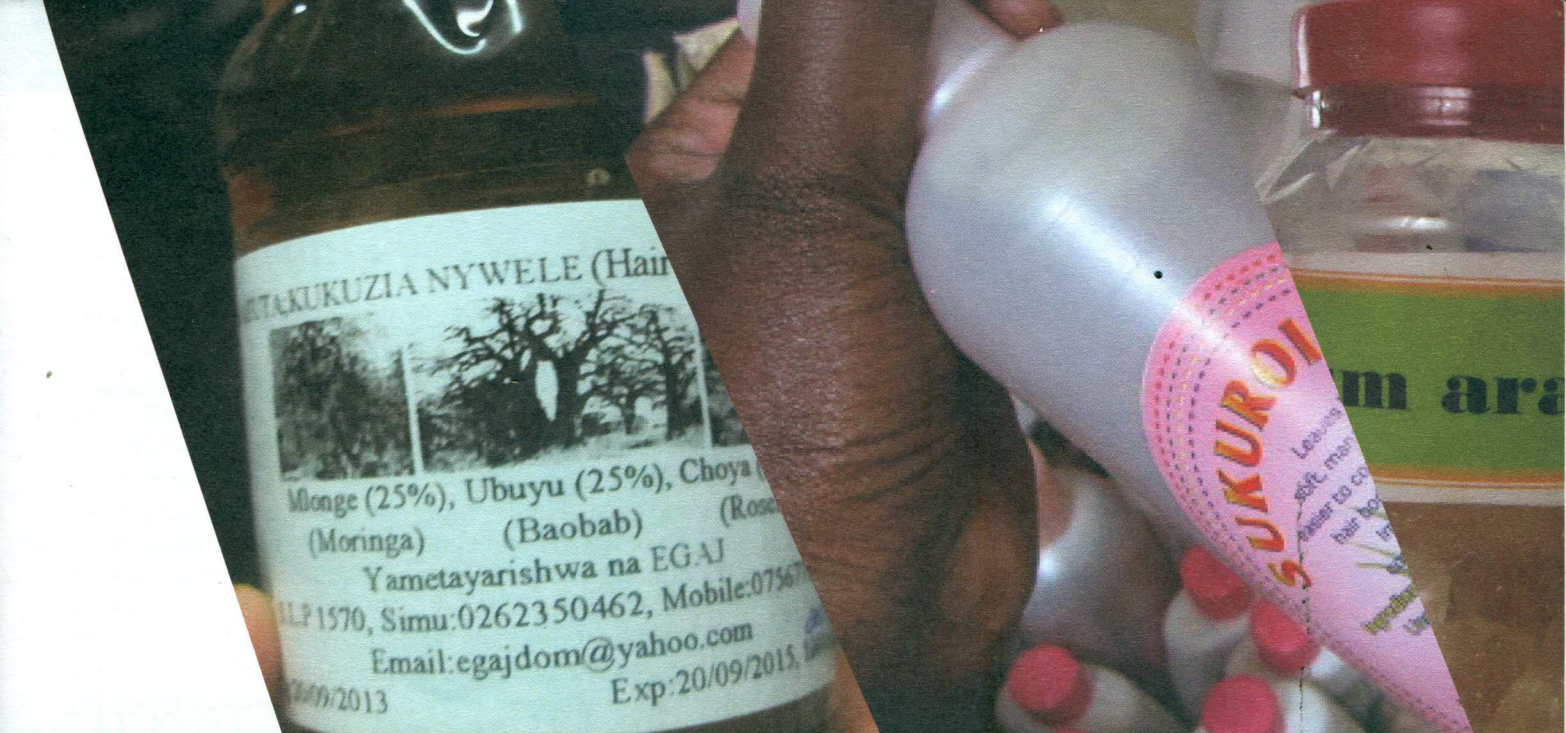




# NATURE BASED ENTERPRISES FOR SUSTAINABLE DEVELOPMENT

Dionysious Kiambi and Elizabeth Obel-Lawson





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# Preface

It is a well established fact that natural resources play a significant role in the livelihoods of rural households. In addition to subsistence and income generation to local communities, they provide most essential goods and services for sustainable livelihoods of the rural majority. Plants are the major source of raw materials for essential oils and resinoids used in the perfumery, cosmetics and flavour industries. Wild plants often provide the only source of medicines that are cheaply and readily available to many rural people. The solutions to Africa's ecological and economic crises lie partly in harnessing these natural resources for sustainable development through the establishment of nature based enterprises. Through improved land management and the use of naturally occurring insects and plants, rural communities can benefit financially and at the same time protect their environment, preserve biodiversity and conserve fragile natural resources. Moreover, the rich biodiversity in Africa provides opportunities for strengthening culture and traditions, and developing alternative enterprises to take pressure off agriculture since arable land is diminishing quickly. There is a high potential for developing nature based enterprises using plants and non-timber forest products (NTFPs), which are a renewable resource that can be exploited commercially in a sustainable way without damaging the environment. The nature based enterprises can provide employment for the youth and contribute to poverty alleviation and sustainable development in general.

The market for natural products is growing fast nationally, regionally and globally, thus sustainable trade in natural products could contribute significantly to economic and social development in Africa. The commercialization of natural products presents opportunities that can be grasped and risks avoided by developing a rules-based system, which ensures that partnerships between producers and market players are sustainable. Since community-based natural products are subject to degradation, as a result of overuse, their sustainable utilization is important for securing livelihoods and enhancing posterity of this vital natural heritage. To be sustainable, nature based enterprises must therefore create a careful balance between environmental, social and economic needs. However, for local communities or groups to benefit fully from the natural resources they manage as common-pool resources, the local, national and international markets must be well structured or in some cases regulated, which may include minimal levels of safety, fair play and information disclosure.

In this booklet, we have tried to demonstrate and show case the potential of nature based enterprises in providing a means of sustainable livelihoods particularly to the youth and majority rural poor, while conserving the environment and natural resources. It is the first publication in the ABCIC's Environmental Conservation Education (ECE) Series and it has been produced with funding from the CIC Insurance Group as part of an ongoing project entitled, "Investing in the youth for posterity", which is implemented jointly with KCA University.

We hope that the booklet will inspire the development of nature based enterprises, especially among the youth, where unemployment levels have now reached an all time high in most of the African countries.

**Dionysious Kiambi**  
Executive Director



# Introduction

**Natural resources play a significant role in the livelihoods of rural households. They are part of the complex and diverse rural livelihoods. They provide subsistence and cash income to local communities. The natural resource base provides most food, fuel, fodder, building materials, traditional medicines, materials for cloth and dyes, gums and resins and fibre. Population pressure, mismanagement of natural resources and poor farming methods have contributed to the destruction of agricultural and grazing lands, leading to a decline in food production, conflict over natural resources and increased urban migration in search of employment. These factors, in addition to inappropriate social and economic policies, traditional, cultural and historic factors have resulted in increasing environmental degradation and the poverty facing most of Africa's populations today.**

The solutions to Africa's ecological and economic crises lie partly in harnessing our natural resources for sustainable development through the development of nature-based enterprises. Through improved land management and the use of naturally occurring insects and plants, farmers can benefit financially and protect their

environment, preserve species, biodiversity and conserve fragile natural resources.

