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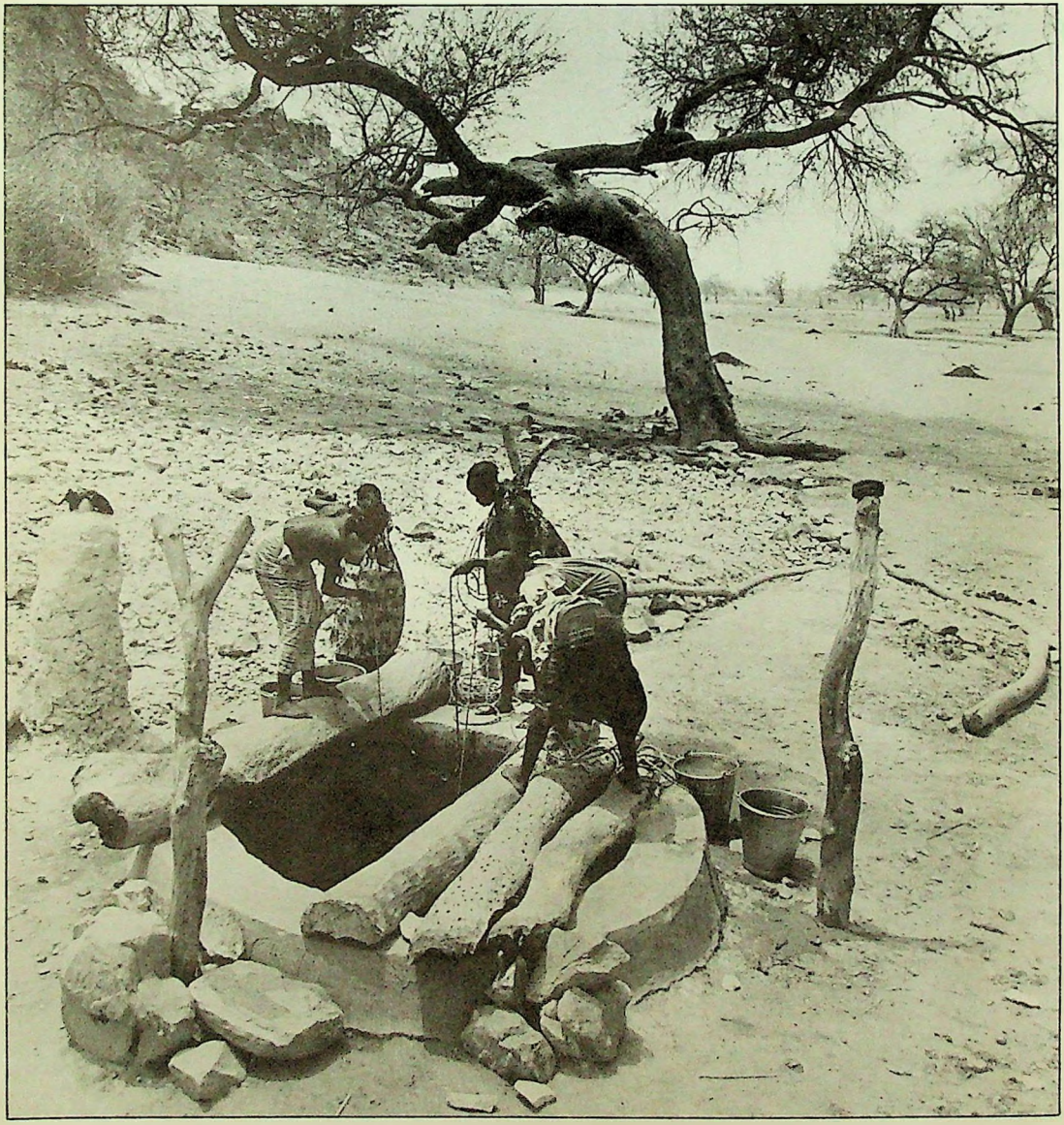

