeper found small amounts of genetically modified (GM) pollen in his honey. He sued the state of Bavaria, which owned trial GM maize plots near his hives, for damaging his produce.

Anyone who sells honey to the public, including the United Kingdom's 40 000 amateur beekeepers, faces tests. Suppliers whose pollen is found to be more than 0.9 percent GM must undergo full safety authorization and label their honey accordingly. The European Commission is expected to finalize the regulations over the next year. (*Source: Daily Mail [United Kingdom], 7 November 2011.*)



### What passes for honey on United States shelves – and the role of pollen

*Food Safety News* bought more than 60 samples from ten states and the District of Columbia in a recent investigation on the quality of honey on grocery shelves in the United States of America. They sent the jars, jugs and plastic bears to Texas A&M University, where Vaughn Bryant, Director of the Palynology Research Laboratory, analysed them. Bryant is a palynologist, someone who studies spores and pollen. He is also a melissopalynologist (someone who studies honey pollen). What he learned in testing for *Food Safety News* should make every honey consumer wary. His key results were that:

- 76 percent of samples bought at groceries had all the pollen removed;
- 100 percent of the honey sampled from drugstores had no pollen;
- 77 percent of the honey sampled from big box [large retail] stores had the pollen filtered out;

- 100 percent of the honey packaged in small individual service portions from fast food chains had the pollen removed;
- every one of the samples *Food Safety News* bought at farmers' markets, cooperatives and "natural" stores had the full, anticipated amount of pollen.

Pollen-free honey may not sound like a problem, but without pollen it is not possible to trace the source. One-third or more of all the honey consumed in the United States of America is likely to have been smuggled in from China and may be tainted with illegal antibiotics and heavy metals. A *Food Safety News* investigation has documented that millions of pounds of honey banned as unsafe in dozens of countries are being imported and sold here in record quantities.

No pollen, no traceability, no assurance of safety. Furthermore, when pollen is filtered from honey, so are many of the health benefits such as allergy relief and the nutritional value of vitamins, minerals and trace nutrients in bee pollen.

The *Food Safety News* test results come just as the European Union has decided to order honey producers to test for the presence of unauthorized genetically modified pollen and to identify pollen as an ingredient rather than a natural component of honey. Industry spokespeople fear the ruling will put many small-scale beekeepers and honey producers out of business. (*Source: www.care2.com, 7 November 2011.*)

## MEDICINAL PLANTS AND HERBS

### Liquorice named "Medicinal plant of the year 2012"

Liquorice has been selected as "Medicinal plant of the year 2012" because of its paramount importance to human well-being worldwide. The selection was made by a panel from the University of Würzburg, World Wide Fund for Nature (WWF) and TRAFFIC and was announced today at an event organized by WWF Germany.

"Liquorice is special because it can quickly soothe sore throats and coughs and was used centuries ago to treat coughing, hoarseness and asthma by Ancient Greek and Egyptian physicians," said Professor Johannes Mayer, an expert on the history of medicinal botany at the University of Würzburg.

The liquorice plant is a woody shrub that is native from the Mediterranean to East Asia,

*We received this interesting feedback from one of our readers, following the reproduction of the TRAFFIC article in NWFP-Digest 17/11.*

I am happy to note that *Jaythimadh* (in one of the main languages of India) or liquorice, has been named the Medicinal Plant of the Year 2012. The article mentions "Ancient Greek and Egyptian physicians" BUT Indian physicians knew about the medicinal properties of *Jaythimadh* even earlier. Western scholars often do not have access to Indian literature because many of the old texts have never been translated into English or other European languages. Hence, Indian scholars often go without being recognized. (Ardeshir Damania, India. E-mail: abdamania@ucdavis.edu/)



Liquorice

the Americas and Australia, and grows up to 1 m tall. It is a member of the Fabaceae (pea family), widely cultivated for its medicinal properties and also for use in beverages.

Only the root is utilized, from which a wide variety of compounds – 400 to date – have been isolated. Among the most important is glycyrrhizin, a chemical that possesses almost 50 times the sweetening power of cane sugar.

Today, liquorice is used as an important ingredient called *gan cao* in traditional Chinese medicine, while in Germany, Europe's major consumer and trader in medicinal plants, around 500 tonnes of liquorice are imported each year, 100 of them consumed domestically in medicinal teas.

The root is also used in confectionery and in many herbal liqueurs. In Japan, liquorice is used mainly in medicine but also as an ingredient in cosmetics. (Source: TRAFFIC, 21 November 2011.)

### Japanese delegation visits India to learn about responsible and sustainable trade of medicinal plants

Representatives from leading herbal companies in Japan have just returned from a visit to India, where they witnessed at first hand the responsible and sustainable collection practices utilized in the medicinal and aromatic plant trade. The visit, organized by TRAFFIC with support from I-AIM (Institute of Ayurveda and Integrative Medicine) took place as part of a project supported by the Keidanren Nature Conservation Fund, with the aim of gaining a better understanding of the benefits of sustainable sourcing of wild medicinal plants and to help promote use of the FairWild Standard within Japanese industries.

Japan was the world's fourth largest importer of medicinal and aromatic plants in 2007, and India the second largest supplier to the country. Many of the plants are wild sourced; however, this is not widely appreciated in Japan.

The Japanese delegates were shown a variety of insights into the trade, including the techniques used to ensure the plants are not damaged during harvesting, the quantities a harvester can gather between early morning and noon, and how local NGOs organize individual harvesters into cooperatives. Briefings took place through face-to-face meetings with local communities and industry, the Forestry Department and other stakeholders.

The FairWild Standard has previously been implemented in field projects in Uttarakhand and Karnataka, and used to inform the National Committee on NTFPs and the medicinal, aromatic and dye plants (MADP) guidelines for India's National Working Plan Code. "Following the success of this visit, we hope that participating companies look favourably upon adopting and implementing the FairWild Standard, to ensure its use becomes widespread within Japanese industry," said TRAFFIC's Kahoru Kanari. "We also hope the companies can help promote our way of thinking within the private business sector. In the long run, involvement of Japanese industry should have a positive impact on conservation of wild plant resources."

