CHAPTER 7 – MAN

Contents

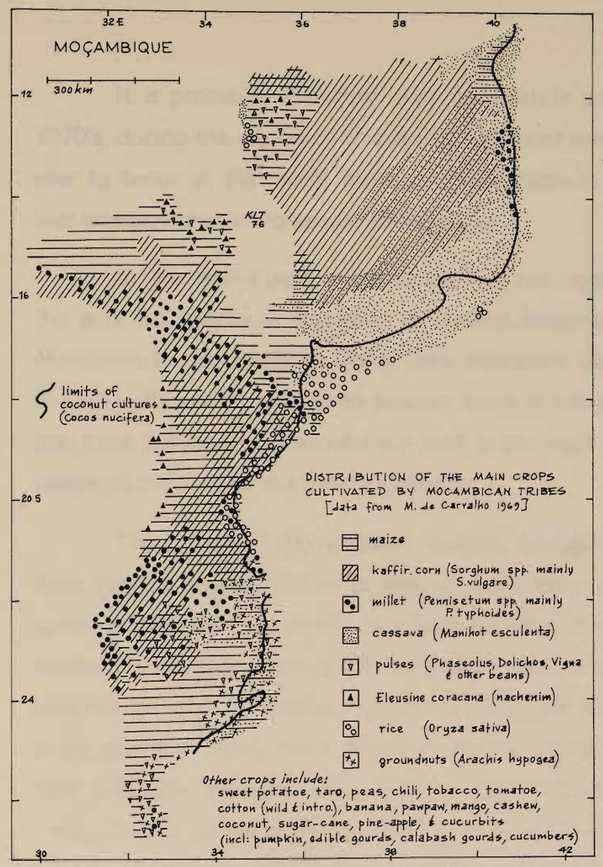
The section on human influence in the Gorongosa ecosystem is interposed here between the earth and life components as man's activities result in both geomorphic and biotic changes in a landscape.

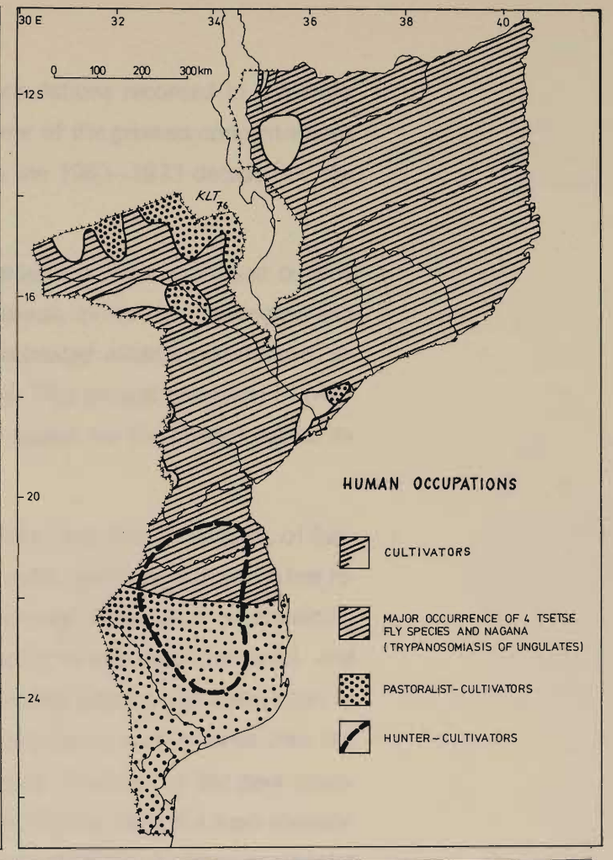
Large scale bulldozed clearance of wooded country for agricultural purposes is striking. As profound over the long term, are the more subtle, cumulative selective changes imposed by primitive cultivating cultures. The impact of shifting cultivation, and previously, the iron-smelting cultures which required hard woods for their furnaces and for hut construction, on the present day appearance and composition of the vegetative cover over various areas is probably far greater than is generally realised.

