## BAMBOO

**Bamboo bicycles: a growing industry**

Riding your bike to work is becoming even more environmentally friendly with the growth of the bamboo bike industry. Londoners who can afford the £3 000 price tag can now buy an organic, biodegradable bike made from bamboo. Calfee Design, one manufacturer of bamboo bikes, is using bamboo harvested in the remote mountains of Yushan National Park, Taiwan Province of China. The bamboo is shipped to the United States of America where it is smoked and heat-treated to prevent splitting. The pieces are then assembled with lugs made from hemp fibre and sent to the United Kingdom for sale.

Bamboo bikes are cropping up in the United States of America as well, and you can even take part in the construction of your ecofriendly transportation. Bamboo Bike Studio, based in New York, is offering two-day bamboo bike-building courses. For US$1 000, you get all the raw materials and instructions to build your own bike, custom-fit for your body and riding style and made with a local, renewable resource – all while supporting a good cause. That cause is the Bamboo Bike Project, which seeks to build a sustainable, ecofriendly bike industry in Ghana – to create a sustainable form of transportation for poor Africans in rural areas.

Here are a few additional reasons why bamboo bikes are growing in popularity:

- bamboo absorbs five times as much greenhouse gas as a "conventional" tree plantation;
- it does not undergo fatigue like metal;
- it is stronger than mild steel and more elastic than carbon fibre; and
- it is the fastest growing plant: some species can grow 1.5 m per day.

If the cost does not turn you away, a bamboo bike could soften your ride to work and your impact on the planet. (*Sources*: various.)

**Bamboo keyboards manufactured in China**

Jiangqiao Bamboo and Wood hail from China's Jiangxi Province, where bamboo resources are plentiful. Although the company began as a flooring company, it is now diversifying its production to include the latest in green design: bamboo keyboards.

In recent years, bamboo has gained popularity as a sturdy, sustainable alternative to wood flooring. Currently, China produces 200 000 $m^3$ of bamboo plywood annually.

Jiangqiao, which began manufacturing the green keyboards last October, has already received orders for 40 000 finished units and is China's sole producer of these keyboards. The company says the product is as strong as its plastic equivalent. Proof that bamboo's strength surpasses what its flexibility suggests lies in the fact that modern Hong Kong developers prefer bamboo over steel reinforcing rods when constructing some of the world's tallest skyscrapers.

Jiangqiao faced the same difficulties that are typical when adapting bamboo for industrial use: keeping the bamboo keyboard frame from cracking, preventing the bamboo bottom plate from distorting and firmly fastening the buttons with the main board. However, the company has successfully developed (and patented) its formula, and also developed a bamboo mouse and USB expected to go on the market this spring.

Although Jiangqiao is not the first company to use natural resources in computer accessories, it may be the most ecofriendly. Much of the bamboo used in the keyboards is leftover scrap from bamboo floorboard manufacturing, says the company's general manager.

Combining efficiency with aesthetically pleasing design, Jiangqiao is earning a name for itself in innovation and sustainability. (*Source*: Sustainablog.com [United States of America], 7 May 2009.)

**Bamboo, cornstalk used in cement-bonded boards in the Philippines**

Manila. The Forest Products Research and Development Institute (FPRDI) of the Department of Science and Technology has developed a low-cost construction material from bamboo and cornstalk. Dr Dwight Eusebio, head of FPRDI's Composite Products Section, said the alternative construction material, called cement-bonded board or CBB, is made from locally available agroforest waste materials.

Eusebio said two bamboo species – kauayan tinik (*Bambusa blumeana*) and bayog (*Bambusa merrillianus*), which thrive all over the country – were selected in making the boards.

The other material, cornstalk, also abounds in the countryside and has no use in most farms in Cagayan and the Ilocos Provinces, including La Union.

Eusebio said CBBs have shown good properties and met required standards in laboratory tests. He said they based the standards on a previously developed wood wool cement board (WWCB) made of yemane (*Gmelina arborea*).

"CBBs are generally known for their resistance to fire, water damage, fungal and termite attack. They also provide excellent sound and thermal insulation," Eusebio said. CBBs passed tests on such properties as static bending, nail head pull-through, thickness swelling and water absorption, he added. He said these boards are commonly used as exterior panels, interior partition walls and ceilings, and in cabinets.

Eusebio said he and a building product manufacturer in Bay, Laguna have already produced 24 2 x 8 ft (0.6 x 2.4 m) boards, which are more than enough to use for a housing unit in Tandang Sora, Quezon City to test the serviceability of CBBs.

FPRDI is mandated to conduct basic and applied research and development to improve the utility and value of wood and non-wood products. (*Source: The Philippine Star* [Philippines], 7 May 2009.)

**Are ecoconscious consumers being bamboozled?**

Because of its many benefits, bamboo has been touted as an environmental miracle crop. It is a significant carbon sink, grows quickly, is more termite-resistant than timber, and can be used for everything from food to clothing material to scaffolding for building construction. But are environmentalists being bamboozled? Despite its benefits, increased bamboo production may also give rise to a number of concerns.

Perhaps the most pressing concern about bamboo arises from the fact that it cannot be sustainably grown on a large scale in North America and Europe, meaning it has to be imported from abroad. Currently, 80 percent of the world's bamboo production comes from China.

There is also concern that increased demand for bamboo could encourage farmers to bolster their use of pesticides to boost yield, which would readily accumulate as runoff in the moist regions where bamboo grows best.

There is also increased distress that bamboo is environmentally inappropriate as a raw material for textiles and clothing fabrics. Because of its rugged fibres, bamboo must be cooked in strong chemical solvents and turned into a viscose solution before it can be reconstructed into proper weaving material.

Furthermore, while expanding bamboo production worldwide could help to prevent deforestation and timber usage at home, there are concerns that it could prompt farmers in the developing world to clear their native forests.

The good news is that many of these concerns are outweighed by the immense benefits that bamboo production brings. Agricultural efficiency is easily its largest benefit. Since bamboos are the fastest growing woody plants in the world, the crop can be replenished quickly. Furthermore, bamboo is self-regenerating, which means that after the stalk has been cut, it rapidly regrows from the remaining rootstock. As long as bamboo is grown in its native habitat, its impact on local ecosystems is minimal compared with the destructive foresting practices of timber production.

Although concerns about bamboo as a textile and clothing fabric are warranted, bamboo is a remarkably suitable replacement for timber as a building material.

Moreover, despite the fact that almost all bamboo has to be imported to North America and Europe, the carbon-conscious consumer can rest more easily knowing that the fuel used for transporting bamboo from Asia to California is essentially equivalent to shipping timber coast-to-coast in the United States of America, according to the United States Department of Energy.

For farmers and local communities in developing countries such as Viet Nam, it is impossible to deny the economic benefits of growing more bamboo. As many as 1.5 billion people already rely upon bamboo or rattan in some significant way, according to the International Network for Bamboo and Rattan (INBAR). (*Source*: Ecoworldly, Guardian Environment Network, guardian.co.uk, 18 February 2009.)

### USE OF NEEM (*AZADIRACHTA INDICA* A. JUSS.) SEED OIL TO PROTECT BAMBOO

Bamboo, a woody perennial plant belonging to the family Poaceae, plays a dominant role as a woody raw material for a variety of products. There are about 75 genera and 1 250 species of bamboo in the world, of which 30 genera and 136 species occur in India; the total forest area covered by bamboo is 9.57 million ha. India is considered to be the second largest producer of bamboo, where annual production may reach up to 4.6 million tonnes.

Because of its remarkable growth rate and versatile properties, bamboo has been exploited for various industrial and architectural uses. It has wide application in the manufacturing of pulp and paper, as a constructional material and for the preparation of handicraft articles.

However, low natural durability and biodegradation by fungi, termites and borers are significant problems in bamboo. Decaying fungi seriously affect the pulp yield, resulting in a loss of up to 25 percent per year. In addition, the loss of fibrous material caused by fungal, borer or termite attack increases chipping losses and reduces digester capacity.

The service life of bamboo can be increased by treatment with preservative solutions. The Forest Research Institute, Dehra Dun, India has been working towards the development of various methodologies and chemicals to enhance the service life of bamboo. Research has been directed towards the development of preservatives prepared from natural products since synthetic preservatives possess environmental polluting properties. *Azadirachta indica*, commonly known as neem, which is a native of the Indian subcontinent, is known for its marked medicinal, insecticidal, pesticidal and fungicidal activity. Previous studies carried out at the Forest Research Institute have also suggested that samples of non-durable wood species treated with neem seed oil performed excellently when subjected to wood-decaying fungi and termites.

A study was therefore carried out to screen the potential of neem seed oil for bamboo protection. The oil was impregnated at different concentration levels into various species of bamboo by the Boucherie process. Treated and untreated samples of bamboo, converted into a sample size of 1 ft (30.5 cm), were installed in a test yard and observations were made at regular intervals on a visual basis. After 12 months, it was noted that samples treated with 10, 15 and 20 percent of neem seed oil were in a sound and normal condition as compared with the control untreated samples that were moderately attacked by termites and fungi.

Further study is therefore required to explore and exploit the potential of neem seed oil for bamboo and wood protection so that it can replace synthetic chemicals. (*Contributed by*: Dr Swati Dhyani, Wood Preservation Discipline, Forest Products Division, Forest Research Institute, Dehra Dun, Uttarakhand, India. E-mail: swatidhyani2004@yahoo.co.in

**Bamboo firewood and charcoal programme in Ethiopia and Ghana**

Addis Ababa, Ethiopia. The International Network for Bamboo and Rattan (INBAR) and the European Union, together with their partners: the Rural Energy Development and Promotion Centre (EREDPC), Ethiopia; the Forestry Research Institute of Ghana (FORIG); the Federal Micro and Small Enterprises Development Agency (FeMSEDA), Ethiopia; the Bamboo and Rattan Development Programme (BARADEP), Ghana; and Nanjing Forestry University (NFU), China, announce the launch of their "Bamboo as sustainable biomass energy: a suitable alternative for firewood and charcoal production in Africa" programme in Ethiopia and Ghana.

The project is the first to develop bamboo firewood and charcoal as an alternative to timber charcoal in the region. It will increase the range of useable bamboo available in

each country, establish bamboo charcoal micro and small enterprises (MSEs), and help government and civil society organizations to support bamboo firewood and charcoal production and use. The experiences from the programme will be applicable throughout the bamboo-growing regions of Africa.

