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Traditional agroforestry practices in Zimbabwe

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Abstract. Traditional agroforestry systems in the communal areas of Zimbabwe are described. There are systems centered on main fields, on home gardens, on homesites and on grazing areas. In the main fields, the major tree-related management practice is the conservation of preferred indigenous fruit trees. Fruit trees are also the focus of forestry activities around the gardens and the homesite; but here it is the planting of exotic species. In a localized area of Zimbabwe *Acacia albida* is important in fields. There is almost no use of tree fallows in Zimbabwe. Trees in grazing areas have numerous roles, but at present there is little knowledge about traditional management practices in these areas. In the development of agroforestry systems in Zimbabwe it is suggested that those systems designed to improve fodder production will make a significant contribution to farm productivity because of the importance of cattle in the farming system and the present fodder shortage. Interventions involving the planting of fruit trees are likely to be very successful, as there is much interest in such planting. Another area that needs to be developed is that of tree plantings to improve soil fertility.

Introduction

The significance of trees in the household economy of small-scale farmers in Zimbabwe has, until recently, received scant attention. Prior to independence in 1980, the little development and extension work that took place in the communal areas, was directed towards annual crops and livestock, and the forestry service concentrated on softwood plantations and indigenous woodlands on state land. Extension officers in communal lands encouraged farmers to remove all trees from arable areas [Abel et al. 1988; Wilson 1989a]. Prior to 1980 the only research on trees in communal areas was the documentation of traditional uses [e.g. Coates-Palgrave 1983] and of vernacular names [e.g. Wild et al. 1972], and very few publications are available from this era.

Soon after independence there was an upsurge of interest in trees in communal lands. The forestry service established an entirely new division

and embarked on the Rural Afforestation Programme, which commissioned a base-line survey of knowledge-attitudes-practices [du Toit et al. 1984]. The agricultural extension service indicated an interest in trees by employing a forester who set up an in-service agroforestry training course. In 1986 the forestry service filled the first agroforestry research post. Trees in communal areas were now also receiving attention from researchers [e.g. Wilson 1989a; McGregor 1989; Campbell and du Toit, in press] and non-governmental organizations [e.g. ENDA-Gumbo 1989].

With the present focus on agroforestry in Zimbabwe, it is important to recognise that there are traditional agroforestry practices, and the present contribution aims to describe these. In many recent publications from other parts of the world, it is recognized that 'agroforestry' is a new name for set of very old practices [Jama et al. 1989; Toky et al. 1989]. All the literature on deforestation and the fuelwood crisis in Zimbabwe [e.g. Whitlow 1978; Whitsun Foundation 1981; Beijer Institute 1985] paints a very negative picture of the communal areas. Is there evidence of tree planting and management of tree resources? In the present work, we view 'agroforestry' in the broad sense, as the integration of woody perennials in a farming system [Young and Pinney 1989], and we concentrate on the communal lands, not the recently resettled areas, in which different processes may be at play [e.g. Hancock 1989; Grundy et al. in press].

The farming system

The farming system in communal areas is based primarily on the production of annual crops (mainly maize), with cattle playing a key role in the provision of inputs [Scoones and Wilson 1988; Wilson 1989a; Reh et al. 1989; Swift et al. 1989]. Cattle provide manure, draught and transport, deficiencies of which lead to reduced crop production [e.g. Shumba 1984]. Leading farmers will manure their fields every 4 to 5 years, with leaf litter derived from trees sometimes being a component of the manure [Abel et al. 1988; Burford 1989; Wilson 1989a]. Manuring is only relevant in dystrophic areas [Wilson 1989a] which are very common in the communal areas. For example, on the eutrophic alluvial plains of the lower Save, no manuring is done [van Oosterhout and Campbell 1985]. The cattle production system is centered on the grazing areas, although cultivated areas also contribute (grass on contour ridges and crop residues) [Swift et al. 1989].

Staples, legume crops and non-food cash crops are grown in the main fields, and vegetables for the relish come from small garden plots [Truscott 1986]. Fruits either come from trees around the homesite or from trees in the