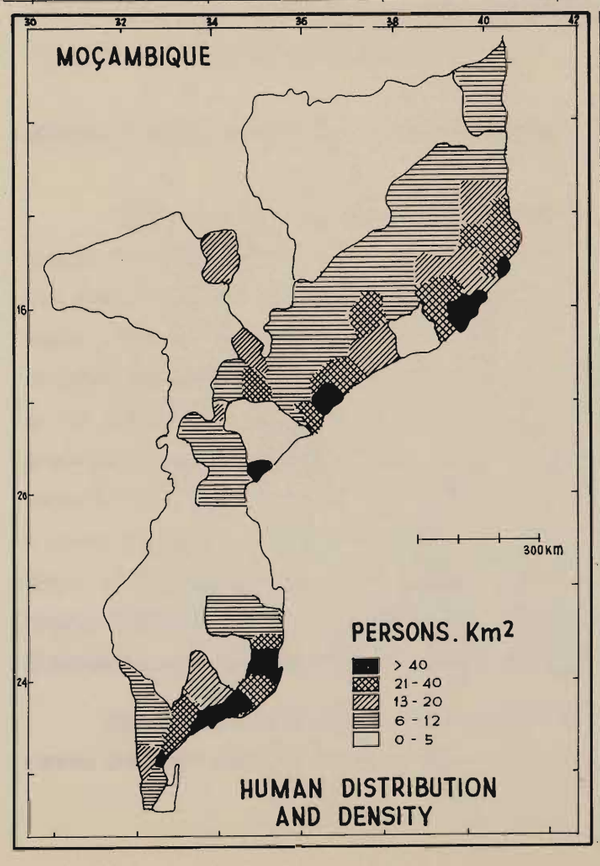
HISTORICAL

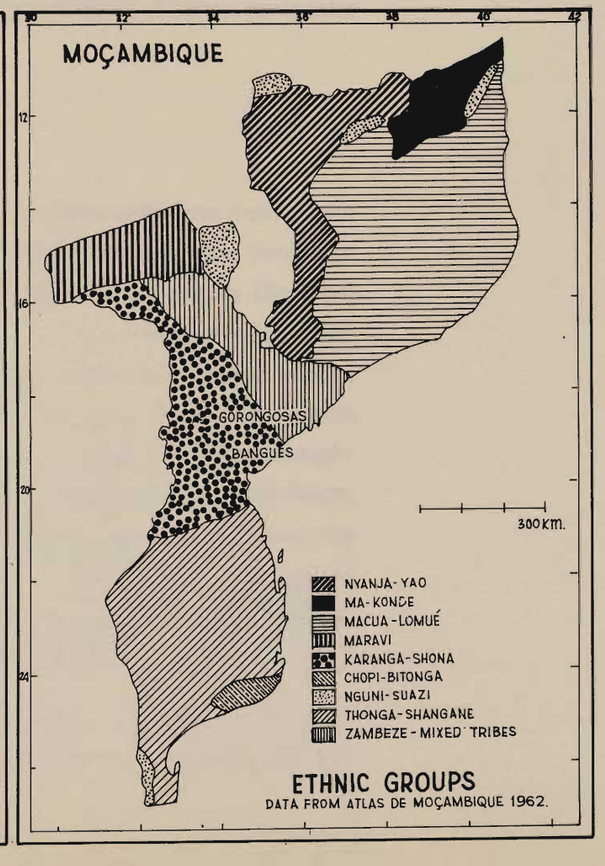
Hunting in the Gorongosa region must have gone on since at least Bushman times and increasingly with the arrival of the Sena (Kararga–Shona) tribes from the north, who replaced the iron-age people in about 1 130 BP (Fagan 1965: 120). As populations built up this hunting pressure increased. The real impact on wildlife probably began with the advent of Indian and Arab trade (12–14C) and the Portuguese (early 1500's to 1600), who specialised in ivory (both elephant and hippo) and slave trade in the entire area between the Zambeze and Save rivers. This region lies between the sea ports which served the Monomotapa and Zimbabwe kingdoms of the interior Mashona plateau, which were the main suppliers of gold from about AD 600 (Summers 1969). Access to the interior was both upriver along the Zambeze, Chiri, Pungue, Buzi, and Save (only in summer) as well as on foot routes up these valleys (and others such as the Mazoe), and on interfluves through the saddles in the Great Escarpment on the Mocambique–Rhodesia border (Balsan 1970, Summers 1969, Axelson 1973). Prior to Portuguese control, trade from Central Mocambique was with East Africa, Somalia, the Persian Gulf, and India, and to a lesser extent between the people of the interior and Madagascar (Kent 1968, 1969). Summers (1969) remarks that ivory and leopard skins were probably East Africa's oldest exports since about 1500 BC. The gold trade came to an abrupt end in about 1825 when the Nguni chiefs Zwangendaba, and later Mzilikazi in 1840, destroyed these kingdoms (Summers 1969).

