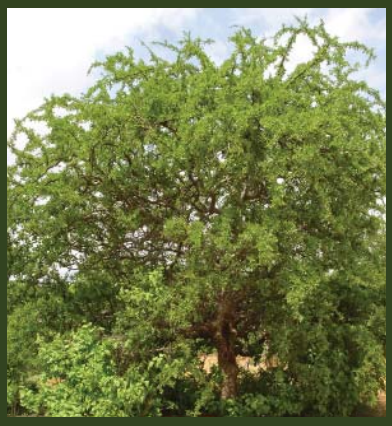

FORESTS
FOR IMPROVED NUTRITION AND FOOD SECURITY

What is food security?

FAO defines food security as a state where all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security.

What is a forest?

A forest is an ecosystem dominated by trees and other woody vegetation. FAO defines a forest as a minimum of 1 ha in size, with at least 10 percent crown cover and with mature trees at least 2 m tall. The definition explicitly includes open woodlands, such as those found in the African Sahel.

Food and nutritional security – a growing global challenge

Feeding the world's population is one of the most pressing challenges facing humanity in the twenty-first century. FAO estimates that 925 million people in the world are food insecure, representing around one in six of the world's population. Spiralling food prices in 2006 and 2007 resulted in food riots in 22 countries as poor households found it increasingly difficult to cover basic food needs. At the Millennium Development Goal (MDG) Summit held in New York in September 2010, countries reaffirmed their commitment to reaching the MDGs, including the eradication of extreme poverty and hunger. Under this goal, there is a commitment to halve the proportion of people who suffer from hunger by 2015.

If this ambition is to be met, it is estimated that food production will need to expand by 70 percent at the global level and to double in developing countries. This goal is made ever harder by the increasing impacts of climate change, including extreme weather events (resulting in both floods and prolonged drought), which are putting poor households at particular risk.

Forests as well as trees on farms are a direct source of food and cash income for more than a billion of the world's poorest people, providing both staple foods and supplemental foods such as fruits, edible leaves and nuts. More than 50 million people in India alone depend directly on forests for subsistence, while in the Lao People's Democratic Republic, wild foods are consumed by 80 percent of the population daily.

Trees are an integral part of the agricultural systems of many small-scale farmers, providing both cash and subsistence benefits. These benefits come from trees that are planted or managed on farms as well as from forest resources in communally managed, open-access or State-managed areas.

This publication:

- highlights how forests, woodlands and trees support food and nutritional security, both directly and indirectly;
- provides policy recommendations on how the contribution of forests and trees to food security can be sustained and enhanced.

Food from the forest

The most direct way in which forests and trees contribute to food security is through contributions to diets and nutrition. Plants and animals found in forests provide important nutrient-rich supplements for rural households. They add variety to diets and improve taste and palatability of staples. Forest foods often form a small but critical part of otherwise bland and nutritionally poor diets.

Leaves

Wild leaves, either fresh or dried, are among the most widely consumed forest foods. They are often used as the basis for cooking soups, stews and relishes which accompany carbohydrate staples (such as rice or maize), adding both flavour and nutritional value to diets. Wild leaves can be excellent sources of vitamins A and C, protein and micro-nutrients such as calcium and iron, which are commonly deficient in diets of nutritionally vulnerable communities. Common leaf vegetable species eaten across different parts of Africa include *Gnetum africanum*, *Adansonia digitata* (baobab) and Cassia obtusifolia. The protein content of baobab leaves is around 14 percent.

Consumption of forest fruit favours conservation

A study on the consumption of wild fruits in Zimbabwe found that while communally owned land was heavily populated and suffered severe deforestation, the availability and use of the three most favoured fruit species (*Diospyros mespiliformis*, *Strychnos cocculoides* and *Azanza garckeana*) were not affected by deforestation. Fruit trees were not cleared, but were deliberately incorporated into new farmland.

Source: Campbell, B.M. 1987. The use of wild fruits in Zimbabwe. *Economic Botany*, 41(3): 375–385.

Fruits

Thousands of species of wild fruits are consumed worldwide. Fruits are especially good sources of minerals and vitamins and sometimes contribute significant quantities of calories. Fruit is most commonly consumed raw, as a snack or dietary supplement. Forest fruits are also widely used for making beverages, most notably beer. In India, it has been estimated that up to 50 million households supplement their diets with fruits gathered wild from forests and surrounding bush land.