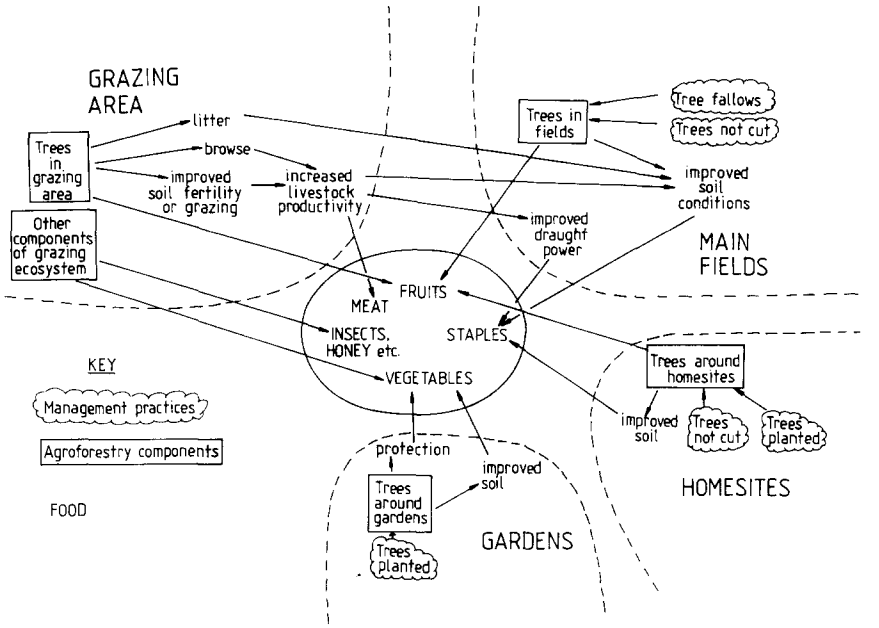

Fig. 1. The role of trees in the household food economy.

main fields or grazing area [Gumbo et al. 1989]. Fruits are frequently consumed when in season and are an important source of nutrients, especially for children [Campbell 1987; Gomez 1988; Wilson 1989b]. Mushrooms, various insects (e.g. caterpillars), honey and wild vegetables are consumed rather rarely and with very pronounced seasonality [Gomez 1988; Wilson 1989b].

Traditional agroforestry practices

Four agroforestry systems can be recognised (Fig. 1), systems centered on (a) main fields (b) grazing areas (c) small garden plots and (d) homesites and home fields. In terms of present management of the agroforestry systems, two major strategies should be recognised: the planting of trees, chiefly exotics, as occurs around homesites and in garden plots [Burford 1989; Gumbo et al. 1989; Hancock 1989], and the selective conservation of indigenous trees, as occurs in main fields, and to some extent in the grazing areas [Campbell 1987]. At present there is very little information about management of indigenous trees. Dwellers in communal areas are very knowledgeable about trees [Wilson 1989a]; and in general about ecological processes [du Toit 1985; Wilson 1988].

Main fields

In spite of attempts by agricultural advisors to have farmers remove trees from fields [Wilson 1989a; Abel et al. 1988], indigenous trees still remain a distinctive feature of most cultivated areas [Campbell 1987; Wilson 1989a]. Almost no planted trees occur in the main field area, unless the main fields are located where former homesites were found [Abel et al. 1988].

Trees are left primarily for their fruits and shade [Campbell 1987; van Oosterhout and Campbell 1985; Wilson 1989a; Gumbo et al. 1989], the latter authors recording that 80% of trees in fields have edible fruits. The preservation of fruit trees in such that even in the most deforested areas of Zimbabwe, the abundance of the most favoured trees has not decreased [Campbell 1987]. Less favoured trees, including fruit trees, are removed; the resultant landscape has a wild fruit tree mix which is directly related to people's fruit choice. Important fruit trees in fields are *Diospyros mespiliformis*, *Strychnos cocculoides*, *Strychnos madagascariensis*, *Strychnos spinosa*, *Berchemia discolor*, *Azanza garkeana*, *Sclerocarya birrea*, *Adansonia digitata* and *Ficus* spp. [Campbell 1987; Gumbo et al. 1989; van Oosterhout and Campbell 1985].

Gumbo et al. [1989], van Oosterhout & Campbell [1985], Wilson [1989a] and Grundy et al. (in press) recorded a number of trees with non-edible fruits in cultivated areas. In many cases the trees are important for shade (e.g. *Combretum imberbe*, *Kirkia acuminata*, *Colophospermum mopane*). Another reason for leaving trees relates to their social significance [Mukamuri, in prep.]. For instance, large *Parinari curatellifolia* individuals are often used as meeting places. Other trees have important medicinal and/or spiritual values (e.g. *Lonchocarpus capassa*, *Kigelia africana*, *Pseudolachnostylis maprouneifolia*) [McGregor 1989; Grundy et al., in press]. Another reason for leaving trees may relate to their difficulty of cutting, though this reason may apply on only recently cleared land (e.g. lands that were cleared up to seven years previously) [Grundy et al., in press]. Species that were said to be left because of their hard wood include *Combretum imberbe*, *Swartzia madagascariensis* and *Pericopsis angolensis*. Other trees are valued for their browse potential [Scoones and Madyakuseni 1987].