Seasonality and Poverty

IDS SUSSEX

SUMMARY

Seasonality and Ultrapoverty
Michael Lipton

The ultra-poor — a group of people who eat below 80 per cent of their energy requirements despite spending at least 80 per cent of income on food — are most vulnerable to seasonal fluctuations in food supply and wage employment, and seasonally induced nutrition and health risks. Low energy intakes are linked with greater seasonal instability, and seasonal fluctuations in employment are also greatest for the ultra-poor. The poor in sub-Saharan Africa are likely to suffer more in these respects than their Asian counterparts because of their less developed irrigation and transport systems. This influences the cropping pattern of African farmers. As population pressure intensifies in Africa, public spending in support of the farm sector is required to reduce the bad season impact on the ultra-poor. Of particular importance are policies to support migrants, provide rural credit and to manage common property resources.

Women and Seasonality: Coping with Crisis and Calamity
Janice Jiggins

This article explores the contribution of female production, labour and domestic domain services to the management of seasonal stress, crisis and calamity, under the headings: switching tasks and responsibilities ascribed by gender; diversifying household income sources; changing the intensity and mix of multiple occupations; household gardening and common property resources; food processing, preservation and preparation; social organisation; gift-giving. It offers an analysis of adversity and calamity which pinpoints the resilience of networks of female-headed households and raises new questions concerning risk preference, probability assessment and the valuation of female labour time.

Food Shortages and Seasonality in WoDaaBe Communities in Niger
Cynthia White

Data on WoDaaBe nomadic pastoralists in central Niger demonstrate that seasonality, through a coincidence of stress factors in the dry and transition seasons, clearly does reinforce poverty in this group. Although important, dry season hardship is merely a symptom of more crucial political and economic factors affecting the WoDaaBe economy.

Household Food Strategies in Response to Seasonality and Famine
Richard Longhurst

Rural families have a range of strategies with which to cope with seasonal and inter-seasonal fluctuations in food supply. For landed households the most important seasonal strategies include choice of cropping patterns to spread risks involving mixed cropping, cultivation of secondary crops, particularly root crops. Other seasonal coping mechanisms include sale of small assets and livestock, drawing down of stored product and cultivation of supportive social relationships. Off-farm income earning work provides one of the best buffers against seasonal stress. If a bad season stretches into a prolonged drought, or if there is a sudden drop in purchasing power, then these activities are further intensified, but families are forced into divesting resources: selling productive assets, constricting food intake, and migration. If investment in rural areas and food production recognised these strategies the severe impact of famine could be avoided.

Biomass, Man and Seasonality in the Tropics
Colin Leakey

Agricultural research linked to government policies to increase the availability of biomass to provide food, forage and medicine requires a re-think. In particular, by ignoring trees and gathered foods, policies have not met demands for food in arid areas, and an emphasis on increasing production per unit area has accentuated seasonality of production by favouring selection of crop species requiring longer periods of moisture availability. The use of plants for medicines, stimulants and control of fertility also has important seasonal effects, but has received minimal attention to date. The classification of Raunkiaer, who distinguished plants on the basis of their modes of protection and size of buds, enables an analysis related to their effective use of moisture and temperature, so providing a framework for linking the seasonal production of biomass to human needs.

Trees, Seasons and the Poor
Robert Chambers and Richard Longhurst

Trees play a significant role in poor people's seasonal livelihoods: this has been a neglected subject due to interlocking biases against understanding how the poor secure their incomes, and ignorance of the multipurpose role of trees. Trees play an important seasonal role through their physical characteristics: deep rooting with access to moisture and nutrients year round. Accumulation of stocks in the form of wood and various beneficial environmental effects. Trees seasonally stabilise, protect and support the livelihoods of the rural poor and policies can be designed which reinforce this important role.

