



Trees in the garden: Interaction between the wild and agricultural domains in practice among the Moru of the southern Sudan

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The Moru people live in the Mundri district of western Equatoria province, of southern Sudan, which is flat, undulating, open woodland savannah with low to moderate relief and narrow incised streamlines. The rains are medium length, most falling in five to six humid months. The 1200 mm and 1300 mm isohyets pass through the Moru area, but the outstanding feature of the rainfall, which has considerable agricultural significance, is its marked variability and unpredictability from one year to the next.

The country is now disrupted by civil war, but as this study relates to conditions of peace, the economic situation is described as such. The Moru people are largely subsistence farmers. They depend on rain-fed agriculture, supplemented by hunting and gathering. The staple crop is sorghum, which is broadcast in association with sesame, cowpeas, bulrush millet and finger millet. The mixtures are not random but are relatively standardized into specific field types (Sharland, 1989). A named field type has recognized ecological requirements, timings of activities and crop mixes thus representing the key management unit of the agricultural system (Schlippe, 1956). There are three major and a number of minor sorghum-based field types, and a number of newer ones based on New World crops, which are now important in the total food system. Risk is spread by diversifying and mixing both the crops and varieties of each crop grown.

Since the population density is low, the area of cultivated land is small relative to the surrounding bush. The garden immediately round the house compound, called *туру'du dri* or *inju dri*, may be cultivated for many years and is used for crops that need the extra fertility provided by household waste or greater protection from wild animals. The main sorghum and sesame fields, however, are traditionally grown away from the house in fields cleared from the wild bush for only two to three years. These fields are cultivated, with a number of members of the extended family having their own segments round a central point or *katiri* (Catford, 1951). Interaction between the cultivated land and the wild bush is very important: the agricultural sector concentrates on the carbohydrate staples and oils, while the wild environment contributes a high proportion of the relishes. Wild foods include vegetables, tubers, wild fruit, oils, salt from lye, fungi and insects, especially termites. Hunting, fishing and honey collection are also important economic and social activities. The bush is also the source of building materials, fuel and fibres.

Land ownership is communal, with families obtaining rights to land by usage after obtaining permission from the chief or subchief. Except round Mundri town and the smaller centres, land is plentiful, so disputes are rare. Settlement is in extended family groups surrounded by their gardens. These families are linked together into clans under headmen and subchiefs, but there are few physical concentrations of villages.

[The Moru people live In an area of the Sudan characterized by flat, open woodland savannah](#)

The importance of understanding trees for Moru farmers

Traditionally the Moru system of cultivation and maintenance of soil fertility has depended on shifting cultivation moving into a bush fallow system, involving a relatively long fallow in which bush regeneration helps restore fertility. The fallow period extends from five to 15 years, depending on condition, although, as seen below, the length of time that has passed is not the main criterion used by the farm family in deciding when to re-use land.

Moru farmers need to understand the characteristics of the trees in their area, first to make best use of their regeneration capacity, and second, and of more immediate significance for the farm family, to avoid unnecessary work in clearing. Appreciation of the relationships of trees with the garden is important for understanding Moru agriculture and for assuring sustainable cultivation in the future when land pressure makes traditional fallow difficult or impossible.

In recent years increasing attention has been focused on development of formal agroforestry techniques as one way to address challenges facing sustainable cultivation in Africa. Study of traditional bush fallow systems reveals that many of the concepts are already well developed in many traditional practices (Rocheleau *et al.*, 1989), including those practised by Moru farmers.

Moru treatment of trees when clearing land for cultivation

When land is cleared for cultivation (whether it be virgin land or regenerated land), the Moru farm family deals with the tree species encountered in one of three ways, depending on the species, their size and conditions in general:

- some mature trees are left as they are;
- most trees and shrubs are cut at a height of 60-90 cm. Trees are very rarely stumped. This is a very significant factor for regeneration as most species ratoon and regenerate from this level. It also has important implications for cultivation, as it permits hoe cultivation, but makes ploughing impractical;
- a few large or very vigorous trees are killed, usually by fire.