The importance of trees in fields for soil amelioration and hence crop production is somewhat controversial, perhaps because effects are modified by the particular rainfall in the growing season [Wilson 1989a; Ingram 1989a] and because the trees could be affecting crops in a variety of ways (fertility, light, moisture, foci for animals) [Ingram 1989a, 1989b]. Farmers recognize the positive effects on crops and will in some cases restrict the use of fertilizer under the canopy [Ingram 1989b; Wilson 1989a]. Wilson [1987]

makes a strong case for their crucial role, but examination of the data (for 50 tree species there is definite information from farmers on the effects on crops, either positive, negative or neutral), there is a highly significant statistical dependence between the production of edible fruit and the effect on soils. Most species without edible fruits are regarded as having negative effects on soils, with only two non-edible species (*Lonchocarpus capassa* and *Kigelia africana*) said to have positive effects. The data suggests that farmers are less likely to associate a species with negative effects, if that species has edible fruits. It is unlikely that edible fruit-bearing species affect soils differentially to other species. No respondents in the survey of Grundy et al. (in press) mentioned the soil ameliorative function of trees in fields, in spite of very explicit questioning. Ingram [1989b] concluded that the enhancement of crop growth by trees, if present, was viewed by farmers as incidental to the traditional role of these trees as providers of fruit and shade. However, she did record higher cob volume under the canopy of *Ficus sur* and *Parinari curtallifolia*, and higher levels of available phosporous, carbon and nitrogen, though there was no simple correlation between raised nutrient levels and increased cob volume [Ingram 1989a].

Acacia albida grows naturally along the major rivers of Zimbabwe. The Zambezi River is the traditional abode of the Tonga people, who, in common with agriculturalists all over Africa where this tree occurs, retain the tree in fields and cultivate under their canopies [Clarke 1983]. A study of a small community in this area revealed that there had been no appreciable decline in soil fertility in fields of *Acacia albida* over two decades [Clarke 1983]. However, the lack of fertility decline may be more due to the inherently eutrophic soils than to trees.

In addition to trees there are also many shrubs in fields and shrubs may outnumber fruit trees. For instance, in the Save area the following species, in order of frequency, were found in fields: *Terminalia sericea*, *Bauhinia thonningii*, *Burkea africana*, *Combretum fragrans*, *Dalbergiella nyassae*, *Pseudolachnostylis maprouneifolia*, *Sclerocarya birrea* and *Strychnos cocculoides* [Campbell and du Toit, in press]. Of these, only the latter two are fruit trees. Most of the rest are present as shrubs and are rapidly regenerating species, without edible fruits and with no other especially favoured characteristics, apart from being used for firewood in the home or used to produce ash for the fields. Tree abundance in fields varies considerably. On eutrophic soils, there are much fewer trees remaining [Van Oosterhout and Campbell 1985; Wiison 1989b; Campbell and du Toit, in press], perhaps because the fruit tree resource was smaller in the original woodland of the soils [Campbell 1987] or because eutrophic soils are more intensively used than dystrophic soils [Reh et al. 1989]. Wilson [1989a] argues that it is due to differential

cutting by people, with trees being left on dystrophic sites because of their positive effect on the nutrient status.

The above discussion has only concerned trees left in fields. The use of trees as a fallow, as in the 'chitemene' system in Zambia [Allen 1965], is not common in Zimbabwe at present. In one area of Zimbabwe, a very high rainfall area (the Honde valley), a tree fallow system is still practised, covering a third of the landscape. Fields are used for 3–8 years and then abandoned for 2–4 years [Campbell and van Oosterhout 1985]. In this miombo woodland/forest area, a shrubland rapidly regenerates during the fallow period. When fields are brought back into production the woody plants are not stumped. All the cleared above-ground biomass is burnt and the ash used as fertilizer. In semi-arid areas, such as the upper Save, shifting agricultural systems were reported from earlier times [Burford 1989; McGregor 1989; Reh et al. 1989], whereas in much drier areas shifting agricultural systems were never common [Wilson 1989a].