Thus up to the time of the proclamation of Gorongosa as a national park the region had since time immemorial been subjected to intensive hunting pressure, particularly of tuskers.









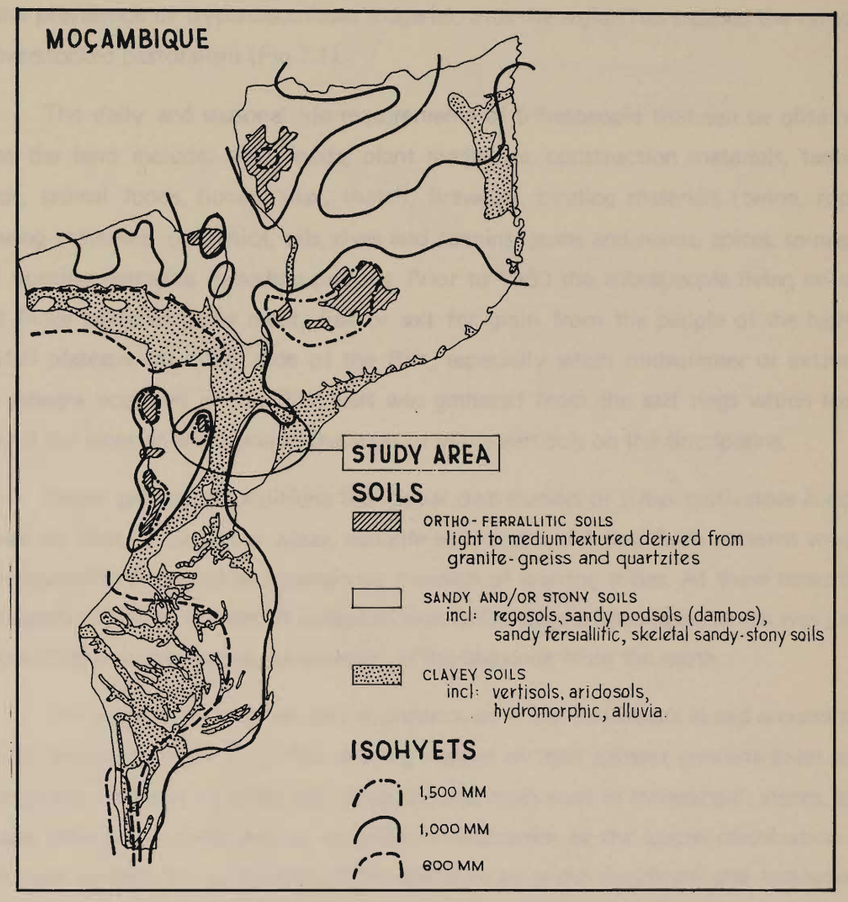


FIG 7.1

BACKGROUND TO HUMAN INFLUENCES ON MOCAMBIQUE LANDSCAPES

It is probable, therefore, that the wildlife populations recorded in the early 1970's, during the period of this study, represent some of the greatest concentrations ever to occur in the recent history of Gorongosa as the 1963—1973 decade saw the best attempt at strict conservation measures.

In the recent past, intensive hunting for trophies and meat continued outside the park boundaries so that most of Central Mocambique, except for Gorongosa and Marromeu in the Zambeze Delta, have extremely decimated wildlife populations, although sufficient in patches to support safari hunting. This general emptying of wildlife from the landscape around the park is the main reason for the present subtle invasion of the park by the local tribesmen.

The import of the relatively modern innovations from foreign cultures, of facilities (trading stores), timber extraction, cash crops, roads, railways and safaris has resulted in depletion of wildlife as a food resource. Increased pressure on the remaining stocks is occurring from tribal cultivators who, despite extensive well-watered and unoccupied areas of similar miombo with forest patches suitable for cultivation in every direction away from the park, are concentrating along riverine sites into the park area after the game resource. With each succeeding reduction of the park boundaries to keep the invading human populations on the outside there is a fresh invasion of cultivators along riverine areas, and workers for safari, timber and cotton companies who operate yet deeper into park area.