Seeds and nuts

Seeds and nuts add calories, oil and protein to diets. In developing countries, edible oil (fat) consumption is often low, and fat or oil commonly constitutes a major household food purchase. Low-fat diets are thought to be detrimental, especially for children, who need energy-dense foods. In addition to the energy they provide, fats and oils are also important for the absorption of vitamins A, D, E and K. Numerous nutritionally important nuts and seeds are gathered in forests; important examples include Brazil nuts (*Bertholletia excelsa*), pine nuts (*Pinus pinea, P. edulis, P. koreensis*), cola nuts (*Cola edulis*) and chestnuts (*Castanea sativa*). Coconuts are of central importance in many cultures; on the world scale, they are the source of 7 percent of the global consumption of fat.

Roots and tubers

A variety of forest plants (frequently climbers) have edible roots and tubers, which provide carbohydrates and some minerals. They are drought and famine foods, not only because they can persist under reduced precipitation, but also because they can be an important source of water during prolonged droughts or in areas of low and erratic rainfall. In addition, roots and tubers are often important ingredients in traditional medicines. In Swaziland, approximately 10 percent of commonly eaten wild species are bulbs or roots.

Mushrooms

Mushrooms, gathered wild from forests and woodlands, are favourites in many cultures, where they are added to sauces and relishes for flavouring.

They sometimes provide a substitute for meat. Fresh mushrooms are often only available for short seasons, but are also dried, which allows them to be traded or consumed year-round. In some cultures mushroom gathering is a major seasonal activity.

Mushroom collection in Siberia

In northern and central Siberia, up to 40 percent of indigenous families engage in mushroom collection. Eighteen species of mushrooms are collected from pine and birch forests across the region. Most are gathered for home consumption, but some people engage in processing and sale of mushrooms in local markets. Up to 100 kg of mushrooms per hectare can be found in the most productive areas, although on average households collect no more than 5 kg of mushrooms per day.

Source: Vladyshevskiy, D.V., Laletin, A.P. & Vladyshevskiy, A.D. 2002. Role of wildlife and other non-wood forest products in food security in central Siberia. *Unasvlva*. 202: 46–52.

Honey

Trees and other plants growing in forests often have an important role in honey production as they provide year-round fodder for bees because of different flowering times. In some cultures, honey is collected from wild colonies, although most honey is harvested from hives placed around farms or in neighbouring woodlands or forests. Honey is a good source of sugar and is also an important ingredient in many traditional medicines. In Zambia, a country with extensive woodlands and dry forests (called "Miombo"), beekeeping and honey production are an important aspect of rural livelihoods, providing up to 25 percent of total annual income for tens of thousands of people and supplementing the diets of at least 250 000 households.

Wild animals, insects and fish

Wild animal species consumed include birds and their eggs, insects, rodents and mammals. Wild animals are often an important part of the diet of people living in close proximity to forests and fallow areas; for some people they are the only source of animal protein. In at least 62 countries worldwide, wildlife and fish constitute a minimum of 20 percent of the animal protein in rural diets. The consumption of game meat is closely linked to the availability and abundance of wild animals, which tends to vary from place to place. As a result, there is great regional variation in wild meat consumption. In West Africa, where the consumption of bushmeat is high, the most consumed game meat species are small animals (such as rodents) due to their natural abundance and few restrictions on their hunting. The economic value of the bushmeat trade in Central Africa is high, with estimates ranging from US$42 to $205 million per year. The total annual harvest of bushmeat in Central Africa amounts to more than 1 million tonnes annually – the equivalent of almost four million head of cattle. Hunting provides between 30 and 80 percent of the overall protein intake of rural households in the subregion. Despite the positive contribution bushmeat provides to food and nutritional security, harvesting often exceeds sustainable levels, mainly as a result of high urban demands and poor regulation.

Fodder and browse for livestock

Many species of trees found on farms, as well forest trees and associated understorey shrubs and grasses, are used for animal feed – either as browse or collected and fed to livestock in stalls. It has been estimated that 75 percent of the tree species (7 000 to 10 000) of tropical Africa are used as browse. Fodder trees contribute in several ways to the overall food and nutritional security of households. First, they make a significant contribution to domestic livestock production, which in turn influences milk and meat supply. Second, fodder contributes to maintaining draught animals and producing manure for organic fertilizer, thereby boosting agricultural production. Tree fodder and browse may consist of leaves, small branches, seeds, pods and fruits, all of which supplement other feeds and which can be a crucial component of livestock diets during the dry season, providing protein, minerals and vitamins.

