

Tapping the potential of ASAL

KEFRI focuses on improving productivity of dryland tree species

A big *Prosopis juliflora* tree in Baringo District, where it is very common

Dryland forestry research aims at enhancing effective reforestation and sustainable management of forest/woodland resources in arid and semi arid lands (ASAL). It focuses on improvement of productivity of proven plantation species (e.g. *Melia volkensii*) to meet industrial demand and community needs.

Other activities of the institute's dryland programme are:

Prosopis management and utilisation

The question of what to do with *Prosopis* trees is now a serious concern in many parts of Kenya, as well as in dozens of other countries around the world, where it has invaded grazing and agricultural lands. *Prosopis spp* is an invasive species and KEFRI's research activities are directed at how to manage it as an economic resource where it occurs. Apart from the rehabilitation potential of the species in dryland ecosystems, *Prosopis* produces quality fuel wood, timber, animal feed and food for human consumption, as well as gums, honey and medicines, in very dry and harsh conditions.

In reality, *Prosopis spp* has the potential to provide the following needs of the populations living in ASAL:

- Major source of firewood, charcoal and construction wood.
- Poles and even sawn timber can be produced across the country.
- Pods are a valuable source of carbohydrates, sugars

and proteins for livestock, as well as people during dry seasons. About 50,000 tonnes of livestock feed can be realised from the species a month, with earnings of over Ksh 100 million accruing to collectors.

- Provision of shade, soil stabilisation and erosion control.



Prosopis juliflora, excellent for honey production

Currently, the government is undertaking the following research issues to address the *Prosopis* problem:

- A national inventory on status and impact of the species on livelihoods and on the environment.
- Holding workshops on integrated management and control of *Prosopis* species in affected areas.
- Soliciting technical support from donors and development partners for *Prosopis* management.
- Linking the livestock feed industry to local people to utilise *Prosopis* pods as an alternative to cereals.

Dryland forest rehabilitation

Forest degradation has become widespread over the years through human activities, land use change and unsustainable and mostly illegal exploitation.

How best then could we rehabilitate these forests to improve national forest cover within the set timeframe as contained in Vision 2030 and the millennium development goals (MDG)?



A one-year-old *Melia volkensii* plantation

KEFRI is responding to these challenges through both proactive and practical approaches. The proactive approach involves training the Kenya Forest Service field foresters and other stakeholders in rehabilitation methods. Secondly, the institute is packaging practical guidelines for rehabilitating natural forests. Practical approaches include the setting up of demonstration sites that are accessible to the public. These sites not only display the most appropriate approaches to rehabilitating natural forests, but also act as experimental plots. Models of rehabilitated forests are demonstrated by KEFRI at Kibwezi, Tiva in Kitui, Marigat, Lodwar and Bura.

Osiris (sandalwood) research and development

The East African sandalwood, scientifically known as *Osyris lanceolata* is a shrub or a small tree growing to a height of six metres. The tree is known by various local names. It is called *msandali* in Swahili, *muthithi* in Kikuyu, *mberegesa* by the Chagga, *olseyeayyesi* in Maasai and *kithawa* by the Kamba, among others. It exists dioeciously (different male and female plants) and is indigenous to East and South African regions. The tree grows at an altitude of between 900 - 2550m above sea level. *Osyris* belongs to a semi-parasitic plant family (the *Santalaceae*) and its roots associate with those of host plants.

Sandalwood is best known for producing fragrance-scented wood and essential oil used in the cosmetic and fragrance industries as well as for medicine. Other uses

include making of red dye and smoking milk containers. The bark is ground into powder that is used to heal wounds, treat stomachache, tonsils, diarrhoea, ulcers, snakebite and rashes.

The demand for sandalwood has by far outstripped the supply. Sandalwood is harvested in the wild by uprooting the whole tree including its roots because the essential oil concentration is higher in the roots than the trunk. Although the available sandalwood resource base is not yet known, much of the harvested material in Kenya is smuggled out of gazetted forests, game parks and nature reserves. This mode of exploitation seriously interferes with its natural regeneration and is not sustainable. Thus, conservation and domestication of this tree should be taken seriously.

The Kenya Forestry Research Institute (KEFRI) has embarked on research geared to domestication and cultivation of sandalwood. Success in the propagation of sandalwood has been achieved using different methods. Seed germination was found to be low and highly variable between individual trees and at times could take up to six months. Research at KEFRI has generated knowledge that will support propagation, cultivation and commercialisation of East African sandalwood.