Seasonality in a Savanna District of Ghana — Perceptions of Women and Health Workers
Gill Gordon

Households in a coastal district of Ghana aim to maintain a constant supply of food by farming, fishing and trading. Trading in processed foods is highly competitive in the rainy season. Many families respond to adverse farming or trading conditions by temporary migration. Seasonal stress reduces women's ability to care for their children and make use of health services. Village health workers perceive their farm work to be of higher priority than their health tasks at a time when demand for their services is greatest. This article suggests measures to reduce the impact of seasonal stress on households and health workers.

Access to Food, Dry Season Strategies and Household Size amongst the Bambara of Central Mali
Camilla Toulmin

This article describes the seasonal variation in production and household organisation in a Sahelian farming village. With the loosening of domestic responsibilities, once the harvest is stored, the dry season offers a range of income-earning activities for the individual to pursue. Those from grain surplus households can use this period to build up private sources of wealth. Grain deficit households must use dry season incomes to help them get through the next farming season. This differential capacity to make use of the dry season accentuates differences in household size and wealth.

Seasonality and Poverty: Implications for Policy and Research
Richard Longhurst, Robert Chambers and Jeremy Swift

There is great diversity in the way different groups of people are affected by seasonality and cope with it. Greater understanding of this diversity is required if policy and project interventions are to strengthen the position of poor rural people. The damaging periods of time can sometimes be very short, regularly crippling families in their efforts to accumulate resources and protect their health. In sub-Saharan Africa seasonality is clearly a major dimension of adverse economic change, of declining food availability and increasing instability in food supply. As a result seasonality has become a more significant point of entry for analysis and action. Policies are needed which strengthen seasonal coping mechanisms, and reflect a decentralised and differentiated approach in timing and targetting on the most vulnerable groups.

RESUME

Les Variations Saisonnieres et l'Ultra-pauvrete
Michael Lipton

Les ultra-pauvres — un groupe consommant moins de 80% de ses besoins en énergie, bien que 80% de ses revenus soient consacres a la nourriture — sont les plus vulnerables a la fluctuation saisonniere des salaires, de l'approvisionnement en nourriture et aux risques de sante et de nutrition que cette fluctuation engendre. L'insuffisance des rations alimentaires est liée à une plus grande instabilité saisonniere, et la fluctuation saisonniere de l'emploi est plus importante chez l'ultra-pauvre. Dans ce sens, le pauvre en Afrique Sub-saharienne souffre probablement plus que son homologue asiatique car ses systemes d'irrigation et de transport sont moins developpes. Ceci influence les habitudes de culture des fermiers africains. Comme la pression de la population s'intensifie en Afrique, il devient necessaire d'allouer des fonds publics en aide au secteur agricole pour reduire l'effet de la mauvaise saison sur les ultra-pauvres. Des mesures en aide aux migrants, favorisant le debloquement de crédits pour le secteur rural et l'administration des resources communautaires sont donc d'une importance toute particulière.

Les Femmes et les Variations Saisonnières: Faire face aux Crises et aux Calamités
Janice Jiggins

Sous les titres suivants, cet article explore la contribution que les femmes apportent à l'organisation de la tension saisonnière, aux crises et aux desastres, par leur production, leur labeur et leurs services dans le domaine domestique; changement dans les travaux et les responsabilités assignes par le genre; diversifier les sources de revenu du menage; changer l'intensite et l'association des occupations multiples; culture du jardin familial et resources communautaires; traitement, conservation et préparation de la nourriture; organisation sociale; echange de dons. Il offre une analyse des concepts d'adversite et de calamité qui cerne la résistance des réseaux de ménages où la femme est chef de famille et soulevent de nouvelles questions concernant les priorités vis à vis des risques à prendre, les calculs de probabilité et l'evaluation du temps de travail de la femme.

Pénurie de Nourriture et Variations Saisonnieres dans les Communautés WoDaaBe au Niger
Cynthia White

Une collection de données sur les eleveurs nomades WoDaaBe dans le centre du Niger nous montre que les variations saisonnieres par la coincidence de facteurs de tension durant la saison seche et les saisons de transition, renforcent très clairement le niveau de pauvrete de ce groupe. Bien qu'importante, la privation causée par la saison seche n'est qu'un symptome d'elements economiques et politiques plus importants qui affectent l'economie des WoDaaBe.