Fuel for cooking and food processing

Fuelwood is the main energy source for cooking and food processing in most developing countries. Fuelwood supplies thus indirectly affect the stability, quality and even quantity of food consumed. Dwindling fuelwood supplies in many rural areas are having increasingly severe impacts on food security and nutrition. Research conducted in rural Ghana, for example, has shown that the proportion of household budgets spent on the purchase of fuelwood rose from 1 percent to over 15 percent of total expenditure over a five-year

Forest caterpillars – an important contribution to local diets

Caterpillars are common insects in the forest, can be easily gathered and are an abundant and popular food source in many parts of the world. Caterpillars are an excellent source of nutrients. They have higher protein and fat content than meat or fish and provide more energy per unit. Research shows that 100 g of cooked insects provide more than 100 percent of people's daily requirements of vitamins and minerals.

Source: FAO. 2010. *Edible forest insects – humans bite back.* Bangkok, Thailand, FAO Regional Office for Asia and the Pacific.

period as fuelwood prices increased. As a result, household food expenditures were diverted to fuelwood purchases, leading to a reduction in the number of meals consumed per day by poor households.

Furthermore, fuelwood shortage can affect the quality of foods consumed if it results in reduced cooking time and consumption of undercooked food. Food processing using fuelwood (traditionally smoking and drying) is also of central importance to food security, as it extends the supply of food resources into non-productive periods.

Reducing vulnerability of poor households

It is often the very poorest who are most dependent on forests. Households living on the margins of poverty are exposed to food insecurity at certain times of the year, when income levels drop. This may be during the "lean season" (the period when crops are growing in the fields, and stocks from the previous season are exhausted) or in times of famine or food shortage. For these families, forests provide an important safety net, and it is in these critical periods that the importance of forest foods is greatest.

This situation is most prevalent in arid areas where food supplies are most vulnerable and food shortages are common. In Senegal, for example, over 150 species of wild fruits and plant foods are consumed. Particularly important species are the baobab (*Adansonia digitata*) and *Balanites aegyptica*, the leaves and fruit of which provide important nutrients and vitamins.

Certain wild fruits such as *Boscia* spp., which fruit all year round, and *Sclerocarya birrea*, which fruits at the end of the dry season, are most commonly used to meet seasonal shortages of vitamins.

Parklands in the West African Sahel

Parklands are landscapes in which mature trees occur scattered in cultivated or recently fallowed fields. Across the West African Sahel, the tree *Faidherbia albida* occurs naturally but is actively managed in a traditional system of agroforestry. The tree fixes nitrogen through its roots and has a positive effect on soil fertility. Its pods and seeds are important sources of minerals and nutrients for livestock, especially towards the end of the dry season when other sources of browse are often depleted.

Community forestry enterprises in Guatemala

With support from non-governmental organizations (NGOs), donors and government agencies, community-owned forest enterprises now manage more than 420 000 ha in the multiple-use zone of the renowned Maya Biosphere Reserve. Each of these enterprises manages a distinct parcel of land – a concession – that the Guatemalan government has leased to them. Their forest product sales have brought new employment, infrastructure, social cohesion and income to an area with high poverty rates and limited economic opportunities. Between October 2006 and September 2007, the concessions produced US$4.75 million in certified timber sales and close to US$150 000 in sales of non-wood forest products. More than 10 000 people directly benefit from forest concessions, and 60 000 receive indirect benefits. Concession employees receive more than double the regional minimum wage. Under village management, biodiversity has flourished and forest fires and illegal logging and hunting have declined dramatically in comparison with the situation in neighbouring national parks.

Source: World Resources Institute. 2008: *Roots of resilience – growing the wealth of the poor.*

Generating income from forests and trees

Food insecurity is generally related to poverty and limited opportunities for employment or income generation. Income from forests and from trees on farms can make a significant contribution to rural households and their food security. Some households in Mozambique, for example, obtain 30 percent of their income from unprocessed forest products such as fuelwood, fruits, mushrooms, insects, honey and medicinal plants.

Women play an important role in the processing of tree and forest products. Given their responsibilities for ensuring food security at the household level in many parts of the world, income generated from such activities is often an important means of providing food for the family

Ironically, in many cases the tropical areas that are richest in forest resources are the poorest, because of their remoteness and low levels of external investment. The collection, processing and sale of forest products (or activities involving non-consumptive use of forests such as ecotourism) are often among the few income-generating opportunities available in these areas.