An important component of natural resources is biological diversity or biodiversity, which is the total diversity of life on earth, and includes all living things, the genes they contain, the ecosystems in which they live, and the interactions between them. Biodiversity is the food we eat, the clothes we wear, the homes we build, and the medicines that heal us. Biodiversity is a human heritage of local communities and society as a whole, and is priceless.

Biodiversity contributes towards food security, nutrition, health, economic development, nature conservation and protection of the environment. Biodiversity supports the agricultural production systems of every farming culture – the crops, livestock and the agro-ecological processes which they are part of. The environmental setting, population, social organization, modern technologies, capital investments and other kinds of socio-economic interventions can enhance or deplete biodiversity. Today, African forests are the most degraded forests of the world with only about one third of their original surface area remaining and representing less than one fifth of the world's total forest resources.

The rich biodiversity of Africa provides opportunities for income generation, strengthening culture and traditions, and developing agribusinesses. Alternate development enterprises should be exploited to take pressure off agriculture since arable land is fast diminishing. Among the natural products are the non-timber forest products (NTFPs). The products from trees and shrubs are a renewable resource that can be exploited commercially in a sustainable way without damaging the environment. Examples of NTFPs are: bamboo, rattan, vines, medicinal and aromatic plants, nuts, fruits, mushrooms, tubers, grasses and leaves, resins, insects and processed products e.g honey and silk. The market for natural products is





growing fast nationally, regionally and globally, thus sustainable trade in natural products could contribute significantly to economic and social development in Africa.

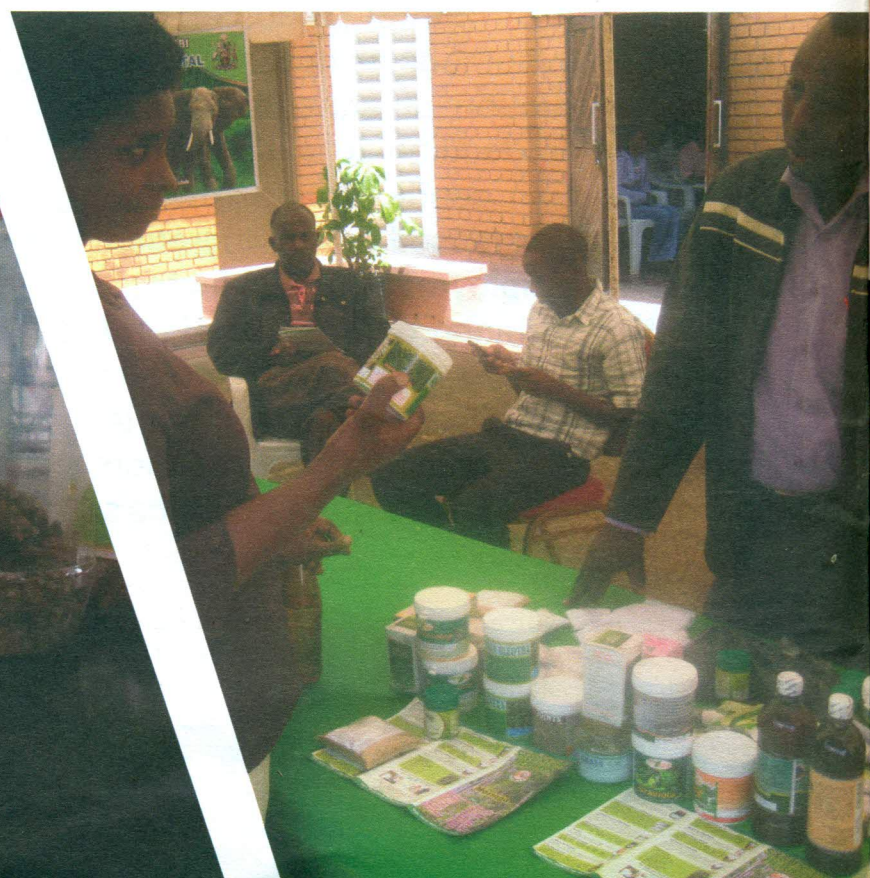
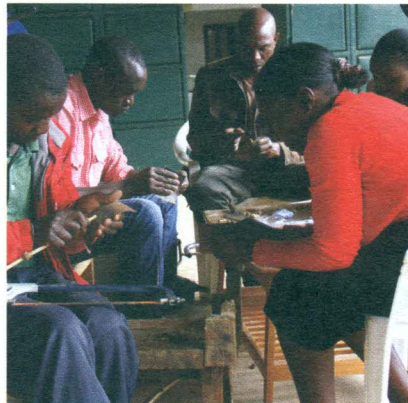
Efforts to address the twin goals of biodiversity conservation and economic development are beginning to emerge in some parts of Africa through sustainable production and commercialization of natural products derived from biodiversity (Sunderland et al., 2004). Policy makers and practitioners are now beginning to look at the opportunities offered by the sustainable commercialization of nature based products and the development of viable natural products sectors. The global natural products industry, including the key sub-sectors of food and beverages, cosmetics, herbal medicines and pharmaceuticals, is currently valued at US \$65 billion per annum and is booming with a 15–20 percent annual growth rate in the last few years (Keynote, 2005). For instance, current formal natural products trade in Southern Africa is estimated at US \$12 million per annum, although it may have the potential to grow by US \$3.5 billion per annum (Bennett, 2006). It is a market that appears set for steady long-term growth.

The potential world market of phyto-medicines or herbal medicines is very large although its significance to the global economy can only be inferred from a few sources

of diverse and inadequate data. The World Health Organization (WHO) estimated in the late 80's for instance, that the world trade in medicinal plants amounted to US \$500 million a year (Lambert et al., 1997).

However, information from diverse sources suggests that the overall trade in herbal medicines has since then greatly increased. It is primarily in tropical regions of the earth, within which a large section of Africa lies, where ethno-botanical investigations are yielding the richest harvest with potential for high economic returns (Ayensu, 1978). WWF (1993) estimates that the turnover of pharmaceutical trade in Western Europe in 1989 was US \$65 million compared to US \$2.2 billion for plant based medicines and about 25% of all pharmaceutical drugs dispensed in the USA contain one or more substances of plant origin. A large number of these medicinal plants are found in Africa.

Many African countries are reaping benefits from the production and sale of plant extracts in both domestic and international markets. For example, about 11 companies are known to export *Harpagophytum* sp. from Namibia and its harvest has become an important source of revenue for local communities with retail levels in western markets being as high as US \$180/kg (Marshall, 1998).





South Africa exports approximately 700 tons of *Aloe fer-ox* per year to Europe, Asia and North America, with the main importing countries being Germany and U.S.A. It is estimated that in 1992 alone, South Africa made US \$1 million from the sales of a wild species of *Aloe* and over 200 people are employed as aloe tapers (IUCN, 1993). The overall size of the national market for medicinal plants is believed to be considerable, with an estimated trade value of at least US \$128 million per annum in 1995. This has promoted additional economic activity and made an important contribution to job creation, with several hundred thousand people directly employed in the industry (Mander et al., 1996)

Most of these products are developed and/or marketed through nature based enterprises. These commercial ventures, seek to supply niche markets with value added natural products in order to bring greater benefits to communities that manage and use valuable common-pool natural resources. The market for natural products is growing fast in most countries in Europe, North America, Japan and Australia, as well as in some developing countries. The market options for increased exports from source countries to these niche markets offer great opportunities for the emergence and development of viable nature based enterprises in the natural products and resources sector.