Dr Coosje Hoogendoorn, Director General, INBAR said: "We are very excited to launch this innovative new programme today. The new bamboo charcoal technologies developed in Asia by INBAR and our partners over the past decade have enormous potential to help reduce deforestation and generate sustainable incomes, and this programme marks a major step in their application for improved energy security, environment and livelihoods of the peoples of the bamboo-growing regions of Africa."

The programme will work in Benishangul-Gumuz state, Amhara national regional state and Southern Nations Nationalities and Peoples' regional state in Ethiopia and the Western region of Ghana to develop at least 1 000 enterprises producing bamboo charcoal, and 30 000 households using it. It will train over 6 000 people in bamboo cultivation, best bamboo firewood practices and bamboo charcoal production, set up three bamboo charcoal technology centres and develop marketing strategies for bamboo charcoal.

Funding for the programme comes mainly from the European Commission's "Environment and sustainable management of natural resources, including energy" programme. (*Source*: INBAR press release, 6 April 2009.)

**FOR MORE INFORMATION, PLEASE CONTACT:**
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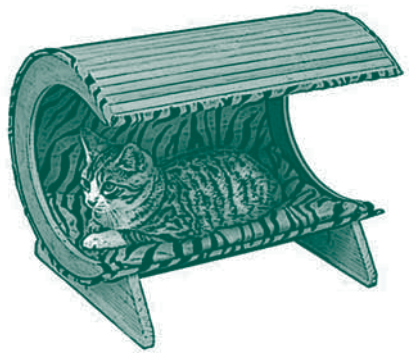


## FRANKINCENSE

**Frankincense: a brief update**

The year 2008 saw the publication of a number of papers on the analysis and therapeutic properties of frankincense gum, extracts and distillates. Frankincense gum (syn. olibanum) (syn. incense) is obtained by tapping the trees of a number of *Boswellia* spp., and the gum and derivatives are valuable exported commodities for the Horn of Africa region (Djibouti, Ethiopia, Eritrea, Somalia and the island of Socotra [off Yemen]), but also for the Sudan and other African regions. Frankincense gum is used to prepare incense, and extracts and distillates have been widely used as fragrance ingredients. Indian, Arabian and African *Boswellia* spp. have a number of uses in local ethnic medicine, which is starting to translate into uses in evidence-based conventional medicine (see, for example, the major feature on frankincense and derivatives in *Phytomedicine*, June 2008).

For a working definition, frankincense can be said to be the dried exudation obtained from the schizogenous gum-oleoresin pockets in the bark of various *Boswellia* spp. – the *Boswellia* group itself being placed within the Burseraceae 12 family.

Frankincense has been very highly valued for thousands of years, and has many uses and applications. It is the Horn of Africa's highest volume export and, apart from uses in incense/perfumery, the gum oleoresin and preparations thereof are also used in a number of medicinal systems, for flavourings and for skin cosmetic applications for toner, emollient and antiwrinkle uses.

Several *Boswellia* spp. are listed in the IUCN Red List of Threatened Species 2008, including several individual species from the island of Socotra. (*Source*: Cropwatch Newsletter [United States of America], 14 January 2009.)

**Frankincense oil may be a treatment for bladder cancer**

According to a study published this week in *BMC Complementary and Alternative Medicine* 2009, 9:6, "Frankincense oil derived from *Boswellia carteri* induces tumor cell specific cytotoxicity". Scientists at the University of Oklahoma Medical Center have found *in vitro* evidence that frankincense oil (probably its constituent boswellic acid) can kill bladder cancer cells without affecting non-cancerous cells.

In order to determine that frankincense was the effective oil, they compared it with sandalwood, fir, palo santo and hemlock oils, which did not differentiate between the types of cells. The study references numerous other studies that have found that frankincense has potential in treating cancerous cells. (*Source*: Aroma Connection [United States of America], 21 March 2009.)

## *HEDYCHIUM SPICATUM*

***Hedychium spicatum* – a commercial Himalayan herb needs entrepreneurship at local level**

The genus *Hedychium* (Zingiberaceae), represented by about 50 species, is found in Africa (Madagascar) and tropical to warm-temperate Asia, with major distribution in tropical and subtropical Asia. Of 30 species in India, *Hedychium spicatum* Buch.-Ham., a rhizomatous perennial herb, is native and near endemic to the Indian Himalayas, growing along a 900–2 800 m altitude in temperate/subtemperate forests in Himachal Pradesh to Arunachal Pradesh; it is found up to 3 200 m in China, Bhutan, Myanmar and Nepal.

Commonly referred to as "bari-sothi/ban-haldi" (shathi) or "kapurkachari" (in the trade), it is used in the Indian indigenous medicine system.

Its robust pseudostem (‹1.5 m) produces broad sessile leaves and extends a little over 30 cm. The white flowers in terminal spikes are fragrant and attract visitors.

This species has scarcely been studied substantially for quantum availability in nature, which is sciophytic, growing as patches, with partial shade. I have investigated over a dozen microhabitats within Himalayan niches. In the relatively dry northwest, the species grows on the ground, especially shady/rocky habitats, whereas in the high rain zones of Sikkim, it flourishes as an epiphyte, besides retaining ground niches.

*Uses.* The rhizomes yield about 4 percent essential oil, possessing antiseptic properties, considered stomachic, carmative, stimulant, insect-repellent and tonic and are used for dyspepsia, asthma, diarrhoea, dropsy, headaches and skin diseases. In addition, the plant is used to curb hair loss. Abir, a fragrant coloured powder marketed for religious ceremonies, is prepared from dried rhizomes. Recently, in the preparation of the anticancer drug,

PADMA 28, a rich antioxidant supporting healthy circulation and general immune health (as PADMA Basic multiherb Tibetan medicine-based formula), a crude rhizome extract of *H. spicatum* is used, as an important ingredient of a mixture among 18 dried/milled herbs/spices, etc. In Tibetan medicines, the species has 19.43 percent uses in 175 herbal formulations. Similarly, one of the pharmaceutical companies in India revealed in the Therapeutic Index its use in 10.3 percent of 233 formulations.

Ethnobiologically, the species is not commonly popular throughout the Indian Himalayas, but use is practised specifically in different regions. In Himachal Pradesh, I studied ethnobiological use of its leaves in making mats for the home, combined with wheat straw, enhancing the durability of the product. In Manipur, the rhizome is cooked to prepare chutney. However, in Sikkim, the people do not see its importance even though appropriate agroclimatic conditions exist, indicating the immense possibility of adopting species under *ex situ* cultivation.

*Markets. H. spicatum* is traded in India and wholesalers are available – the Amritsar and Delhi markets are particularly large. As dried slices, rhizomes are marketed from different Himalayan ranges. Large traders often employ local agents to collect raw material from villagers, who are lured economically for *in situ* harvesting. In Himachal, the species is mentioned under export permit after 1993, by the State Forest Department, with Rs70/quintal royalties. In Sikkim, by 2001, the state government had completely banned the harvesting of herbs from the wild, viewing their depletion with concern. However, good populations of *H. spicatum* at present available are an important genetic resource and need to be identified and evaluated for elite stock and immediate *ex situ* multiplication. In recent years, few organizations have fixed their selling rates of self-produced fresh rhizomes/whole plants of herbs; for *H. spicatum*, rates varied between Rs8–10/plant or 50–80/kg (fresh rhizome).

Increased wild harvesting has led *H. spicatum* to be considered vulnerable (IUCN criteria; CAMP workshop, north India), and as rare for Garhwal-Himalayas. Specific habitat requirements have made the species highly susceptible to forest degradation. Ongoing global warming and resulting habitat loss may further adversely affect its populations. Its natural spread is

*Hedychium spicatum*

highly rhizome-dependent and voluminous *in situ* harvesting may negatively influence its survival.

For global demand, the herb offers immense scope for commercial entrepreneurship through *ex situ* conservation/cultivation. Rhizome segments may be used for developing planting material at short intervals and *ex situ*-produced seeds for mass multiplication. Sandy loam soil with forest humus is the best substrate for vegetative propagation providing ›90 percent success and averaging 30–60 percent seed germination in wild populations. Standardizing propagation, suited to regional physiography, is a prerequisite, choosing 2 000–2 400 m as appropriate altitudes. Organic-based field demonstrations at different agroclimatic zones, involving stakeholders, are strategic at the local/regional level.

Marketing produce should not be a problem; direct connectivity between growers and pharmaceuticals needs strengthening and scientific guidelines/monitoring are vital. (*Contributed by*: Dr Hemant K. Badola, Scientist, Conservation of Biodiversity, G.B. Pant Institute of Himalayan Environment and Development, Sikkim Unit, Gangtok (Campus: Pangthang), Sikkim 737 101, India. E-mail: badolahk@yahoo.co.in *or* kbadola@rediffmail.com)

## HONEY

**Scientists identify antibacterial agent in manuka honey**

Chemistry Department researchers at New Zealand's Waikato University made a breakthrough discovery when they identified the source of the antibacterial activity in manuka honey. Waikato University Associate Professor Dr Merilyn Manley-Harris said: "We have known for some time that a unique antibacterial activity of manuka honey is associated with the presence of methylglyoxal, or MGO. But until now the origin of methylglyoxal was not known."

The research showed dihydroxyacetone, or DHA, was present in young honey shortly after the bees had deposited it in the comb. As the honey ripens, the DHA converts to MGO, the component that gives manuka honey its antibacterial activity. The researchers stored the young manuka honey for 120 days and found a strong correlation in the dropoff of DHA, and an increase in MGO. Since DHA is not antibacterial like MGO, the antibacterial activity increases as the honey matures.

Dr Manley-Harris said that when the researchers realized that DHA was the precursor of MGO, they set about determining its origin. "They discovered it when they tested the nectar from manuka flowers from various trees around Hamilton and the Waikato," she said.

This discovery will enable producers to determine when a batch of honey will mature, whether it will remain inactive and other details. (*Source*: Indian newslink [New Zealand], 12 May 2009.)

**British beekeepers charge high prices for "local" manuka honey**

Beekeepers in the United Kingdom have imported manuka plants from New Zealand to produce their own version of medicinal manuka honey, which they are selling at £5 (US$13) a teaspoonful.

The honey is being produced on the Tregothnan estate in Cornwall, United Kingdom. Tregothnan's garden director, Jonathan Jones, said: "The honey is expensive, but it is Britain's only manuka honey. It has become a lifestyle product, a luxury. This year is the first time the plants produced nectar, which gave us our first jars, around 100. They were sold to women of a certain age who are very health conscious, but recently we have been getting much wider interest."

The estate company claimed the price tag was justified because its 100 000 bees are housed in 20 special hives claimed to be worth £5 000 each and have the exclusive run of the garden's manuka bushes.