Strategies des Familles pour la Production de Nourriture en Reponse aux Variations Saisonnières et a la Famine
Richard Longhurst

Les familles rurales ont toute une serie de stratégies qui les aident a faire ux fluctuations saisonnieres et inter-saisonnieres de l'approvisionnement en nourriture. Pour les menages proprietaires terriens, afin de diminuer les risques, les strategies saisonnieres les plus importantes comprennent le choix de l'echelonnement des recoltes nécessitant une culture mixte, la culture de plantes secondaires en particulier de plantes à racines. D'autres mécanismes saisonniers les aident a faire face au probleme, tels la vente de petits biens et de batail, la limitation des produits emmagasines et l'entretien de relations sociales de soutien mutuel. Un travail salarie procurant un revenu independent de celui de la ferme est une des meilleures garantie contre les tensions saisonnières. Si une mauvaise saison se prolonge pour devonir une secheresse ou qu'une baisse soudaine de pouvoir d'achat se produise, alors ces activites s'intensifient encore plus, mais les familles sont obligees d'avoir recours à des moyens dépreciatifs: vente de biens productifs, reduction des rations de nourriture, migration. Si les investissements dans les secteurs ruraux et de la production alimentaire tenaient compte de ces strategies, l'effet desastreux de la famine pourrait être evite.

Biomasse, l'Homme et les Variations Saisonnieres sous les Tropiques
Colin Leakey

Il est necessaire de repenser la recherche agronomique associee aux mesures gouvernementales visant a ameliorer l'accessibilite a la masse biologique afin de fournir de la nourriture, du fourrage et des medicaments. En particulier, ces mesures en ne tenant pas compte des arbres et de la nourriture récoltee par la cueillette, n'ont pas satisfait les besoins alimentaires des regions arides, et la concentration des efforts sur l'augmentation du taux de production a l'unite a accentué les variations saisonnieres de la production en favorisant la selection d'espèces nécessitant de plus longues periodes d'humidité. L'utilisation de plantes pour la fabrication de remedes, de stimulants et pour le contrôle de la fertilite a aussi des effets saisonniers importants, auxquels, jusqu'à present, il n'a ete porte qu'un minimum d'attention. La classification de Raunkiaer, qui etablit une distinction entre les differentes plantes en utilisant leurs modes de protection et la dimension de leurs bourgeons rend possible une analyse basee sur leur besoin effectif en humidite et température, nous donnant ainsi un cadre de travail qui nous permet d'établir le lien entre les besoins humains et la production saisonniere de masse biologique.

Les Arbes, les Saisons et le Pauvre
Roobert Chamber et Richard Longhurst

Les arbres jouent un rôle considerable dans les moyens de subsistence saisonniers des populations pauvres: un sujet neglige a cause de connexions complexes entre differents prejuges qui empêchent de comprendre la maniere dont le pauvre assure ses revenus, et l'ignorance concernant les rôles et usages multiples des arbres. De part leurs caracteristiques physiques, les arbres jouent un rôle saisonnier important: des racines profondes qui ont acces a l'humidite et aux substances nutritives toute l'année, une saison où ils produisent des fruits et une où ils ensemencent des graines qui s'etendent sur de longues periodes, ils contribuent à une accumulation de stocks en bois, et ont bien d'autres effets benefiques sur l'environement. Les arbres, au fil des saisons, stabilisent, protectent et soutiennent les moyens de subsistence des populations rurales pauvres et des mesures peuvent être prises de maniere à renforcer ce rôle important.