Since community-based natural products are subject to depletion as a result of overuse, their sustainable utilization is therefore important for securing livelihoods. To

be sustainable, nature based enterprises must balance environmental, social and economic needs. In addition, certification systems for sustainable wild harvesting, domestication and cultivation may enable greater access to premium markets.

### Characteristics of nature based enterprises:

- They use renewable natural resources.
- Raw materials are often found in remote locations, hence transport could be a challenge.
- Raw materials may be seasonal and available in small quantities.
- Cultivation activities depend first and foremost on access to land.
- There is need to maintain consistent quality and quantity of products.
- Competition from illegal activities affects pricing and distribution.
- Marketing strategies, product quality enhancement and sustainability of production are important prerequisites for successful nature based enterprises.





# Key sources of nature based enterprises



Above: Gum Arabic

## Plants

Plants are the major source of raw materials for essential oils and resinoids used in the perfumery, pharmaceutical, cosmetics and flavour industries. Wild plants often provide the only source of medicines that are cheaply and readily available to many rural people. However, local knowledge on precise methods of preparation and dosages is needed, and the guidance of an authentic herbal practitioner should always be sought before using wild plants medicinally. This is important because the side effects and active compounds for most of them have still not been precisely determined.

Indigenous plants materials can be used in establishing smallscale industries based on medicinal or essential oils. The aromatic products industry is heavily dependent



Images of papyrus and some of its products

on natural essential oils, a few of which can be found in indigenous plants such as the African citronella (*Cymbopogon* species), grasses that grow wild in several areas of the Rift Valley in Kenya. Camphor basil (*Ocimum kilimandscharicum*) is another common wild plant whose leaves are a good source of camphor oil. Cedar wood (*Juniperus procera*) also produces an essential oil.

*Acacia senegal*, a common drylands tree is the source of gum arabic, a high earning product on the international market. Gum arabic, the dry sap tapped from the debarked tree branches, is used extensively as an emulsifier or stabilizer in food, beverage and pharmaceutical

products, printers' ink, paint, papers and textiles. Sudan dominates the world market, producing about 80% of the world's supply and controls 60 % of the global market. The US imports about 25% of Sudan's gum arabic. In 2010, Sudan exported 34,800 tonnes of gum arabic, while Kenya exports only 150 tonnes annually. Other countries in the gum trade are Nigeria, Cameroon, Mali and Chad.

Another group of plants, *Commiphora* species are a source of myrrh, a mixture of gums used in flavours for wines, beverages, confectionery and soups. *Melia volkensii* is a source of insecticides. There are many other plant species that are used as traditional sources of natural dyes, medicines and a wide range of other products.

Wild vegetation also provides fibre, which is used widely in making ropes, twine, thread, baskets and bedding support. Papyrus (*Cyperus papyrus*) which is found in the wetlands is used

to make baskets, mats and thatching. Papyrus can be compacted to form hard charcoal briquettes, and is also use to make cardboard and paper.

## Medicinal plants

### Medicinal nature based enterprises:

#### **The case of Muliru farmers conservation group**

Kakamega Forest is the last surviving rainforest in Kenya. Located in the country's Western Province, it is home to a unique variety of ecosystems and diversity of flora



Above: *Ocimum kilimandscharicum*

Above: Muliru Farmers

and fauna. One species endemic to Kakamega Forest is *Ocimum kilimandscharicum*, a medicinal herb of the mint family, known locally as 'mwonyi'. This indigenous medicinal plant has been used traditionally by several communities in eastern Africa for the treatment of colds, flu and coughs, sore eyes, diarrhoea, abdominal pains and measles. *Ocimum kilimandscharicum* leaves contain essential aromatic oils. The leaves are added to boiling water to release an aroma which was useful in the treatment of respiratory problems and ailments when inhaled by the patient. The local population also use the plant as a mosquito repellent, a source of nectar for bees in apiculture, as a flavouring agent, and protection of stored grains from pests and insect infestation.

The Muliru Farmers Conservation Group was formed in 1997 with a vision of sustainably cultivating *Ocimum kilimandscharicum* and other *Ocimum* species (*O. ukambarensis* and *O. suave*) as a means of conserving the Kakamega Forest and offering forest-adjacent communities an alternative source of income. The initiative combines traditional knowledge with modern science and technology, and brings together a diverse partnership of rural farmers, research institutes and the private sector to harness the commercial value of this medicinal plant. The group works with local farmers to develop purified extracts of essential oil from the leaves of *Ocimum kilimandscharicum*, which are developed into products under the brand Naturub®. The brand has been formally registered as a medicine in Kenya and is marketed as a balm and an ointment that treats flu, colds, chest congestions, aches and pains, insect bites, and muscular pains.

The International Centre of Insect Physiology and Ecology,

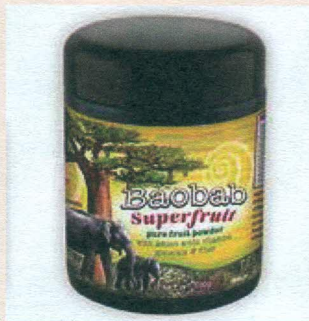
(ICIPE) and partners introduced on-farm cultivation of medicinal plants such as *Ocimum kilimandscharicum* so that their wild stocks could be conserved. The plants take about six months to grow and once established, thrive as perennials and can be harvested three times a year for more than five years. With assistance from ICIPE and its partners, and funding from the UNDP/GEF-Small Grants Programme, the Ford Foundation, the Swiss-based Bio-vision Foundation and MacArthur Foundation, the farmers have been able to put up a hydrodistillation facility in their village. Leaves from the herb generate three times the income that farmers previously obtained from maize cultivation. The group members have also mastered the technology of extracting essential oil from the leaves of the plant. Importantly, the group has acquired the necessary enterprise development capacity to contract other farmers adjacent to Kakamega Forest and to manufacture Naturub® range of products and make them available in leading outlets across the country. The farmers are now running a commercially viable, profit-making venture, without causing any harm to the forest.

This highly successful forest conservation project has been recognised globally. In September 2010, during the United Nations General Assembly and MDG Review Summit held in New York, the Muliru Farmers Conservation Group was presented the prestigious Equator Prize. The Equator Prize is awarded by the Equator Initiative, a partnership that brings together the United Nations, governments, civil society, businesses and grassroots organisations to build the capacity and raise the profile of local efforts to reduce poverty through the conservation and sustainable use of biodiversity. The group was one of 25 winners selected from nearly 300 nominations from 66 different countries in Africa, Asia and the Pacific, Latin America and the Caribbean.

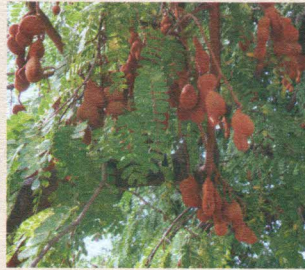


## Wild fruits

A number of wild fruits are very nutritious, and have great economic potential, if they can be promoted and utilized as a way of diversifying the food base. *Tamarindus indica* (Tamarind) and *Adansonia digitata* (baobab) are both hardy trees of the drylands that produce edible leaves and fruits that can be used in making drinks, jams and confectionaries. The powdery pulp of *Adansonia digitata* is especially useful as its powdery pulp has a very high protein content (2.5 g) and can be used for compositing other flour-based foods especially cassava. Studies show that it is also very rich in vitamin C (360 mg), phosphorous (1330 mg) and calcium (530 mg). These figures are much higher than for any introduced species in the Kenyan drylands. Products from these two indigenous fruit trees have local, national and international markets. There are many other such indigenous fruit tree species that individuals and communities are using to process, add value and market products for sustainable livelihoods.