Amvorobem, amvorowe, zambirika	Kyeleku
<i>Annona senegalensis</i>	<i>Sterculia setigera</i>
Dolome	Kyiyi
<i>Diospyros mespiliformis</i> , <i>D. abyssinica</i>	?
Fola	Ladra
<i>Antidesma venosum</i>	?
Gorokomba	Lagba
<i>Bridelia</i> sp. (nr. <i>P. scleroneura</i>)	<i>Balanites aegyptiaca</i>

Goromono	Lengo
<i>Vangueria apiculata</i>	?
Itu	Lira
<i>Borassus aethiopicum</i>	<i>Securinega virosa</i>
Kawa	Liwa, lindri
<i>Butyrospermum niloticum</i>	<i>Phyllanthus muelleranus</i>
Kidru	Logo
<i>Lannea</i> sp.	<i>Nauclea latifolia</i>
Ki'du	Mbelegu
<i>Ficus salicifolia</i>	<i>Rhopalapilia umbellulata</i>
Ki'du tore	Motro
<i>Ficus</i> sp.	<i>Parkia africana</i>
Kinju	Njuku'de
<i>Grewia mollis</i>	<i>Ximenia americana</i>
Kiroro	Nyo ga
<i>Gardenia</i> sp.	?
Kokokolo, akangia (ma)	Ngo'ba
?	<i>Carissa edulis</i>
Kyedo	Ngutru
<i>Vitex madiensis</i> , <i>V. doniana</i>	? (<i>Pterocarpus</i>)
Kyele	Titi
<i>Sclerocarya caffra</i>	<i>Tamarindus indica</i>

Trees left uncut

The mature trees that are left are generally chosen as those that will not interfere with the growth of crops in their shade. This is expressed in Moru as *ice se fu inya ku* ("trees that do not kill sorghum").

These mature trees are left for various practical reasons. They may not be worth the extra work of killing, especially if they have a high crown. This is the case with species like gwari (*Khaya* spp.), a'ba (*Isoberlinia doka*) and kasa (*Daniellia oliveri*).

Another reason for conserving a tree may be that it provides fruit that is considered to be worthwhile by adults. The most important fruit in this respect are kawa (*Butyrospermum niloticum*), kyedo (*Vitex madiensis*), itu (*Borassus aethiopicum*) and titi (*Tamarindus indica*). As a result, certain fruit-trees and especially palms tend to increase in areas of cultivation (Johnson, 1985). It should be noted that although many fruits can be eaten (see box), not all of them have the same status. Some trees provide fruits that are only eaten by children or as famine foods, in which case the adults would not especially keep them in cultivated areas, though their location in the immediate vicinity of the home and garden may be noted.

The shade that the trees provide is important for resting (and cooking) under while working in the fields. Against this must be balanced the perches the trees provide for birds which are universally recognized as major pests.

Some trees are left for ritual purposes. These may be whole groves which have spiritual significance due to their location, or species with a particular attribute, for example the rain tree, kyeleku (*Sterculia setigera*). Other trees observed to be left uncut include kiroro (*Gardenia* sp.), payi (*Dalbergia melanoxylon*); ladra, lokpo (*Terminalia bronii*), kyeleku

(*Sterculia setigera*), manja (*Piliostigma thonningii*) and lodo (*Kigelia africana*).

Trees cut (but not killed) in cultivated areas

A majority of the trees are cut down to a stump of 30-60 cm at the time of clearing. When the Moru clear open woodland savannah, which they call *lowo* land, clearing takes place at the same time as cultivating and broadcasting the seeds. This creates a labour bottleneck, and the additional work that would be required to clear the stumps or kill the roots is not considered worthwhile. It is probably the labour involved that is the primary determinant, though as seen below there is an understanding of the long-term regenerative value of leaving the trees.

In the second and third years of cultivation, the new sprouts from the tree stumps are easily cut back. The branches that are cut from the regenerating stumps are not a big burden and are part of what are considered weeds or *kangwa* in Moru. However, when the land is left for fallow after the third season, the stumps quickly put on substantial biomass and regenerate into trees. This greatly increases the value of the fallow. The Moru recognize that thick bush, which they call *kwokye*, regenerates more quickly and the fallow needed is much shorter, while more open woodland needs a longer fallow period.

