



# Pastoralist's species and ecosystems knowledge as the basis for land management

Pastoralism has been practiced in many of the world's drylands for centuries and many important dryland ecosystems are grazing-dependent. Pastoralists have a rich understanding of the environments that they manage and have developed sophisticated systems of resource management that conserve biodiversity. Pastoralist knowledge systems are crucial to the sustainable management of the drylands, and pastoralists are in the best position to ensure ecosystem integrity and to maintain biodiversity in the drylands. However, in eastern Africa there are numerous constraints that impede pastoralists from applying their knowledge, and sustainable rangelands management requires attention to certain critical policy issues:

- **Enable pastoralism by removing policy disincentives-** pastoralists already have huge incentives to sustain their environments, and ensuring that they conserve their environment does not require informing or training them, so much as removing policy disincentives and creating an enabling political and social environment for sustainable pastoralism; and
- **Recognise pastoralist knowledge-** pastoralists have detailed knowledge of their environments and sustainable rangeland management. Drylands policy needs to recognise this wealth of knowledge and capitalise on it to achieve the twin, mutually supportive goals of rangelands wealth creation and drylands conservation.

Customary institutions enable pastoral knowledge to be used effectively and have traditionally governed the sustainable use of drylands environments for millennia. Common lands are not a free-for-all and most pastoral lands have traditionally been communally or privately managed, except where a management vacuum has been created. Wherever new institutional arrangements emerge, they should accommodate traditional knowledge and should not assume that pastoral resources are unmanaged.

## Understanding drylands ecosystems

In drier parts of pastoral Africa, grazing systems are characterised by their complexity, high variability and uncertainty. Under such circumstances, management systems must have the capacity to respond quickly and intelligently to unforeseeable challenges and opportunities, despite the fact that it might never be cost effective to fully understand why things happen in precisely the way they do. This is management in the sense of adaptive coping, rather than optimization and control<sup>1</sup>.

For most pastoral communities food security is synonymous with fodder security. Fodder security strategies include seasonal movement, use of tree leaves and pods during dry seasons, lopping branches to improve access to browse, burning of old pasture and feeding of crop residues. Pastoralists have long relied on an array of rangeland plants for food and for medicines and they have developed a deep knowledge through their long and intimate association with their environment.

Pastoral mobility is both flexible and selective. In much of Eastern Africa, movement is organised on the basis of mobile camps, although a growing number of communities are demonstrating a reduced degree of household mobility than in the past. When communities move they are often preceded by a number of scouts who move ahead of the herds to assess the resource availability and quality and to collect information on the grazing potentials of the area toward which the herds are moving (Box 1). In Sudan for example, herds do not graze at random, but in selected sites known to be the best available, whilst poorer sites are avoided and left to regenerate. This selectivity is intentional, both to ensure that the best pasture is available for stock and also to ensure that poorer sites are left to regenerate.

### Box 1: Pasture assessment in Ethiopia

As in many East African pastoral communities, in the Afar region of Ethiopia, scouts report back to the community on the condition of distant pastures, making an estimate of how long the fodder and water will sustain a given number of livestock. Elders usually make the final decision over how to use the resources, including the number of stock to take and the duration of grazing. To facilitate the decision making, rangeland use is classified according to livestock suitability ratings, taking into consideration the vegetation composition and the feeding preferences of domestic livestock. Grazing is timed to safeguard plants during seed production so that seed banks are not mined: a typical outcome when mobility is restricted.

### Species knowledge and use

Knowledge of the nutritive value of plants is vital for pastoral management of the rangelands. The Maasai, for example, are well aware that key perennial grass species such as *emuru* (*Cynodon dactylon*) and *orpalakai* (*Panicum maximum*) are most suitable for milk production. Amongst Kenya's Pokot, knowledge of fodder species is equally well-developed, such as fodder that promotes milk production or meat production, or provides dry or wet season fodder, and fodder for different stock species and ages.

