

Animals and Trees: Food For Thought

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SUMMARY

Animals and trees are examined from a position of mutual benefit rather than exclusive land use forms. Trees on the one hand provide fuel, the material for shelter and animal fodder. On the other hand animals may by grazing reduce the fire hazard and improve the soil fertility through droppings. Specific tree species are described, some of which may be used as fodder trees and others as a source of medicine.

A principal task is to persuade the farmer of the benefits of planting and tending trees; the Veterinary Scientist, coming into direct contact with the farmer as he does, could play an essential part in this task.

INTRODUCTION

Forestry and Animal Husbandry have often been considered as mutually exclusive forms of land use. On the one hand the forester has tried to prevent domestic animals grazing and browsing in the forest for they have been looked on as potential causes of tree damage, especially the ubiquitous goat, and a factor to eliminate if the danger of soil erosion is high.

Woodlands and forests harbour the vectors of diseases, such as ticks and tsetse fly, and the only way to eradicate these diseases is to remove the woodland and forest habitats. This conflict between the two forms of land use need not necessarily occur and in many areas trees could be of definite benefit to the Agriculturalist and Veterinarian for they could provide fodder, shelter, shade, and an improved microclimate, not to mention the medicinal value of much flora within the forest.

Advantages of combining forestry and agriculture

Controlled grazing within a forest may be mutually beneficial, for the animals to obtain food and at the same time reduce the ground vegetation, which could be a potential cause of fire. The animal droppings in the forest also improve the soil structure and fertility. However it is the trees outside the forest that could and should give the most benefit to the farmer, especially the pastoralist. The Veterinary Students should be aware of the advantages of judicious planting of trees and encourage the farmers and peasants to protect and grow trees. With intelligent tree planting it is even possible to increase crop and livestock production.

For many people living in the rural areas the tree is looked on as a source of fuelwood and a material for building houses, shelters, cattle pens and animal enclosures. Each individual may consume between one and one and a half tons of wood products per year, and a family of five may require, depending on the carrying capacity of the land, the equivalent of one quarter to one hectare of land to meet their requirements of wood products. This does not have to be done at the expense of the animal or plant crop. Trees can be grown scattered throughout the

field along boundaries, by water courses and in areas of little agricultural value. In fact the land fertility would improve if trees were scattered over it for they pump up, via the roots to the leaves, nutrients from the lower soil layers; the fallen leaves and twigs help to form a compost which retains these nutrients in the top soil, thus making them available to crops and grasses.

If trees are scarce then the peasants have to spend much time searching for fuelwood and poles. It may even drive the population to burning animal dung and any scrap of vegetable matter, with a predictable deterioration of the land fertility and carrying capacity.

The construction of water holes in some areas of the country has had a deleterious effect on the surrounding area, for the provision of water did not go hand in hand with the planting of trees. The presence of water led to a concentration of animals and people which in turn led to a rapid denudation of vegetation. In many areas of the sub-Saharan region of Sahel this caused desertification and the same thing could happen in Tanzania, in the semi-arid areas.

Trees have been virtually eradicated from vast tracts of land in Africa mostly in an uncontrolled and haphazard way, but in general with the best of intentions to provide more land for farming. In many areas, and where land clearing has been pushed beyond a critical point, soil fertility and crop yields have dropped. The total output of food crops, milk, and meat, instead of being enhanced has faltered and both towns and rural areas have suffered from the connected consequences of higher food prices and a shortage of fuel.

If instead of recklessly removing all trees, some forest vegetation had been left on the farmland, much better conditions for all concerned would undoubtedly have been preserved. Conversely farm yields could in many places be raised if trees were restored to fields and pastures. Over large areas of Africa, it may in fact be profitable to cover as much as 5 - 10% of the existing farmland with trees. The improvement in agricultural yields that could be expected from the beneficial influence of the trees would undoubtedly in many cases exceed the percentage of land occupied by the trees, and in addition the wood produced by the trees would help to overcome the firewood crisis.

Fodder trees

The logical and necessary step to take is to persuade the rural population to plant trees not only in village woodlots but more importantly along boundaries and scattered throughout the fields. There are more than one hundred species of trees in the tropics that may be used as animal feed and amongst the most useful are trees of the family *Mimosaceae* (Mimosa) such as the genus *Acacia*, a genus scattered throughout the tropics and *Leucaena*, a native of Central America. These species have the ability to fix soil nitrogen and thus improve soil fertility, while at the same time provide fodder, food and wood products.

Acacia albida is a large savanna tree that occurs on sandy soils in some of the drier parts of Africa; it grows on land usually valued for its high fertility. This tree has a remarkable soil improving ability for, contrary to most trees, it loses all its leaves at the onset of the rainy season, these leaves decay rapidly and release nutrients into the soil just when the agricultural crops need them most. In the dry season the tree is covered with dense foliage and its shade is much favoured by cattle. Towards the end of the dry season, cattle are even more strongly attracted by the large amount of protein - rich pods that fall to the ground.