An intensive round-table meeting of leading herbal companies in Japan will be held next month in Tokyo. (Source: TRAFFIC News Update, 10 February 2012.)

.....

### FOR MORE INFORMATION, PLEASE CONTACT:

MKS Pasha, Coordinator, Research and Training, TRAFFIC India, 172 B Lodhi Estate, New Delhi 110003, India. E-mail: kpasha@wwfindia.net or Kahoru Kanari, Senior Programme Officer, TRAFFIC East Asia – Japan, 6th Fl. Nihonseimei Akabanebashi Bldg, 3-1-14, Shiba, Minato-ku, 105-0014 Tokyo, Japan. Fax: (81) 3 3769 1304; e-mail: kanari@trafficj.org/



### MULBERRIES

#### Silk versus synthetic fibres

Scientists at the Universities of Oxford and Sheffield in the United Kingdom have demonstrated that natural silks are a thousand times more efficient than common plastics when it comes to forming fibres. A report of the research is published this week in the journal *Advanced Materials*. The finding comes from comparing silk from the Chinese silkworm with molten high-density polyethylene (HDPE) – a material from which the strongest synthetic fibres are made. The researchers used polarized light shining through a disk rotating over a plate to study how the fibres are formed as the two materials are spun.

Silk is a natural protein fibre, some forms of which can be woven into textiles. The best-known type of silk is obtained from the cocoons of the larvae of the mulberry silkworm, *Bombyx mori*, reared in captivity. The shimmering appearance of silk is a result of the triangular prism-like structure of the silk fibre, which allows silk cloth to refract incoming light at different angles, thus producing different colours.

Silk is one of the strongest natural fibres but loses up to 20 percent of its strength when wet. It has a good moisture regain of 11 percent. Its elasticity is moderate to poor: if elongated even a small amount, it remains stretched. It can be weakened if exposed to too much sunlight. It may also be attacked by insects, especially if left dirty.

HDPE forms filaments at over 125° C and in addition requires substantial energy input in the form of shear force applied to the material in its molten form. Silk, in contrast, in the same setup forms filaments at ambient temperature and in addition requires only a tenth of the shear force. If the energetic costs of melting HDPE are included for comparison, silks become a thousand times more efficient.

The discovery of a low-energy method for fibre formation has led the researchers to

view silks as a new class of polymers they call aquamelts.

"Silk produced by spiders and silk moths demonstrates combinations of strength and toughness that still outperform their synthetic counterparts," said Dr Chris Holland of the Oxford Silk Group, part of Oxford University's Department of Zoology. "Not only are silks superior to man-made fibres, they are produced at room temperature with just water as a by-product."

"Combining the best of polymer science with biology we were able to determine how much energy is required to form these two fibres," he said. "And it seems that we have discovered some fundamental differences between natural and synthetic materials. With hundreds of millions of years of R&D in fibre production it is not surprising that silkworms and spiders have found ways to conserve energy while still making superior fibres." (Source: University of Oxford [United Kingdom], 23 November 2011.)

#### **Uganda to export silk to the Islamic Republic of Iran**

Uganda is set to start exporting the silkworm to the Islamic Republic of Iran. Mohammad Ali Mousavi, the chairman of Iran-Uganda Establishments, said the production of silk from the 1 000-ha farm in Kisozi, Gomba district should start next month.

Mousavi said that over 500 000 mulberry trees had been planted over a period of ten years. The silkworms feed on the leaves of the mulberry tree to produce silk. "Now is the time to reap. The investment is worth US\$9 million [about 27 billion Ugandan shillings]," he said. "Once we start, we shall be producing at least 1 500 tonnes for export to Iran." About 5 000 jobs will be created once production kicks off. "We have 14 000 hectares, but we are currently utilizing only 1 000. We hope to increase production this year," Mousavi added.

The multibillion investment is an initiative of the Iran Agro Industrial Group. If production hits full capacity, Uganda will be among the top producers of silk in the world. China is the number one silk producer, followed by India, Thailand, the Republic of Korea and the Islamic Republic of Iran.

Mousavi said Uganda will be exporting silk worth US\$200 000 (about 560 million shillings) every year once production commences, adding that the country's climate was conducive for silk production. "Whereas we can produce silk only once a year in Iran, in Uganda we can produce it

seven times." He started investing in silk production in Uganda in 1992. "We have the capacity of producing 30 bags of egg worms from just one hectare of land," he explained.

"Textile manufacturing will be possible with this silk produced from the moth of caterpillars," Mousavi said. "Once the investment grows and we get government support, we can start producing upholstery, wall coverings and carpets." (Source: New Vision [Uganda], 26 January 2012.)

#### **Silk no longer reels out happiness for farmers in India**

Fifty-year-old Rangamma, a landless silk farmer from Jalamangalakur village near Ramanagara [India], looks defeated as she comes to terms with the price her silk cocoons have fetched at auction at the Ramanagara Cocoon Market, the largest in Asia.

The cocoons having sold for only Rs171/kg, Rangamma, who grows mulberry on leased land, gets to take home a paltry Rs4 626 for the little over 27 kg she brought to the auction. "I will grow three more crops this year. But if the price keeps slumping, how can I feed my family of four when I need to pay Rs15 000 annually to cultivate mulberry on my leased land," she wails.

There are many more distraught mulberry growers such as Rangamma at the bustling cocoon market, which auctions about 50 000 kg of cocoons daily and sees 3 000 licensed cocoon dealers and thousands of farmers arrive not only from Ramanagara, Kanakapura and Channapatna in the state, but also from Tamil Nadu and Andhra Pradesh.

The slash in import duty on raw silk from 33 to 5 percent last March has wiped the smiles off the faces of nearly 10 lakh silk farmers of the state, who are having to battle rising expenditure and dipping incomes.

