Trees, Seasons and the Poor

Robert Chambers and Richard Longhurst[1]

The seasonal importance of trees to the poor is not, to our knowledge, a subject which has received any comparative analysis. In an earlier collection on seasonal dimensions to rural poverty [Chambers, Longhurst and Pacey 1981] there was no chapter on trees, and the words 'trees', 'forests', 'wood' or 'fuelwood' are not in the index. This neglect, while unfortunate, can be understood as the outcome of professional biases against trees and tree products as they matter seasonally to the poor. Neglect of the poor and of seasons needs no comment. Nor is the neglect of trees in this context difficult to understand: foresters have been most concerned with trees for timber in commercial plantations or in protected forests, [although this climate of opinion is changing; see, for example, FAO 1985:2] and with keeping poor people away.

Agricultural research and extension have concentrated on private farming property and have been less concerned with common lands where trees important to the poor are often found; and in private farming systems, professionals in, for example, agronomy, animal husbandry and agricultural economics, notice trees only peripherally. Even today, agroforestry remains a fringe subject which falls between the disciplines. More generally, outsiders' perceptions of how poor people contrive their livelihoods round the year focus on the more obvious agricultural activities of crop and livestock agriculture and tend to overlook the diversity of their activities, especially outside the main crop seasons. Where poor rural people's use of trees is not recognised, it is often seen negatively — as a problem: of encroachment on forests, of cutting trees for charcoal, of environmental degradation. When all these biases interlock, it is scarcely surprising that the seasonal importance of trees to poor rural people has not been a central subject. Too easily, how poor people use trees in their livelihood strategies has been either ignored, or treated as a topic more suitable for dilettante social anthropology than for mainstream professional concern.

Yet there is evidence that trees often play a major part in the livelihood strategies of poor rural people. Livelihoods here refer to the year-round levels of wealth and of stocks and flows of food and cash which poor rural people seek to provide for their physical and social well-being, minimising risks and meeting contingencies. The most conspicuous and important activities to gain livelihoods are crop and animal husbandry, and these are subject to seasonal peaks and troughs, in activities, and in flows and the resulting stocks. The problems of the lean season are well known and well documented with a concurrence during the rains and before harvest of low food stocks, high indebtedness, hard work, and disease; and in the slack season after harvest there is often less to do and a gap in productive activity. In practice, the many uses of trees include helping poor people to mitigate these problems.

The physical and biological basis for trees' seasonal contributions to livelihoods is both obvious and easy to overlook. Therophytes[2] (annuals yielding their crop above the ground) dominate cultivation but are shallow rooting, dependent on timely rainfall or irrigation, and sharply timebound in the activities (planting, weeding, transplanting, harvesting, etc.) which they require. For their part, domestic livestock require continuous attention, and especially feeding, without which they soon waste and die. Phanerophytes (perennial trees and shrubs) in contrast, have several special characteristics. While there are exceptions, these include:

— deep rooting with access to moisture either all year round, or for much more of the year than therophytes, enabling them to transpire and photosynthesise over longer periods, and to trap and recycle deeper soil nutrients.

[1] The authors are grateful to Jim Redhead for comments; however, the responsibility for the views expressed is theirs alone.

[2] See pp 39 of this *Bulletin* for a further definition (Leakey).

— less precisely timebound activities, with leafing, fruiting and seeding spread over longer periods than therophytes,[3] and with other products including fuelwood available either at any time of the year or over extended periods.

— accumulation of stocks, in the form of wood, over periods of years, so that stinting in consumption adds to future stock.

— environmental effects including shading, reducing wind and soil erosion, and shielding against heavy rain.

— demanding little attention once well established.

These characteristics are supplemented, according to species, by others with seasonal significance in complementing crop and animal husbandry, and in supporting livelihoods at what would otherwise be more difficult times of the year.