Variations Saisonnieres dans une Region de Savane au Ghana — Remarques faites par des Femmes et des Aides médicaux
Gill Gordon

Les familles dans une region cotiere du Ghana s'efforcent de maintenir un approvisionnement constant en nourriture, par l'agriculture, la pêche et le commerce. Le commerce d'aliments transformes est extrêmement competitif durant la saison des pluies. En reponse à de mauvaises conditions pour l'agriculture ou le commerce, beaucoup de familles choisissent une migration temporaire. Pour les femmes, la tension saisonnière diminue leur aptitude a prendre soin de leurs enfants et utiliser les services de sante. Dans les villages, à une époque où la demande pour leurs services atteint son maximum, les aides médicaux ont remarqué que le travail de la ferme a priorité sur leurs devoirs concernant la sante. Cet article suggère des mesures pour reduire l'effet de la tension saisonniere sur les familles et les aides médicaux.

Acces a la Nourriture, Strategies de la Saison Seche et Dimension de la Famille chez les Bambara dans le centre du Mali
Camilla Toulmin

Cet article illustre la variation saisonniere de la production et de l'organisation de la famille dans un village fermier du Sahel. Avec le relâchement des responsabilites domestiques, une fois la récolte engrangee, la saison seche offre a l'individu un choix d'activites salariées. Les membres d'un menage ayant un surplus en grain, peuvent mettre à profit cette periode pour accumuler des biens. Ceux qui ont un deficit en grain doivent utiliser les revenus de la saison seche dans l'attente de la prochaine saison agricole. Cette inegalite dans leur aptitude a utiliser la saison seche accentue les differences dans la dimension et la fortune des menages.

Variations Saisonnières et Pauvreté: Conséquences pour la Recherde et la Politique à suivre
Richard Longhurst, Robert Chambers et Jeremy Swift

Il y a une grande diversite dans la maniere dont differents groupes sont affectes par les variations saisonnières et la maniere à laquelle ils y font face. Il nous faut atteindre un plus haut degre de comprehension de la nature de cette diversité si l'on veut que des mesures et projets d'intervention renforcent la position des populations rurales pauvres. Les periodes néfastes peuvent quelquefois être de très courte durée, mais endommagent regulierement les efforts portes par les familles a l'accumulation de biens et la protection de leur sante. En Afrique sub-saharienne, il est evident que les variations saisonnieres sont une dimension majeure d'un changement economique defavorable, d'un declin de la disponibilite de la nourriture et d'une augmentation dans l'instabilite de l'approvisionnement. En consequence, les variations saisonnieres sont devenues un point de depart plus significatif pour une analyse et une ligne d'action. Il faut donc prendre des mesures qui renforcent les mecanismes saisonniers de defense et refletent une approche decentralisee et differenciee dans le temps ayant pour but les groupes les plus vulnerables.

RESUMEN

Estacionalidad y ultrapobreza
Michael Lipton

Los ultrapobres — un grupo de personas que consumen menos del 80% de sus requerimientos energéticos, pese a que gastan al menos 80% de su ingreso en alimentos — son los más vulnerables a las fluctuaciones estacionales de la oferta de alimentos y del empleo remunerado, así como a los riesgos sobre la nutrición y la salud inducidos por la estacionalidad. El bajo consumo energético está vinculado a la mayor inestabilidad estacional y además las fluctuaciones estacionales del empleo también son mayores para los ultrapobres. Los pobres del subsahara africano están expuestos a sufrir más que sus contrapartes asiáticos, a raíz del menor desarrollo de sus sistemas de riego y transporte. Este hecho afecta el

Editorial

Rural poverty in developing tropical countries has a seasonal dimension. There is a simultaneous prevalence of sickness, malnutrition, indebtedness, hard work, discomfort and poor food availability at certain times of the year, usually during the rains. This period before harvest — 'the hungry season' — is one of considerable stress for rural people, exacerbating their poverty. Poor people are less able to cope with this regular period of stress than rich people, who can usually exploit it to their benefit. The difficulties and stress experienced on a seasonal basis are, of course, anticipated by poor rural people: they are a regular event to be navigated each year. There are different ways of coping — of moving resources around — in ways that relate to productive activities and social and demographic mechanisms. Some of these mechanisms are described in this *Bulletin*. In calling this issue 'Seasonality and Poverty', the focus is on how seasonality affects poor people, how they respond to it and how development can assist them in the face of these stresses.[1]