Their misery is compounded by the low minimum support price of Rs160/kg of cocoon extended by the government, which is nowhere near their cost of production of around Rs350/kg. Things were even worse some months ago when the cocoon price crashed to Rs70/kg.

With the selling price slumping below the basic cost of production, the farmers are being pushed into a debt trap, which they have no way of escaping. Small farmers are in deeper trouble, having to cope with crop loss, poor quality yield, crashing markets and an emerging labour shortage. Many are now migrating to the cities for jobs – a trend

that clearly does not augur well for the state's silk rearing industry.

A majority of farmers coming to the cocoon market have no alternative occupation or lucrative crop to fall back on. All they can look forward to is more uncertainty in the future. (Source: Deccan Chronicle [India], 21 January 2012.)



#### **The Brazil nut and wildlife**

The Brazil nut tree demonstrates the important links between plants and animals in an intact rain forest. For example, there are two species of poisonous frog (*Dendrobates castaneoticus* and *D. quinquevittatus*) that almost exclusively use the rain-filled hollow of Brazil nut fruits for their tadpoles.

The Brazil nut flower has a closed hood and is pollinated efficiently only by large-bodied bees capable of pushing open the hood and entering the flower. These bees of the genera *Bombus*, *Centris*, *Epicharis*, *Eulaema* and *Xylocopa* live in the closed forest. A recent decline in Brazil nut production has been linked to pollination deficiency, possibly owing to the smoke from forest fires reducing bee abundance or to the reluctance of some bees to visit fragmented landscapes.

The creamy, pale yellow flowers are also a favoured food of paca, peccary, armadillo and deer. Hunters often build platforms near Brazil nut trees, where they wait for game to come and devour the thousands of meaty flowers scattered on the forest floor.

The agouti is a true friend of the Brazil nut as it is one of the only animals able to gnaw through the thick, hard husk of the nut fruit to reach the nuts inside. It is primarily the agouti, but occasionally squirrels, that disperses Brazil nuts throughout the forest. The agouti scatter-hoards the seeds up to 1 km away from the mother tree, burying and reburying them at depths of 1–2 cm to dig up and eat during the leaner times between fruit seasons. Like squirrels, the agouti may forget some of their buried seeds, allowing the seeds to

germinate. Given their key role in dispersing seeds, it is important not to overhunt the agouti, so that there is no shortage of Brazil nut trees in the future. Scientists think that both the work of the agouti and that of people following indigenous management practices have been responsible for creating high concentrations of Brazil nut trees in certain areas. (Source: FAO, 2011. *Fruit trees and useful plants in Amazonian life.*)

#### **Project on Maya nut: an ancient food for a healthy future**

Maya nuts (*Brosimum alicastrum*) belong to the fig family (Moraceae). They were the staple food for pre-Hispanic cultures throughout the neotropics, who probably ate them boiled, and protected them as a source of food that attracted their favourite game species (deer, wild pigs and large forest rodents). Maya nuts are exceptionally nutritious, providing high-quality protein, calcium, iron, folate, fibre and antioxidants. They are also one of the best native forage species and show great promise in providing ecological alternatives to pasture for cattle ranches in the neotropics. In recent history, Maya nuts have been critical to rural food security; thousands of villages throughout Central America and Mexico have survived drought and famine by eating the "lifesaving" nuts when no other food was available.

The Maya Nut Institute is working to rescue lost traditional knowledge about the Maya nut tree for food, fodder and ecosystem services. Since our inception in 2001, we have trained more than 17 000 women from 1 150 communities in Honduras, Nicaragua, Guatemala, El Salvador, Mexico, Cuba, Peru, Jamaica and Haiti. This programme has resulted in the planting of more than 1 300 000 new seedlings.

Our programme focuses on women as the caretakers of the family and the environment, and addresses key factors for sustainable livelihoods – sociocultural, environmental and economic – by creating leadership, educational and economic opportunities for women and girls. Our newest programme, "Healthy Kids, Healthy Forests" (Bosques Sanos, Niños Sanos) aims to provide Maya nut-based school lunches to rural children. Starting in Guatemala in 2008, we are now feeding children in Nicaragua, El Salvador, Mexico, Haiti and Guatemala with Maya nut school lunches. These communities are planting Maya nut trees as "food forests" to sustain the programme in the future.

In addition to these accomplishments, we plan to carry out the following: (i) create a

women's alternative marketing organization to certify Maya nuts produced and sold by Maya Nut Institute-trained producer groups; (ii) create a certification scheme to certify sustainable, women-produced, fairtrade, organic Maya nuts; (iii) establish an international Maya nut standard; (iv) promote certified Maya nuts to the public through a Web site that brings together all the producer groups in the region; (v) expand the programme to the Plurinational State of Bolivia and Colombia in 2012; (vi) obtain research funding to explore the *Brosimum* genome; (vii) expand the "Healthy Kids, Healthy Forests" school lunch programme from 46 schools in 2008 to 100 schools in 2012; and (viii) obtain recognition of the Maya nut in school lunch programmes from the World Food Programme. (Source: Eco-Index® Monthly Update, March 2012.)

---

#### **FOR MORE INFORMATION, PLEASE CONTACT:**

**Erika Vohman, Founder and Executive Director, Maya Nut Institute, PO Box 2371, Crested Butte, Colorado 81224, United States of America.**  
E-mail: [mayanut@gmail.com](mailto:mayanut@gmail.com); <http://mayanutinstitute.org/>

#### **Le noisetier d'Afrique (*Coula edulis* Baill.). Un produit forestier non ligneux méconnu**

Les produits forestiers non ligneux (PFNL) représentent un enjeu alimentaire, culturel et économique considérable pour les populations d'Afrique centrale. Les communautés rurales dépendent en effet largement de ces produits, sources d'aliments, de fourrage, de médicaments, de gomme, de résine et de matériaux de construction. Les PFNL commercialisés contribuent à satisfaire des besoins quotidiens et assurent des emplois et des revenus, notamment pour les populations rurales. Ces dernières sont en outre détentrices d'excellentes connaissances, issues du savoir traditionnel, quant à la valeur et aux propriétés de nombreuses espèces végétales encore sous-utilisées. Il s'agit là de plantes sauvages ou cultivées dont le potentiel a été peu exploité commercialement, mais qui constituent un support pour la subsistance économique et alimentaire des populations locales. Ces ressources sous-utilisées comprennent notamment des légumes africains traditionnels.