However, pastoralists use plants for much more than livestock feed. They are used in social and cultural functions, for fencing livestock kraals, or as medicine. For construction, the Maasai use species that are strong and resistant to termite attack and decay, such as *oltarakwai* (*Juniperus procera*), *oloirien* (*Olea europaea* ssp. *africana*), *olkiloriti* (*Acacia nilotica*) and *ololiondoi* (*Olea capensis*).

For kraal fencing, the Maasai use branches of thorny acacias and *olelehua* (*Tarchonanthus camphoratus*) or, where thorny material is limited as in Ngorongoro highlands, by sticking *olelehua* and *olmisigiyoioi* (*Rhus natalensis*) into the ground.

Numerous wild fruits, seeds, tubers, barks, gums and leaves are also used by pastoralists for human consumption as food or medicine. Amongst the Afar of Ethiopia, common food plants include *garsaitu* (*Dobera glabra*), *madertu* (*Cordia sinensis*), *alaitu* (*Balanites rotundifolia*). For example in Kenya, Uganda and Tanzania, 1,280 plant species have been identified that are used for traditional medicine. Amongst Kenya's Pokot, out of 307 plant species, 61 (20%) were used for food and 118 (39%) for medicine. The Borana pastoralists of Ethiopia and Kenya use at least 100 plant species for medicinal purposes. The limited availability of modern medicines has meant that the importance of herbal remedies has continued to grow. While, the global market for traditional therapies is over US \$65 billion a year and is steadily growing, and the commercialization of these remedies, especially when they are "discovered" by outsiders, has increased pressure on the respective plants, and in some cases almost to the point of extinction.

Many rangeland trees are also vital to the pastoral economy and are actively preserved and managed sustainably by pastoralists. *Acacia tortilis* for example, one of the most important trees in the drylands, are conserved for shade and as a food source. The pods are a valuable food for livestock, and in some areas are collected and sold and may even be ground to flour for human consumption. *Acacia senegal* is an important source of fuelwood and fibre as well as gum arabic production. It is used to make well linings and tool handles, while the bark, leaves and gum have numerous medicinal properties.

### Ecosystems knowledge as the basis for land management

In-depth pastoral knowledge of complex rangeland agro-ecological dynamics is critical in detecting resource availability. This knowledge includes understanding erratic climatic patterns and familiarity with patchy range resources. Water availability is often the limiting factor in pasture utilisation, whilst wild fruits and nuts, medicinal plants, and salt-licks provide important supplemental food resources for pastoralists. Pastoralists also have a well developed local knowledge about browse and grass species most favoured by their livestock.

One of the ways that pastoralists assess the palatability of plants is to monitor animal behaviour when grazing. Animals tend to be selective on which plants to graze and browse and which ones to avoid, and will often spend more time grazing palatable plants. Palatable species therefore decrease faster than others in the annual grazing cycle, but they are often the species that are most suitable for milk production and the general health of the animals. Others plants can reduce animal health and productivity and the species are recognised by pastoralists, who try to prevent animals from heavily grazing them.

Pastoralists have elaborate systems of ecological classification, such as the *deegaan* system of Somalia, which enable them to practice deferred rotational management by moving livestock to seasonal pastures to optimise the use of crop residues, grasses and shrubs. The Somali system divides grazing habitat into four micro-categories based on plant cover and soil type: *Harqaan/gabiib* (thick bush, clay soil); *Adable/dhoobey* (thick bush, black soil); *Dooy* (open bush, red soil with good water conservation); *Bay* (open bush, mixed grey and red soil). Similarly elaborate knowledge systems exist amongst Tanzania's Barabaig, for whom grasslands or '*moheda*' are the preferred grazing area. Grasslands with trees are known as '*getaghuld*', and grasslands with shrubs, suited to goat herding, are known as '*manang'anedd*'.

<sup>1</sup> Behnke, 1994 (full ref?)