The diversities of trees and their phenologies, products and uses, of environments in which trees and people live, and of livelihood strategies, pose problems for analysis and generalisation. The range of uses of trees is so vast that only some of the seasonal aspects can be sketched here. The uses include timber, firewood and poles. In addition, so-called 'minor' forest products of commercial or consumption value include fruits, berries, nuts, fodders, gums, resins, dyes, tannins, medicines, wax, honey, insects, saps, soaps, poisons, fibres, bamboos and canes, to mention but some. All we can attempt here is a preliminary mapping of some main features, with a few illustrations. Some of the seasonal, or counterseasonal, contributions of trees to the livelihoods of the poor can be presented under four heads:

- micro-climatic effects
- slack and lean season food and fodder
- livelihood activities: smoothing peaks and filling slacks
- meeting seasonal contingencies

Micro-climatic Effects

While the macro-level climatic effects of trees are a matter of scientific controversy, the micro-level effects are not. At the micro level, trees moderate climatic extremes, with benefits for crops, livestock and human beings. Scattered trees can have a similar effect to shelter belts in reducing wind speed and moisture losses.

Intercropping trees with therophytic crops can reduce the crops' yields through root competition, too much shading, and in other ways, but can also improve and stabilise yields, reducing losses in bad years. Alley cropping (alternating lines of woody perennials and annual ground crops) can provide leaf litter and shading, humidity and other micro-climatic effects which increase and/or stabilise crop yields in a manner similar to other intercropping. Tree litter slows the run-off of rain, protecting soils and increasing infiltration of water. Through composting and mulching, leaves can maintain soil fertility. Many savanna trees are nitrogen fixing and their leaf litter rots to provide nitrogen as well as to improve soil structure e.g. *Acacia* spp. They are an important part of the fallow.

Trees benefit livestock in tropical conditions by reducing heat stress. The main processes of heat exchange between animals and the environment are through shortwave radiation (mainly input), long wave radiation (mainly output) and convection. Suitably shaped and leafed trees intercept shortwave radiation from the sun, allow convection cooling by the wind, and permit long wave radiation losses from animals. The gains for animals include eating and grazing for longer, needing less water, improving conversion efficiency of fodder, improved reproduction rates (independently of quality and quantity of fodder available), and better growth rates, milk yields and wool production [Robinson 1983:161-2].

The physical benefits of tree protection to humans through shade from sun and shelter from rain and wind are well known. A survey in White Nile Province in Sudan found that trees were most valued as a source of fodder, but the second value was shade from the summer's heat, which was put higher than both domestic fuel[4] and providing building poles and tool handles [Anwar Abdu reported in Horowitz and Badi 1981:20]. Trees in paddy fields to give shade while mothers transplant or weed are an important amenity for small children. Following a rapid appraisal of trees in paddy fields, a team from Khan Kaen University concluded that 'One of the primary uses of trees in paddy fields in Thailand is as shade for humans and livestock. In one of the hottest parts of a tropical country like Thailand, this is not a trivial usage' [Grandstaff *et al*, c.1985]. The physiological importance of shade and reduced heat stress for human beings, especially in hot seasons, is so obvious that it can be easily overlooked.

Slack and Lean Season Food and Fodder

The seasonality of tree food products and fodders varies. Some are available in the wet season at the same time as cultivated crops, some all the year round,

[3] For examples see Taylor [1962:56] who shows the fruiting of four savannah species. The shortest fruiting period is six weeks and the longest six months.

[4] It is notknown whether there was a male bias among respondents. If women collect fuel, they might place it higher than men would.

and some in the lean period which includes the end of the dry season and the early wet season. The latter two seasonalities are of greatest interest here. In particular, trees which provide food for people in the lean period, and fodder for animals in the late dry and very early wet seasons are especially beneficial for the poor.

The best known human foods from trees are fruits, leaves, nuts, seeds, oils, and extracts like sago, besides indirect foods like honey and insects. Most of these are available only for certain periods in the year.