[A woman caring for trees near the house compound](#)

Killing "problem" trees

The shade provided by large trees sometimes impedes the growth of the sorghum crop. These and others that regenerate too vigorously have to be killed. This is sometimes done by girdling but more often by fire. Wood collected from clearing the rest of the area is heaped round the base of the trunk and left to dry and then a large fire is kindled. The process is described in Moru as *edene asi* sit. Dry-season grass fires are common, so those species remaining in most of the agricultural area at least are fire-resistant; therefore, a very hot fire is needed to kill these trees.

The worst tree for competition with crops (although as seen below it is also a soil improver) is considered to be *karanyi* (*Anogeissus leiocarpus*) because the roots have an influence a long way out from the tree, and it spreads quickly to form thick forest. Likewise *kirilo* (*Harrisonia abyssinica*) is considered a bad weed, as many develop in a restricted area, shading out the sorghum under them. *Kirilo* roots also have an influence far out from the trunk. They are thus always killed by fire. Other species burnt include *kurugu* (again a good soil improver), *kidro* (*Lannea* sp.), *miri* (*Azelia africana*) and *karajeje*.

The big tree trunks do not impede cultivation once they have been killed and so are left to stand dead in the field. However, when they fall, they are burnt to remove them from the field. The resulting ash is recognized as being good for the soil, and is particularly favoured by the Moru for finger millet (*kyifo*).

Firewood

During the process of clearing land for cultivation, much firewood is generated. Indeed, fuelwood is never in short supply in rural areas and does not require much time for collecting. Additional firewood is always collected when the wood is already dead and dry, so although trees are killed for cultivation they are never killed just for fuel. This is more an expedient than a principle, as firewood is collected to be used immediately rather than being stored. Firewood is normally broken from dead branches, since termites very quickly destroy wood that has fallen to the ground.

All dry wood is given the name *tiza* meaning firewood. However, certain species are identified

by the Moru as particularly suitable. These include manja (*Piliostigma thonningii*), kinju (*Grewia mollis*), la'da (*Combretum* sp.) and karanyi (*Anogeissus leiocarpus*). The reasons given for these being so good include the fact that once the fire is established it continues burning, and the half-burnt wood (*kyele*) doesn't burn out quickly. This is important because food is often left cooking when women go to work in the fields or home gardens. Manja (*Piliostigma thonningii*) is recognized as particularly good because a fire made of it can be banked at night and then fanned into flame again in the morning. The other main factor making these species good firewood from the Moru perspective is the absence of much smoke. Karanyi (*Anogeissus leiocarpus*) is said to have no smoke at all.

There is a second group of trees that is also used for firewood but considered less desirable. It includes a'ba (*Isobertinia doka*), which is good but smoky; ngelebe (*Combretum* sp.), which lasts well but is smoky, kawa (*Butyrospermum niloticum*), which is good firewood but seldom used, because the tree is protected for oil, gwari (*Khaya* spp.); yowari, which burns well but does not last very long; lagba (*Balanites aegyptiaca*), which is good firewood but inconvenient because it is thorny; and lokpo (*Terminalia bronii*), which is good firewood but not popular, because the bark chars easily after bushfires arid makes the collector dirty.

Since fires are often lit within the house, smoke is generally a disadvantage because it stings the eyes. However, there are some advantages in smoke, especially for controlling insects in the roof, or when kitchen fires are lit under the grain store, and in these cases species not otherwise favoured may be used. One species of particular interest is ngungu (*Pterocarpus* sp.), which is burnt to give a sweet-smelling smoke that repels mosquitoes.

Certain species are considered positively bad for firewood and would only be used if nothing else were available. These include katraka (*Hymenocardia acida*); angyiriya (*Crossopteryx febrifuga*); and karikye.

A few species are not used, because of traditional beliefs. Kiroro (*Gardenia* sp.) is avoided by some who say that if it is used, leopards will attack. Another belief is that if kiroro is used, children will be born with large heads. Simply breaking up kurukuru (scientific name not available) is said to provoke illness in chickens.