PRESENT POPULATIONS AND DISTRIBUTION

The tribal people in the Gorongosa ecosystem are Sena with three main dialect groups, the Chegorongosa on the west of the Rift and the Cheringoma and Bangue on the east of the Rift. They are primarily shifting cultivators using ***mapira (Sorghum*** kaffir corn) as the major crop as this can withstand the occurrence of midsummer droughts and general predominance of poor sandy soils. Maize is of second import, or the major crop locally where more fertile pockets of soil occur. Other crops include ground-nuts, pumpkin, cassava, sweet-potato, colocasia and various beans. In drought years the ripe grain of indigenous grasses are gathered, especially ***Panicum maximum***, a robust 3 m tall form which is abundant in pure swards on certain Rift alluvia in the shade of ***Piliostigma thonningii*** and ***Acacia sieberana*** savanna woodlands and on the heavier black soil patches in ***Brachystegia*** riverine areas. ***Urochloa mossambicensis, Echinochloa*** and wild ***Sorghum*** are also important grain foods at such times.

Certain families specialize in bee-keeping for which undisturbed miombo savannas are a pre-requisite. There is thus a friction between the cultivators and bee-keepers as one displaces the other. Land hunger pressures due to population increases or cash crop demands cause the remaining undisturbed woodlands to be utilized and the bee-keepers are then forced to move. No cattle are kept, and goats only rarely, due to the prevalence of trypanosomiases (nagana), thus the region has escaped the ravages of overstocked pastoralism (Fig 7.1).

The daily and seasonal life requirements of tribespeople that can be obtained from the land include: veld foods, plant medicines, construction materials, famine foods, animal foods, honey, wax, thatch, firewood, binding materials (twine, rope) weaving materials, cosmetics, oils, dyes and tannins, gums and resins, spices, spinages, and hunting materials including poisons. Prior to 1950 the tribespeople living on the Rift Floor bartered game meat, fish or salt for grain from the people of the higher rainfall plateaux on either side of the Rift, especially when midsummer or extreme dry seasons occurred in the Rift. Salt was gathered from the salt rings which form around the bases of termitaria in the areas of saline vertisols on the floodplains.

Under primitive conditions the spatial distribution of tribal cultivators is controlled by that of perennial water, suitable soils and social ties. Such patterns would be temporarily disrupted at intervals by invasion of warring tribes. At these times the cultivators hid away in sites of seclusion such as Gorongosa Mountain, which was used by the Chegorongosa during the invasion of the Maconde from the north.

The present distribution and abundance of tribal cultivators in and around the park is shown in Fig 7.2.). The striking feature of their present concentration patterns is their relation to roads (eg. along the old main road to Inhaminga), stores, and lumber camps, all of which bear no relation whatsoever to the spatial distribution of soils most suitable for cultivation. Other patterns are more significant and fundamental as they relate directly to water and optimum soils, for example those on alluvial fans and the red clay loams associated with dolerite dykes (locally referred to as ***matakamashaa***). Part of the past distribution (Fig 7.2), as obtained from local headmen, shows one striking contrast with the present pattern and which is the result of perhaps the most ironic affair in the chequered history of changing park boundary limits.

Until the 1950's the Rift Floor area between the Pungue River and the Urema Lake, and between the floodplains and the western slopes of the Rift Valley, supported the greater part of the human population now shown on the dissected midlands between the rift and the eastern base of Gorongosa Mountain. There were, therefore, only rare tribal cultivators in the area between the mountain and the Rift Valley, and shifting cultivation with large cotton cash crop production took place in the Rift Floor