Baobab products



Tamarind tree fruits



Tamarind tree products

also a multi-billion pharmaceutical industry internationally. The sap and leaves are used locally to cure various ailments including malaria, fungal and bacterial diseases. Sustainable utilization of aloe resources can help empower communities to create wealth for sustainable livelihoods and contribute to biodiversity conservation. Trade in aloe products can be based on harvesting of both wild and cultivated plants. The international market for aloes has grown considerably in recent years as demand for their products increases.

There are four main products commercially exploited from aloes: aloe gel, bitter gum, dye and live plant ornamentals. The sap of certain aloes has medicinal or cosmetic applications. The main source of aloe gel is *Aloe vera*, which is cultivated as a commercial crop in many countries and is used extensively in the pharmaceutical and cosmetic industries.

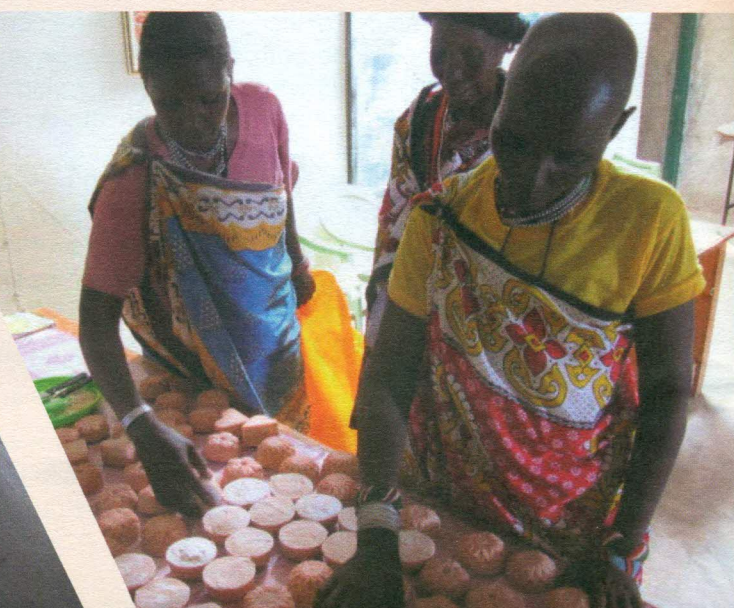
Aloes are well adapted to drylands, they are useful in rangeland rehabilitation, and also provide forage for bees and live fencing. Aloe cultivation can support honey production for income generation. Aloes can be planted alongside other plants or intercropped with other crops such as beans and require little upkeep. The challenges facing aloe utilization programmes in general include inadequate technological development, institutional capacities, value addition, conservation and market access.

Before embarking on commercial aloe production, it's advisable to: a) advise farmers on the varieties best suited for their areas; b) educate farmers on production methods; c) obtain expertise in product development and quality assurance and d) establish marketing channels.

Images of *Aloe vera* products



Images of Nabulu Aloe Project





## Aloe products development: The case of Nabulu Women Group

A good example of community nature based enterprise using Aloe products is Nabulu Women Group in Laikipia. The Maasai are pastoralists, thus the main resource for living are the cattle that traditionally belong to men. In time of drought, husbands move from one place to another in order to find pastures for their cattle. When this happens, they leave behind women with children who have to cater for their basic needs by themselves. This implies that women have to find ways to provide food for the family, school fees for the children, and medical care, among others. Laikipia East is a semi-arid area where production of charcoal is the only source of women's livelihood. However, women have realized that the cutting of trees has brought very negative impact on the environment such as lack of rain and an increased erosion of the soil with consequent loss of land. Almost every year they face starvation due to drought. This situation pushed the women in 2008 to create an alternative source of income. This is how Nabulu Women Group was born and the project of plantation of *Aloe* began. Nabulu Women Group (that in Maasai language means "to grow") is located in Kimakandora, Laikipia East Constituency in Kenya. The group is composed of 20 Maasai women between 25 and 39 years. The women meet twice a week to learn (to read, write and speak) Kiswahili, thus having the opportunity to be educated, allowing them to grow as a group and as individuals, gaining strength and courage to express themselves without fear and create a sustainable livelihood for themselves. During this time, they come together to make natural *Aloe* products such as soaps, creams, body lotion, shower gel and shampoo. The sale of *Aloe* products helps the Nabulu Women Group members to stay together with their families, to have access to a balanced diet (eating at least once a day), to gain access to health care, receive education and improve their shelters.

## Bamboo

Bamboo, a member of the grass family, is a natural and renewable resource that grows rapidly and is easy to maintain. It is the strongest and fastest growing woody plant on earth and could easily substitute all known wood applications without having to cut down entire bamboo plantations. Bamboo continuously grows after harvest without having to re-plant it. Bamboo also converts about 35% more CO<sub>2</sub> into oxygen than a regular tree.

China and India are the leading bamboo producing countries. Owing to its immense value as a source of food and beverages, source of clean carbon, and commercial products such as furniture and paper, the tree has an estimated global trade worth of US \$2 billion per year, with Asian countries leading in bamboo trade.

Bamboo controls soil erosion due to its intertwined roots that hold the soil firmly and can be used to rehabilitate infertile land. The tree is resistant to diseases and needs no fertilizers to grow well. It only needs weeding, and has a lifespan of 50-70 years. The leaves can also be used as fodder for animals. The more the culm of a bamboo tree is cut, the more it shoots. Bamboo shoots have a high nutritional value and are a delicacy in Chinese cuisines. They can be harvested after six months and their sap is used to make local wines.

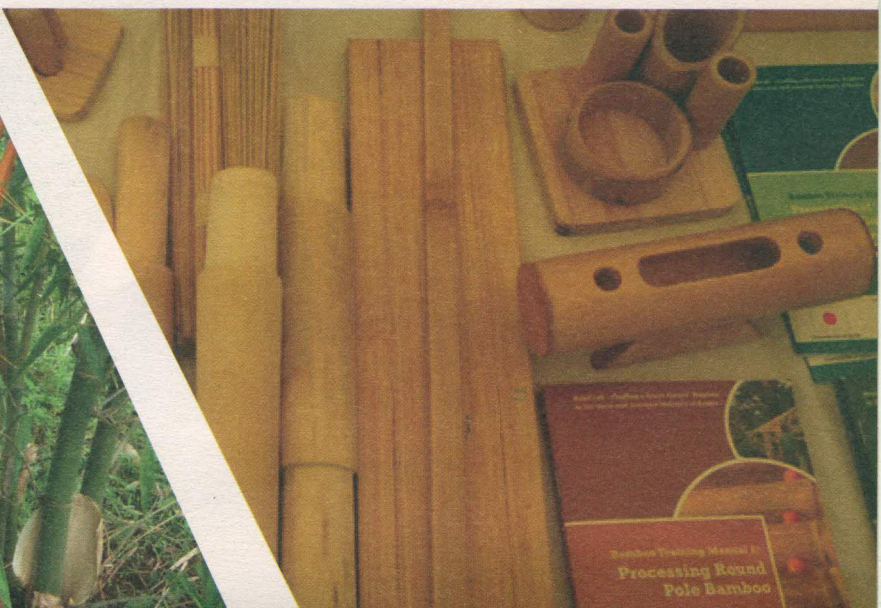
The seedlings take between one and two years before they are ready to be planted and a bamboo tree takes about three to four years to mature. An acre of land takes about 244 bamboo seedlings and these could earn a farmer about US \$115,000 per year.