The seasonal problems of rural people vary between different environments. They relate to the nature of the local ecology and natural rhythms of plant and animal growth, local production and income-generating activities and cultural patterns. The reaction of individuals and communities in pastoral areas will vary compared to those of, for example, communities of cultivators. The overall wealth of a community or a family could lift them above or depress them below the critical level of livelihood which determines whether seasonal stress leads to constraints, preventing families from meeting subsistence needs without some loss of function. The many and varied environments in which seasonal influences operate are also described in the *Bulletin*.

Seasonal stresses are not the only contingency faced by rural people and although regular, may be less severe than the irregular unanticipated problems created by variations in food and employment availability between, rather than within years. Two or three poor years of food production can often lead to famines, as seen recently in parts of sub-Saharan Africa. A third even more spasmodic and random contingency can be that which strikes individual families in the form of a sudden death, an accident incapacitating working members or a huge, although generally expected, expenditure such as for a wedding or birth naming ceremony. When these contingencies overlap, as they can do for families at a certain stage in its life cycle, inhabiting areas that are drought prone, then the family is likely to be driven into deep impoverishment.

The context in which seasonal factors influence economic development is clearly as important as the nature of those seasonal forces. The contingencies described above broaden seasonality beyond a narrow definition and place it within this wider context. The way in which people respond to stress and its corollary — how development and policy can strengthen people's ability to withstand stress — requires this wider definition. This suggests three levels of analysis to seasonal problems, especially within conditions seen today in sub-Saharan Africa. These involve the examination of relationships between first, different types of seasonal patterns and the importance of particular types of significant elements; second, regular patterns and irregular bad years which throw regular seasons out of gear, and third, regular seasonal fluctuations and those underlying the economy such as long-term declines in food production, availability of able-bodied workers in rural areas, degradation of the environment, erosion of common property resources and so on.

[1] The papers in this *Bulletin* are developed from an IDS conference held at Stafford House, Hassocks, Sussex on 13-15 February, 1985, and organised by Robert Chambers, Richard Longhurst and Jeremy Swift. Acknowledgement is due to those attending the workshop for contributions to the discussion and conclusions. They were Caroline Allison, David Butcher, Robert Chambers, Alison Evans, Catharine Geissler, Gill Gordon, Patrick Hardcastle, Ced Hesse, Janice Jiggins, Colin Leakey, Michael Lipton, Richard Longhurst, Penelope Nestel, Clare Oxby, Claudia Pendred, Sara Randall, David Sahn, Jeremy Swift, Camilla Toulmin and Cynthia White.

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The need to develop the links between seasonality *per se* and the other processes of impoverishment has been reinforced by the experience of policy-makers and researchers since the conference on Seasonality held at IDS in 1978 pulled together case studies and focused thinking more intensively on seasonal issues [Chambers, Longhurst and Pacey 1981]. Policy-makers do regard seasonal phenomena and the inter-relationships between them as too important to ignore, and believe that resources applied to alleviating seasonal hardship would bring considerable benefits. The argument for seasonality-related interventions has often revolved around one of cost effectiveness: that resources applied at specific times of year will be more effective than strategies that exist all year round, and that raising people above the seasonal threshold will remove a constraint that will encourage self sustaining growth.

In proposing this argument it has sometimes been difficult to see how interventions could be successfully timed — switched on and switched off — in locations where the administration of programmes and projects is always difficult and where withdrawing services and resources would be unacceptable to all concerned. Some interventions of this type are feasible and include selective use of public works, services related to specific farming operations and timing of education services. But generally the subject now needs to be approached from the point of view of influencing existing policies by seeking to incorporate an element that will cope with seasonal stress — by spreading it out, reducing it or by strengthening buffers that exist to counter its worst effects. This approach — to 'season proof' development policy — inevitably leads into more demanding research and policy territory, but avoids the danger of relegating seasonally to an interesting but intractable phenomenon.