As population pressures increase near Mundri town and to a lesser extent around rural centres, the more desirable firewood species are becoming relatively scarce. While people still recognize the value of good firewood trees, there is the potential for encouraging the planting or managing of firewood crops, especially if they have a dual purpose. There do not seem to be any customs that point against the planting of trees or the cutting of specially planted trees for firewood. The fact that all firewood is at present collected from already dead wood is, however, significant in that the planting of trees that need to be cut and stored may encourage exploitation of natural trees as well.

Although less common than fuelwood among the Moru, charcoal is also used. Unlike firewood, charcoal usually involves deliberate cutting of green wood, which is set alight and then covered with soil to keep as much air out as possible. The best charcoal is made from karanyi (*Anogeissus leiocarpus*) and lagba (*Balanites aegyptiaca*). Good charcoal can also be made from manja (*Piliostigma thonningii*) and kinju (*Grewia mollis*), although big pieces are difficult to find. Gwari (*Khaya* spp.), kawa (*Butyrospermum niloticum*) and kidru (*Lannea* sp.) are also often used. Blacksmiths, who need a charcoal that will give a very hot fire, prefer weri (*Prosopis africana*), but this is not used for domestic purposes as it does not burn well unless fanned with a bellows.

Moru understanding of trees and fertility

The traditional knowledge base for Moru farmers includes a clear understanding of the

concept of regeneration, though a Moru may have a different way of expressing things from a western scientist. For example, the farmer says that leaves falling from trees make sorghum grow beautifully. The effect of the fertility rather than the soil chemistry or structure is what is noted.

Before land is cleared for cultivation it is normally judged by the state of regeneration of the trees and the grass and herb species which predominate as a result of the relative fertility. Planners or researchers who ask farmers to estimate the length of the fallow are thus not relating to the perception of the farmer. Many farmers do not know how long land is left, but all know very clearly when land is ready for cultivation.

[The shade trees provide it important for resting under while working in the fields](#)

Trees as fertility indicators

The fertility of the soil is judged by the Moru not by studying the soil itself, but through an examination of what is growing in the soil. This is indicated by both the species composition and the size or health of the various plant species. Certain species of tree in particular are recognized as showing that the soil will be fertile and good for cross (either for cross in general or in some instances for specific crops). Karanyi (*Anogeissus leiocarpus*) is in particular recognized as indicating good soil. It is very vigorous and can spread quickly to the thick forest called *kwokye* in Moru. As a result, more work is needed to clear land with much karanyi, but it is generally considered that those who are willing to put in the work will reap the benefits in yields.

Another species that improves the soil but shades out the crops and has to be killed is the thorn tree, kurugu. Both karanyi and kurugu leave the land with good organic matter under them. The grass, dodo, that often grows under karanyi and kurugu is also recognized in its own right as an indicator of good soil. It is noteworthy that these trees are so vigorous that they would not be suitable for alley cropping or other more formalized methods of agroforestry.

Another species that is recognized to give good organic matter is the introduced species *Lantana camara* (sometimes called *tiltyan* or *dasira* in Moru). This is a very weedy species that is spreading fast round Mundri town. It is not easy to clear, as it is thorny, but it is not necessarily seen by farmers as a nuisance, as it is used for the reinforcing in mud walls and does improve fertility.

There are species of tree which are recognized as indicators of good soil, but are not as vigorous and so can just be cut down and left to regenerate later. Most of these will also grow on poor soil but are known to produce good soil sooner when land is left as fallow. This is backed up by the fact that many are legumes. Land where there is much ori (*Acacia seyal*) is normally good, especially for finger millet (kyifo). Fu'du (*Dichrostachys cinerea*), 'bopi and katraka (*Hymenocardia acida*) are similar in this respect. However, though both ori and fu'du are legumes and replenish the soil, both have thorns and so are not very compatible with cultivation when many people work in bare feet and weeding is by hand. Another legume, payi (*Dalbergia melanoxylon*), which is seen as improving fertility, is itself very slow-growing.