The creation of small or medium-sized forest-based enterprises can help secure better market access and share, or add value to harvested products. Many small-scale enterprises are based on non-wood forest products (NWFPs). They are particularly important in arid and semi-arid areas where agricultural production is more vulnerable to external threats such as drought or extreme weather events. The collection and sale of gum arabic (from *Acacia senegal* and *Acacia seyal*) in 17 countries across dryland Africa is an example of how NWFPs are increasingly integrated into global markets. Four processors in the United States of America and Europe account for about 70 percent of world trade in raw gum, which is then processed and resold as additives for the food and drinks industry. Between 2003 and 2007, the European Union imported 200 000 tonnes, valued at close to US$432 million. Establishing local processing and value-addition measures could help producer countries realize an increased market share of this lucrative trade.

Harvesting of NWFPs must be managed and regulated in order to be sustainable. However, regulations governing the harvesting of forest products, as well as related permits, licences and taxes, are often complex, and in order to compete effectively, small enterprises may be forced to operate without the required paperwork. Weak or selective enforcement of existing regulations can foster unsustainable harvesting of NWFPs and create unfair competition for small enterprises.

Small-scale forest enterprises generally operate in the informal sector, and their contribution to the economy is often "hidden", in contrast with larger-scale private-sector activity such as timber harvesting. National reporting and statistics on forestry or trade rarely capture the contribution of NWFPs. FAO's Global Forest Resources Assessment 2010 reports that the value of NWFP harvesting was about US$18.5 billion in 2005, but notes that this is probably a significant underestimation of its true value.

Employment in forest industries, management and conservation provides jobs for around 10 million people worldwide, although this figure appears to have declined slightly in the recent past because of gains in labour productivity.

Many countries report increased employment in management of protected areas. Given that most forestry employment takes place outside the formal sector, it is likely that official figures are again an underestimation of its true contribution to rural livelihoods and national economies.

"White gold": the shea butter trade in West Africa

The shea tree (*Vitellaria paradoxa* and *Vitellaria nilotica*) grows naturally across the West African Sahel region. There are more than 500 million fruiting shea trees across the production belt, and FAO estimates that total shea nut production is approximately 600 000 tonnes per year. The primary export market for shea butter is in the chocolate and confectionery industry. However, shea is also used as a cooking fat, food accompaniment and skin-care product in West Africa. Harvesting and processing is predominantly a women's activity. Across West Africa about 4 to 5 million women are involved in the collection, processing and marketing of shea nuts and butter, and it provides about 80 percent of their income. In Burkina Faso, exports of shea butter and unprocessed shea kernels brought in CFA 5 billion (US$7 million) in 2000, making it the country's third most important export, after cotton and livestock.

Source: Ferris, R.S.B., Collinson, C., Wanda, K., Jagwe, J. & Wright, P. 2001. *Evaluating the marketing opportunities for shea nut and shea nut processed products in Uganda.* Natural Resource Institute and FoodNet.

Prunus africana bark – from overharvesting to sustainability?

The tree *Prunus africana* grows in the high-altitude mixed forests of Cameroon. Its bark is converted into an extract used to treat benign prostrate cancer, mainly in the United States and Europe. However, because of overharvesting, the Convention on International Trade of Endangered Species (CITES) placed restrictions on its export in 2008. Since then, the government of Cameroon has been working on the development of sustainable use guidelines and preparing an application to CITES to permit harvesting and trade in *Prunus* bark to resume.

Source: Ndam, N. 2004. *Prunus* medicinal bark. In C. López & P. Shanley, eds. *Riches of the forest: for health, life and spirit in Africa*, pp. 33-36. Center for International Forestry Research.

Stabilizing, sustaining and restoring agricultural production

Across the tropics, trees are integrated into agricultural systems in a variety of ways, providing a range of benefits in terms of restoring or sustaining soil fertility and boosting food production. Farmers have historically protected, managed or planted trees on their land, and are increasingly doing so as nearby forests recede or are degraded from overharvesting.

In upland areas, where steep slopes and high rainfall create a high risk of erosion, trees help stabilize topsoils and prevent loss of important nutrients, helping to maintain agricultural production.

In dryland and semi-arid areas, trees and woodlands provide shade to growing crops and protect them from extreme temperatures. They minimize soil water loss through evaporation and transpiration and reduce wind speed and loss of topsoil through wind erosion.

In arid areas herders and pastoralists often actively manage trees and forests as a source of browse and fodder for domestic animals.