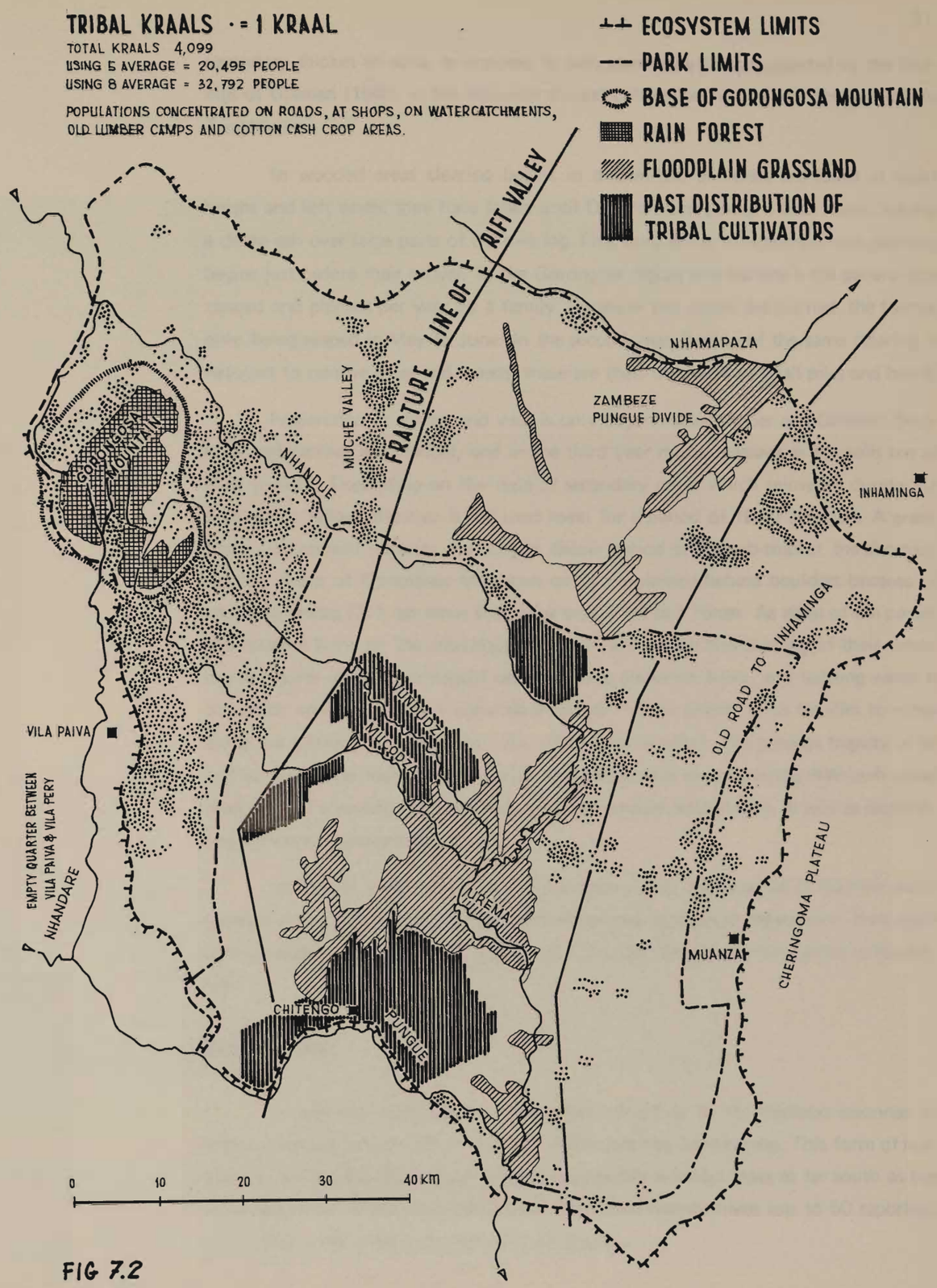


FIG 7.2

DISTRIBUTION AND NUMBERS OF TRIBAL KRAALS IN THE GORONGOSA SYSTEM
(DATA FROM AIR COUNT BY K.L. TINLEY 1971)

areas noted above. At this time the main concentrations of wildlife were on the floodplain areas north (Macoreia) and northeast (Guinha) of the Urema Lake. In the 1950's the human population on the Rift Floor area was moved out of the park and settled in the area around the base of Gorongosa Mountain as no one in authority realized that the entire park ecosystem and about 12 000 tribespeople south of the mountain were dependent for their perennial water solely on the water flowing off Gorongosa Mountain. The addition of a large population to the eastern base of the mountain, resulted in encroachment of the catchment and riverine areas on which all life depends.

CULTIVATION

Shifting cultivation can decrease the area of forest, replacing it either with open communities or with thicket, and spread the increase of thicket in savanna areas when left fallow for long enough. Not only are there far reaching changes in the physiognomy and composition of the vegetation due to selective felling and clearing, but new erosion cycles (especially nickpoints) are initiated and older processes are accelerated, and in this way soil moisture regimes are changed. These changes are greatest, or most permanent, where forest and savanna systems interdigitate in tension zones of ecological instability.