Three themes in the *Bulletin* appear of importance to the editor, with no apologies made for their obviousness. The first is that already mentioned: poor rural people have means of coping — up to a point — with stress from expected seasonal events and contingencies. The nature of these individual and household level strategies is mentioned or described in detail for different parts of the world in nearly all of the articles in the *Bulletin*. This frequency of examination of such strategies is important because policies should build on what people do already if poverty — seasonal or general — is to be reduced.

Second, the ownership of assets is an important means of remaining independent of seasonal stress. Their sale (or mortgaging) is a major instrument used by people to cope but in so doing they run the severe risk of becoming poorer as a result. Asset sale leads to further accentuation of the unequal distribution of resources. What assets are important is obvious in most cases, less so in a few others. In physical form, they include land, livestock, crops in store, dung, trees, household implements and jewellery; social assets include membership of occupational groups and foodsharing networks. People make use of other resources by diversifying income sources, often by intensive use of natural resources. The wide range of uses made by people of plants, trees, livestock and other animals is evident in several articles. The natural environment provides many seasonal buffers. Conservation of natural resources and measures to reconstitute assets after sale — or better to avoid sale in the first place — are important.

Third, to counter seasonal poverty we must continue to take a firmly interdisciplinary line and to exploit the linkages that exist between our knowledge of natural resources, economic phenomena and social relationships. Rural people look at seasons in a holistic manner and so there is no reason why professional outsiders should not do the same.

The bias in the *Bulletin* is towards articles that refer to sub-Saharan Africa, but many carry important implications for development in other parts of the world. Michael Lipton, for example, reviews his research on the poor and ultra poor from a seasonal perspective and shows that reaction to seasonality is one of many variables which distinguishes these two groups. Differences exist in labour force behaviour, demographic structure and asset and land characteristics. The ultra poor do have more unstable diets seasonally than their poor counterparts; in terms of labour supply, fluctuations are greatest for the poor and the wage rate falls and fluctuates in a most damaging way for them. Janice Jiggins examines the means whereby women cope with seasonality, reminding us that there are considerable differences within households in terms of suffering from seasonality and response to it. Experience suggests that harmful effects are often handed on from men to women. Attention is drawn to the resilience of women's social networks.

The two studies from the Sahel, by Camilla Toulmin among the Bambara of Central Mali and Cynthia White on the WoDaaBe in Niger examine strategies adopted by those pastoral communities in response to seasonality. Toulmin emphasises the importance of off-farm income sources and also shows how larger households are more able to withstand the negative effects of seasonality. White shows how large-scale animal losses by families in bad years used to be made up, but new forms of development have made pastoralists more vulnerable. As a result permanent impoverishment can follow but policies could be designed to mitigate this. Richard Longhurst reviews

the household food security strategies adopted by households, with particular reference to northern Nigeria. Such strategies include crop diversification and mixed cropping approaches, the building up of stores such as body fat, small stocks, and grain, short or long-term migration, and the development of social contracts between families and communities. The way in which these seasonal strategies are extended in the face of famine conditions is shown for other parts of the world, including Rajasthan in India.

The research efforts of natural scientists often ignore seasonal factors. The crops, trees and agricultural systems that are encouraged often do not help people in meeting seasonal food supplies. Colin Leakey proposes a revival of thinking along the lines of life forms in relation to adapting to different climates and hence seasonal production of biomass. On the same theme Chambers and Longhurst show how trees have been ignored as important seasonal buffers for the poor: as sources of food, forage and incomes. Yet it is clear that they play essential roles in alleviating seasonal hardships.