The honey is claimed to have medicinal qualities and can help ailments including

gum disease, sore throats, acne, sunburn and digestive problems. (*Source: The New Zealand Herald* [New Zealand], 19 May 2009.)

**Exporters misuse the "Kashmir" honey brand**

Honey exporters of Punjab and Tamil Nadu have been alleged of selling inferior quality honey under the brand name "Kashmir". Kashmiri apiculturists have demanded legal action against the "brand theft".

Apiculturists have alleged that a Punjab-based exporter, Kashmir Apiaries Exports, a leading honey producer in India, has been selling honey extracted from Punjab and elsewhere under the Kashmir brand to European and Middle Eastern countries.

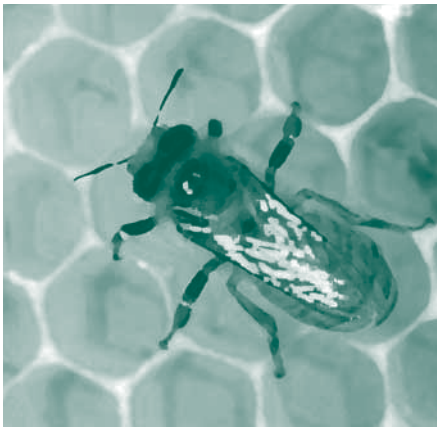
Every year, 70 000 tonnes of honey are produced in India, of which 25 000 tonnes are exported. Punjab's contribution to the honey exports is around 5 500 tonnes, of which 3 000 tonnes, worth US$3 million, are exported to the United States of America, United Kingdom, Europe and West Asia.

Although the Punjab-based honey exporter claims to be collecting honey from Kashmir to Kanyakumari, Kashmiri bee keepers belie the claim, saying that the exporter is cheating buyers by mixing Kashmir honey with significantly large volumes of honey produced from other states.

Lion Kashmir Honey, a Chennai-based honey exporter, claims to meet international standards for the Kashmir status. However, since no geographic identification (GI) status has been granted to Kashmir honey, such claims by manufacturers are baseless. A proposal has already been sent to the Ministry of Food Processing and as soon as Kashmir honey is granted a GI status, a campaign will be launched against all such parties.

Kashmir honey is unique because it is produced from wild trees – about 90 percent from acacia trees (commonly known as kikar) and the remaining 10 percent from wild flowers. The honey produced in other states comes either from poplar trees or mustard plants. Moreover, Kashmir honey is a fertilizer- and pesticide-free product, and its glucose and fructose content is several times higher than that of the honey produced in other parts of the world.

If the Good Manufacturing Practices (GMP) and Good Agricultural Practices (GAP) standards are maintained, 1 kg of



Kashmir honey would sell for more than Rs1 000 on the international market. (*Source*: Institute of International Trade [India], 12 May 2009.)

## KAVA

**Kava (*Piper methysticum*) can help treat anxiety, depression**

Kava (*Piper methysticum*), used for generations in traditional ceremonies by Pacific islanders, is an effective and safe treatment for anxiety, university researchers say. During a 60-person trial undertaken at the University of Queensland (UQ), Australia, people with "chronic high levels of anxiety" feel less worried and, in some cases, less depressed. "We've been able to show that kava offers a natural alternative for the treatment of anxiety and, unlike some pharmaceutical options, has less risk of dependency and less potential of side-effects," said lead researcher Jerome Sarris, a Ph.D. candidate from UQ's School of Medicine. "We also found that kava had a positive impact on reducing depression levels, something which had not been tested before."

Critically, the study's participants did not show any signs of potential liver damage – contrary to concerns that prompted European, United Kingdom and Canadian authorities to ban kava sales in 2002. Kava products sold in these countries were based on ethanol or acetone extracts of the kava plant, Mr Sarris said, not the water-soluble extracts used traditionally by Pacific islanders and approved for sale in Australia.

Kava contains the psychoactive agent "kavalactones" and a traditional ceremony involves pulping roots of the plant and then drinking them mixed with water. This is said to have a tranquillizing effect but without the loss of mental clarity associated with alcohol.

Vanuatu and Fiji are among the world's largest producers of kava, and Mr Sarris said that the loss of major export markets had delivered a significant blow to the islands' economies. "Allowing the sale of kava in Europe, the United Kingdom and Canada would significantly enhance Pacific island economies, which have lost hundreds of millions of dollars by not being able to export the plant over the past several years," he said. (*Source*: The Age.com [Australia], 11 May 2009.)

## MEDICINAL PLANTS AND HERBS

**Medicinal plants becoming extinct**

According to a report from the international conservation group, Plantlife, 15 000 of 50 000 medicinal plant species are under threat of extinction. Medicinal trees at risk include the Himalayan yew (*Taxus wallichiana*), a source of the anticancer drug, paclitaxel; the paper bark tree (*Warburgia* spp.), which yields an antimalarial; and the African cherry (*Prunus africana*), an extract of which is used to treat a prostate condition.

Most people worldwide, including 80 percent of all Africans, rely on herbal medicines obtained mainly from wild plants. This presents a risk because the loss of medicinal plants used to make traditional remedies, together with the loss of medicinal plant diversity in general are quite disastrous. Commercially, collectors generally harvest medicinal plants with little care for sustainability, partly through ignorance, but mainly because such collection is unorganized and competitive.

The solution is to provide communities with incentives to protect these plants. Projects in many countries have shown that this approach can succeed. (*Source: Times of India*, 12 January 2009.)

**Cat's claw (*Uncaria tomentosa*) could tackle dengue fever**

Curitiba. An Amazonian plant could form the basis of a drug to combat dengue fever, according to Brazilian researchers.

A group of scientists at the Viral Immunology Laboratory of the Brazil-based Oswaldo Cruz Foundation has found that compounds of the plant cat's claw (*Uncaria tomentosa*) – native to the Amazon rain forest – have both antiviral and immune system-regulating properties

when they come into contact with infected cells in the laboratory.

Cat's claw is known in traditional medicine for its anti-inflammatory – immune system-regulating – effects, which prompted the scientists to investigate the plant.

Dengue fever is a disease caused by a virus of the genus *Flavivirus*, transmitted by *Aedes aegypti* mosquitoes. The World Health Organization (WHO) estimates there might be 50 million dengue infections worldwide every year. No effective medicine exists so the only recommended treatment is hydrating patients while they are recovering.

Besides *Uncaria tomentosa*, the Brazilian group is currently looking for antidengue properties in solutions of approximately 15 other plants.

The research was published in International Immunopharmacology in December. (*Source*: SciDev.Net Weekly Update [2–8 March 2009].)

**Medicinal value of forskolin**

India is rich in medicinal plant biodiversity and is one of the 12 megabiodiversity hot-spot regions of the world, having 2.4 percent of the world's area with 8 percent global diversity. *Coleus forskohlii* is a medicinal plant well recognized by traditional users, pharmaceutical industries, entrepreneurs and innovative and progressive growers.

The tuberous roots of *Coleus forskohlii* are found to be a rich source of forskolin; a labdane diterpenoid activates cyclic adenosine monophosphate or cyclic AMP (cAMP) in the cells. In addition, diterpenoids have been reported to be present in these tuberous roots.

*Coleus* is the only known natural source of forskolin.

Because of its versatile pharmacological effects, forskolin is used for the treatment of eczema (atopic dermatitis), asthma, psoriasis, cardiovascular disorders and hypertension, where the decreased intracellular cAMP level is believed to be a major factor in the development of the disease process.

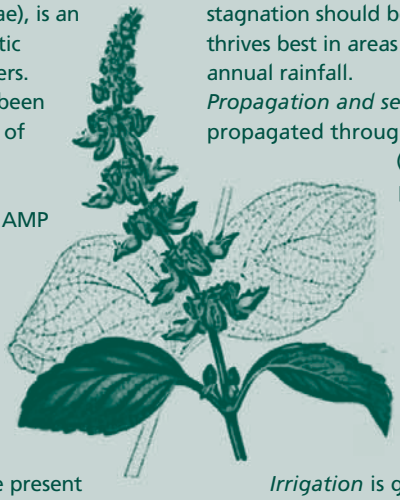
It is being developed as a drug for glaucoma, congestive heart failures and certain types of cancers. The drug is claimed to improve appetite, facilitate digestion and increase vitality. The crop is popular owing to its extensive use in preparing Ayurvedic and Unani medicines for curing anaemia, inflammation, flatulence, dropsy, insomnia and convulsions. In addition, it possesses positive inotropic, broncho-spasolytic, antithrombotic and platelet aggregation inhibiting activities and has proved to enhance fat loss without loss of muscle mass in human beings.

Forskolin is a vasodilator, increases the skin's natural resistance to burning under ultraviolet light and promotes nerve repair by increasing cAMP concentrations. It has been shown to be safe and effective and has great potential as a sports supplement. Forskolin can reduce blood pressure and improve heart function in people with cardiomyopathy. It helps in relaxation of the arteries and other smooth muscles. It also increases cerebral blood flow. This indicates that it may be helpful in improving post-stroke recovery. Inhibition of platelet aggregation (blood clotting) also adds to its value in the treatment of cardiovascular and cerebrovascular disorders. It has been found that symptoms of psoriasis have been improved through the use of forskolin.

(*Contributed by*: M. Velmurugan, K. Rajamani, P. Hemalatha and C. Harisudan, Tamil Nadu Agricultural University, Coimbatore – 641 003, India. E-mail: hortmrvelu@yahoo.com)

**CULTIVATION OF MEDICINAL COLEUS (*COLEUS FORSKOHLII* BRIQ.) IN INDIA**

*Coleus forskohlii* Briq. (syn. *Coleus barbatus* Benth.), belonging to the Labiatae family (Lamiaceae), is an ancient, perennial aromatic herb with fasciculate tubers. The tuberous roots have been found to be a rich source of forskolin; a diterpenoid activates cyclic adenosine monophosphate or cyclic AMP in the cells. In addition, minor diterpenoids, i.e. deacetylforskolin, 9 – deoxyforskolin, 1, 9 – deoxyforskolin, 1, 9 – dideoxy-7 – deacetylforskolin and four other diterpenoids have been reported to be present in the tuberous roots of *C. forskohlii*.



This plant is well known throughout the country and is known as *Pasan Bhedi* in Sanskrit, *Patharchur* in Hindi, *Garmalu* in Gujarati, *Maimmul* in Marathi, *Makkadi beru* or *Mangani beru* in Kannada and *Koorkan kilangu* in Tamil. The crop has been distributed all over the tropical and subtropical regions of India, Pakistan, Sri Lanka, Egypt and Ethiopia. In India, it is found in the subtropical Himalayan regions from Kumaon to Nepal, Bihar and the Deccan plateau of South India.