Apart from alluvium and soils derived from basic rocks, the soils of the Gorongosa region are predominantly poor and sandy. Thus over the greater part, cleared land is only occasionally used for semi-permanent cultivation, ie. for periods of up to twelve years without respite. The indicator plants used by the tribal cultivators to discern the best soils are the trees ***Piliostigma thonningii*** and ***Acacia sieberana*** and the grasses ***Pennisetum purpurem,*** first and foremost, then ***Panicum maximum and Hyparrhenia rufa.***

The cultivators quite naturally prefer to use sites where the least work is required. Thus in mountain and flatland, the margins of grassy drainage lines are used first, although seasonal waterlogging requires mounding of the soils on which the crops are planted. Next in preference are savannas, and lastly thicket and forest which require the most work in clearing. Some of the savanna and riverine areas covered in ***Pennisetum*** require an inordinate amount of work to remove the large tough tufts of this grass, but it is well worth the effort as these soils are amongst the most productive. It is significant that areas of savanna replaced by thicket only require half the usual 15 to 20 year fallow before they are used again. The reason for this is probably a faster build up of humus under thicket than in secondary savanna where annual fires burn each year's leaf-fall supply. The report by tribesmen of the rejuvenating effects of secondary thicket on soils, as opposed to secondary savanna, is supported by the findings of Gillman (1945) in the Maconde thicket cultivation system near the Rovuma in Tanganyika.

In wooded areas clearing begins in midwinter; the trees are felled at waist height and left where they have fallen until October. Everything is then burnt, leaving a dense ash over large parts of the clearing. First rains arrive in November and planting begins just before their arrival. In the Gorongosa region one hectare is the general size cleared and planted per year by a family. Sorghum and maize are planted, the former only being reaped in May to June. In the second year, hoeing of the same clearing is required to remove grass and weeds, these are then thrown into small piles and burnt.

Preparation in the second year is only begun in September and October. Sorghum and cassava are planted, and in the third year mostly cassava as the soils are at their poorest. Depending on the type of secondary cover which reinvades during the subsequent fallow, the area is not used again for a period of 10 to 20 years. A grass-scrub replacement requires the longest fallow period and scrub-thicket the shortest. On the slopes of Gorongosa Mountain crops are planted behind boulders because of the steep slopes (3°), on areas that once supported rain forest. As most of the perennial streams born on the mountain are small, cultivation and burning of their catchments results in their permanent destruction as perennial flows, and running water is thereafter confined to each occurrence of rain. These effects force families to move along the contour to undamaged sites with perennial water. The greatest tragedy of all is that a relatively few tribal people are thus responsible for destroying their own water resource and affecting thousands of their own people downstream, as well as jeopardising the park ecosystem as a whole.

In riverine areas two, or even three, crops a year are obtained as the river water recedes. The bottom lands are planted with maize and beans in the autumn, then again in midwinter giving harvests in August, and October before the rains arrive in November.

BEE-KEEPING

In common with most of the tribes occurring in the miombo savannas of Africa, those on either side of the Rift Valley practise bee-keeping. This form of husbandry is practised throughout Mocambique in the miombo areas as far south as the Limpopo River. Many individuals own more than twenty hives (up to 50 reported) which makes this a full-time, specialist occupation.

PLATE 13 MAPIRA (SORGHUM) CULTIVATION IN CLEARED MIOMBO SAVANNA WOODLAND OF THE MIDLANDS

Shifting cultivation on shallow sandy fersiallitic soils developed on crystalline migmatitic granite-gneiss (2 to 3 year use with 15 to 20 year fallow).

(photo: J. L. P. L. Tello)

The hive is made from a bark tube removed from the basal 2 m of a living miombo tree. ***Brachystegia boehmii, B. spiciformis,*** and ***Julbernadia globiflora*** are particularly used. From the two latter species bark is removed in the midrains period when it strips off most easily. However the first species strips cleanly throughout the year and is therefore the most valuable. This feature is well known by elephant who strip the bark of ***B. boehmii*** throughout the dry winter season ignoring the other species until summer.

The tube is made by cutting around the trunk of the tree at two ends, one longitudinal slice is cut between them so that the bark can be peeled off in one piece. Wooden pegs are driven through the now overlapping longitudinal slit and the ends closed with coils of palm leaf or grass. The bark tube is then lodged in a tree as high as possible so as to be conspicuous to swarms or scout bees passing over the canopy (Guy 1971). In the hot dry period prior to the first rains in November, when swarming occurs, the general leaflessness of the trees renders the hives more obvious. Lodging the bark tubes as high as possible also protects the hives from the honey badger and from veld fires, which in three metre tall grass scorches trees to a high level. A more recent innovation to foil honey badgers is a thin metal sheet attached around the base of the tree which acts as an effective skid. The propolis of stingless bees is used to bait new bark hives. Honey is removed mainly in the autumn and early winter, and the wax is moulded into blocks and sold at trading stores.