De nombreuses espèces donnant lieu à des PFNL restent cependant en outre peu étudiées sur le plan scientifique, par exemple *Coula edulis*. Les connaissances encore fragmentaires à ce sujet montrent pourtant

que les fruits de cette espèce à usages multiples sont régulièrement consommés et commercialisés par différents groupes ethniques. La culture de *Coula edulis* reste toutefois limitée, notamment à cause du faible taux de germination de ses graines. Son bois, renommé pour sa résistance aux termites, est utilisé localement comme matériau de construction. Les recherches sur les propriétés mécaniques de ce bois ont confirmé ses potentialités technologiques, qui pourraient conduire à revendiquer pour cette espèce une place de choix parmi les essences commerciales. Mieux connu, le potentiel de *Coula edulis* pourrait permettre d'envisager une gestion durable de cette ressource, conciliant exploitation du bois et production alimentaire.

L'abondance actuelle de l'espèce dérive sans doute de l'intérêt que les hommes lui portent depuis 5 000 ans. La reconnaissance et l'intérêt des valeurs culturelle, économique et alimentaire de *Coula edulis* sont en effet bien établis. *Coula edulis* fait l'objet d'utilisations diverses de la part des communautés locales, principalement à des fins alimentaires et médicinales. Par ailleurs, son bois est utilisé pour confectionner les armatures de cases et ses qualités technologiques sont susceptibles d'être exploitées commercialement. Une attention particulière doit donc lui être prêtée, car il constituera alors un cas typique de ressource concurrentielle (convoitée à la fois par les compagnies forestières et les populations locales), à l'instar du moabi. Une description fiable de son écologie, de ses mécanismes de régénération et de sa dynamique des populations devrait permettre de disposer d'éléments de base pour envisager son exploitation durable. L'étude des niveaux de prélèvements par les populations locales, la description de sa filière de commercialisation et l'analyse de son potentiel de domestication devraient compléter cette approche, en vue d'aboutir à un modèle de gestion qui pourrait s'avérer applicable à d'autres PFNL moins connus. (Source: *Biotechnol. Agron. Soc. Environ.* 2011, 15(3): 485-495.)

---

**POUR EN SAVOIR PLUS, CONTACTER L'AUTEUR**  
**PRINCIPAL:** Christian Moupela, Université de Liège-Gembloux Agro-Bio Tech., Laboratoire de foresterie des régions tropicales et subtropicales, Unité de gestion des ressources forestières et des milieux naturels, Passage des déportés, 2. B-5030 Gembloux, Belgique.  
Courriel: [cmoupela@student.ulg.ac.be](mailto:cmoupela@student.ulg.ac.be); [cmoupela@yahoo.fr](mailto:cmoupela@yahoo.fr)


**RATTAN**
**Rattan: facts and figures**

**What is rattan and where is it found?** Rattan is a naturally renewable palm that grows in the tropical regions of Africa, Asia and Australasia and is used, among other things, for furniture, handicrafts and building material. Rattan continues to be an invaluable part of rural people's livelihoods in South and Southeast Asia.

Rattan belongs to the palm family (Arecales or Palmea) and is found from sea level up to 3 000 m. Around 600 species and 13 genera of rattan are known. Although most rattan species are native to the tropical regions of Africa, Asia and Australia, there is wide variety in their distribution. Commercially used rattan usually grows in hilly tropical areas, with a mean annual temperature of 25° C and an annual rainfall of 2 000 mm. As a result, the main area for rattan production is in the tropical regions of South and Southeast Asia.

There are different types of rattan palms, such as high or low climbers, single-stemmed or clustered rattan species. Some have very short and underground stems. Several rattan species are known to reach lengths of 100 m.

The majority of the world's rattans are found in Indonesia's forests, with most of the rest of the world's supply provided by the Philippines, Sri Lanka, Malaysia, the Lao People's Democratic Republic, Cambodia, Viet Nam and Bangladesh. Almost all rattan is collected from tropical rain forests.

Because of deforestation, rattan populations have decreased over the last few decades and there is now a shortage of supply.

**Rattan collection and processing.** Rattan is an attractive resource because it is easier to harvest than timber, easier to transport and also grows more quickly than trees. Rattan canes are cut in the forest and are partially processed before being sold. Canes of small diameter are dried in the sun and often smoked using sulphur. Large canes are boiled in oil to make them dry and protect them from insects.

**Rattan products.** Because it is light, durable and relatively flexible, rattan is used for a range of purposes: food (the inner core as well as the shoot of some of the rattan species is edible); furniture (the main end-product of rattan); shelter (rattan is an approved material for house building in rural areas); and handicrafts (besides furniture, handicrafts provide the main income of the rattan industry). The skin of rattan strands is

peeled off and used for weaving, while the "core" of the rattan can be used for various purposes in furniture-making (wicker). Some rattan fruits exude a red resin called dragon's blood. This resin was once considered to have medicinal properties and was also used as a dye for violins.

**Other rattan benefits.** Rattan harvesting and processing provide alternatives to logging timber in areas where forests are scarce. In fact, rattan grows best under some sort of tree cover, including secondary forest, fruit orchards, tree plantations or rubber estates. As a result, rattan planting indirectly protects tree cover, along with forests. Some rattan species are appropriate for small-scale cultivation under fruit trees or in rubber gardens. This allows smallholders to earn extra money on small areas of land. (Source: WWF Web site, [wwf.panda.org/](http://wwf.panda.org/)).