In India, the plant is cultivated in Rajasthan, Maharastra, Karnataka and Tamil Nadu in an area of about 2 500 ha. The scientific cultivation of the crop is given below.

*Varieties*. Maimmul, Mangani beru and Garmai are some of the popular varieties in India.

*Soil and climate*. Well-drained red loamy soils are suited for cultivation. Water stagnation should be avoided. The crop thrives best in areas receiving 70 cm annual rainfall.

*Propagation and season*. The crop is propagated through terminal cuttings (10 cm). Commercial planting is carried out during June–July.

*Planting* is carried out at 60 x 45 cm spacing (37 030 plants/ha). In low-fertile soils, planting is done at 60 x 30 cm (55 500 plants/ha).

*Irrigation* is given immediately after planting and subsequently at weekly intervals.

*Manuring*. Incorporate 15 t/ha of farmyard manure (FYM) during final ploughing. Nitrogen, phosphorus and potassium (NPK) at 30:60:50 kg/ha should be applied in two split doses at 30 and 45 days after planting. Apply 10 kg ZnSo 4/ha to avoid micronutrient deficiency.

*Harvest* can take place five to six months after planting and must be carried out without damaging the tubers.

*Yield*. Fresh tubers: 15–20 t/ha; dry tubers: 2 000–2 200 kg/ha.

*Post-harvest handling*. Harvested tubers are cut into small pieces and dried under shade until they reach 8 percent moisture level.

## NATURAL FIBRES

**Natural fibres – an overview**

Natural fibres are greatly elongated substances produced by plants and animals that can be spun into filaments, thread or rope. Woven, knitted, matted or bonded, they form fabrics that are essential to society.

Like agriculture, textiles have been a fundamental part of human life since the dawn of civilization. Fragments of cotton articles dated from 5000 BC have been excavated in Mexico and Pakistan. According to Chinese tradition, the history of silk began in the twenty-seventh century BC. The oldest wool textile, found in Denmark, dates from 1500 BC, and the oldest wool carpet, from Siberia, from 500 BC. Fibres such as jute and coir have been cultivated since antiquity.

While the methods used to make fabrics have changed greatly since then, their functions have changed very little. Today, most natural fibres are still used to make clothing and containers and to insulate, soften and decorate our living spaces. Increasingly, however, traditional textiles are being used for industrial purposes as well as in components of composite materials, in medical implants, and geo- and agrotextiles. Animal fibres include wool, hair and secretions, such as silk. (*Please see page 36 for more information on silk.*) *Plant fibres* include seed hairs, such as cotton; stem (or bast) fibres, such as flax and hemp; leaf fibres, such as sisal; and husk fibres, such as coconut. (*Source*: International Year of Natural Fibres 2009 Web site; www.naturalfibres2009.org/)

**The revival of the most resistant natural fibre in the world**

Apart from the non-wood sources of raw materials for pulp making, a number of

**EXAMPLES OF PLANT FIBRES**

**Abacá (*Musa textilis*)**

También llamada cáñamo de Manila, el abacá se extrae de la vaina de las hojas que rodean el tronco de la planta de abacá (*Musa textilis*), pariente cercana de la banana, nativa de Filipinas y ampliamente distribuida en los trópicos húmedos. Cosechar abacá es laborioso. Cada tallo debe cortarse en tiras, las cuáles son raspadas para remover la pulpa. Luego las fibras se lavan y secan. El abacá es una fibra de hoja, compuesta por células largas y delgadas que forman parte de la estructura de soporte de la hoja. El contenido de lignina está por encima del 15%. El abacá es valorado por su gran resistencia mecánica, flotabilidad, resistencia al daño por agua salada, y por el largo de su fibra - más de 3 metros. Las mejores clasificaciones del abacá son finas, brillantes, de un color habano claro y muy fuertes.

El líder mundial en producción de abacá es Filipinas, en donde unos 90 000 pequeños agricultores (*encima*) cultivan la planta en 130 000 hectáreas. Aunque la planta se cultiva en otros países del Asia sudoriental, el rival más cercano de Filipinas es Ecuador, en dónde el abacá ha sido sembrado en muchas fincas y la producción está cada vez más mecanizada.

*Usos*. Durante el siglo XIX, el abacá fue ampliamente usado en aparejos de barcos, y la pulpa era usada para hacer sobres resistentes de papel manila.

Hoy, aún se emplea para hacer sogas, bramantes, cordeles, líneas de pesca y redes, así como tela basta para sacos. También está creciendo el nicho de mercado especializado en ropa, cortinas, pantallas y tapicería de abacá.

El papel hecho de la pulpa de abacá es usado para esténciles, para filtros de cigarrillos, bolsas de té y piel de salchichas, y también para papel moneda (los billetes del yen japonés contienen hasta un 30% de abacá).

La Mercedes Benz ha usado una mezcla de polipropileno termoplástico e hilaza de abacá en partes del cuerpo de los automóviles. Se estima que la producción de fibra de abacá utiliza un 60% menos de energía que la producción de fibra de vidrio.

*Producción y comercio*. En el 2007, Filipinas produjo cerca de 60 000 toneladas de fibra de abacá, mientras que Ecuador produjo 10 000. La producción mundial está evaluada en cerca de 30 millones de USD al año. Casi todo el abacá producido es exportado, principalmente a Europa, Japón y los Estados Unidos de América. Filipinas incrementa sus exportaciones en forma de pasta de abacá más que en forma de fibra bruta.

**Ramie (*Boehmeria nivea*)**

Native to East Asia and commonly known as China grass, ramie (*Boehmeria nivea*) is a flowering plant of the nettle family. Its bark has been used for millennia to make twine and thread, and spun as grass cloth (or "Chinese linen"). It grows to a height of 3 m. Yields of green plants range from 8 to 20 tonnes/ha, with fibre yields of 1.5 tonnes reported.

Ramie fibre is white with a silky lustre, similar to flax in absorbency and density but coarser (25–30 microns). One of the strongest natural fibres, it has low elasticity and dyes easily. Strands of ramie range up to 190 cm in length, with individual cells as long as 40 cm. Transfibre fissures make ramie brittle but favour ventilation.

The ramie plant is grown for fibre mainly in China, Brazil, the Lao People's Democratic Republic and the Philippines. While it is considered a promising "ecological" fibre for use in textiles, fibre extraction and cleaning are difficult and labour-intensive.

*Uses*. Coarse ramie fibres are suitable for making twine, rope and nets. Wet-spun, it produces a fine yarn with high lustre, suitable for a wide range of garments, ranging from dresses to jeans.

Fabrics of 100 percent ramie are lightweight and silky, similar in appearance to linen. The Korean traditional costume, the ramie *hanbok*, is renowned for its fineness. However, since it has low elasticity and resilience, ramie is usually blended with other textile fibres. It increases the lustre and strength of cotton fabric and reduces shrinkage in wool blends. It is also blended with silk.

*Production and commerce*. FAO estimates world production of ramie green plant at 280 000 tonnes in 2005, almost all of it grown in China. Most of the ramie fibre extracted is used in producing countries, and only a small percentage reaches

plants provide fibrous substances suitable for making cloth, ropes and woven materials, including several species of grasses (*Sterculia villosa, Broussonetia papyrifera, Agave sissalana, Ceiba pendandra*, etc.) and palms (*Carludovica palmata* and *Brahea dulcis*). Palms and grasses are used for weaving baskets, hats, mats and other items in Latin America, Africa and Asia. Bromeliad species also provide an important natural source of fibre.

Pita (*Aechmea magdalenae*), a thorny-leaved terrestrial bromeliad, grows naturally in the tropical forests of southeastern Mexico. It is not easy to harvest or carry, and in order to gather 1 kg of pita fibre, about 300 leaves need to be collected.

The longer the leaf the better, because it means a longer fibre and a better market price. Processing begins by scraping away the leaf pulp, pulling out the fibre, bleaching it in lemon juice and washing powder, combing it and finally rolling it into thread. The fibre is then used to embroider leather articles, e.g. belts, boots and saddles, by skilled craftspeople, sold principally in Mexico, the United States of America and Spain.

One hectare of forest can provide about 20 kg of fibre each year and an average cash income can amount to US$930/ha, an income far superior to that obtained by coffee or cattle producers. Pita is the most valued and sought-after natural fibre on the Mexican market and surpasses the price of linen and silk, with a price as high as US$100/kg. (*Source*: Elaine Marshall and Cherukat Chandrasekharan. 2009. *Non-farm income from non-wood forest products*. Diversification booklet 12. Rural Infrastructure and Agro-Industries Division. Rome, FAO.)

international markets. The main importers are Japan, Germany, France and the United Kingdom.

**Jute (*Corchorus capsularis* et *C. olitorius*)**
Extrait de la tige de plantes appartenant aux genres *Corchorus capsularis* et *C. olitorius*, le jute est une fibre naturelle très résistante; il vient en deuxième position, après le coton, en termes de volume de production et d'utilisation. Pendant la révolution industrielle, il a connu un grand essor dans la fabrication de toile de sac, se substituant au lin et au chanvre cultivés en Europe. Si les sacs constituent encore de nos jours la majeure partie des produits manufacturés en jute, un grand nombre d'articles novateurs à haute valeur ajoutée ont vu le jour: revêtements pour sols, composants, géotextiles, non-tissés, pâte à papier, textiles techniques, produits chimiques, tissus d'habillement, artisanat et accessoires de mode.

La plante herbacée dont est extrait le jute abonde dans les régions humides (températures comprises entre 24 et 38 degrés et précipitations annuelles de 1 000 mm au moins). Le Bangladesh et le Bengale-Occidental sont les principaux producteurs mondiaux de jute, suivis de loin par le Myanmar et le Népal. Le jute est produit par de petits paysans. En Inde et au Bangladesh, on estime que 4 millions environ de paysans vivent de cette culture, assurant la subsistance de 20 millions de personnes, et que des centaines de millions de personnes travaillent dans le secteur manufacturier. Les paysans vendent leur production à des négociants ou sur le marché local. La fibre change ainsi plusieurs fois de mains et de catégorie avant d'arriver à l'usine ou d'être exportée.