The phenology of the miombo and Rift Valley system is described in Chapter 8, and shows the seasonal peaks and sequences of flowering in closely related species in the same system and between the different ecosystems. Bees are active throughout the year in the region, and in March, bees have been recorded in the canopy of mopane woodland, for example, actively collecting propolis from the sweet resin secretions of the leaves and new bark of the terminal branchlets. Bees also collect grass pollen much more than is generally realised. This activity occurs in the early mornings whilst the pollen is moist and sticky. ***Cynodon dactylon*** and ***Echinochloa species*** appear to be the most important. As the primitive bee-hive smokers are made of a bundle of green, and partially dry, grass which are abandoned as soon as they catch alight, the bee-keepers are major culprits in setting fire to the countryside in the autumn.

FISHING

Various fishing methods are practised by the tribespeople in both the floodplain areas and in the small streams of the uplands. Reed barriers with valved baskets are used in seasonally flooded plains, similar to that described for southern Mocambique and Tongaland (Tinley 1964). The thrust baskets are similar in construction to those of the upper Zambeze and Okavango (Maclaren 1958), which have an extension of wattles past the upper hand opening to form a handle. Plant poison is also used in fishing, chiefly in the upland areas, including Gorongosa Mountain, and when applied indiscrimately some streams become fished out. This is tragic, not only as a waste of a resource, but as the little scientific collecting done here has shown the presence of newly described endemics such as ***Parakneria mossambica*** (Jubb & Bell-Cross 1974), unique biotic elements can be lost before they are known.

The plant poisons are derived chiefly from the pounded stem and root-bark of trees and shrubs such as ***Strychnos potatorum, Mundulea sericea,*** and ***Albizia versicolor.*** In the drier areas of the Zambeze and Save valleys, bark of the riverine tree ***Croton megalobotrys*** is important. The large tubered ***Neorautanenia mitis***, with annual aerial parts, is a potent fish poison used from coast to coast between the 15 and 20° latitudes where it occurs on compacted sands or calcareous sandy clays. The tuber is cut up into small pieces, pounded, then sown into the water in the normal way. The roots of an unidentified shrub known as ***nyakorakota*** and a cultivated plant ***mutika (Tephrosia sp.)*** are also used as fish poisons.

Prior to the use of manufactured string, fish nets were made of fibre from baobab bark and sansevieria. The nets were then preserved by soaking in boiled bark chips of tannin-rich species such as ***Euclea, Ficus, Piliostigma, Lannea*** and ***Acacia.*** On the coast the bark from mangroves such as ***Bruguieria gymnorrhiza*** is used. Most of the baobabs in the Urema Trough have large rectangular scars where sheets of bark were cut out for making cord, including nooses strong enough to snare animals the size of wildebeest and sable.

Barbless spears are also used for fishing. The spear shafts are generally made from the solid-stemmed bamboo ***Oxytenanthera abyssinica*** common in the higher rainfall savannas on either side of the Rift. The bamboo is of course used for many other purposes including the construction of huts and grain stores.

CASH CROPS

In addition to the unfortunate but inevitable industrially orientated grid (Tinley 1971) imposed on the land and people, by roads, trading stores etc (Figs 7.2 and 7.4), perhaps the greatest iniquity was the introduction of a cash crop economy to shifting cultivation cultures. As noted above, shifting cultivation is a means of obtaining the highest productivity from a poor substrate, by the process of alternating

PLATE 14 THE RAVAGES OF CULTIVATING ON WATER CATCHMENTS

Before..... perennial rain forest stream on southwest slope of Gorongosa Mountain.

After .....the same stream several kilometers below the preceding photo, near the base of the mountain where riverine forest has been cut and burnt in stages upstream for cultivation.

cultivation with long periods of fallow. Thus any clearing of land required above the annual food-growing requirements of a family means that the bank of land for future use is expended for a cash return.

Cotton is the main cash crop which is grown around, and until the early 1950's, inside the national park on the Rift floor north of the Pungue River. Cotton growing by each family requires opening up three to four times the area required for food over the same shifting cultivation cycle. In this way, land hunger under relatively low population concentrations develops and causes a typical chain reaction. Pressure to return to fallow areas too soon results in diminished yields and stunted crops. This then forces the clearing of riverine and forest vegetation resulting in damaged catchments and spring areas. Politically, grave problems then arise as the tribal people, who have never directly benefited from the park they surround, demand park land to make up the shortage caused by cash crop cultivation.