Rattan is the common name for a diverse group of climbing palms found throughout Old World tropical forests. They have been used for binding, basketry, home construction, food and numerous other non-market purposes for centuries while the canes of some species are gathered for the multibillion dollar furniture, handicraft and mat-making industries. Simply put, rattan is vital to the culture and economic well-being of millions of collectors, artisans and labourers throughout tropical Asia and Africa. (Source: S.F. Siebert. 2012. *The nature and culture of rattan: reflections on vanishing life in the forests of Southeast Asia*. University of Hawai'i Press, Honolulu, Hawaii.) (Please see pages 10–11 and 74 for more information.)

**The important role of rattan plantations in salvaging the rattan furniture industry in the Philippines**

Rattan production in the Philippines is experiencing a drastic decline. Forest statistics show that 32 336 000 lineal metres of cane in 2008 were reduced to 3 102 000 m in 2009. This resulted in a loss in export revenue of more than US\$12 000 for that period alone. With the continuing destruction of forest habitat, it is expected that this scenario will further worsen. In 1988, the Philippine Government established approximately 12 000 ha of rattan plantations to salvage this multimillion dollar industry, which means that these materials are now ready for harvest. Plantations could definitely provide an inexhaustible supply of raw canes for the industry but their use is a big risk for manufacturers. Limited information pertaining to the growth habits of the plant and on the kind and quality of cane produced in plantations is the cause of such uncertainties.

Financial assistance from the International Foundation for Science (IFS), Sweden, the Philippine Government and the University of the Philippines Los Baños has led to a series of scientific inquiries on plantation-grown *Calamus merrillii* Becc. (*palasan*), one of the commercially important Philippine species. Data revealed that the growth rate of the cane was highly affected by the soil pH, organic matter, nitrogen, potassium and phosphorous content of the site. Furthermore, site elevation, amount of sunlight exposure and topography also had a direct impact on cane production. Growth rate ranged from 0.36 to 3.79 m/yr.

In terms of basic cane properties, studies showed that fibre length was from 1.3649 to 1.9124 mm, fibre wall thickness from 0.0054 to 0.0109 mm and fibre distribution from 21.14 to 38.42 percent. Specific gravity varied from 0.38 to 0.51, modulus of rupture was from 14.35 to 32.45 MPa, while modulus of elasticity went from 3.23 to 6.37 GPa. All these properties were minimally affected by the growth rate of the plant. Unlike wood whose properties are normally altered in plantation conditions because of the production of juvenile wood, plantation-grown *palasan* stems were unaffected by growth-enhancing activities.

Furthermore, comparing the properties of plantation-grown canes with wild canes taken from natural forest revealed that the

two were practically the same in all aspects, e.g. mechanical, physical, structural and chemical properties. They were also similar in terms of their softening temperatures. Thus, it can be said that plantation-grown *palasan* stems behave similarly to wild canes during processing. This proves that plantation canes could be extensively used in the rattan industry without sacrificing the quality of the finished products. This is good news for rattan manufacturers not only in the Philippines but in all rattan-producing nations. (**Contributed by:** Dr Willie P. Abasolo, Chair, Forest Products and Paper Science Department, University of the Philippines Los Baños, Laguna, Philippines 4031. Fax. 63-49-536-3206; e-mail: willieabasolo@yahoo.com/)

## SHEA BUTTER

### As the shea industry continues to grow, stakeholders set their sights on Cotonou for annual conference

With rising global interest in shea, the African shea industry is growing at an unprecedented rate. Prices for shea have increased by a staggering 50 percent since 2006 as the shea-producing industry has forged connections and built on its strength. Now, industry stakeholders will focus on positive impacts to communities and strengthening sustainability at the sixth annual shea conference, which is being hosted by the Global Shea Alliance. "The industry is expanding so rapidly – this is a critical time for shea," said Gilles Adamon of Natura, a Benin shea butter producer.

Shea nuts grow on wild trees that are critical to maintaining environmental sustainability in the West African Sahel region. Harvested mainly by some four million women in the region, shea is a significant and growing source of income for families and communities. A 2010 USAID study showed that for every US\$1 000 of shea nuts sold at the farmgate level, US\$1 580 in additional household income is generated in the local

economy. A major aim of the 2012 shea conference ([www.globalshea.com](http://www.globalshea.com)) is to highlight and strengthen the shea industry's focus on the triple bottom line of people, planet and profit.

With 12 000 tonnes in processing capacity and 35 000 tonnes of shea nuts harvested for export each year, Benin is an ideal place for industry stakeholders to identify new investment opportunities that will benefit business and local communities.

"We see our annual participation in the shea conference as critical," said Monica Hjorth of AAK, the world's leading trader of shea nuts. "It allows us to discuss the most important issues in an industry that has such a huge impact on the world."

The conference includes a business-to-business forum that will match companies to service providers, financiers, suppliers and others, according to their needs. A set of field trips will take conference participants to important industry sites across Benin.

After launching the Global Shea Alliance at Shea 2011 in April, industry stakeholders are developing the vision for the industry. The Alliance connects hundreds of companies across the sector, providing a platform for advocacy, promoting shea worldwide, and helping to set quality standards across the industry. "The Alliance has brought together the entire industry to build strength and forge collaborations for the positive development of the shea industry worldwide," said Eugenia Akuete, President of the Global Shea Alliance.

Shea, which is used widely in food products, is also growing in popularity for its benefits as a natural cosmetic as well as emerging research suggesting health benefits of its natural oils. (Source: West Africa Trade Hub, 21 February 2012.)

(Please see page 70 for more information.)

## SHELLAC

### Shellac's as tough as nails

Edmonton, Canada. A manicure that lasts up to two weeks without chipping or smudging may sound too good to be true, but thanks to a hybrid gel polish, it doesn't have to be.