## Putting ecosystem knowledge into practice

**Defining grazing reserves** is a common practice throughout the pastoral areas of eastern Africa. Riverine areas are of particular importance and trees in these areas, such as *Acacia*, *Salvadora*, *Hyphaene*, *Cordia*, and others, are protected from indiscriminate felling. Dry season grazing areas are also protected to ensure access to pasture at times when livestock must move to perennial water sources. In Ethiopia such grazing reserves include the Awash river, Cheffa valley and Gewane Swamp in Afar, the rivers Wabi Shebelle, Genale, Dawa and the valleys of Errer, Jerer and Fafen in Ogaden, and in South Omo reserves are found at the Omo river and lake Turkana. In Borana the reserves are found around the famous traditional deep wells of Melbena, Dubluk and others.

**Controlled burning** is another traditional practice of pastoralists for managing the rangelands to reduce woody growth, to encourage germination of new grasses, and to control pests. The Barabaig for example, in a practice called *ghwardaida ng'yanyid*, light fires before the onset of the rains in November or February, with the aim of burning unpalatable dry and dead grass and other plant debris that remain. When the Maasai burn pasture, they do so in the evening when winds are gentle, so as to maintain control over the fire, and they select areas that have not been burnt that year, ensuring that wild, uncontrollable fires are less likely. Fires are set when the first rains are expected, to ensure that new grasses quickly develop. Burning destroys coarse grass that are not palatable for wild or domestic animals as well as controlling pests that decimate both wild and domestic populations.

**Forests are managed by pastoralists**, because although few pastoralists practice tree planting, few pastoralists cut trees either and throughout eastern Africa the practice of lopping branches and pollarding trees is common. Trees are actively conserved and protected because of their usefulness in the pastoral economy, for example providing fruit, shade, construction material and fuel. Strong sanctions exist to deter felling. Pollarding is practiced in North West Kenya, for example to harvest browse for livestock, and is particularly applied to trees such as *Balanites aegyptiaca* and *Dobera glabra*, for which pollarding has the advantage of also ensuring that the lower branches grow more thickly. Cutting back of trees also leads to better ground cover of perennial grass and is thus advantageous to livestock. In Beni-Amer and Hedareb pastoralist villages of Eritrea, there is a traditional management system and by-laws for conserving forests, enforced by elders (or *lijna*). A similar system of tree tenure or *Ekwar* exists in Turkana, Kenya, and is associated with ownership of *Acacia tortilis* and its pods along rivers, and is a critical dry season grazing resource.



**Range enclosures**, to protect grazing patches and promote regeneration, although promoted by research stations as a 'modern technology' for the rangelands, is also a widely known traditional pastoral resource management strategy. Territorial divisions, for example the *Madda* of the Borana or *Metaro* of the Afar, allow communities to enclose grazing areas and ensure their protection for certain uses, such as calf rearing or milking stock feeding, or for fattening breeding bulls or oxen for sale. Calf enclosures are particularly common (known as *kalo* in Borena, *deso* in Afar and *olokeri* in Maasai). A similar system is also practiced by the Sukuma agro-pastoralists, referred to as *Ngitiili*. These reserved grazing and browsing areas are found near the homestead, or in places associated with permanent water, or in some cases they may be found on livestock trekking corridors where they enable transhumance.

**Livestock selection** is routinely practiced by pastoralists throughout eastern Africa, who are accomplished livestock breeders with clear goals of optimising livestock survival whilst retaining productivity, even in periods of high climatic stress. As well as high survivability, and being suited to milk production, which is a major pastoralist objective, indigenous breeds have significantly lower production costs in extensive systems. The Karimojong of Uganda for example maintain their breeds through careful controlled breeding, castrating or selling undesirable males to remove them from the gene pool, or loaning desirable bulls to relatives and neighbours. Uganda's Bahima pastoralists name their animals so as to enable them to trace the genealogical relationships of their cattle as far back as ten generations. Such breeding skills produce animals that are well adapted to their environment and production systems, but which also produce desirable and marketable goods: Afar fat-tailed sheep, and Somali black-head sheep for example, are both highly sought after in Middle Eastern markets, yet are both well adapted to dry and hot climates.