Bamboo's use as a timber substitute can help reduce pressure on forests and contribute to forest conservation. Bamboo is a material that carpenters and builders find easy to cut without sophisticated tools or equipment. It provides a low cost solution for making a wide range

Bamboo



Images of bamboo products





of products, including furniture and houses. Bamboo's circular form and hollow sections make it a light building material which is easy to handle, transport and store. Bamboo structures are highly resilient to mechanical stress.

Bamboo can be cut and laminated into sheets and planks to give engineered bamboo boards. This process involves cutting stalks into thin strips, panning them flat, boiling and drying the strips. They are then glued, pressed and finished. Products made from bamboo laminates include floor boards, cabinets, furniture and home decorations. Bamboo meant for use in construction should be treated to resist insects and pests.

### Bamboo enterprises

Bamboo is an important foundation and basis of nature based enterprises, in addition to its multiplicity of environmental benefits. It is a fast growing, renewable and widespread environment enhancing resource. The benefits of bamboo in rehabilitation of degraded forest lands, reforestation, biomass generation, carbon sequestration, erosion prevention and river basin protection are well documented. Bamboo is unique in terms of its potential contribution to sustainable development, but the increasing opportunities to use it to improve poor people's incomes and at the same time conserve their environments are still largely untapped in many countries. Bamboo industry can give an important contribution in providing income generation, renewable resources and housing.

The economic potential of bamboo is exemplified by the Kenya Bamboo Centre, which aims at promoting and increasing the use of bamboo as an environmental friendly material, renewable source of energy, and contributing factor to reducing deforestation and mitigating climate change whilst improving the living conditions of vulnerable people. It offers excellent opportunities for environmental sustainability combined with poverty reduction and can be considered as a bridge between climate change mitigation and poverty alleviation.

Bamboos provide significant climate services and en-

hance rural and urban livelihoods through a myriad of attractive products. Even in the absence of carbon payments, bamboo plantations can be profitable. Bamboo industry has produced striking results, significantly reducing poverty, boosting employment and regional development. Bamboo provides raw material for about 1500 known commercial products. These range from handicrafts, such as woven baskets, to high value industrial goods such as pulp, paper and textiles, bio-fuels, charcoal, housing, panels, flooring and furniture. It's culms (poles) are the strongest and lightest natural material known. Its tensile strength makes it a good construction material. The Kenya Bamboo Center deals with the propagation of various species of bamboo, production and marketing of high quality products while offering training services to individual, organizations and communities covering all the aspects of bamboo. Currently, KBC makes the following products: furniture items including chairs, sofas, beds, book shelves, tables and blinders; bamboo crafts such as candle holders, pen holders, flower pots, phone holders, hammocks, trays, cooking sticks and weaving products including table mats and baskets.

Another case study is the use of bamboo in construction of low-cost houses for the rural communities. The project, "Tobacco to Bamboo", is pioneering the construction of cheap bamboo houses in the Kisumu and Kakamega areas of Western Kenya. The project was launched by Maseno University's School of Environment and Earth Studies in 2006. It began as a research activity to encourage the cultivation and utilization of bamboo as an alternative livelihood to tobacco farming in South Nyanza and Western Kenya and later set up nurseries in Migori, Kuria, Homa Bay and Suba districts. Maseno University launched housing projects within the campus and town and trained 15 youths in bamboo housing and another 240 small-scale farmers in bamboo plantation establishment, setting up 240 field experimentation sites. The aim is to train 20,000 farmers to exploit bamboo as a source of income and sustainable livelihoods in the next 15 years instead of growing tobacco in the region and Kenya.





# Tree nurseries

Forestry as a sector plays a vital role in the socio-economic and rural development of a country, apart from its role in maintaining ecological stability. Forests are a traditional source of a multitude of products particularly fuelwood, fodder, smallscale non-timber products and constructional timber and have sustained large masses of populations. Forests generate employment especially in rural areas, thereby contributing to rural incomes and poverty alleviation. There is a direct relationship between environmental degradation and poverty. The need to create income generating activities in the rural areas in order to alleviate poverty is urgent. Commercial tree planting on a small scale is one way of assisting communities to generate additional incomes in the rural areas. For example, the demand for poles, charcoal and logs is rising and a ready market exists for these products.

In order to increase opportunities for entrepreneurship and employment in forestry while avoiding deforestation and forest degradation, it is necessary to support the development of sustainable small and medium sized forest enterprises. This should include promoting the participation of small scale forest producers in market oriented activities in agro-forestry, tree growing, small scale wood processing and the provision of ecosystem services and increasing opportunities for green jobs. These forestry-based business ventures need to be supported by a continuous supply of seedlings. The establishment of tree nurseries is therefore a potential nature based enterprise for supplying seedlings and also as a source of livelihoods.

There are numerous examples of women and youth groups, community based organizations and even large scale commercial enterprises that have established tree nurseries as a source of income and diversification of revenue streams. One illustrative example is the Kimathi

Horticultural Tree Nurseries Group in Central Kenya, which was started in 2009 with funding from the Kazi Kwa Vijana (KKV) program. The program presented the local youth with an excellent opportunity to earn additional income. The group saw the lack of adequate seedlings in the local Kenya Forestry Services (KFS) tree nurseries as an opportunity to earn extra income, firstly from the growing of seedlings for sale to the KFS, and secondly by providing the labour for planting and maintenance of tree seedlings. They first started small scale tree nurseries in the members' homes for the initial six months and later decided, for easy management, to have one central tree nursery as well. The group rented a piece of land from a local farmer, at a cost of US \$235 for three years and entered into a written agreement that was witnessed by the local Chief. To date, the group has a total of about 41,950 indigenous and 22,000 exotic tree seedlings in its central nursery and members' individual nurseries, with a net value of about US \$14,118. The youth have been engaged in the raising of tree seedlings, tree planting and pruning in forest plantations. They have planted some 45,000 assorted tree seedlings in the local forest area. The trees planted include *Croton megalocarpus*, *Prunus*

*africana*, *Olea africana* and bamboo among others. About 80% of the trees have survived the poor weather conditions and the group looks forward to the Kenya Forestry Services to engage it in the first weeding for the trees. In many cases, profits were reinvested in productive activities such as beekeeping, poultry farming and rabbit rearing. The Kimathi Horticultural Tree Nurseries Group is a revealing example of empowering the youth through forestry, particularly income generation from tree nurseries. The Group has created employment opportunities for the youth while involving them in forest conservation activities and raising their awareness of environmental conservation issues (ILO & OECD, 2011).





# Commercial insects



Insects are a critical natural resource of every ecosystem and the basis of two important income earners, honey and wild silk. Insects make a large proportion of dryland fauna but their commercial role in providing dryland ecosystem services, aesthetics, honey production, silk farming, pollination and ecotourism is not fully exploited. Commercial insects enterprises can provide income generation alternatives to extraction of forest products such as timber, poles and fuelwood. They are particularly suitable for use in buffer zones around protected forests and in harsh agro-ecosystems where food production is marginal and the risk of crop failure is high. The raising of bees and silkworms through apiculture and sericulture technologies can help small scale landholders to improve their economic well being through self-reliance. These agricultural practices conserve natural resources, thus contributing to the conservation and protection of the environment.