Grazing areas

The woodlands of the grazing areas are mostly much changed from the climax woodlands that formerly occupied the areas [Campbell and du Toit, in press; Wilson 1986, 1989a; McGregor 1989], but much of the change has been brought about by events beyond the control of peasant farmers [e.g. Wilson 1986, 1989a; McGregor 1989]. In some areas, mines were responsible for wood extraction, while most areas were affected by the land-use policies of the colonial governments. People were moved from lowlands to uplands, with two moves being made in some areas. Thus, areas were cleared for fields, where stumping was required, with these fields later having to be abandoned and used as grazing area. Density and stature of woody plants is much reduced, with resultant reduction in overall cover, and there have been shifts in species composition. The biggest changes in composition occur on sites used for cultivation and then abondoned, with *Acacia* spp. dominating after abandonment. This phenomenon is not very common in most communal areas as almost all land with eutrophic soil remains in cultivation and such a dramatic shift in composition occurs more rarely on dystrophic soils.

Wood extraction leads largely to reduced stature and thinning, rather than to major changes in composition [Campbell and du Toit, in press]. Although the grazing areas are the major source of wood for construction and fuel [du Toit et al. 1984], fruit trees in the grazing areas are rarely cut, a further indication of their importance to households [Campbell and du

Toit 1988; Posselt 1939; Wilson 1989a]. Fruit trees contribute less than 10% cover to the ecosystem [Campbell 1987].

Trees in grazing areas may improve soil conditions in the main fields either directly, through the use of litter for composting of gardens or for manure bulking [Burford 1989; Wilson 1989a; Swift et al. 1989], or indirectly, by their contribution to the productivity and size of the cattle herd (with the end effect being higher quantities and better quality manure, Swift et al. 1989). The indirect effect occurs largely because many of the dominant trees in the grazing areas provide good browse, e.g. *Julbernardia globiflora*, *Combretum apiculatum*, *Colophospermum mopane*, *Lonchocarpus capassa*, *Terminalia sericea* [Scoones and Madyakuseni 1987; Abel et al. 1988]. Wilson [1989a] concludes that browse is clearly supplying a large proportion of the protein intake of stock, especially during the critical late dry season when there is little grass. He notes that browse quality is said to be better on eutrophic soils by farmers, a correlation that is supported by ecological studies [Campbell 1986; Frost et al. 1986; McKey et al. 1978].

Apart from browse, savanna trees have been shown to provide environments for nutritious grasses [Kennard and Walker 1973] and to increase infiltration rate, soil moisture content, decomposition rate and the level of extractable phosporus, nitrogen and organic matter in the soil by 2–5 times as compared to open areas [Campbell et al. 1988]. In Mazvihwa, Scoones and Madyakuseni [1987] have recorded many trees which are said to promote grass production (e.g. *Grewia flavescens*, *Parinari curatellifolia* and *Bridelia mollis*).

Garden plots

Gardens often have exotic fruit trees associated with them, and the fruit tree composition appears to differ from that around homesites (e.g. a greater prevalence of bananas). Garden plots are sometimes protected from animals by live fencing (e.g. *Commiphora* spp.), but more often are protected by brushwood fences, usually of *Acacia* spp. [Burford 1989].

Homesites

It is around homes that households concentrate their tree planting activities. In a survey of a number of communal areas, du Toit et al. [1984] found that 61% of households had planted trees. Most of the tree planting households had planted fruit trees (one third having planted shade trees and only 10% having planted gums). Katarere [1987] and Hancock [1989] recorded similar percents having planted fruit trees in communal areas. Hancock [1989] found that households planted on average about 7 trees.

The most important planted fruit tree in the upper Save was mango, followed by, in roughly equal frequency, pawpaw, mulberry, citrus and guava [Reh et al. 1989]. In a higher rainfall area, Hancock [1989] found a different suite of planted fruit trees. The most frequent species, in order of frequency were peaches, mangoes, bananas and mexican apple. Not all the fruit trees around homesites are exotics; Gumbo et al. [1989] found that 10% of the fruit trees were indigenous trees that had not been cut. In general few households plant indigenous fruit trees [less than 5% – Campbell 1987; Hancock 1989], but experimentation with these species occurs where appropriate projects are initiated [Gumbo et al. 1989]. The trees around homesites also include a number of hedge plants. Reh et al. [1989] recorded *Euphorbia* and *Agave* as the most frequently planted hedges. Trees around homesites are often planted in association with the home fields in which a variety of crops are grown (staples and vegetables).

Possible agroforestry interventions

Overall strategy

Figure 1 indicates that trees have many important roles in the food production system. The number of possible interventions, especially when combined with the number of potential tree species, is endless. A comprehensive list of species for a wide range of potential agroforestry practices has been compiled by Spicer (undated) in the Agroforestry Training Manual.