Si la culture du jute est exigeante en main-d'œuvre, elle est peu gourmande en engrais et en pesticides. La fibre est le plus souvent récoltée manuellement, la mécanisation n'étant pas adaptée à la culture à petite échelle pratiquée dans les pays en développement. Les tiges sont fauchées et couchées sur le champ pour les débarrasser des feuilles; au bout de quelques jours, elles sont liées en faisceaux. On procède ensuite au rouissage, qui consiste à faire flotter les tiges sur un cours d'eau pour les libérer de la pectine et autres substances mucilagineuses qui les soudent. Le rouissage est terminé – il dure de une à trois semaines - quand l'enveloppe de la tige, qui contient la fibre, se sépare facilement du cœur ligneux. Après avoir extrait la fibre, le plus souvent manuellement, on procède au lavage et au séchage.

La production de jute fluctue au gré des conditions météorologiques et des cours. Ces dernières années, elle s'échelonnait entre 2,3 et 2,8 millions de tonnes, à l'instar de la production de laine. Mais la valeur du jute, nettement inférieure à celle de la laine, est estimée à 480 millions de tonnes. L'Inde fournit 60 pour cent de la production mondiale et le Bangladesh la presque totalité du reste. Ce dernier exporte près de la moitié de sa production annuelle sous forme de fibre brute et le restant sous forme de produits manufacturés. L'Inde exporte seulement 200 000 tons d'articles en jute, le reste étant utilisé sur place.

Les utilisations du jute sont en plein essor dans le monde entier car le secteur manufacturier s'intéresse de plus en plus aux matières biodégradables respectueuses de l'environnement et pouvant se substituer aux matières synthétiques. Cependant les producteurs de jute et le secteur de transformation n'ont guère innové en matière de production et de transformation.
*Le kénaf, fibre apparentée*. Tout comme le jute, le kénaf sert à fabriquer des cordes, des ficelles et des toiles grossières, mais il est issu d'une autre plante, *Hibiscus cannabinus*. En 2007, la production atteignait 340 000 tonnes, l'Inde étant le principal producteur. Parmi les utilisations récentes de la fibre, citons le papier journal, les mélanges de cultures, les matériaux d'emballage et les emballages en matériaux composites. (*Source*: International Year of Natural Fibres 2009 Web site, www.naturalfibres2009.org/)

**For more information, please contact: Brian Moir, International Year of Natural Fibres Coordination Unit, Trade and Markets Division, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy. Fax: +39 06 57054495; e-mail: IYNF-2009@fao.org)**
*(Please see page 66 for more information on the International Year of Natural Fibres.)*

### NATURAL DYES AND COLOURS

Many forests are rich repositories of plants producing dyes and pigments that can be sustainably harvested for commercial use and processed locally, thereby supporting rural employment and development.

Ornamentation of cloth with natural dyes dates back about 3 000 years, and because of the toxic nature of some synthetic pigments, there has been a resurgence of interest in natural dyes. An advantage of natural dyes lies in the potential for designers to control variations of shade and tones, which is not possible with synthetic dyes. Dye pigments are derived from tree bark, leaves and wood, including the bark of akan-asante or yaruba (*Anonidium mannii*) and the leaves of magnolia (*Rothmannia whitefieldii*).

Examples of natural dyes include henna, which is extracted from the dried leaf of *Lawsonia inermi* and provides a dye ranging in colour from black to red; kamala, an orange-yellow dye used for textiles, obtained from the fruit of the kamala tree (*Mallotus philippinensis*); and the widely used blue-coloured indigo dye (*Indigofera tinctori*), traditionally used for dying a variety of textiles, including silk and wool garments.

Research from the forests of Peru has identified 56 dye-yielding plants, and the Vegetable Dye Society in Bangladesh has identified about 30 dye-yielding plants for textiles.

Some common natural dyes used for silk in the Lao People's Democratic Republic include the following.

- *Pink*. Rind of mangosteen fruit (*Garcinia mangostina*)
- *Red/purple*. Stick lac, wood of *Caesalpinia sappan*
- *Yellow*. Root of berberin (*Coscinium finestratum*)
- *Orange*. Seed of annato (*Bixa orellana*)
- *Greyish-black*. Fruit of ebony (*Diospyros mollis*)
- Pinkish-grey. Leaf of teak (*Tectona grandis*)
- Grey. Tuber of *Dioscorea bulbifea*

(*Source*: Elaine Marshall and Cherukat Chandrasekharan. 2009. *Non-farm income from non-wood forest products*. Diversification booklet 12. Rural Infrastructure and Agro-Industries Division. Rome, FAO.)

## RATTAN

**Villagers from Southeast Asia benefit from sustainable rattan harvesting**

Can the sustainable use of rattan boost communities, businesses and the environment? Yes, that is the firm belief of the World Wide Fund for Nature (WWF), which piloted a community-based sustainable management and production model project that began in 2006 in the Lao People's Democratic Republic and Cambodia and is now engaging Viet Nam.

More than 90 percent of rattan processed in the Mekong subregion comes from natural forests, but rattan stocks are being depleted at an unsustainable rate, fears WWF.

Rattans are climbing palms belonging to the palm family, with tough stems, which can be used for food, shelter and furniture. A survey by WWF in 2008 showed that rattan is a major NTFP and one that makes a crucial contribution (more than 30 percent cash and non-cash value) to local livelihoods

In Sopphouan, a small village of approximately 400 inhabitants outside Lak Xao, in the province of Bolikhamxay, Lao People's Democratic Republic, the WWF rattan project has already brought positive results. "Last year our village earned 8 500 000 kip (approximately US$1 000) in additional income from rattan seedlings and rattan cane. This is an important contribution to the livelihood of farmers who are otherwise wholly dependent on family-based rice production and other small-scale crops," says Phantone Keomany, 43 years.

To secure a long-term use of the resource, the villagers have started nurseries and plantations, which they proudly show to visitors. This bold initiative entails an entirely new way of thinking and requires careful long-term planning. Previously, rattan was only harvested in the wild state directly from the forest.

Since 2006, the project has been carried out in collaboration with forest researchers, other NGOs, government institutions and

with economic support from the global home furnishing company IKEA. The subsequent phase (2009–2011) entitled "A switch to sustainable harvest rattan production and supply" was launched on 5 March 2009, with funding mainly from the European Union and IKEA. "Our goal is that by 2010, 100 communities in the Lao People's Democratic Republic, Cambodia and Viet Nam will be engaged in sustainable rattan production and with 40 percent of the identified small and medium enterprises (SMEs) actively engaged in cleaner rattan production. This will support local economies and help conserve forests," says the WWF regional rattan programme manager.

WWF, with national stakeholders, is engaging with rattan traders and processors to develop more environmentally and economically viable processing practices with the aim of becoming more efficient, improving resource usage and reducing raw material wastage along the supply chain.

At the same time, WWF works with national, regional and international buyers to influence the demand for cleaner and more sustainable rattan at fairer prices. In doing this, they work with entrepreneurs or rattan processors and traders, who are the people that buy the raw material, add value by processing it and then link up with regional and international buyers such as IKEA.

Through this approach, WWF is confident that incentives will be in place for local communities to conserve forest ecosystems where rattan is available. (*Contributed by*: Thibault Ledecq, Chief Technical Advisor, WWF Greater Mekong Programme – Laos Country Programme, PO Box 7871, House 39, Unit 05, Ban Saylom, Vientiane, Lao People's Democratic Republic. E-mail: Thibault.ledecq@wwfgreatermekong.org or thibledecq@gmail.com; www.panda.org/greatermekong

**Viet Nam: Nghe An exports rattan products for the first time**

The central province of Nghe An, Viet Nam, will send its first consignment of rattan products under a recently signed contract between the Duc Phong company and the leading Swedish company IKEA.

The Duc Phong company, based in Nghe An, will export three models of rattan lamps, earning a minimum revenue of VND25 billion in the first year of the contract and tripling their revenue over the next five years. The company, which currently needs an additional 4 000 workers to complete the contract, is outsourcing much of the work to local households. It has conducted extensive research on different kinds of rattan products such as tables, lanterns and other interior decorations for markets such as Japan, the United States of America and Europe. As many as 80 percent of Duc Phong products have been designed by the company, with the rest coming from individual customers.

Duc Phong, which processes millions of tonnes of rattan per year, also takes the lead in growing rattan, reducing its dependence on outside sources. It has so far spent nearly VND100 billion planting 1 350 ha of rattan in four districts and the company adopts an approach that combines its own investment with the local labour force. Duc Phong is expected to produce 7 tonnes of rattan/ha over the next 30 years, ensuring the sustainability of its production. (*Source*: Voice of Vietnam News [Viet Nam], 9 March 2009.)

## SAFFRON

**Saffron cultivation in Afghanistan: a lucrative NWFP and a potential alternative to poppy**

After the fall of the Taliban in Afghanistan, development organizations and multinational forces are making efforts to find an alternative crop to replace illicit poppy cultivation in the country. It is assumed that the dilemma of this war-devastated country has long been correlated with the production of poppy itself. Development workers are hoping that saffron could be a lucrative alternative to poppy.

Popularly known as *jafran* in the Middle East and Asia, saffron is the most valued and most luxurious spice in the world and comes from the saffron plant (Crocus sativus L.). The flower of the plant contains three stigmas, which are collected and dried, becoming the saffron spice. The plant has a corm/rhizome that is about 3 cm in diameter and weighs up to a maximum of 8 g. Saffron has narrow leaves like grasses with a length of 6–10cm and a width of 2–3 mm. Its flower is light purple, with red or white stripes.

The uses of saffron are many. The saffron stigma is rich in aroma and used as a spice, a condiment, an aphrodisiac and a colouring agent.

In dried or powdered forms, stigmas are commonly used as the following.

- *A therapeutic plant*, excellent for stomach ailments and as an antispasmodic; it helps digestion; and it heals a variety of diseases ranging from arthritis to impotence and infertility. It is also used for curing asthma, coughs and the common cold. Saffron anticancer effects have been studied.
- *A spice* used in cooking for colouring and as a flavouring agent. It is also used for making cheese products, in milk- or cream-based confectionery and in dairy products such as ice cream-flavoured milk.
- *A material* used in the pharmaceutical, cosmetics and perfume industries.
- *A dye* used extensively in textile production.

Saffron leaves are also used as animal feed.

### SAFFRON (*CROCUS SATIVUS*)

*Crocus sativus* belongs to the family Iridaceae. The flowers of *Crocus sativus* have trifid orange-coloured stigmas. Saffron is the dried form of these stigmas. The name saffron is obtained from the Arabic words "sahafarn", meaning thread and "za'faran", meaning yellow.