The latest intrusion in the Rift Valley on a grand scale is the cultivation of sugar, which requires heavy irrigation in the winter due to the extreme Rift Valley dry seasons, and the added problem of salinization then arises. The Pungue plains, crossed en route to Beira, are now under sugar but were reported to have been covered by tremendous herds of buffalo, similar to the Zambeze Delta, in the 1940's.

The cash crop agriculture in Mocambique was merely shifting cultivation on the large scale, as after three years the soils became exhausted and it was uneconomic to fertilize such large areas. Thus a new wooded area would be cleared and used for the next three years. In this way vast areas were rendered useless to tribal cultivators, forcing them into larger concentrations and resulting in devastation of water catchments, riverine areas and invasion of the specially protected forest reserves and national park areas.

Under such inexorable pressures it is surprising that any areas retain their pristine conditions. It is also clear that authorities can seldom resolve this problem as they tackle the results and not the primary causes. The irony of this successional process of land devastation, and the disruption of tribal social life and their precarious balance with the land resources, is that this is the procedure adopted by the industrial approach to "development" of a country.

TIMBER EXTRACTION

In addition to cash crop pressure the invasion of timber extraction companies, with each company vying to take out the most in the shortest possible time, has caused widespread damage to virgin forest and savanna woodland areas. The temporary establishment of timber extraction stations or sawmills sets in train another typical succession. Access roads made into uninhabited areas, and bulldozed tracks through forests to extract the largest timber, provide ready made clearings for shifting cultivators. Temporary lumber camps and sawmill sites are also responsible for new human settlements in otherwise uninhabited country. Once the timber supply is exhausted from an area the companies move on leaving nuclei of cultivators where trading stores have become established.

The traders then set up their own systems of barter, especially in drought (famine) periods, when meal is supplied in exchange for animal pelts. To obtain animal pelts, more and more ingenious snaring methods are employed until the habitats become cleaned out. Thus the wildlife meat resource is reduced to near extinction levels long before the bulldozer returns to open up wooded country on the large scale for the production of cash crops by companies.

The main timber species extracted from the mosaic of forest, miombo and riverine areas on either side of the Rift Valley include the following:

Adina microcephala (for sleepers)
Brachystegia spiciformis (for sleepers)
Burkea africana (for sleepers)
Cassipourea gummiflua
Chlorophora excelsa
Erythrophloeum africana (for sleepers)
E. suaveolens
Kyaya nyasica (mbaua)
Millettia stuhlmannii (panga-panga)
Pterocarpus angolensis (mbila)

SELECTIVE INFLUENCES ON HABITATS

Selection is on several fronts, and all influence the differential success of species in recolonization and succession according to the efficacy of their dispersal mechanisms. Useful trees which provide edible fruit or perennial shade are often left standing by man and they eventually come to dominate the landscape. An example of this type of selection are the cultural-savannas in the Macia area, as seen from the main road between the Incomati and Limpopo Rivers in southern Mocambique. Those woody species most useful as wattles for hut construction are changed by overcutting to a more productive multiple–stemmed growth form, or are eliminated from an area. Other multiple-use species such as baobab ***Adansonia digitata*** are either planted around kraal sites, or grow from the refuse heaps where the unused parts of edible fruits and seeds are thrown. On the Rift Valley plains for example, islands of baobabs on mounds are generally associated with old hearths and masses of pot sherds now being exhumed

by the incisional erosive phase of the plains. Secondary growth on fallow fields is composed of weeds (usually alien plants), primary invader species, and coppicing of some of the woody species from the original mature woody cover. These regrowths typically form even-aged stands, sometimes of one or several species paralleling the appearance of primary savanna invasions of floodplain areas. Fire used excessively (twice a year) to clear secondary growth or tall coarse grass cover also has a selective influence.

Removal of these selection pressures by movement of people to another area provides a mosaic of different aged stands at different stages of succession. Although edaphic controls may still determine the species composition in different sites, these disruptions can confound or make a mockery of näive approaches to explain pattern and process purely by physical environmental factors alone.

The impact of peasant cultivators, accelerated by new pressures and controls of industrially orientated cultures, has thus had far-reaching implications in influencing the appearance and composition of many present day ecosystems.

The part played by shifting cultivation, pastoralism, timber extraction and other forms of landuse, in moulding the cover and surfaces of present day landscapes is thus essential for meaningful interpretation and analyses of many present geomorphic processes and biotic systems.

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