**Herd diversity** is a critical means of managing the floristic diversity of the drylands, and pastoralists maintain diverse species in order to harness a wider range of pasture and browse species, and to optimise the herd's productivity and resilience. Diversity helps to insure against major disease outbreaks, since the different domestic species are generally not susceptible to the same pathogens. Goats and cattle are typically bred as dual purpose animals, with milk production having great significance, whereas sheep are often more marketable. In the more arid areas, the camel is also an economically important and highly adapted animal that produces both milk and meat, and provides important transportation in remote areas. In parts of Eastern Africa, such as Northern Kenya, pastoralists are rearing more camels as a response to increases in climatic uncertainty.

## Constraints to pastoral ecosystem knowledge

Pastoralists may have extensive knowledge about their environment, but they are frequently prevented from using that knowledge effectively. Constraints come from the weakening of customary institutions for decision making and resource control, and their replacement by alternative power structures that do not have a strong knowledge base about rangeland environments. Constraints are also felt when non-pastoral competitors are overtly favoured, through policy incentives and political support, and when resources are channelled into substituting and undermining pastoralism. Other obstacles to effective resource management include the loss of key natural resources, the loss of access to resources, and restrictions of mobility.

Undergrazing occurs in the drylands as well as over-grazing indeed, the two often go hand-in-hand as an outcome of restricted mobility. Un-grazed perennial grassland accumulates dead material, less nutritious grasses and woody plants. Unless such grasslands are grazed, many grasses lose vigour and die early, thereby becoming less effective competitors against woody plants. Grazing maximizes pasture production and encourages perennial grasses at the expense of woody vegetation. Sustained overgrazing reduces ground cover, plant height and forage quality. But, if it is seasonally managed with long rest periods, it is an effective pasture management system.

Much environmental degradation in pastoral areas has been brought about by development programs and externalities (for example losses of pastoralist lands to agriculture, irrigations, settlements, and as officially reserved areas), rather than by pastoralism. Degradation can be due to a natural and dynamic process caused by the use of resources by pastoralists, for example as a result of herd growth in good years as a buffer against uncertain environmental catastrophes. However, such degradation is often over-stated, based on minimal or distorted evidence, and is subject to natural checks and balances. Other degradation is caused by development interventions, such as the installation of new permanent water sources, the building of dispensaries and schools, the various forms of involuntary sedentarisation projects and the introduction of other forms of

poorly planned development programs. Some of these interventions may be desirable and necessary, but their impact on the rangelands, and particularly their impact on pastoral mobility, must be reduced to ensure sustainable development of the drylands.



## Conclusions

Pastoralists have the knowledge, skills and institutions to make them effective natural resource managers of both ecosystems and species. Research from Kenya also shows that pastoralists' attitudes towards wild game conservation are more positive than among cultivator populations. The notion that pastoralists routinely degrade their environment has long been in question, and the reality is that pastoralists can be the best custodians of drylands environments, but they need to be able to exercise their knowledge and use their management institutions.

The reality is that pastoral livestock herds are vital for ecosystem health in the drylands, through seed dispersal and scarification, through manuring, and through grazing followed by rest periods which favours the survival of certain range species. Pastoralists themselves are also vital for ecosystem viability and actively manage their natural resource base through water development, bush clearing, tree regeneration, use of bush fires, and by ensuring that livestock mobility is effectively practiced.

Economically, pastoralists use their environmental knowledge to sustainably maximise output from the drylands. Alternative land use systems that are promoted for the drylands are never as flexible as pastoralism and often are both less productive and more environmentally harmful. However, a great deal can be done to enable pastoralists to exercise their knowledge and use their institutions. Substitution of pastoralism with inferior systems has to be resisted and respect must be developed for the way pastoralists manage their environment. Support must be given to customary decision making structures so that pastoral knowledge can be brought to bear on drylands biodiversity and ecosystems.