This presence of cattle under and near the trees assists enormously in the up-keep of soil fertility. Also the trees pump up nutrients that have been lost from the top soil and therefore inaccessible to most farm crops. Lastly the large crowns of *Acacia albida* provide excellent protection against desiccating winds and wind erosion. The ability of this tree to shed its leaves at the onset of the rains and its mainly deep roots makes it an ideal tree to plant throughout the fields.

Prosopis cineraria is another most useful tree for the drier areas of the country, it keeps its leaves during and after the rains but only throws a light shade. It has a vigorous taproot system and does not develop strong lateral roots so it hardly competes with agricultural crops and therefore may be planted throughout the fields. It produces excellent fodder for milk sheep and goats and the trees are regularly lopped for this purpose. In certain parts of India farmers will maintain as many as forty *Prosopis cineraria* trees per hectare and sell the fodder on a commercial scale. However this tree is susceptible to goat damage and has to be protected especially when it is small.

Prosopis chilensis on the other hand has unpalatable leaves but edible pods and therefore requires little protection against animals. It is ideal to plant round villages but does not tolerate grass competition and will suppress crop if planted in fields.

A tree of great promise in many areas of Tanzania, except the very dry regions and on arid and mineral poor soils, is *Leucaena leucocephala*. Its leaves and pods may be harvested regularly as hay or forage. It is suitable for dairy and beef cattle and goats but may also be used to feed poultry provided it is used with other feed because of toxicity problems related with mimosine. The Tsetse Research Station in Tanga Region is conducting trials using *Leucaena* to feed goats. At Morogoro it is used as a mulch on the "zero cultivation" area and the forestry division is researching into the raising of *Leucaena*. It is a drought resistant species but shows vigorous growth and can be used for poles and fuelwood after two or, three years as well as providing fodder.

There are many other tree species which may be used as fodder tree and a list of the most promising ones with a short synopsis is given in the appendix. However, there is one other species *Ailanthus excelsa* that is worthy of mention. This tree requires a minimum of 600 mm rainfall per annum and therefore is not suited to the dry areas of Tanzania. It is normally planted in rows along farm boundaries for it competes with agricultural crops if planted in fields. It is a tree that goats will not touch unless they are trained to eat it. This is done by the use of a paraffin pad placed on the nose. Once the goats have accepted it they readily devour it and it stimulates milk production. The tree is cropped twice a year by removing about one third of the young stems and leaves; the farmers in India are willing to pay a premium price for feed from this tree. In fact some farmers make more money per hectare by growing this tree than by growing traditional farm crops.

Medicines

Many plant species including trees have contributed a wide range of drugs and pharmaceuticals, including analgesics, anti-leukaemic agents, enzymes, hormones and anti-coagulants. Of the 76 major pharmaceutical compounds obtained from higher plants only seven can be commercially produced at competitive prices through synthesis.

Many strains of Plasmodia, which cause malaria are developing resistance to synthetic quinine and once again the drug industry is having to turn to naturally derived quinine from the Cinchona tree.

The Maytenus shrub found in East Africa provides an alkaloid compound that is highly active against leukaemia and malignant tumours in animals, while related plants in Ethiopia show promise as key sources for several more anticancer drugs.

Another Ethiopian plant, the soapberry (*Phytolacca dodecandra*) produces a compound that kills the Bilharzia-transmitting snail thus offering a means of reducing this debilitating disease. Many of the trees and shrubs growing in the woodlands and forests are a potential source of medicine and much work has still to be done. However, prevention is far better than cure and to keep the animals on a healthy diet could prevent many diseases, this is where fodder trees could play their part in many areas of Africa.

The Role of the Veterinary Scientist.

It is all very well talking about the benefits of trees but how to convince the farmer to plant trees is the main problem. Here the Veterinarian could play as vital a role as the extension worker. He comes into direct contact with the animal husbandman and could encourage the farmer to plant trees for his own and his animal's needs. The farmer requires very little convincing if his animals are starving, or if the family has to spend many hours each day searching for fuel and poles but it is in areas where fodder is reasonably abundant that the task of persuasion may be most difficult, but even in these areas there may be seasonal shortage or the food may not be the most desirable. However, the basic necessity of an expanding population and a country growing in wealth is to increase productivity per unit area.

In order to do this the life sustaining surface layer the soil must be managed with knowledge, understanding and care. 75% of tropical soil nutrients are held in the biomass of the growing plant community. If this community is removed then much of the soil fertility is lost at the same time. By removing the tree crop, the mechanism for pumping leached surface nutrients is also destroyed. Of course the application of fertilizers can restore the fertility but many farmers cannot afford such inputs, and these inputs are unnecessary if the biomass is kept intact or if it is restored by natural means in places where it has been removed. The planting of trees can ensure that not only is the fertility of the soil maintained but improved while at the same time meeting the needs of the population both man and his domestic animals.