One of the biggest nail innovations of 2010, shellac (a resin secreted by the female lac insect, *Laccifer laccata*) has steadily gained recognition for its sleek finish and long-lasting results. Developed by California-based company Creative Nail Design, shellac is steadily gaining popularity in Canada as well. The product brushes on like regular nail polish, but is the first-ever "powder polish" to

set like a gel nail under ultraviolet light. This curing process makes shellac more flexible and durable than the average manicure, and avoids the lengthy drying times of regular polish.

The treatment is more nail friendly than its gel counterpart in that no sculpting or heavy filing is required, and nails may feel stronger and look healthier as a result. (Source: Edmonton Journal, 8 February 2012.)

## STEVIA

### Stevia in Europe

In case you missed it, the European Union (EU) approved stevia (*Stevia rebaudiana*) last autumn as a food additive for foods and beverages. The approval, specifically intended for stevia's sweetening compounds (steviol glycosides), comes at a time when consumers increasingly demand products with little or no added sugars. According to market research group Datamonitor, global launches of products with "no sugar added" positioning increased from 490 to 2 308 during 2009–2010.

But an EU approval is just the beginning for stevia foods in Europe. While proponents of the zero-calorie, natural sweetener are understandably smitten over its growing recognition, the European legislation (as it currently reads) presents some initial challenges. Stevia-sweetened products must have the ingredient listed under its designated E number – E 960 – which may be accompanied by the ingredient name steviol glycosides. This isn't doing much for the average consumer who isn't yet familiar with the stevia plant, much less the name of its scientifically active compound.

A listing of stevia leaf or stevia extract elsewhere on product packaging would make for a "friendlier" label, but allowing alternative wording will be up to individual member states. Marketers may also wish to fall back on images of the stevia plant, if authorized.

An acceptable daily intake (ADI) for steviol glycosides set at 4 mg/kg of body weight presents another challenge. The European Food Safety Authority (EFSA) (Parma, Italy), the health body that established ADI, considers it a "conservative" level that might still be exceeded by some users.

Flavoured soft drinks are predicted to be the biggest contributors of stevia to the EU diet. Exposure limits in these products specifically may be subject to change. EFSA says that it will reassess this ADI in the



future, following information it will request from producers and users of steviol glycosides.

But even with intangibles like these yet to be clarified, the notion of mass stevia consumption in Europe is not going anywhere. Whereas EFSA directives allow member states a "take it or leave it" approach to legislation, the stevia approval comes in the form of a regulation, something the International Stevia Council (Brussels) affirms cannot be denied in any member state. "Steviol glycosides have been authorized through a Commission Regulation and therefore EU member states have to implement the legal text in full," said the International Stevia Council's executive director Maria Teresa Scardigli. "They do not have the freedom to deny the use of stevia at a national level."

Stevia's approval in Europe casts a little more uncertainty on the artificial sweetener industry worldwide. To make Europe's case more interesting, EFSA recently announced its intent to speed up a risk assessment of the artificial sweetener aspartame, from its original 2020 deadline to a much earlier deadline of 2012. Rising concern from regulatory bodies and consumers over artificial sweeteners has already led suppliers to take stock in stevia and other alternatives. Shortly following the EU's stevia approval, Chicago-based Merisant, which supplies the artificial sweetener Equal, expanded its Misura stevia line with a launch of the first tabletop stevia sweetener in Italy. Other companies have made similar advancements. (Source: Nutritional Outlook, 8 February 2012.)

## TAMANU OIL

### Uses and products

Oil extracted from the fruit of the *tamanu* (*Calophyllum inophyllum*) has been used as a traditional medicine and cosmetic in Pacific island cultures for centuries. The oil is tinted green, is thick and woodsy or nutty smelling, and is easily absorbed into the skin. It does not solidify in cool weather as does coconut oil. Modern cosmetic products based on *tamanu* oil are sometimes mixed with olive oil or shea butter.

Traditional and modern uses are all topical – the oil is not edible. In addition to being used as a massage oil and skin moisturizer, *tamanu* oil has traditionally been used to treat various skin injuries such as scrapes, burns, insect bites, sunburn,



*Calophyllum inophyllum*

and diseases and sores such as dry skin, psoriasis, eczema, ringworm and even nappy rash. The oil has traditionally been used to treat rheumatism and inflammation and is believed to help heal scars.

While some claims are clearly exaggerated, medical research has shown that *tamanu* oil has antibacterial properties and may help promote healing of scars. Other *tamanu* plant extracts and chemicals derived from them have been shown to decrease the growth of tumours and inhibit leukaemia cells in laboratory settings. The results of some studies have even shown that inophyllums, chemicals extracted from *tamanu* oil, inhibit HIV reverse transcriptase in a novel way, which indicates that some day they may be used as part of a combination therapy for AIDS. The main fatty acids that comprise the oil are palmitic, stearic, oleic and linoleic acids. There has been at least one case documented of an allergic reaction to the oil, so individuals should apply a small amount first as a test before using. A qualified medical professional should be consulted for serious or long-term injuries or diseases.

*Tamanu* oil was traditionally used as lamp oil in Polynesia and has been proposed as a source of biodiesel. However, the high value of the oil in the cosmetics market today makes it unlikely that it would be burned for energy. In addition to the fatty acids, the oil also contains up to 30 percent resins, and there was early interest in the use of the oil as a varnish. Traditionally, the oil was used to help waterproof *kapa* (bark cloth) in Hawai'i.

*Tamanu* nuts are usually harvested from the ground beneath wild stands. The nuts are harvested when the husks are partially or wholly rotten but the kernels are still fresh. While processing is done by hand in

most locations, simple machines used to extract the kernels from macadamia nut (*Macadamia spp.*) or *kukui* (candlenut) could also be adapted to work for *tamanu*. The kernels need to be dried to produce the oil. Sun drying takes one to two months, but nuts may also be dried in homemade solar driers similar to those used to dry fruit or coffee, or in an oven at 37° C. In former times, nuts were baked on hot rocks from a fire. Some kernels will develop mould during the drying process, and these need to be removed daily or they will ruin the whole batch. Wood-fired copra driers are sometimes used to dry *tamanu* kernels on islands where there is a copra industry, but this lends a smoky odour to the oil. Kernels may be cut in half to speed the drying process. Processing begins when the kernels turn deep golden brown and an oily film forms on the surface. The kernels are then ground in a food grinder and cold-pressed to extract the oil. Extraction of the oil in boiling water is not recommended as heating may change the chemical properties of the oil. *Tamanu* oil is usually sold in pure form but it may also be mixed with olive oil or shea butter. It has a shelf-life of about a year.