Fruiting periods vary in both duration and seasons. According to tree type, fruiting periods can occur at different times of the year and last for periods of one to six months. Citrus such as orange and lime produce mostly at the end of the rains and in the early part of the dry season. Mango can produce its fruits at the beginning of the rains. Uvilla (*Pourouma cecropiaefolia*) is a small tree of Brazil, Colombia and Peru which provides a small fruit over three months of the wet season. In areas of north India where three is no second (rabi) harvest because of lack of irrigation, ber (*Zizyphus* spp) is another counterseasonal food. It ripens from mid-February to mid-April when other fruits are in short supply. It is rich in vitamin C and minerals [Sood *et al*, 1980]. Such tree products are usually available in large amounts for relatively short periods. Vitamin C, in which fruits are usually rich, can be stored in the body to a limited degree, with a carry-over of benefits beyond the time when fruits can be eaten.

Besides fruits which are directly consumed, dry season food is provided and prepared in a variety of other ways. The locust bean (*Parkia* spp) is a perennial tree legume food in Africa, Asia and South America; the beans of the savannah species in West Africa (*P. clappertonia*) mature in the dry season during February-March and are fermented into the high protein and fat food *dawa dawa* which is used as a soup ingredient [Campbell-Platt 1980]. *Dawa dawa* also stores well. Similarly the cashew nut (*Anacardium occidentale*) provides edible nuts and fruits towards the end of the dry season, the nuts having a high content of oil. Baobab (*Adansonia digitata*) is an important source of dietary calcium, available in March (near the end of the Northern dry season). The mongongo tree (*Ricinodendron rautanenii*) is a staple food of the Basarwa (Bushmen) in the Kalahari in Botswana [Lee 1973]. The mongongo year begins in April at the end of the wet season with the fall of fruits which are harvested until September. The fruits are prepared by steaming and peeling, and are then cooked to separate the flesh from the nuts. The flesh is then eaten and the nuts are roasted and cracked.

Other tree foods are available all year round or can be stored. The oil palm (*Elaeis guineensis*) provides oil which is a valuable source of vitamin A and energy in West Africa. Plants start to yield three to four years from transplanting and crop throughout the year, reaching a peak in the early rains. Palm wine is also a part of the diet to varying degrees. The sago palm (*Metroxylon* spp) provides a secure food source year-round for the poor in parts of South East Asia and Oceania: though a poor source of nutrients, it is a good source of energy, and complemented with fish and wild leafy vegetables can provide a satisfactory diet [Ulijaszek 1983]. Food availability over an extended period can also be achieved through 'storage' of some fruits or trees, or picking and drying them for storage in the home. Nuts such as those of the mongongo can also be stored.

Finally, perennial and seasonal tree foods are a fall-back in bad years and famines. Fruits, nuts, seeds, and berries can all serve this function. Several examples are given in this *Bulletin*, such as *Boscia senegalensis* in Mali (Toulmin). In Tanzania, Newman (1975) has shown how two or three tree species provide food for every month of the year. Their use intensifies during famine, an observation impressively documented for Swaziland by Ogle and Grivetti (1985).

Trees contribute to animal fodder in two ways: indirectly, through effects on the underlying pasture and directly through leaves, pods and fruits. In savanna conditions where trees are not too dense, there can be beneficial indirect effects where grasses in the understory of trees start growing earlier and continue growing for longer, spreading the period of availability. The quality of pasture may also be better over a longer period: the digestibility of grasses decreases with maturity, so any factor such as reduced light and/or temperature under trees which shows growth and delays flowering is likely to improve pasture quality [Robinson 1985:158]. There are also direct effects through the counterseasonal supplies of tree fodders. In parts of Rajasthan, dry season fodder is provided by the dried leaves of the Khejri tree, *Prosopis cineraria*, which is grown in an agroforestry combination on cultivated fields: after the ground crop harvest, the trees are harvested by lopping, and the leaves stored and fed to animals and sometimes sold, throughout the dry season. Perhaps the best known example is *Acacia albida* which flowers and fruits to drop its pods in the late dry season and shed its nutrient-rich leaves early in the wet season [Teel 1984:61]. In West Africa, *A. albida* is intercropped with sorghum and millet which it does not significantly shade during the wet season and the pods and leaves provide good fodder for goats and cattle at a time of dry season scarcity. In Western Darfur in Sudan, seasonal cattle migration exploits the *A. albida* in the alluvial valley bottoms, with the unusual result that more protein is available to animals in the mid to late

dry season than at other times [Wilson *et al*, 1980:129-30]. The list could be lengthened. Suitable multi-purpose trees which provide counterseasonal fodder can often improve animal nutrition and performance. One gain is stronger animals for land preparation for cultivation when the rains come, otherwise a time when draught animals are undernourished and weak.