On tropical soils with low fertility and poor structure, agriculture usually needs to be alternated with periods of bush fallow. This system of production is called slash-and-burn or swidden agriculture. The use of fire and the addition of biomass from the regenerating tree cover during fallow periods help restore soil fertility.

When human population pressure is low, swidden agriculture can provide people with a secure source of food and income and can be sustainable over long periods.

As populations increase, however, slash-and-burn systems can lead to deforestation and forest degradation across wide areas, which in turn results in increasing emissions of greenhouse gases.

Tree gardens in Java, Indonesia

The tree gardens of West Java, known locally as *kebun* or *talon*, are traditional multiple-storeyed agroforestry systems. They comprise a mix of trees serving a wide variety of purposes, often with the inclusion of annual crops. The tree gardens are planted on communal lands surrounding villages. The plants found in tree gardens ensure an effective nutrient cycle and relatively low levels of leaching and erosion. The tree gardens produce a small, continuous supply of wood and non-wood products for subsistence use and a small surplus for sale to local markets. In times of crisis or income shortage, higher production and marketing levels may be attained.

Source: Wiersum, K. 1985. Tree gardening and taungya on Java: examples of agroforestry techniques in the humid tropics. *Agroforestry Systems*, 1: 53–70.

Indirect benefits provided by trees and forests

Forests improve the quality of water and help regulate flow, reducing the risks of extreme flooding events or the drying up of rivers during the dry season. This has important implications for food security, enabling farmers downstream to undertake agricultural production with less risk.

As climate change takes effect, rural communities will become increasingly vulnerable to crop failure caused by disruptions to familiar weather patterns and shifting distributions of crop diseases and pests, which will in turn have negative impacts on their food security. Healthy forests can help buffer the impacts of extreme weather events, whose frequency and severity are expected to rise with global warming. Forests are also important as carbon sinks, soaking up atmospheric carbon and storing it in trees and soils. Deforestation and forest degradation release carbon into the atmosphere, contributing to climate change.

Trees in forests and on farmland support bees and other pollinating insects, which ensure a healthy production of grains and seeds both for consumption and for planting in the coming years.

Forests play a crucial role as gene pool reserves (including a large proportion of agricultural crops currently cultivated around the world). An example is coffee, which originated from natural forests in East Africa (Ethiopia, Uganda and the Sudan). The natural varieties are still used today in genetic improvement programmes for their »farmed varieties. The same is true for cacao, tea, avocado and many others. »

Finally, trees provide an important buffer against the impact of storms, reducing damage to crops, property and lives, as demonstrated in the coastal areas affected by the 2004 tsunami in Southeast Asia.

Mangroves protect farms, property and lives

The 2004 tsunami left behind untold human suffering and tragedy across Asia. However, recent research has shown that coastal areas buffered by coastal forests, such as mangroves, were strikingly less damaged by the tsunami than areas without trees. Conserving or replanting mangroves not only provides a buffer for tsunamis and storms, but also enhances fisheries and forestry production, which artificial coastal protection structures do not do. Growing pressure from coastal development and prawn farming in recent years has resulted in the loss of mangroves and wetlands in many parts of the world.

Source: Science Daily. 2005. Mangroves shielded communities against tsunami. 28 October 2005. Available at: www.sciencedaily.com/releases/2005/10/051028141252.htm

Policy recommendations

Forests and trees on farmland contribute to food security for millions of people around the globe. In many places, however, deforestation and land use changes pose a threat to the multiple benefits that these resources provide, intensifying the challenge of achieving the Millennium Development Goal of eradicating extreme poverty and hunger.

The following actions are necessary to sustain these benefits and to realize the full contribution of forests and trees, to meet not only food security goals but also wider economic development objectives.

Increase investment

Governments and development partners should increase budget allocations in support of sustainable forest management and rehabilitation of degraded lands. Depending on the condition of the forest, approaches may include protection, management and restoration. Investing in sustainable forest management represents a cost-effective way to support poor and vulnerable households, without investing in more costly social welfare programmes. Furthermore, investing in sustainable forest management will help mitigate the effects of climate change by reducing greenhouse gas emissions and will increase forest resilience to help vulnerable rural communities adapt to the negative impacts of climate change.

Increase local control over forest management and use

A clear sense of ownership helps give local people the sense of responsibility to conserve forest resources and the incentive to invest in long-term management. One important aspect of devolving rights and responsibilities is equipping local people with the skills with which to manage resources sustainably. Necessary tools include overall principles of sustainable forest management as well as harvesting guidelines and quotas for specific products that are in high demand and limited supply.