The plant is native to southern Europe and is cultivated in Spain, France, Italy, Greece, Turkey, the Islamic Republic of Iran, India and China. Saffron grows well in cold regions. (*Source: MFP News*, (19)1, January–March 2009.)

Afghanistan has all the environmental criteria appropriate for the production of saffron. For best growth and production, saffron requires mild winters with heavy snowfall and hot summers. It grows well under temperate and dry climates; its vegetative growth coincides with cold weather and freezing conditions. It tolerates a maximum of +45 °C and a minimum of -18 °C. The annual rainfall requirement for saffron is about 300 mm. Maximum water requirement is in March and April of about 15–20 litres/$m^2$ per irrigation period. The plant can be grown in a wide range of soils, with moderate structure and good infiltration. But for best growth and production, the soil should be sandy loam, rich in calcium and with a high content of organic matter. The soil is prepared in autumn or winter and an application of 8–12 tonnes of well-decomposed animal manure/acre (0.4 ha) is recommended.

The flowering stage of saffron starts from October and continues for some three weeks. Each flower lives only for 48 hours, which is the reason why saffron has such a high value. The optimal harvest time is therefore early in the morning before full sun. A flower collector can collect as many as 3 000 flowers per hour. The saffron flowers should be stored at temperatures near 0 °C and the layer of fresh flowers should not exceed 10 cm. Under these conditions, saffron flowers can be kept for up to seven days.

Post-harvest processing gives the best saffron spice quality. During this processing, the stigmas are separated from the flowers. The stigmas are bright orange-red and are clearly visible among the lilac petals. It takes some 450 000 stigmas to make up 1 kg of saffron spice. Workers, therefore, must process 150 000–170 000 flowers to produce 1 kg. The deep red stigmas are attached to the flowers by pale filaments called styles. These, as well as the yellow stamens, are worthless as spice. Many merchants prefer to buy only pure saffron, requiring that the stigmas be separated from the styles, which has to be done by hand as long as the material is fresh. In Afghanistan, most saffron is air dried and packed in airtight and light-protected containers such as tin cans and dark glass.

Farmers cultivate saffron bulbs in late May to August and reap the purple flowers in mid-October. The average yield of saffron is 7 kg/ha and a maximum could be 24 kg/ha. The Afghan saffron markets are mostly within Afghanistan itself, the Islamic Republic of Iran, India, Dubai, Pakistan, the United States of America and Europe. Prices of saffron

### HISTORY OF SAFFRON

The history of saffron is very ancient and esteemed. Historical accounts suggest that the cultivation of saffron was started in 1600 BC by the Minoans. But cultivation is probably older than that and is believed to have begun in Southwest Asia. The Minoans probably brought saffron as a traded item from the East as part of their network of sea and land traders who ranged throughout the Mediterranean at that time.

Native to Southeast Asia, the crocus species produces the valuable reddish-orange colour stamens cherished by cooks around the world to colour and flavour their dishes.

The Persians had spread cultivation of saffron corms throughout the Persian Empire along the Silk Road routes by 500 BC and cultivation in northern India and Kashmir was formally under way.

The Phoenicians dominated the Mediterranean trade of saffron spice during Greco-Roman times. Subsequently, the Romans brought saffron with them to Europe. Saffron gradually spread to North America through the Anabaptists from Eastern and Central Europe, who set up profitable saffron trading from 1730 to 1740 with the Spanish settlers in the Caribbean. This trade continued until the 1812 war.

Historical accounts of saffron cultivation in India date back to 550 AD.

At present, the major saffron-producing countries in the world are Spain, the Islamic Republic of Iran and India.

range from US$1 200 to 1 400/kg in local markets (December 2007) and US$1 400 to 8 000/kg in the European and American markets (2006). It has been estimated that the net income/ha from saffron is $2 716.

To eradicate opium production in the country, the Government of Afghanistan is being supported by international donor agencies in terms of technical and financial support but the results will only be visible when an alternative income source is in place. Considering the massive pressure from the government and other agencies, farmers tend to refrain from opium production rather than getting interested in saffron production for its high price in the domestic and international markets. Experts at the Ministry of Agriculture in Kabul have admitted that saffron is compatible with the climate and soil of the southern, eastern and western parts of the country and its cultivation does not require additional irrigation, which the country lacks.

Donors such as the United Kingdom's Department for International Development (DFID) have funded projects to promote saffron production in Afghanistan. A handful of entrepreneurs have also invested in the packaging, branding and export of Afghan-made saffron to regional and European markets. Afghanistan's western neighbour, the Islamic Republic of Iran, is a leading saffron exporter. However, insecurity and narcotics gangs have hindered government efforts to replace poppy with lawful crops since these groups earn large profits from illicit poppy cultivation and they oppose and impede saffron cultivation by forcing farmers to grow poppies.

Saffron quality tests show that Afghan saffron can be one of the best in the world in terms of quality. This is attributed to the climatic conditions of Afghanistan as suitable for growth and production. In the context of Afghanistan, saffron has a tremendous opportunity on the domestic and international market since demand is increasing every year. It is hoped that this spice will soon replace the poppy throughout the country for its high market value.

Meanwhile, farmers involved in opium cultivation should be assisted and promoted to cultivate saffron as their alternative livelihood. It is time for the United Nations, donor agencies and NGOs to work together in Afghanistan to explore the utilization and development of this valuable NWFP in the country. (*Contributed by*: Mohammad Muktadir Hossain, Sector Specialist [Forestry], Agriculture Development Programme, BRAC Afghanistan, House 45, Lane 4, Baharistan, Kart e Parwan, Kabul, Afghanistan. E-mail: muktadir21@yahoo.com; www.bracafg.org)

**Saffron cultivation and use in India**

In India, the cultivation of saffron is mostly carried out in Kashmir. However, Himachal Pradesh and the upper regions of Uttar Pradesh are favouring saffron cultivation.

Saffron is extensively used as a spice (especially in Kashmir). Saffron has also been used as a flavouring and colouring agent and in food, sweets, tobacco and the zarda industries. It is also used for improving skin complexions and is a valuable medicinal herb. The saffron pigment is used to stabilize light-sensitive insoluble drugs. A hair tonic with saffron extract is extremely effective at promoting hair growth. Saffron is also used in Ayurvedic and Unani medicine. (*Source: MFP News*, (19)1, January–March 2009.)

*Sandalwood*

## SANDALWOOD

**Sandalwood: a critical view of developments**

The fact that some sandalwood species are under threat is an inconvenient truth ignored by many cosmetic companies and essential oil traders. Four *Santalum* (sandalwood) species are present in the IUCN Red List 2008, including the extinct *Santalum fernandezianum*. The more familiar *Santalum album* L. is one of the remaining three, assessed as vulnerable in 1998, but a more detailed breakdown of the ecostatus of individual *Santalum* species from various geographic locations, with ancillary notes, is available on the Cropwatch Web site (www.cropwatch.org).

The shortage of East Indian sandalwood oil has been caused by the ravages of spike

disease over many decades and, to a lesser extent, by fire, vandalism, animal damage and other factors, on the existing Indian sandalwood forests in Karnataka and Tamil Nadu, not to mention the ruthless overexploitation of this declining resource by illegal distillers, smugglers and corrupt officials. Arguably the overexploitation of sandalwood only came about because of the persistent market demand for sandalwood logs for incense, wood carving and furniture making, to continue the supply of sandalwood-based attars and, of course, the demand for sandalwood oil itself (which some have estimated at 250 tonnes/year), despite warnings of serious resource depletion from eco-aware groups.

A few years back, some aromatherapy profession officials and certain aromatherapy essential oil trading representatives belittled the threat to sandalwood, and inferred that if any blame was to be apportioned at all, it should be laid at the door of the major user, the fragrance industry. Even now, within the European Union, nationally run aromatherapy vocational courses still feature sandalwood oil for study. The incense trade has naturally ignored its obligations almost completely and, as far as we can tell, many sectors of the conventional perfumery trade have done the same.

Cropwatch is persuaded that with proper policies and investments, some sandalwood sources could be made truly sustainable, and we believe this may well be the case in Vanuatu. However, taking pure East Indian sandalwood oil as a benchmark, the odour profiles of sandalwood oils from other geographic locations and/or other species are usually different in character, lack fine notes and may be oversweet (as with East African sandalwood oil) or predominantly woody-camphoraceous (as with Chinese sandalwood oil), or just plain lacking in impact and character (as with Indonesian sandalwood oil). From here, the future looks difficult for sandalwood. (*Extracted from*: Cropwatch Newsletter, January 2009.)

**Southeast Asia smuggling via Nepal in upward swing**

Siliguri. According to the Sashastra Seema Bal (guards at the Indo-Nepal border) and Nepal security agencies, over 1 000 tonnes of red sandalwood have been seized during the last year from both sides of the border. Apparently the wood is in high demand because it is used to make the butts of guns.

While talking to *The Economic Times* about the possible buyers, a senior intelligence official specializing in cross-border smuggling prevention said, "Due to less fragrance but equal curving capacity and strength, red sandalwood is preferred for making butts of firearms. China is one of the largest buyers. Now since all attention is focused on political developments in Kathmandu, the grey trade operatives are likely to increase their activities."

The consignments, generated largely as a result of illegal Indian felling in Karnataka, are first routed to Nepal through the porous Indo-Nepal border along Uttar Pradesh, Bihar or West Bengal. From there, they get into China through Tatopani on the Arniko Highway in North Nepal, the largest Sino-Nepal trading point.

"Arniko Highway has practically been taken over by red sandalwood smugglers," said Nepali exporters working in Tatopani. "The Governments of India, Nepal and China should jointly focus on the issue on common interest," they added. (*Source*: *The Economic Times* [India], 12 May 2009.)

## *SCLEROCARYA BIRREA*

***Sclerocarya birrea*: a lesser-known NWFP of Africa**

The contribution of forests and trees to food security in Africa is vast, diversified and highly valuable. It ranges from the direct production of food to the provision of jobs, income generation and support for the sustainability of farming systems. The foods from forests and trees are particularly essential to improve the nutritional status of the people by providing vitamins and other elements, which are not found in food produced by agriculture.

In spite of the importance and richness of food from forests and trees, progress has been very slow in considering measures and programmes to increase the contribution of wild plants and animals to food production and food security. A combination of initiatives aiming at improved knowledge of local and traditional practices, inventorying and managing resources, and further integrating trees in farming systems could have a significant impact on food security and income generation.