*Images of the honey production technologies*

There are three important groups of commercial insects that can be raised through the practice of apiculture (bee keeping), sericulture (silkworm farming) and conservation with economic incentives. These are;

- Honey bees and stingless bees
- Mulberry and wild silk moths
- Butterflies

In addition to supporting conservation of the ecosystem, these species are commercially valued as pollinators of forest, horticultural and agricultural crops, and for their marketable products. Bee products include honey, propolis, royal jelly, wax, pollen and bee venom, while silk fibres and moth pigment dyes are obtained from moths.

The main bottlenecks in modernising apiculture and advancing sericulture in African countries are the lack of training and infrastructure. To help countries overcome these hurdles, the International Centre of Insect Physiology and Ecology (ICIPE) has developed a practical guide to give hands-on information to farmers on modern technologies of sericulture and apiculture for income generation and maintainance of the natural ecosystem.

In apiculture, improved technologies have been developed for raising bees, as well as various techniques to improve the yield of valuable hive products. In sericulture, strategies to successfully rear silkworms on mulberry plants are provided. In the practice of wild sericulture, practical information is given on how to raise silkworms in the wild. Detailed information on the harvesting of silk cocoons for making silk cloth is also provided.

## Bees and their products

Bees, as pollinators contribute immensely to agricultural production and plant reproduction. Over 60% of plants and 30% of food crops, especially vegetables and fruits, require pollinators for reproduction. The practice of apiculture does not only generate income, but also improves nutrition and leads to increased crop yield through enhanced pollination. The most common bee products are honey, beeswax and propolis.

Nearly 40-50 % of all beeswax is used in the cosmetics industry, pharmaceuticals use 25-30% and the remainder





Images of bee products

is used in the manufacture of candles, polish, etc. Africa and Latin America are the largest producers of beeswax.

Propolis is used for improving human health and vitality. It is sold as capsules, tablets or granules, which can be swallowed or chewed in throat pastilles, and in chewing gum for throat infections and asthma. It is also used in cosmetics and healing creams. Pollen has antibiotic properties and contains lipids (fats), ash, organic acids, free amino acids, terpenes, enzymes, vitamins, nucleosides, flavonoids and growth regulators.

Honey is the most important and popular bee products. It is five times more expensive than oil and demand for this natural product is increasing not only in Africa but globally as well. Priced at between \$6-\$9 (Ksh500-Ksh800) per kg, one kilo of honey in Kenya costs five times the price of petrol (\$1.20 or Ksh105). And in the Arab market, a jar of honey can fetch almost double this amount (\$15-\$20). A study by Global Industry Analysts Inc predicts that honey production globally will reach 1.9m tonnes by 2015. Kenya's export statistics between 2008 and 2010 support this trend with volumes more than doubling from 7,935 kgs to 18,871 kgs over the period. Ethiopia is the largest producer of honey in Africa, and according to USAID, produces approximately 45,300t annually. Tanzania is the second largest (8,000t annually) according to the Grassroots Business Fund and Kenya ranks third in the region, followed by Uganda and then Rwanda, with just 4,000t a year. "African honey has a unique flavour profile, which makes it comparable to some of the premium honey in the markets," said Alexei Bezborodov from Honey Care Africa. The local honey suppliers have stated that the high levels of local demand for honey have prevented them from venturing into the export market. Demand for honey in Kenya is so high that the country is unable to satisfy itself and is forced to import from neighbouring Tanzania. According to the latest statistics from the United Nations Commodity Trade Statistics Database, Kenya imported honey worth \$228,604 from markets such

as Egypt, Australia and Tanzania (Jiwaji, 2014). Apiculture therefore provides immense opportunities for nature-based enterprises for job creation, sustainable livelihoods and poverty alleviation.

## Silkworms

The agricultural and climatic conditions in many regions of Africa are favourable for silkworm farming, or sericulture. Sericulture is an agro-based cottage industry based on the use of silkworms and mulberry plants to produce high quality silk. Being labour-intensive, sericulture could provide gainful employment to a large number of people. It can be practised under varying agro-climatic conditions with minimum investment and skills. The gestation period to yield is short and many crops can be harvested yearly. Mulberry, a plant used for rearing of silk worms, is drought resistant and an ideal crop for drylands. It is also a good livestock feed. An acre of mulberry could provide full time employment for four people. The steps in sericulture include silkworm egg-rearing, cocoon production, fibre processing, reeling, spinning, dyeing, warping, weaving, finishing and printing. The end product is a high quality textile that can be marketed locally and exported for income generation. Markets for both raw and processed silk exist in East and West Africa, and world demand is increasing, while production in the major silk producing countries is gradually decreasing for reasons such as industrialization, reduced land availability for agriculture and high cost of labour.

ICIPE has screened various cultivars of mulberry that suit local conditions and developed silkworm races which are suited to many semi-arid areas throughout East Africa. A technology package for small scale silkworm rearing is available, including disease control measures. ICIPE also has a post harvest facility at its Nairobi-based headquarters for testing the strength of raw silk and demonstrating the techniques of unreeling the cocoons and processing the filaments to the weaving stage.



## Wild silk moth farming

Wild silk moth farming can supplement subsistence farming, while helping to conserve forests biodiversity. Over 60 wild silk moth species exist in East Africa, presenting a high potential that has not been fully exploited. Wild silk moth farming requires minimal expenses compared with other agricultural enterprises.

Mwingi District, in eastern Kenya, is an arid area, but a local community there is successfully producing silk and honey for income generation and environmental conservation. ICIPE introduced to the community alternative sources of income generation through the development of silkmoth and honey-bee technologies.

Members of the Mwingi Honey and Silk Marketplaces farm silk worms, practice beekeeping and are responsible for management and conservation of the acacia forest. With more bees and enhanced pollination, agricultural production has also improved. At the same time, the causes of ecosystem degradation have been addressed through vital information provided by the project, which has influenced policies that link integrated biodiversity conservation with economic development. New forest and environmental policies and legislation in Kenya now promote local community conservation of natural forest cover through participatory management processes.



## Butterflies

Butterflies (Order: Lepidoptera) are brightly colored flying insects with two pairs of large, conspicuous, fluttering flight wings that vary in color and pattern from species to species. They are mainly day-flying insects with the life cycle consisting of four parts: egg, larva, pupa and adult. Some butterflies have evolved symbiotic and parasitic relationships with social insects such as ants. Some species are pests because in their larval stages they can damage domestic crops or trees. However, some species are agents of pollination of some plants, and caterpillars of a few butterflies (e.g., Harvesters) eat harmful insects.

Butterflies are found worldwide and many species migrate to avoid adverse conditions. Most migrate relatively short distances, but monarchs and several other species migrate thousands of miles. There are about 870 species of butterflies in Kenya, 34 of which are endemic. Arabuko-Sokoke Forest Reserve is a 420 km<sup>2</sup> coastal forest in Kenya and is the largest and most intact coastal forest in East Africa. It also has 30% of Kenyan butterfly species.

The greatest threats to butterflies are habitat change and loss due to residential, commercial and agricultural development. Climate change is also threatening butterfly species.