Livelihood Activities: Smoothing Peaks and Filling Troughs

Crop activities in tropical agriculture usually have sharp peaks and long troughs, especially but not only with unimodal rainfall. The peaks are often tightly time-bound especially for land preparation, planting, transplanting (with rice), weeding and harvesting. The peaks in labour demand often constrain production and are also periods of stress for children, women and men. Yield losses also follow untimely or incomplete performance of operations. Measures which reduce or spread peak labour demands or which fill troughs with productive or remunerative activity, will variously reduce stress and improve livelihoods. Trees can and do contribute to both.

The stress of peak labour demands can be eased in several ways. If trees are intercropped with agricultural crops, total production including the trees may increase but agricultural crop production may decrease, reducing the total peak labour demand for the crop; and activities like weeding may be reduced through a ground cover of leaf litter and through shading. When work leaves no time for cooking, families can rely on foods such as mangoes [Hoskins 1985]. If firewood has to be collected, it can be stocked in the dry season so that it does not require work during the crop season. If tree fodders are collected for animals, they can either be stored, or, as occurs in the foothills of the Himalayas, fodder trees on common land can be used during labour slack periods and fodder trees close by on the farm reserved for times of peak labour demand or other stress, such as rice transplanting.

Perhaps more important to poor people, though, are the opportunities for productive and remunerative activity in the slack dry seasons and in bad years which trees so often provide. These take many forms and yield many products. The use of bamboos for making baskets and other containers and the role of *Acacia nilotica* in providing all the tannin on which the West African leather industry is traditionally based are just two examples. But perhaps the most widespread activities are with firewood and charcoal. These are easier to collect, prepare and transport in dry seasons. Research and writing on rural energy have been more concerned with them as problems — of supply and cost for urban people, of time and energy expenditure for rural women, and of environmental degradation — than as opportunities for rural incomes and livelihoods. Yet in most places fuelwood and charcoal prices, and so potential benefits to producers, transporters and sellers, have been rising compared with food. Firewood collection and charcoal preparation have been seen as problems to be controlled rather than means of livelihood to be encouraged and developed. But for many poor rural people they are not only a major source of slack, dry season livelihood, but also one which has become potentially more remunerative.

Historically, a long transition is taking place from trees as common or free access resources, to trees as private property. Charcoal burning in Mbeere in Kenya is a well researched and documented case which may be typical of this transition in many other parts of the world. In Mbeere in the latter 1970s, Brokensha and Riley (1977,1978) found that producing charcoal was regarded as a sign of poverty: in a small survey of 35 charcoal sellers, all but one were characterised as poor people. Nearly all had entered the business to get money to buy food or to pay school fees, and many had started burning charcoal in desperation during a famine in which their crops had failed (in an area where the records showed that six out of ten rainy seasons produced inadequate harvests). Charcoal production increased during any food shortage and was concentrated in the dry season [Brokensha and Riley 1977:19].

In Mbeere, as elsewhere accessible to roads, the better species were being rapidly cut out, while land adjudication and allotment removed trees from the common domain, reducing the opportunities for poor people to supplement their dry season livelihoods through charcoal burning. With such a transition, the opportunities shift from common or free access trees to trees on private farms: farmers near Kano in northern Nigeria, for example, lop branches from the trees on their land during the dry season and take them on donkeys to Kano to sell returning with town refuse for farm manure [Foley and Barnard 1984:56]. But whether with earlier common or free access to trees, or later with private trees, the cutting, preparing, transporting and selling firewood and charcoal remain important counterseasonal activities for dry periods which dovetail nicely with wet season cultivation.