The Veterinarian could liaise with the Forestry Department in his particular area and find out what kind of plants they have available and even suggest fodder tree species that could be tried. In the five year development programme of Tanzania, much emphasis is placed on village forestry and the district Forest Officer should be more than pleased to give not only advice but seedlings to the Veterinary Officer or his assistants. In turn the Veterinary Staff could report to the forestry staff those villages or farmers who are willing to plant trees.

We have to move from a situation where Livestock experts, Agronomists, Veterinarians and Foresters often look after their own narrow interests, competing more often than cooperating to one characterised by informed collaboration leading to a higher degree of basic land use and a greater understanding of the lands capabilities, and in this the Veterinary Scientists has an essential part to play.

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Suitable tree species for fodder

Appendix

In many pastoral agricultural regions, trees could not only supply fuelwood, poles and other wood products but assist the farmer; many trees will provide fodder and shade. There is a need to discover the most suitable ones and the following species are amongst those which could be tried (see next pages)

Key: LMO - Leguminous trees, trees that fix nitrogen.

- Acacia albida*: a tree that loses its leaves in the wet season and produces edible pods at the end of the dry season when food is at a premium. This tree can be grown throughout the farmers fields for it will not interfere with the arable crops.
(LMO)
- Acacia tortilis*,
A. Senegal these trees are already native to the dry regions of Tanzania. Like the previous *Acacia*, they fix nitrogen and therefore are soil improvers.
- Aegel marmolosa* a fruit and fodder tree.
- Ailanthus excelsa* : a tree that goats won't touch unless they are trained to eat it. It stimulates milk production when fed to goats. Farmers in India are willing to pay a premium price for feed from this tree. It is good for planting in fields. Requires a minimum rainfall of approx. 600 mm per year.
- Atriplex nummularia* : the salt bush, thrives in highly saline soils. Requires as little as 150 - 200 mm rainfall. Can produce 8-10 times more than pasture under similar conditions. Contains digestible protein averaging 12% of dry matter.
- Azadirachta indica* : The Indian neem, a tree already tried in Dodoma and other dry areas of Tanzania.
- Baphia kirkii*
(LMO) : suitable as a charcoal species.
- Bauhinia racemosa*
(LMO) : used for human and cattle consumption. Its flower buds may be used as a vegetable.
- Brosimum alicastrum* : indigenous to moist forests of Central and South America but extremely tolerant of drought. Cattle enjoy leaves and branch tips. Abundant fruit used for pig feed. Branches can be lopped regularly. Fodder considered equal to best pasture.
- Cassia siamea*
(LMO) : already a proven tree in Dodoma. Young leaves and flowers may be used in curries for human consumption.
- Cassia sturtii* : grows well with only 200-250 mm rainfall producing annually about a ton per hectare of dry matter in two grazing periods. Shows around a 12% protein content which is similar to that of alfalfa.

- Colophospermum mopane*
(LMO) : good for fuelwood, poles and browsing. When cut it suckers, therefore re-establishment is easy.
- Dalbergia sissoo* : planted in quantity round Islamabad, in Pakistan. Good for charcoal and fodder.
- Dicrostachys nutans*
(LMO) : shows vigorous growth in dry areas, a useful browse tree.
- Erythrophleum guineense*
(LMO) : a good charcoal species.
- Euphorbia caducifolia*
E. terucalli
E. balamifero : shrub with dens foliage that could solve the fencing problems round plantations and woodlots because goats shun this species. The leaves and fruit are considered a delicacy in certain parts of the world.
- Gmelina arborea* : a utility hardwood, cattle eat the fruit, flowers give a good honey.
- Leucaena leucocephala*
(LMO) : an excellent animal feed. May also be used for human consumption. Resists drought. Prefers elevations below 500 m. and needs non acid soil. There are bush and tree varieties.
- Parkia clappertoniana*
(LMO) : a farm tree with edible pods.
- Prosopis chilensis*
(LMO) : has vigorous growth, unpalatable leaves but edible pods. Good to plant round villages. Does not tolerate grass competition. Will suppress crops if planted in fields.
- Prosopis cineraria*
(LMO) : has deeper roots than *P. chilensis* but susceptible to goat damage. May be planted in fields. Leaves and pods edible.
- Prosopis tamarugo*
(LMO) : hard tree. Native of Atacama Desert of Northern Chile. Can grow on soils covered with a salt crust. Edible leaves and pods.
- Ziziphus mauritania* : an arid zone shrub producing a valuable edible fruit the size of an apple.