*Sclerocarya birrea*, which is a wild/semidomesticated tree, can be used as a case tree to reveal the potentials of lesser-known but valuable trees. The species is widely distributed, occurring in 29 different countries in Africa from north to south and east to west: Senegal, Guinea-Bissau, Côte d'Ivoire, Mauritania, Mali, Burkina Faso, Ghana, Togo, Benin, the Niger and Nigeria in western Africa; Chad and the Sudan in Central Africa; Eritrea, Ethiopia, Uganda, Kenya and the United Republic of Tanzania in eastern Africa; and Angola, southern Congo, Zambia, Malawi, Mozambique, Namibia, Botswana, Zimbabwe, South Africa, Lesotho and Swaziland in southern Africa. In addition, within the past 30 years the tree has been established in plantations in Israel and Oman.

*Sclerocarya birrea*

Across Africa the tree has three subspecies, namely *S. birrea, S. multifoliolata* and *S. cafra*. The United Republic of Tanzania is the only country where all three subspecies occur, so is the most diverse ecoregion for *Sclerocarya*.

The tree provides fruits and many other locally used NTFPs. In a few countries, the fruits are processed into products that are traded internationally. The fruits are rich in vitamin C, about five times higher than that of citrus fruits. They are also used to make juice, jam, jellies and as a cosmetic agent. The fruit pulp is eaten fresh, boiled to a thick paste for sweetening porridge, or fermented to make alcoholic drinks of both local and commercial value.

The tree's leaves and bark have medicinal properties.

In famine years, the kernel is locally roasted and eaten. At 96 percent dry matter, the kernel is 57.3 percent fat, 28.3 percent protein, 6 percent total carbohydrates, 2.9 percent fibre and is rich in phosphorus, magnesium and potassium.

The fruits of *Sclerocarya birrea* are also used to brew the popular Amarula cream in South Africa. Amarula is almost exclusively

available in luxurious outlets and hotels, sold on average at US$2–5/5 cc volume. This cream thus generates substantial amounts of income from local and international markets.

Empirical experiments are still needed to develop better ways of harnessing the potential of *Sclerocarya birrea*. The ultimate goal must be for local people to apply this knowledge to diversify their income and improve their livelihoods. (*Source*: Guardian in IPPMedia.com, 6 January 2009.)

## SHEA BUTTER

**Fair trade partnerships**

Ottawa. Knowledge shared throughout the millennia by generations of African women meets the twenty-first century, during Fair Trade Month. Ten Thousand Villages, a North American fair trade dealer and Uniterra, one of Canada's leading international voluntary programmes, welcome their partners from Burkina Faso to celebrate Certified Fair Trade shea butter. Ms Kourtoumi Chalim Aschlet Niangao and Mr Abou Dradin Tagnan represent the Union of Producers of Shea Products of Sissili and Ziro in Burkina Faso, where shea is the third largest export.

Shea, dubbed "the gold of African women", is well known for its moisturizing and protective properties. Equitably traded organic shea turns those benefits into real gold for nearly 3 000 women, who have doubled their income as a result of this collective. Since earning fair trade certification in 2006, producers have poured much of their earnings back into community projects such as literacy groups for women, programmes for children orphaned by HIV and Aids, and the construction of a childcare centre. These are welcome developments in Burkina Faso, one of the poorest countries in Africa, ranked at 173 of 177 on the Human Development Index.

Despite the economic downturn, Canadian sales of fair trade shea products are on the rise. Ten new personal care products, prepared with certified fair trade shea, will be launched this month at Ten Thousand Villages' 47 stores throughout Canada, at festival sales and on its Web site. Shea Delapointe, a Quebec-based family business and a Ten Thousand Villages supplier, imported 9 tonnes of certified fair trade shea in 2008, expected to double in 2009, thanks to fair trade partnerships between Canadian entrepreneurs and African producers. (*Source*: marketwire.com [Canada], 7 May 2009.)

## SILK

**Nainital Research Centre, India, achieves world record in breeding silkworm eggs**

Nainital-based Regional Oak Tasar Research Centre has created a world record in the field of silkworm egg-laying. The scientists and other staff members of the research centre are very pleased by the way their project has shaped up.

The average number of eggs/moth at the research centre is in the range of 240 to 260 as compared with China's 160–200 eggs. The number of eggs/g is 108–110 in comparison with China's 120 eggs/g. These yardsticks signify that the eggs at the research centre are healthy. The main reason for this success can be attributed to the innovative measures taken by scientists at the centre.

"We provide good feed to the silkworms due to which the silkworm gains more weight. When it converts into pupa, it becomes big and therefore the moth is also big, and when the moth is big, it will certainly produce more eggs," said Dr R.S. Yadav, a scientist at the Regional Oak Tasar Research Centre. The centre has also been taking special care to minimize egg losses.

**SILK**

Silk is produced by the silkworm, *Bombyx mori*. Fed on mulberry leaves, it produces liquid silk that hardens into filaments to form its cocoon. The larva is then killed and heat is used to soften the hardened filaments so they can be unwound. Single filaments are combined with a slight twist into one strand, a process known as filature or "silk reeling".

A silk filament is a continuous thread of great tensile strength measuring from 500 to 1 500 m in length, with a diameter of 10–13 microns. In woven silk, the triangular structure of the fibre acts as a prism that refracts light, giving silk cloth its highly prized "natural shimmer". It has good absorbency, low conductivity and dyes easily.

Silk is produced in more than 20 countries. While the major producers are in Asia, sericulture industries have been established in Brazil, Bulgaria, Egypt and Madagascar. Sericulture is labour-intensive. About 1 million workers are employed in the silk sector in China. Sericulture provides income for 700 000 households in India and 20 000 weaving families in Thailand.

*Uses*. Silk's natural beauty and other properties – such as comfort in warm weather and warmth during colder months – mean that it is much sought after for use in high-fashion clothes, lingerie and underwear.

Silk is used in sewing thread for high-quality articles, particularly silk apparel, and in a range of household textiles, including upholstery, wall coverings and rugs and carpets.

It is also being used as a surgical suture – silk does not cause inflammatory reactions and is absorbed or degraded after wounds heal.

Other promising medical uses are as biodegradable microtubes for repair of blood vessels and as moulded inserts for bone, cartilage and teeth reconstruction.

*Production and commerce*. Global silk production rose from around 100 000 tonnes in 2 000 to 150 000 tonnes in 2006, thanks mainly to the growth of China's output. China produces about 70 percent of the world's silk, followed by Brazil, India, Thailand and Viet Nam, with minor production in Turkmenistan and Uzbekistan. India, Italy and Japan are the main importers of raw silk for processing. The unit price for raw silk is around 20 times that of raw cotton. (*Source*: International Year of Natural Fibres 2009 Web site, www.naturalfibres2009.org/)

**For more information, please contact: Brian Moir, International Year of Natural Fibres Coordination Unit, Trade and Markets Division, FAO, Viale delle Terme di Caracalla, 00153 Rome, Italy. Fax: +39 06 57054495; e-mail: IYNF-2009@fao.org**

*(Please see page 66 for more information on the International Year of Natural Fibres.)*

India is the second largest producer of silk after China and the largest consumer of silk in the world. (*Source*: Thaindian.com, 18 April 2009.)

**Silkworm's chemical attraction to mulberry leaves discovered**

Tokyo. Japanese scientists say they have isolated the jasmine-scented chemical that attracts silkworms to mulberry leaves – their primary food source. The findings could help silk producers fine-tune the diets of silkworms to get them to eat more and digest food more efficiently, a study published in *Current Biology* reported on Friday.

The chemical cis-jasmone emitted in small quantities by the leaves of the mulberry tree triggers a single, highly tuned olfactory receptor in the worms' antennae, said Kazushige Touhara, a professor at the University of Tokyo. Cis-jasmone is so powerful that just a tiny amount draws silkworms towards the source of the smell, he said. Cis-jasmone might be added to artificial diets to increase the efficiency of the worms' food intake. It could also be used to develop a safe form of pest control, attracting unwanted insects also drawn to the scent of cis-jasmone. (*Source*: United Press International, 8 May 2009.)

## WILDLIFE AND BUSHMEAT

**Primate hunting reaches crisis point in Latin America**

Monkey numbers in Latin America have fallen dramatically in recent years as primate hunting reaches unsustainable levels. Most are used for food, but an increasing number of souvenirs are also produced using dead monkeys.

The authors of a report published this week by the British wildlife charity Care for the Wild International and the German organization Pro Wildlife claim that the number of primates hunted in Latin America could be as high as 10 million a year. In some parts of the Amazon basin, the numbers of medium- and large-size primates have dropped by a staggering 93.5 percent over the last 20 years.

The report concludes that primate populations in 16 of the 22 Latin American countries are under threat, particularly larger species such as woolly, spider, howler and capuchin monkeys. One of the report's authors, Sandra Altherr of Pro Wildlife, said it appeared that the extent of primate hunting in Latin America was higher than in Africa or Asia.

"While the devastating effects of the bushmeat trade in Africa continues to hit the headlines, the largely uncontrolled hunting of primates in Central and South America has been all but ignored," Altherr told Spiegel Online. "At an international level there is almost no discussion about this problem. We need to change this because the situation is becoming worse."

The report also found that primate hunting in Latin America, once a subsistence-level activity, is becoming increasingly commercialized, with traditional hunting methods being replaced by modern weapons.

The report also claims that the hunting of primates for food rather than habitat loss poses the most serious threat to the survival of large primates in Latin America within the next two decades. As the rain forest is cleared away by loggers, new paths and roads into forest regions allow hunters increasingly easy access to primate breeding grounds.

Primate hunting is already illegal in most Latin American countries, but Altherr said that the authorities in many areas turned a blind eye to the problem. (*Source*: Spiegel Online International, 13 April 2009.)

**The impact of hunting on the biological community**

Hunters focus initially on large animals and continue to hunt them even when their numbers become low. Such species comprise the majority of the mammalian biomass in undisturbed forests and play keystone ecological roles. Reduction or loss of such species will have wider impacts on the forest community, as a result of the following factors.