It has been claimed that sandalwoods show different growth patterns on different host species. At KEFRI, successful host species include pigeon pea (*Cajanus cajan*), *Rhus natalensis* and *Carissa edulis*.

Domestication and commercialisation of indigenous fruit trees in drylands of Kenya

Many of the challenges to achieving millennium development goals (MDGs) in Third World countries like Kenya include food insecurity, poverty, malnutrition and environmental degradation. Because of fragile ecosystems, frequent droughts and famine and frequent crop failure in the drylands, people suffer diminished opportunities to economic growth.

Surprisingly, drylands have abundant natural resources including wild plants and cultivated native species with great agronomic and commercial potential. Many of these species, particularly the fruit trees, have neither been fully utilised nor promoted or researched and therefore their economic potential still remain greatly underutilised.

For these reasons, KEFRI research activities focus on the improvement of production, domestication and marketing of indigenous fruit trees in drylands. Some of the widely preferred indigenous fruits for commercial exploitation include *Sclerocarya birrea* (marula), *Tamarindus indica* (mgwaju), *Adansonia digitata* (baobab), *Berchemia discolor* and *Vitex payos*. Most of these fruits are known to be rich in minerals and vitamin C. For example, the vitamin C content

in marula fruit is several times that found in citrus fruits. Again, nearly all the parts of *A. digitata* fruit are useful. The fruit pulp makes a refreshing drink, rich in vitamin B₁ and C. The fruit contains 310 mg of vitamin C, compared to 57 mg in commercial fruits such as citrus. The young soft leaves can be utilised as a vegetable while the bark provides fibre for weaving.

In recent years, these tree species have attracted local and international interest because of the frequent droughts and famines that have hit the country. KEFRI and its partners have embarked on a project to domesticate and commercialise these indigenous fruit tree species. In this regard, KEFRI has identified over 100 indigenous fruit species found in the drylands of Kenya. Due to the large number of species involved, research has prioritised some species for domestication. These include *Adansonia digitata*, *Tamarindus indica*, *Vitex doniana*, *Berchemia discolor*, *Lannea alata*, *Cordia sinensis*, *Boscia coriacea*, *Grewia tenax*, *Ximonia americanum*, *Ziziphus mauritiana*, *Carissa edulis*, *Sclerocarya birrea*, *Hyphaena compressa* and *Acacia tortilis*.

KEFRI is further conducting research in propagation methods on indigenous fruits. The methods include seed germination, vegetative propagation and micro-propagation. Protocol for propagating marula through tissue culture and use of *mycorrhizal fungi* to enhance growth has been developed.

In addition, KEFRI is conducting research on value addition for indigenous fruit trees. The potential for processing juice, jam and wine for some species has been identified.

Aloe plantation in Taita Taveta District



A women group in Mwingi District, trained by KEFRI scientists, processing various baobab products

Aloe species have high potential to grow and produce commercial gel in drylands. Aloe can grow and produce in less than two years. KEFRI has tested different types of aloe species and identified commercial ones for the benefit of different communities. KEFRI has identified 57 species and

subspecies of Aloe in Kenya, but 22 of these are enlisted in the 1997 red list of threatened and rare plants in the country.

A number of farmers have undertaken Aloe growing as an income venture. One such farmer is Sam Mwamunga in Tomoni, Voi, in Taita Taveta District.



A one-year-old Aloe vera plantation

Doum palm

The doum palm or gingerbread palm, *Hyphaena compressa*, is a dioecious, usually branched palm of two, four, eight or sixteen heads of fan-shaped leaves. It occurs as dense, fire resistant forests of coastal arid regions from East Africa to India. While it is propagated from seeds, which take a very long time to become established, it can also be planted from suckers originating at the base.

The vegetative parts of the doum palm, trunk and leaves, just like those of other palms, are used in weaving and construction. In addition, the young, still-not-unfolded leaves are used for weaving versatile mats. The sap obtained from tapping the apex of the palm has the usual multiple purposes, but its use is prohibited in some countries because of the alcoholic toddy.

The fruit pulp smells like gingerbread, hence the name of the palm. It is used in various ways in cooking, and varieties differ in their edibility. While the unripe kernel is edible, the ripe kernel is too hard to eat and is used only as a vegetable ivory. To the people of the deserts where doum palms are found, this palm is a life-sustaining blessing.

High quality fibre for basket making is an alternative livelihood in the drylands of Kenya. The basketry industry fills a gap during the drought and supports the poorest of the poor in the pastoralist system. A household can earn, on average, Ksh 3,000 per month from such products **M**

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