### Value-added processing

The value of *tamanu* oil lies not just in its physical and healing properties, but with the connection that consumers make with the Pacific islands. For Western users, it allows an escape from the daily routine and the chance to try something exotic. For consumers in Hawai'i or Polynesia, using *tamanu* oil allows them to connect with a cultural tradition. The oil is seen as a treat or an indulgence rather than something for everyday use. As currently sold, it is packaged in very small bottles, usually only 30 ml (1 oz) and seldom more than 60 ml (2 oz) with labels evoking Hawai'i or the South Pacific. For the Hawai'i market (or for marketing to those who have visited Hawai'i), the oil is labelled *kamani* oil, using the Hawaiian name, but for the rest of the world it is more commonly labelled *tamanu* oil, using the Tahitian name. Although the oil is now also sourced from Madagascar, marketing emphasizes the connection with Tahiti or Hawai'i rather than with Africa. Value is added to the product not so much by processing as by packaging and marketing. Some oil is marketed as being USDA-certified organic, although it is unlikely that pesticides or chemical fertilizers are used to any great extent for

*tamanu*. *Tamanu* wood is likewise prized in Hawai'i, Tahiti and elsewhere in the Pacific because of its cultural connections.

#### Markets

*Tamanu* oil is traded internationally, from wholesale producers to bottlers and retailers. Retail prices advertised on the Internet for pure *tamanu* oil range from US\$4.00 to US\$40.00 for a 30 ml bottle. Shelf prices for *tamanu* oil in Hawai'i are about US\$10 for a 30 ml bottle. Opportunities exist to produce and market locally sourced *tamanu* oil for local sale in resort locations rather than producing it in bulk for the wholesale market. In Hawai'i, consumers might prefer oil produced in Hawai'i from trees grown in Hawai'i, and a grower would be able to realize more income from local retail sales than from wholesale sales. (Source: J.B. Friday and R. Ogoshi. *Tamanu* (*Calophyllum inophyllum*). In C.R. Elevitch (ed.). 2011. Specialty crops for Pacific islands. Permanent Agriculture Resources, Holualoa, Hawaii.)

**FOR MORE INFORMATION, PLEASE CONTACT:**  
James B. Friday, College of Tropical Agriculture and Human Resources, University of Hawai'i at Mānoa, Komohana Agriculture Complex, 875 Komohana St, Hilo, HI 96720, United States of America. E-mail: [jbfriday@hawaii.edu/](mailto:jbfriday@hawaii.edu/)

## TRUFFLES

#### Italian truffles achieve PEFC certification

White truffles (*Tuber magnatum* Pico) from Muzzana del Turgnano, a small town in northern Italy between Trieste and Udine, have become the world's first truffles to obtain PEFC certification (Programme for the Endorsement of Forest Certification).

"While the main focus of PEFC as the world's largest forest certification system is promoting sustainable forest management and certified timber, the importance of certified so-called 'non-timber forest products' cannot be underestimated," said Antonio Brunori, Secretary General of PEFC Italy. "These products often represent a significant source of income for rural communities (all over the world) and are an integral part of local people's lives. In addition, they help in increasing their connection to the forest, which is certified for its sustainable management: this certification of one of its products will help them in communicating their territory and natural resources, enhancing the value for tourism and hospitality activities."

"Furthermore, NWFPs allow us to better inform the public about the benefits of certification as people can relate more to forest-derived products such as truffles, essential oils, mushrooms and even beer – products that they can experience with all their senses. Timber products such as wooden beams, paper or furniture tend to be of a more 'functional' nature and therefore do not convey the message of sustainability that well," Mr Brunori continued.

The truffles are harvested by hand in the region's PEFC-certified Baredi Forest, which covers over 160 ha of communal land. The Muzzana white truffle boasts a unique odour and is considered to be very tasty and of high value to chefs everywhere, and has a retail value of around €3 000/kg.

Certification of the truffles was pioneered by the Associazione Muzzana Amatori Tartufi (Muzzana Amateur Truffle Association) and involves a system that assigns barcodes to each and every truffle harvested on behalf of the Association. In addition to originating from PEFC-certified forests, this system also ensures that the truffles come from local forests, namely the Baredi Forest.

"The white truffle is the most valued of all underground fungi and represents a great example of the value that non-wood forest resources offer to local communities," said Enore Casanova, President of PEFC Friuli-Venezia Giulia. "Only local people with the required skills and experience in harvesting are allowed to pick these certified truffles, and we are very proud to have harvested the first PEFC-certified truffles in the world."

**FOR MORE INFORMATION, PLEASE CONTACT:**  
Antonio Brunori, PEFC Italia, Strada dei Loggi, 22, 06135 Perugia, Italy. E-mail: [info@pefc.it](mailto:info@pefc.it); [www.pefc.org/](http://www.pefc.org/)

## WILDLIFE

#### Biodiversity: endangered and in demand

With an ingredients list that includes rhinoceros horn and tiger bone, traditional Asian medicine is on a collision course with wildlife preservation.

It looks innocuous enough: a small phial bearing a white and orange label with the words *Shi-He Ming Yan Wan*. Yet the pills contained within are said to hold great healing powers, able to cure just about anything, from a mild fever to a brain haemorrhage, from cancer to AIDS. The pill's power, it is claimed, comes from a small amount of rhinoceros horn. Little

wonder then that people pay as much as US\$50 000/kg, roughly the same as the price of gold.