Any intervention that is planned must conform with local conditions, meet the needs of local farmers and build on farmer practice and knowledge [Fujisaka 1989; Gumbo 1989]. Interventions should therefore be worked out after some form of farming systems diagnosis has been undertaken [Abel et al. 1989]. A key constraint in communal areas is labour at peak times of the agricultural season. The farmers of Ungowa Communal lands, for example, average only two adults working full-time on the family holdings, hardly enough to tackle the various chores rural life demands [Gumbo et al. 1989]. Labour constraint has a great bearing on the type and form any intervention will take.

Other components limiting the productivity of the farming system are draught power and soil fertility (the latter in the dystrophic systems). Cattle are important in providing draught and manure [Scoones and Wilson 1988; Wilson 1989a; Reh et al. 1989; Swift et al. 1989]. There is inadequate grass to maintain the herd sizes needed to provide sufficient inputs, let alone sufficient to even maintain present herd sizes without environmental

degradation [e.g. see du Toit and Campbell 1989]. Thus interventions involving fodder production should be considered as a priority.

Fodder trees

The value of fodder trees has long been recognised in Zimbabwe [West 1950]. Communal farmers do recognise that their livestock browse in the late dry season, when grass is scarce [Scoones and Wilson 1988], but these farmers do not have a strong tradition of cut and carry (although they are known to do so in drought years). Hence farmers may not be enthusiastic about interventions to build up fodder banks of fast-growing exotics (the legume leucaena being a likely candidate for such an intervention). Farmers tend to favour a scheme of enrichment planting in the grazing areas with their own local trees (e.g. *Julbernadia globiflora*, *Lonchocarpus capassa*, *Combretum apiclatum* and *Kirkia acuminata* – Gumbo 1989).

Fruit trees

Interventions involving the planting of fruit trees, chiefly exotics, are likely to be very successful, as there is much interest in such planting. The conservation of indigenous fruit trees in cleared lands should be further encouraged by agricultural extension officers, while enrichment planting of grazing areas and contour planting should be attempted. There is potential for increasing the practice of contour planting. This kind of intervention would not lead to any loss of land, but researchers would need to determine optimal tree heights on contours. The intervention of planting or leaving trees in fields is likely to come into conflict with agricultural extension as there still is a belief that trees should not be left standing in fields.

Soil fertility improvement

Another intervention which suggests itself is the direct use of trees to increase soil fertility [Young and Pinney 1989]. The ability of indigenous trees, chiefly fruit trees, to increase soil fertility, as claimed by farmers, requires much further research. Research should also seek to determine the optimum crop-tree mix, as well as the general configuration of the trees on the land. Interventions could, for the present, be concentrated on the planting of exotics, whose soil ameliorative effects are well known (here we include *Acacia albida* using the appropriate provenance). The intervention referred to as planted fallow, where land is put to fast-growing legumes for two to three seasons after which the trees are removed and the land put to crops,

is not possible in many Zimbabwe's Communal Areas, as land is generally scarce and a farmer cannot afford to leave land fallow [Burford 1989].

Hedges

Yet another possible intervention could be that of hedges. Hedges can be established to protect arable areas, gardens and homesteads. Live hedges do not just offer protection but also act as windbreaks and provide organic material to the adjacent areas. Besides this a hedge could also provide fuelwood, poles, fruits etc. Hedges are not likely to require much in terms of labour. A total of 17 tree species and 13 shrubs have been suggested for hedges [Spicer, undated].

Conclusions

The rather negative picture of the actions of peasant farmers, as arising from accounts of deforestation and fuelwood crises, is not justified. Rather, there is widespread tree planting, there is careful conservation of trees and there is a wealth of knowledge about the role of trees. Furthermore, many of the changes in woodland extent and structure were bought about by factors over which peasant farmers had no control.

This paper has attempted to provide an insight into the present agroforestry systems in Zimbabwe's Communal Areas, but unfortunately very few of the agroforestry practices have been documented in detail. In many other countries the positive attributes of agroforestry are not only well known but are also well documented [Ingram 1989b]; the challenge facing researchers in Zimbabwe is to elucidate local agroforestry practices.

Trees have a crucial role to play in the food production systems. One of their most important roles is as a source of fruit, and many of the traditional interventions (planting and conservation) involve fruit trees. Future interventions in this area are likely to be very successful, because of the high value placed on fruit trees by peasant farmers.

Fodder banks have potential to be valuable interventions. Cattle are a limiting resource for crop production in communal areas, and fodder from trees is presently an important component of their diet. Fast-growing legumes could add substantially to the fodder resource. However, local farmers are not experienced with growing trees for fodder, and may thus not be very enthusiastic at present.

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