Meeting Seasonal Contingencies

Trees which can be cut and sold are good savings banks and insurance for poor rural people [Chambers and Leach 1986]. They can be used to raise money to deal with contingencies, especially through sale of firewood, timber and charcoal. Trees can also sometimes be pledged or mortgaged. In India they are

even beginning to be used as security for consumption loans from banks (personal communication, Aloysius Fernandez).

Contingencies occur at any time of the year but tend to concentrate in the lean and difficult seasons. In tropical conditions, sickness is often most prevalent in the rains, especially with malaria, diarrhoeas, dengue fever, guinea worm disease, skin infections, and snakebite. Deaths and funerals are more common then, and funerals can require considerable sudden outlays. The lean season of the rains is, moreover, the time of greatest food shortage and indebtedness. To cut and sell firewood or timber, to make and sell charcoal, or to sell or mortgage standing trees, is usually easier in the dry season, not least because of wet season demands on labour for cultivation and problems of communications and transport, but the demand for firewood may be higher in the rains. An example, though tragic, from Bangladesh shows how even small young trees can help a desperate family through a seasonal bad time. In their book *Quiet Violence* [1983:160-167] Betsy Hartmann and James Boyce recount the trials and tribulations of a landless family — Abu, Sharifa and their six children. They had suffered a long impoverishing sequence, ending by mortgaging and selling their wooden bed, cow, plough, land and finally Sharifa's earrings and gold nose pin, to meet pressing needs. Out of food, in debt, with creditors pressing for repayment at sowing time when cash and food were short, and needing money to buy seed to plant on sharecropped land, Abu cut down first the young mango tree, and then the young jackfruit tree on their tiny plot and sold the wood and roots for rice.

Trees in Seasonal Strategies

In practice, then, trees do play a part in the seasonal strategies of poor rural people, adding diversity and security to their repertoires and resources for gaining livelihoods round the year. Further analysis may well show that trees are often of special significance in easing or accentuating the seasonal burdens of women, especially with firwood and fodder collection.

Maggie Murray/Format

Project to plant trees. Central region of Burkina Faso.

As they emerge from this evidence, trees seasonally stabilise, protect and support the life and livelihoods of the rural poor. They stabilise microclimates and production. They protect physically against the climate and against excessive labour peaks, and socially and economically against contingencies. And they support livelihoods with time-flexible activities which can be fitted into other demands. With the gradual loss of common and free access trees, the onwership of trees by the poor assumes greater importance so that such benefits can be retained and enhanced.

Perhaps the most important policy implication is local diagnosis to access seasonal links between trees and different groups of poor rural people, and to identify potentials. Possible interventions for counterseasonal benefits for the poor from trees include:

— the transfer of suitable multipurpose trees to new environments to fill gaps and slacks. Experience from several countries suggests that rural people's overriding concern is with multipurpose trees and not for fuel (firewood and charcoal) alone, important though this is especially where there are markets for it [FAO 1985];

— vesting rights of ownership and use of trees, whether in forests or on common land, in landless and small farming families;

— planting trees on household plots and small farms;

— tie-ridging and other microcatchment water harvesting and concentrating for trees in semi-arid and arid conditions;

— developing agroforestry and agro-pastoral systems with demand for labour and flows of products better spread around the year.

The diagnostic method need not be complicated. It will best start with current onwership, access and uses of trees by the poor. The Diagnosis and Design methodology developed by John Raintree and others at ICRAF (The International Council for Research in Agroforestry, Nairobi) is on these lines. It starts off from household supply problems such as food, fuel, shelter, raw materials for household industry, cash, and savings and investment and then asks how they are met and how trees introduced into farming systems might help households meet them better. This is called the 'basic needs' approach for description and diagnosis of household production systems [Raintree and Young 1983:12]. FAO has begun to collect research on fruit-bearing forest species and has initiated research on local needs for trees. ICRAF is generating a data base on multipurpose trees.