- *Loss of pollinators*. Large fruit bats in particular are extremely important pollinators of many tropical forest trees.
- *Loss of seed predators* (e.g. pigs, peccaries, agoutis, large squirrels). With reduced seed predation, trees with large seeds are at a competitive advantage over trees with smaller seeds. In one study in Panama, such trees dominated forest patches after less than 75 years following the depletion of seed-eating animals.
- *Loss of seed dispersers* (e.g. primates, frugivorous bats, frugivorous birds, forest ungulates). Many large animals play a primary role in seed dispersal; seeds of up to 75 percent of plant species in African rain forests are dispersed by animals. Hunting can deplete complete guilds of seed dispersers by removing primates, large birds and bats. The exact balance between animal dispersed plants and vegetative propagation of rain forest plants is still unknown, but the loss of seed dispersers will undoubtedly affect forest composition, in ways that are difficult to predict.
- *Loss of predators* (e.g. large cats, raptors). This can cause unusual and uneven densities of different prey species. In turn, proliferation of certain prey species can lead to declines or local extinctions of their animal or plant food species, which changes forest composition and decreases overall biodiversity. In Barro Colorado Island, Panama, the absence of large predators led to an increase in mesopredators (coatis). The increased predation by the mesopredators on birds' eggs and fledglings caused declines and local extinctions of many low-nesting birds.
- *Loss of food for predators*. Hunting of ungulates and primates can reduce the populations of predators that depend on them for prey. In India, hunting can result in reductions of 90 percent of the prey eaten by tigers. This reduces tiger densities and also results in their hunting smaller prey, thereby causing further detrimental effects on the biological community. The loss of animals from forest ecosystems and the resultant disruption of ecological and ultimately evolutionary processes, changes in species composition and probable reduction in biological diversity are collectively known as the "empty forest syndrome".

(*Source*: R. Nasi, D. Brown, D. Wilkie, E. Bennett, C. Tutin, G. van Tol and

T. Christophersen. 2008. *Conservation and use of wildlife-based resources: the bushmeat crisis.* CBD Technical Series 33. 50 pp. Bogor, Indonesia, Secretariat of the Convention on Biological Diversity, Montreal, and Center for International Forestry Research [CIFOR].)

**FOR MORE INFORMATION, PLEASE CONTACT: Secretariat of the Convention on Biological Diversity, World Trade Centre, 413 St Jacques, Suite 800, Montreal, Quebec, Canada H2Y 1N9. Fax: 1 (514) 288 6588; e-mail:secretariat@cbd.int; www.cbd.int**

### "FOOTBALL FOR THE FORESTS" BUSHMEAT AWARENESS MATCH WILL TAKE PLACE IN 2010

The antibushmeat charity football match scheduled for June 2009 in Yaoundé, Cameroon has been postponed to 2010.

Given that 2009 is the International Year of the Gorilla, the Great Apes Survival Project (GRASP) Secretariat announced that they are planning an antibushmeat charity football match to be held in Yaoundé between the national teams of Cameroon and Nigeria. It is hoped that the good example of the football heroes of Cameroon and Nigeria will have a significant behavioural impact on the illegal harvesting of bushmeat in the region. The aim is to broadcast the match throughout equatorial and southern Africa and use any revenue generated to support gorilla conservation projects in both countries. The "Football for the Forests" match will also serve as an awareness-raising pilot project to determine the possibility of future matches between great ape range states and to determine possible involvement in 2010's World Cup in South Africa. The GRASP Secretariat is provided jointly by UNEP and UNESCO. (*Source: Nature & Faune*, 23(2), 2008.)

**For more information, please contact: Great Apes Survival Project (GRASP) Partnership Secretariat, United Nations Environment Programme, PO Box 30552, Nairobi, 001100 Kenya. Fax: +254 20 7624249; e-mail: grasp@unep.org; www.unep.org/grasp**

### Frogs important food source

With its famous diversity of frog species, Madagascar has long been targeted by smugglers for the pet trade. While this threat is relatively well understood, less known is the domestic market for edible frogs. Writing in *Tropical Conservation Science*, researchers from the University of Aberdeen (United Kingdom) and institutions in Madagascar provide a glimpse into this activity.

Richard Jenkins and Malagasy colleagues conducted a five-month survey of collectors delivering frogs to a restaurant in eastern Madagascar. They found a thriving trade – 3 233 frogs were delivered to the restaurant during the period. Income for collectors selling edible frogs was only slightly lower per edible frog (US$0.29) than it was for *Mantella milotympanum* ($0.32), a critically endangered frog collected for the international pet trade, thus providing an importance source of income for frog hunters. The researchers are now working to determine the sustainability of the industry.

The authors conclude by noting that forest degradation – largely a result of conversion of agriculture – probably damages frog habitat, thereby potentially impacting collector livelihoods. (*Source*: Mongabay.com [Madagascar], 23 March 2009.)

### The role of taste in determining the demand for wild meat

The role of taste and cultural preference in driving the demand for wild meat is unclear. It is commonly believed that people in tropical forest countries often prefer the taste of wild meat over that of domestic animals, and that wild meat consumption is a deeply rooted tradition that is highly resistant to change. These views are supported by the continuing demand for wild meat from formerly rural people now living in middle-class urban or even overseas environments, from Jakarta, Libreville and Brazzaville to London and New York. In these cases, wild meat is consumed as a luxury item to maintain a link to a departed lifestyle and is not a staple source of animal protein.

Scientific data to determine how important a role taste and culture play in the overall demand for wild meat are scarce. Most studies of preference have often simply documented that consumers noted "meat hunger" when their diet is composed primarily of starches, or have focused solely on which species of wildlife consumers prefer. They have not established that consumers have clear taste preferences for wild meat relative to the meat of domesticated animals. In a recent study in Gabon, consumers were asked to select which of two plates of meat they preferred. Only poor rural people showed a measurable preference for bushmeat. And, of the 42 subjects who stated a preference for domestic poultry, 78 percent avoided bushmeat when given the choice of porcupine or chicken. Overall, results suggest that taste is not the primary determinant of consumer demand for wild meat. (*Source*: R. Nasi, D. Brown, D. Wilkie, E. Bennett, C. Tutin, G. van Tol and T. Christophersen. 2008. *Conservation and use of wildlife-based resources: the bushmeat crisis.* CBD Technical Series 33. 50 pp. Bogor, Indonesia, Secretariat of the Convention on Biological Diversity, Montreal, and Center for International Forestry Research [CIFOR].)

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### United States of America imports 1 billion pet animals from the wild between 2000 and 2006

Poor regulation of the international wildlife trade has increased the vulnerability of the United States of America to outbreaks of disease and alien invasive species, report researchers writing in *Science*.

Analysing Law Enforcement Management Information System (LEMIS) data gathered by the United States Fish and Wildlife Service from 2000 through 2006, Katherine Smith of Brown University and colleagues found that of the more than 1.5 billion live wildlife animals legally imported to the United States of America

during the period, only 14 percent were classified to the level of species despite federal mandates for such labelling. The lack of accurate reporting makes it impossible to "accurately assess the diversity of wildlife imported or the risk they pose as invasive species or hosts of harmful pathogens", they write.

"If we don't know what animals are coming in, how do we know which are going to become invasive species or carry diseases that could affect livestock, wildlife or ourselves?" asked Peter Daszak, President of Wildlife Trust and a coauthor on the paper.

"The threat to public health is real. The majority of emerging diseases come from wildlife," added Smith, Assistant Research Professor in the Department of Ecology and Evolutionary Biology at Brown University and lead author on the paper. "Most of these imported animals originate in Southeast Asia – a region shown to be a hot spot for these emerging diseases."

The researchers found that 92 percent of imports were designated for commercial purposes, the majority of which were for the pet trade. Almost 80 percent of shipments contained animals from wild populations, "the majority of which have no mandatory testing for pathogens before or after shipment," they note.

The authors call for stronger regulation to improve monitoring of the live wildlife trade. They note that Congress is currently deliberating the Nonnative Wildlife Invasion Prevention Act (HR 669), which would tighten regulations on wildlife imports but say that the proposed legislation does not go far enough to control what they term "pathogen pollution".

The authors further urge education programmes to make individuals, importers, veterinarians and the pet industry aware of the "dangers of diseases transmitted from wildlife to humans and domesticated animals". They also call for captive-breeding initiatives to reduce pressure on wild populations and reduce the risk of disease introduction. (*Source*: Mongabay.com, 30 April 2009.)

**Great hornbill at stake**

Hornbills, especially great hornbills, are slowly and steadily vanishing from the still intact forests of Arunachal Pradesh, India. Hunting has proved to be a far greater threat than habitat loss from logging and shifting cultivation.

Great hornbill body parts, especially the casque and feathers, are an important part of the traditional rituals and customs of many tribes. Hunting is deeply ingrained in the local culture across the state and perhaps across many a tribe in northeast India, making the curbing of hunting an exceptionally challenging task. The younger generation is slowly forgetting the rules of hunting that their ancestors revered. (*Extracted from*: CEPF E-News, January 2009.)

**WILDLIFE SEIZURES AND PROSECUTIONS**

- Investigators have seized about 300 wildlife items, including rhinoceros teeth, tortoise shells, snake skins and a crocodile (species not reported) from a collector in what is described as the biggest haul of illegal wild animal trophies in western Switzerland. The collector is said to have acquired approximately 600 trophies; about 200 items were apparently imported illegally and 350 were later sold over the Internet and by post.
- In July 2008, forest police of Manzhouli, Inner Mongolia, seized 190 bear (CITES I/II) paws and 14 moose *Alces alces* noses, which were to be sent to Harbin, Heilongjiang Province by train.
- In April 2008, two wildlife dealers were arrested in Douala, Littoral Province, after being found trying to sell leopard *Panthera pardus* (CITES I) skins and trophies derived from other species. The arrest was carried out by the Provincial Delegation of Forestry and Wildlife, in collaboration with the forces of law and order, the judiciary and the Last Great Ape Organization (LAGA), and was part of a nationwide programme launched in 2003 by the Government of Cameroon, with technical assistance from LAGA, which aims at the effective enforcement of the country's 1994 wildlife law. The enforcement programme targets wealthy dealers rather than villagers.

(*Source: TRAFFIC Bulletin*, 22(1), October 2008.)

**Tree iguanas targeted by hunters as source of traditional medicine in the Plurinational State of Bolivia**

Harvesting of a Bolivian lizard for its purported healing powers is leading to its depletion, report researchers writing in *Tropical Conservation Science*.

Erika De la Galvez Murillo and Luis F. Pacheco of the Universidad Mayor de San Andrés found that collection of the Andean tree iguana or "Jararank'o" (*Liolaemus signifer*), a lizard found on Bolivia's dry altiplano for use in traditional medicine, reduced the population by nearly half relative to unharvested sites. They note that the species may suffer increased mortality when dens are destroyed during harvesting since mother lizards – targeted by collectors for their size – care for their young.

To improve the sustainability of the practice the authors suggest that hunters avoid collecting females and destroying dens. (*Source*: Mongabay.com [Bolivia], 23 March 2009.) ♣

**Strength does not come from physical capacity. It comes from an indomitable will.**

***Mahatma Gandhi***