Some communities in Kenya have initiated butterflies conservation efforts with commercial incentives, using international market outlets. One such initiative is Kipepeo (Swahili for butterfly), which is a community based enterprise that supports the livelihoods of people living around Arabuko Sokoke forest in coastal Kenya. This provides an incentive for their participation in the conservation of a forest with high biodiversity and endemism. Kipepeo seeks to demonstrate the tangible link between conservation and sustainable livelihoods.

Kipepeo currently sells butterfly and moth pupae and other live insects as well as honey and silk cloth produced by the community. The pupae are exported and the live insects hatched and displayed in insect parks globally. As the market place for nature based products from the Arabuko Sokoke forest, Kipepeo coordinates production and sales and ensures thorough training and monitoring so that the insects are bred and raised on-farm in a sustainable manner from wild parent stock. The purchase of Kipepeo products contributes directly to the conservation of critical natural heritage for future generations.

The Kipepeo Market Place is located at the Gede Ruins National Monument, 20 kilometres south of the resort town of Malindi and near the world famous Watamu beach. In 1993, at the start of Kipepeo, the community annual per capita income was about US \$40. Through the Kipepeo supported livelihoods, most of the group members have doubled this per capita with the earnings going over US \$1,000 per year depending on their individual efforts. Kipepeo sells high quality butterfly and moth pupae of a wide range of attractive species from Arabuko Sokoke. Some Kipepeo butterflies (*Papilio ophidicephalus*, *P. phorcas*) are also reared in other high biodiversity forests in the coast region such as the Shimba and Taita Hills. Producer Associations of mainly butterfly farmers and beekeepers participate in the management of nature based enterprises at Kipepeo through the Market Place Committee that acts as its Board. The groups are also actively involved in forest protection, advocacy and awareness creation of the benefits of the nature based enterprises.



# Ecotourism

The International Ecotourism Society (TIES, 1990) defines ecotourism as "responsible travel to natural areas that conserve the environment and improve the well-being of local people." Therefore, ecotourism activities can take an unlimited number of forms, provided that they support both local people and wildlife. Both organizations and businesses exist to promote ecotourism, selling packages and providing information to aid the ecotourist in enjoying travel responsibly.

## Principles of ecotourism

Ecotourism is about uniting conservation, communities, and sustainable travel. This means that those who implement and participate in ecotourism activities should follow the following ecotourism principles:

- Take mitigation measures against any possible negative impact
- Build environmental and cultural awareness and respect
- Provide positive experiences for both visitors and hosts
- Provide direct financial benefits for conservation
- Provide financial benefits and empowerment for the local people
- Be sensitive to the host countries' political, environmental and social climate

Ecotourism, characterized by responsible travel to natural areas that promote conservation of the environment, is one of the fastest growing segments of tourism worldwide, and is growing at a pace of more than 20 per cent annually - two to three times faster than the tourism in-

dustry overall. Ecotourism can provide local communities with motivation to maintain and protect forests and wildlife. When local people get income and employment from ecotourism, they are far less likely to destroy the natural resources through unsustainable exploitation due to a better sense of collective responsibility, ownership and environmental stewardship

## Features of ecotourism

Ecotourism involves traveling responsibly by conserving resources; supporting small, community or family-run businesses at the destination; and leaving little or no trace of your presence.

## Functions of ecotourism

Ecotourism commonly incorporates efforts to support research, raise funds or create awareness of environmental causes in a specific region.

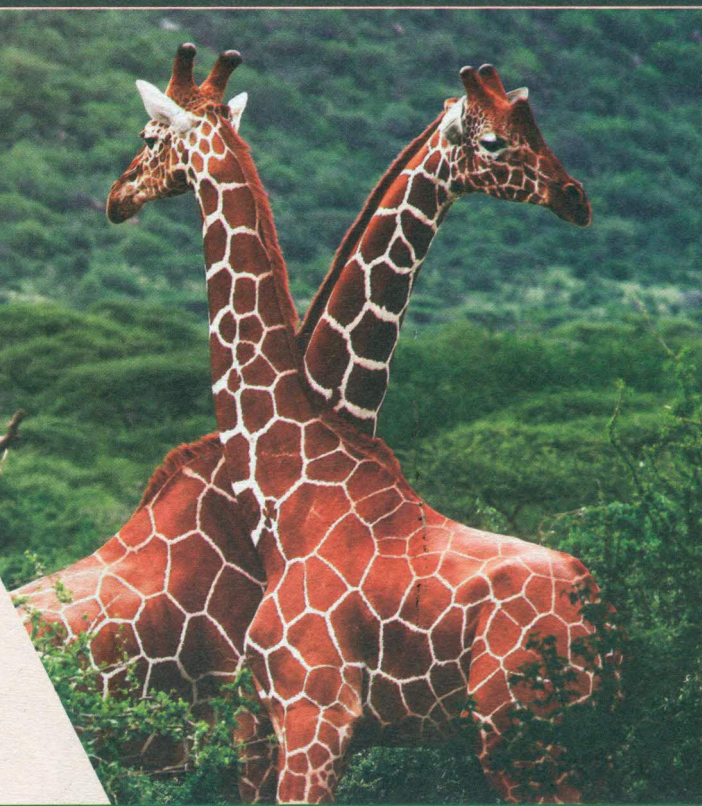
## Considerations in ecotourism

Ecotourism brings more people, and thus more traffic and consumption, to previously remote and isolated areas. No matter how hard a traveller may try to minimize his impact, it's impossible not to have some effect on the environment and culture.

## Benefits of ecotourism

### Local benefits

Economic benefits from tourist visits help local popula-





tions to see value in conserving and protecting natural resources.

### **Traveller benefits**

Travel to natural destinations increases the environmental awareness of the traveller, creating a bond that may result in financial and legislative support of preservation and conservation efforts.

### **Environmental risks of ecotourism**

While striving to minimize impact, ecotourism often takes visitors to pristine areas, sometimes fragile environments that have evolved with little human activity, which increases their environmental risks.

### **Green washing**

A negative impact of ecotourism is the practice of green washing, where some enterprises take advantage of its economic value and label their practices, products and services as environmentally-friendly when they are not. It's wise to research an ecotourism group's claims and its ethics and business practices.

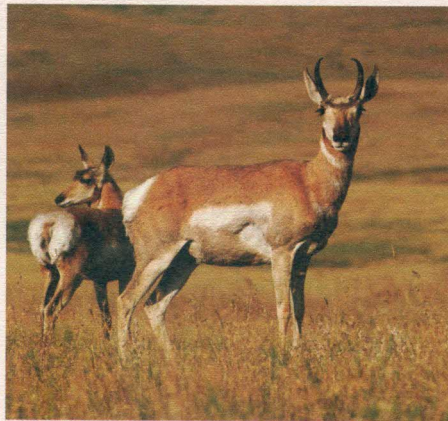
### **Air travel**

The Global Development Research Center estimates that tourism accounts for 60 per cent of air travel, a major contributor to greenhouse gas emissions.

## **Examples of ecotourism in Kenya**

### **Mt. Longonot Adventures**

Mt. Longonot Adventures is a youth community based enterprise, which offers unique guided nature walks with a package that includes porting luggage, camping inside or at the base of Mt. Longonot National Park, bird watching, rock climbing on the walls of Mt. Longonot crater and outside catering services. In addition to tour guiding within the central Rift tourist circuit, they also extend the services to other parks in the county. They arrange for the visitors' accommodation and travel needs and offer camping tents, hiking poles and cycle bike safaris for hire.