The interesting interaction of sesame drying racks

A further interesting relationship of trees to the garden is provided by the racks for drying sesame. Being so easily dehiscent, sesame has to be carefully dried to avoid large losses of seed. It is dried on racks, called *doro* in Moru, made from long poles tied across a row of upright posts. The length of the rack depends on the amount of sesame grown, but as it is a major crop the amount of timber needed is not insignificant. The problem of getting enough timber is made worse by the fact that the sesame needs to be dried at a time of year when the grass is very long, making it difficult to move in the bush. So, as agricultural land use intensifies, suitable poles become more difficult to find in some areas. When the idea

of planting trees round the compound was introduced, some farmers singled out the benefit for sesame drying racks as one of the major reasons for planting timber trees.

Sesame cultivation is important in the Moru culture

Lira (*Securinega virosa*) is a species which, although it can grow to some extent where land is not fertile, is generally considered to indicate good soil when well established, and to improve the soil. Land where lira is abundant is considered particularly good for the Moru sorghum variety nyara go, which is grown in the first year after clearing (Sharland, 1989).

Other species are indicators of fertility in that they either will not grow on infertile land or respond well to fertile land and show it clearly in their growth. These include the shrubs kinju (*Grewia mollis*), manja (*Piliostigma thonningii*) and rere and the herb kabalili (*Dolichos schweinfurthii*), which is a particularly well-recognized fertility indicator. The quality of growth of these trees is used to indicate the presence of good soil. The mere presence of the species left as stumps at the time for clearing, however, does not mean the soil will be especially improved by them. In poor soil they are weak and do not compete with other species.

The fact that the Moru recognize certain species to be indicators of good soil, and that these species are divided between those that improve the soil and those that merely indicate good soil, shows a good understanding of the different relationships of trees with the soil. This should facilitate longer-term sustainability, especially as there is a very close link with legumes. It is important therefore not to confuse the improvers with the mere indicators.

Interaction with animals - trees and browse

Many of the eastern Moru keep sheep and goats. Goats will browse most vegetation, but the boys who look after the goats can identify the species that the goats chose when there is plenty of food available, and those which are just nibbled in passing. Several of the preferred shrub and tree species are also soil improvers, Especially noteworthy are ori (*Acacia seyal*), lira (*Securinega virosa*), rere, payi (*Dalbergia melanoxylon*) and fu'du (*Dichrostachys cinerea*). These species may therefore be valuable not just for their relationship to crops but also for planting for browse, especially for use during the rains when burnt pasture is not available and high-quality fodder is in short supply. The branches cut at the time of cultivation and weeding could be used for feeding the livestock.

Cattle cannot be kept in most of the Moru area, but there is one area where a traditional, trypanosomiasis-resistant breed is important. Cows depend far less on browse than on grass. There are, however, certain tree and shrub species that cattle are said to find particularly palatable. Most noteworthy of these are lira (*Securinega virosa*), katraka (*Hymenocardia acida*) and mele (*Lonchocarpus* sp.).

The best charcoal for household cooking is made from karanyi (*Anogeissus leiocarpus*) and lagba (*Balanites aegyptiaca*)

Conclusion

Trees are recognized by the Moru as having distinct relationships with agriculture and animal husbandry. Certain species are retained in cultivated areas, but others that are considered harmful to crops are cut or killed. The different ways trees are treated show a clear differentiation between species.

Certain species of trees and shrubs are also recognized as improving the soil, and there is recognition of both positive and negative relationships between specific trees and specific crops. Many, but not all, of the indigenous species are probably suitable for formalized agroforestry and for alley cropping, with fallow being replaced in time and space by rows of

appropriate soil-improving trees.

Contrary to popular assumptions, not all species of tree are treated as equally suitable for firewood. The conservation and planting of preferred species in conjunction with sustainable agriculture has high potential for development among the Moru, and could be instrumental in decreasing the risk of future fuelwood shortages in the face of increasing population pressure. The need for browse for goats coincides closely with those species that contribute to soil enrichment. This need, and the many other uses the Moru have for the various species of tree found in their area, points to the potential for more formal development of agrosilvicultural systems and agroforestry.

Perhaps of even wider significance, the Moru understanding of the interaction between a large number of tree species and a large number of crop species is a resource of great value to researchers and extension agents in the field of agroforestry. These interactions so familiar to the Moru are the very ones on which formal science is lacking information.

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