The rhinoceros and its horn are not alone: powdered tiger bone is used to treat rheumatism; and the scales of the toothless, anteater-like pangolin are believed to reduce swelling and improve blood circulation. It is a similar story for many other endangered species whose commercial use is restricted – or banned outright – by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The illicit trade in wildlife is a booming industry, estimated by the United States congressional research service to be worth as much as US\$20 billion globally each year. Although this figure includes trade in bushmeat, skins and exotic pets, in the expanding Asian market, estimated to be the largest in the world, a significant driver is traditional Chinese medicine (TCM). Indeed, despite showing signs of decline in the 1990s, the poaching and trade of endangered animals such as tigers and rhinos are once again on the rise. Yet cheaper and more potent alternatives are available. Organizations such as the American College of Traditional Chinese Medicine say that sustainable substitutes have been used successfully for nearly two decades. So why is there still a burgeoning market to use these precious animals in traditional Asian medicine?

One likely factor driving this demand is the rise in the wealth of China, says Sabri Zain, director of advocacy for TRAFFIC International in Cambridge, United Kingdom, which was established in 1973 to monitor wildlife trade.

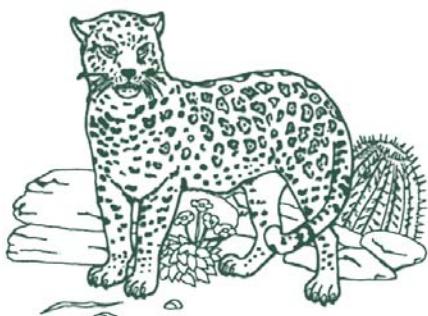
The market for these substances also seems to be expanding. A range of new products has emerged over the past decade, available as black market products or through online stores. "Tiger bone is now being used in wine," says Debbie Banks, a senior tiger investigator with the



Environmental Investigation Agency (EIA), a campaign group in London. Association with status is a major issue, reflected in the demographic of the modern-day user of these products, says Zain. "It is a myth that these products are only being consumed by an older generation. It is also young, wealthy professionals," he says. "It may be a way of showing their peers that they can afford these very expensive medicinal products."

In Viet Nam, which is one of the largest markets for TCM outside China, traditional remedies are much sought after. If incomes were to increase, so too would consumption of products containing endangered species. This is hardly surprising, says Zain, given the perception that products such as rhino horn are capable of curing cancer – a medicinal property previously unheard of in traditional Asian medicine.

But perhaps the most disturbing notion is the prospect that people might trade in endangered animals as a means of "investing in extinction". This is the idea that by actively buying up and stockpiling rare animal parts, one can not only push up the price, but also encourage further poaching that will eventually force the species into extinction. In cold-blooded business terms it makes an awful lot of sense, says John Scanlon, secretary-general of CITES in Geneva,



"Illegal and unsustainable wildlife trade has reached unprecedented levels in Southeast Asia. If enforcement efforts are not stepped up, many species will be lost forever. Existing tools such as CITES and the ASEAN Wildlife Enforcement Network must be fully utilized and urgent action must start now." (Source: C.R. Shepherd, Deputy Regional Director, TRAFFIC Southeast Asia. *TRAFFIC Bulletin*, 23(3), 2011.)

Switzerland. "If something is rare it becomes more attractive," he says. "And the rarer something is, the more valuable it becomes."

Scanlon concedes that he only has "rumour and anecdotal evidence" that anyone is actually "investing" in the demise of a species. "It is still speculative," he adds. According to EIA, however, tiger farms are stockpiling the bones and skins of tigers that die. Indeed, Chinese authorities have set up two operations – one in Guangxi and one in Geilongjiang – to dismember the carcasses of dead tigers and destroy all but the bones and skins. The Chinese authorities say this is to ensure there is adequate supervision of the carcass and body parts, but why the bones and skin are then not destroyed is not clear. So although there is no proof of people stockpiling wild tiger parts, it is certainly happening in farms.

There is no simple solution to tackle illegal trade in these endangered animals, says Scanlon. But the hope is that progress can be made by adopting diverse tactics, including controlled delivery, tracking illicit substances to the buyer. (Source: *Nature*, 22 December 2011.)

#### Regional wildlife conservation project in Asia

Dhaka, Bangladesh. On Sunday, the World Bank launched a wildlife conservation project here that will also cover three neighbouring countries. The Strengthening Regional Cooperation for Wildlife Protection in Asia project, which is to be implemented in Bangladesh, Bhutan, India and Nepal, aims at helping participating governments to enhance shared capacity, institutions and knowledge. It also aims at addressing cross-border poaching and other regional conservation threats to habitats in border areas.

With South Asia's rich biodiversity, the region is a lucrative target of the illegal wildlife trade, said the Washington-based lender in a statement, adding that illegal poaching of the iconic tiger and elephant, deer and reptiles, different species of birds and corals is the most severe threat against biodiversity conservation.

To address this, the World Bank recently approved a US\$36 million fund for wildlife conservation efforts in Bangladesh. Participation by other tiger range countries in South Asia and Southeast Asia is envisaged in later phases, the statement added. Bangladesh holds the largest remaining population of tigers in the Sundarbans. Habitats across Bangladesh,

Bhutan, India and Nepal are home to over 65 percent of the 3 000 or so remaining wild tigers. Bangladesh faces severe conservation challenges, said the statement, adding that 4–5 percent of faunal species and about 10 percent of floral diversity have become extinct in the last century in the country.

No single country can manage or eliminate the threat of wildlife poaching on its own, said the statement, adding that neither can a single country manage contiguous cross-border wildlife habitat effectively, since wild animals cannot be confined to national boundaries.

It said conservation of these habitats would also contribute to sustainable livelihoods for people dependent on forests. The project is expected to bring about regional collaboration in combating wildlife crime. (Source: *Zee News* [India], 13 February 2012.) ♣



**Nearly all men can stand adversity, but if you want to test a man's character, give him power.**

*Abraham Lincoln*