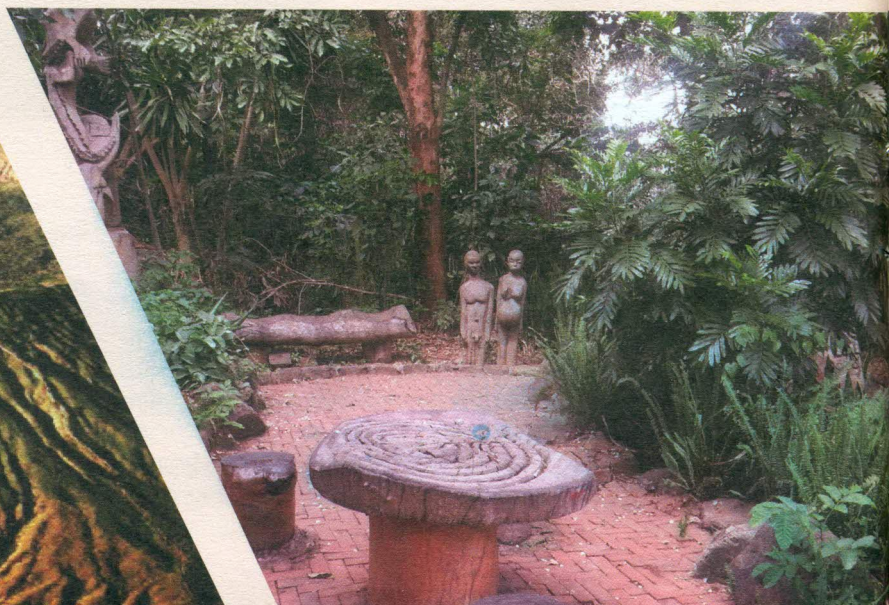
Mt. Longonot Adventures is a member of Ecotourism Kenya. The group is located in Mt. Longonot area in Mai Maahiu, Naivasha. They have specialized in organising mountain climbing in Mt. Elgon, bike riding in Longonot, Suswa and Hellsgate areas, rock climbing, nature walks, Presidential Award hikes, game drives and bird watching, game

viewing and camping.

*Mt. Longonot*



*Images of ecotourism and cultural preservation*





## Achievements

- All the group youth group members are able to earn a decent living from the business.
- Through the revenues generated, the group has assisted in paying high school fees for the less fortunate students from within the community.
- The group has been actively involved in environmental rehabilitation projects in the area.
- The group has participated in business marketing exhibitions, hence able to promote their enterprise.

## Arabuko-Sokoke Forest

The Arabuko Sokoke Forest and Mida Creek on the north coast of Kenya are two adjacent habitats that form an important ecosystem with unique bird biodiversity. Birdlife International has ranked Arabuko Sokoke as one of the most important forests for the conservation of threatened birds on mainland Africa. Together, Arabuko Sokoke and Mida Creek form part of a UNESCO Biosphere Reserve. Threats to these habitats include illegal logging, poaching and land clearing. Negative attitudes sometimes existed among local communities towards the forest owing to the heavy destruction of farm crops by elephants and baboons from the forest.

But a project that involves the local communities in economic activities and environmental education has now shown positive attitude change. Implemented by A Rocha Kenya, a national NGO affiliated to A Rocha International, in collaboration with Kenya Wildlife Service and the Kenya Forest Services, Arabuko-Sokoke Schools and Ecotourism Scheme (ASSETS) is a well targeted sustain-

able development programme.

ASSETS promotes ecotourism by providing facilities which allow visitors a more in-depth experience of the sites. A tree house has been constructed near the visitor centre in the forest and a hanging mangrove walkway and bird hide is located at Mida Creek.

The project has demonstrated that equitable distribution of benefits accrued from conservation-dependent ecotourism amongst the forest communities could be one of the major driving forces for its success.

The three aspects of the programme are:

- the development of appropriate ecotourism
- building local capacity to manage the tourism ventures
- supporting an education bursary scheme for local school children.

## Botanic Gardens

Plant species threatened with extinction as well as plants of particular interest and value can be preserved for both scientific study and tourist interest in botanical gardens. Botanical gardens are more likely to succeed as a measure to conserve endangered species if they are in areas similar to the original habitats. Located at the National Museums of Kenya grounds, the Nairobi Botanic Garden is one such educational garden with thematic displays including a herb garden, grass garden, orchid house, succulent garden, quarry garden, food garden, children's garden, the cycad and the sculpture garden. Both local and international tourists normally visit botanical gardens.

Images of Botanical gardens





# Organization of nature based enterprises



The commercialization of natural products presents opportunities that can be grasped and risks avoided by developing a rules-based system, which ensures that the partnerships between producers and market players are sustainable. The act of engaging stakeholders on key strategic issues of supply and demand for natural products (market surveys), viability of raw materials production and viability of processing and marketing (economic analysis), suitability of production and processing locations (locational analysis), sets in motion sustainable processes that address on-going policy and market structure issues. Stakeholder and institutional analysis is also an important element in defining and clarifying the roles of different partners. This process of staking out interests helps to ensure mutual accountability and transparency. It serves to demystify the market and build confidence among the partners. Collaboration and joint action among producers, buyers, and other stakeholders is a practical way by which costs can be lowered and perhaps more resources made available for poverty reduction. A market cannot operate without adequate information. Leaving decisions on what is relevant performance in the hands of a single group distorts the decision-making process of the market. Thus, making sure that relevant and transparent information about input supply, extension and training, output collection and performance monitoring is provided to all will allow the market to operate more effectively.

For local communities or groups to earn more from the natural resources they manage as common-pool resources, the local, national and/or international markets must be well structured or in some cases regulated. Regulations could include minimum levels of safety, fair play and information disclosure. The principles that

should prevail include openness and feedback, shared decision-making, diversity of perspectives, social equity among members of the groups, environmental sustainability and community vitality. However, the challenge is to incorporate these principles within the market system to come up with innovative solutions.

## Nature based enterprise models

There are diverse enterprise models and 'one size fits all' rule is not applicable and the following has to be noted:

Many small producers need to create the 'critical mass' necessary for viable industrial production.

Sustainable management of resources and development of nature based enterprises is not only about inter-generational equity but it also makes good business sense.

It is feasible to achieve the highest quality natural products, harvested from the wild by rural and community level producers, under conditions of fair trade and ecological sustainability.

Nature based enterprises can be competitive in markets that demand efficient and high quality production. However, product development is a process, which sometimes requires investment and research, among other things.

For communities to participate fully in successful nature based enterprises, they need to be well informed of the challenges, and benefits obtained from sustainable use of natural products.

Awareness building and education on environmental issues are required, as is community organization for skills training in entrepreneurship, access to credit and mar-



ket-sourcing. The profitability of any enterprise is the key to its success. Therefore marketing strategies, product quality enhancement and sustainable production are important prerequisites.

## **Developing natural products value chains**

The steps to be taken in building natural products value chains include:

- Making a business plan with systems in place for quality monitoring and carrying out market research
- Inviting a commercial partner, either as a service provider, shareholder or buyer through long term equitable trading relationship.

- Developing the physical structure and acquiring equipment for processing the natural products, with value addition.

- Ensuring maintainnace of quality standards, quality control and assurance

- Developing the human resource capacity needed through technical and managerial training

- Having a fair system where all actors in the value chain from producer to marketer benefit in relation to their inputs.

- Designing and branding your product

- Packaging and marketing your product



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