Diagnosis by the poor themselves and their knowledge of trees and their uses are an important element, with special efforts to involve women. As always, analysis starts best not with the preconceptions of outsiders, but with the needs and priorities of the rural poor themselves. And the categories and conclusions of this article must themselves be subject to correction by those rural people who use, or might in future use, trees in their seasonal strategies for survival and livelihood.

References

Brokensha, David and Bernard Riley, 1977, 'Vegetation changes in Mbeere Division, Embu', *Working Paper No 319*, Institute for Development Studies, University of Nairobi, September

—1978, 'Forest, foraging, fences and fuel in a marginal area of Kenya', paper for USAID Africa Bureau Firewood Workshop, Washington DC, 12-14 July

Campbell-Platt, G., 1980, 'African locust bean (*Parkia* spp) and its West African fermented food product, *dawa dawa*', *Ecology of food and Nutrition*, vol 9, pp123-32

Chambers, Robert, Richard Longhurst and Arnold Pacey (eds.), 1981, *Seasonal Dimensions to Rural Poverty*, Frances Pinter, London

Chambers, Robert and Melissa Leach, 1986, 'Trees to meet contingencies: savings and insurance for the rural poor', IDS, Sussex (mimeo)

FAO, 1985, 'Tree growing by rural people' *FAO Forestry Paper* 64, Rome

Foley, Gerald and Geoffrey Barnard, 1984, *Farm and Community Forestry*, Earthscan Technical Report No. 3, International Institute for Environment and Development, London

Grandstaff, Somluckrat, Terry Grandstaff, Pagarat Rathakette, David Thomas and Jureerat Thomas, c.1985, 'Trees in Paddy Fields in Northeast Thailand', forthcoming in Gerald G. Marten (ed.), *Traditional Agriculture in Southeast Asia: A Human Ecology Perspective*, Westview Press, Boulder (Co)

Hartmann, Betsy and James Boyce, 1983, *A Quiet Violence: View from a Bangladesh Village*, Zed Press, London

Horowitz, M. and K. Badi, 1981, *Sudan: Introduction of Forestry in Grazing Systems*, FAO, Rome

Hoskins, M., 1985, 'The promise in trees', *Food and Nutrition* 11, pp44-6

Lee, R., 1973, 'Mongongo: the ethnology of a major wild food resource', *Ecology of Food and Nutrition* vol 2, pp307-21

Newman, J. L., 1975, 'Dimensions of Sandawe Diet', *Ecology of Food and Nutrition*, vol 4, pp33-9

Ogle, B. and L. Grivetti, 1985, 'Legacy of the chameleon: edible wild plants in the kingdom of Swaziland, Southern Africa. A cultural, ecological, nutritional study. Part IV — nutritional analysis and conclusions', *Ecology of Food and Nutrition* vol 17, pp41-64

Raintree, J. B. and A. Young, 1983, *Guidelines for Agroforestry Diagnosis and Design*, International Council for Research in Agroforestry, Nairobi, November

Robinson, Patrick, 1983, 'The role of silvopastoralism in small farming systems', in D. A. Hoekstra and F. M. Kuguru (eds.), *Agroforestry Systems for Small-Scale Farmers*, Proceedings of an ICRAF/BAT Workshop held in Nairobi in September 1982, International Council for Research on Agroforestry, Nairobi, pp147-69

Sood, D., D. Wagle, H. Nainawatee and H. Srivastava, 1980, 'Quality attributes of some Ber (*Zizyphus jujube*) strains, *Indian Journal of Nutrition and Dietetics* vol 17, pp447-51

Taylor, Charles J., 1962, *Tropical Forestry, with particular reference to West Africa*, Oxford University Press, London

Teel, Wayne, 1984, *A Pocket Directory of Trees and Seeds in Kenya*, Kengo, Nairobi

Ulijaszek, S., 1983, 'Palm Sago (*Metroxylon* spp) as a subsistence crop', *Journal of Plant Foods* vol 5, pp115-34

Wilson, R. T., Liz Bailey, J. Hales, D. Moles and A. E. Watkins, 1980, 'The cultivation-cattle complex in Western Dafur', *Agricultural Systems* vol 5, pp119-35