Develop and implement pro-poor forestry measures

In the absence of deliberate measures to benefit the poor, the more affluent and educated members of society tend to profit from forest management at the local level. Poor people – those who are most dependent on forests for both food and income – are less able to invest time and resources in forest management, although they have the most to gain from it. Specific measures to increase the participation of and benefits to poor households might include channelling forest revenues to projects that will be attractive to poorer households; removing forest fees, subscriptions or levies for poorer households; and ensuring that poorer households are represented on local forest management committees.

Support the development of economically, socially and environmentally sustainable small and medium forest enterprises (SMFEs)

Governments can help strengthen SMFEs in many ways to reduce poverty and improve food security:

- Grant and protect legal access to forest resources by rural communities.
- Curb illegal logging and unsustainable harvesting of non-wood forest products (NWFPs) through governance and legal reforms, training and information to forest users, to reduce unfair competition.
- Simplify procedures for SMFE registration to reduce costs and enhance value-adding opportunities.
- Provide financial incentives, including tax breaks for start-up SMFEs.

Service providers, including NGOs, the private sector and donor-funded projects, can help to establish producer organizations that can represent the interests of SMFEs at the

regional or national level while also facilitating economies of scale in processing and marketing, and greater bargaining power, including at the policy level.

Integrate the contributions of forests and trees into national food security strategies and policies

The first of five principles agreed at the World Summit on Food Security hosted by FAO in November 2009 commits member countries to "invest in country-owned food security plans and strategies, aimed at channelling resources to well-designed and results-based programmes and partnerships". This principle was re-emphasized at the United Nations Summit to review progress on the MDGs in September 2010. The evidence presented above emphasizes the need to enhance the general recognition of the multiple contributions of forests and trees to food security and to better link them with these emerging strategies.

Improve national capacity to monitor and assess the contribution made by forests and trees to food security

Monitoring progress and impact is a critical aspect of national and regional food security strategies. National reporting frameworks that distinguish where and how food is obtained (produced, purchased or gathered from the wild) must include the contribution of forests and of trees on farms, both planted and wild. Recognition of the full contribution of the forest sector is fundamental for increased investment. Forest agencies and national statistical bureaus need to be more effective in recording and promoting the contribution of forests and trees at all levels of society.

Encourage intersectoral and interagency collaboration.

To increase the role of forests and trees in food security, government agencies responsible for forestry need to work more effectively with and through organizations beyond the forest sector

These might include ministries for agriculture and food security, livestock, water, lands, environment and energy, as well as non-sectoral agencies such as ministries for local government, finance and planning. Collaboration should help integrate forestry and food security messages into laws and policies across government. In the field, extension and field staff from different disciplines should be encouraged to work together at the community level in multistakeholder platforms. Greater collaboration among countries is required for the management of shared forest resources. Exisiting collaborative efforts in the Congo Basin (COMIFAC), the Amazon basin (OTCA) and the Mediterranean area (Silva Mediterranea) need to be strengthened and extended to other regions.

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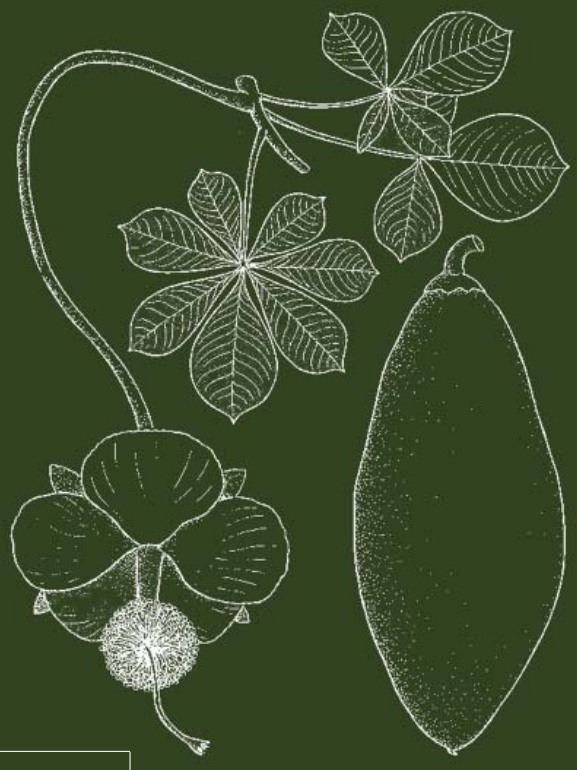

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