The extent of migration as another seasonal buffer is described in several articles. Gill Gordon's case study from Ghana shows the impact of migration on child nutrition and health which previous work has shown to be seriously affected by seasonal changes. She makes suggestions for primary health care measures which can provide for better child health in the wet season.

The final article on the implications of seasonal factors for research and policy indicates the need to think carefully about location and target groups. Seasonality needs to be integrated into development policy, but a fair amount of 'fine tuning' will be required so that people do not become improverished either by seasonal influences or by the very policies that are designed to help them.

R.L.

Reference

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Seasonality and Ultrapoverty

Michael Lipton

I The Distinction between Poor and Ultra-poor

Ultra-poor people are those who live in ultra-poor households. These are households with so little income per consumption unit that — if they adopt spending patterns (both among foods and as between them and non-foods) typical of their household size, composition and income — they are in a typical week able to eat so little food as to be a significant risk of not meeting their dietary energy requirement. In year-round or seasonally-spaced surveys, ultra-poor households, as a proportion of all households in any group, can be estimated by finding the proportion who follow the 'two 80 per cent rule': i.e. the proportion eating below 80 per cent of FAO/WHO (1973) weight-adjusted dietary energy requirements, despite spending at least 80 per cent of income on food. Although for most low-income countries only 2-5 per cent of persons, in typical surveys not carried out in acute famines, either suffer from grade III anthropometry or fall into severely undernourished groups [Bengoa and Donoso 1974; Keller and Fillmore 1983] — and although it is only severe undernourishment that is linked to functional impairment [Lipton 1983] — many more people are *at risk* of falling into such groups if bad life events, years, and/or seasons overlap or coincide. For most low-income countries, 10-20 per cent of people appear to fall into these ultra-poor groups, i.e. to follow the 'two 80 per cent' rule at any given moment of survey; such people, and especially their children, would be at quite substantial risk of descending into the severely undernourished 2-5 per cent, if their ultra-poverty were long sustained.

There are quite sharp turning points in food behaviour [Rao 1981; Lipton 1983a, 1985a; Edirisinghe and Poleman 1983] as between the ultra-poor, who follow the 'two 80 per cent' rule, and everybody else, including the moderately poor. *Only* the ultra-poor appear to maintain the ratio of food outlay — and even of outlay on coarse, low-cost energy sources — to income, when they become a little better off. Also the ultra-poor have sharply higher child/adult ratios; and are especially likely to be landless, or (in semi-arid areas) to operate below five acres or so. The ultra-poor also differ in certain labour-market characteristics. Although, even among the poor, lower income induces higher participation in work, this does not work among the ultra-poor, perhaps because they are too often hungry or ill. Also the ultra-poor, being more often dependent on casual labour than are other groups, show higher unemployment — but the places, years and seasons of substantially higher unemployment feature only slight reductions in labour supply (participation), and therefore somewhat lower real wage-rates [Lipton 1983a, 1983b, 1983c, 1985b].

If the ultra-poor are at much greater risk, especially of lasting harm to under-fives, from undernutrition — and if their conditions make a normal response to investments or incentives, e.g. via raised workforce participation, specially difficult, and appear to mandate a 'food first' approach — then the separate identification of these ultra-poor households is crucial for the success of targeted policies against poverty. For example, in Kenya, areas with only slightly above average *incidence* of poor people have much greater measured *severity* of poverty [Greer and Thorbecke 1986], probably indicating a much greater proportion of ultra-poor (among the poor as a whole) than in other areas. These very poor areas, at least *a priori*, appear likely to be risky and unirrigated; the effects of seasonality, in such areas especially, upon the ultra-poor therefore merits close attention.

II Seasonal Differentiation

Very interesting inferences are suggested by Dr. Emmy Simmons's work on three villages in northern Nigeria [Lipton 1983a:42]. Non-poor households there show no relationship of calories per consumption unit to seasonal instability. Those with very low income per consumption unit — who normally average below 2,200 kcal per consumption unit per day over the year — show some tendency to suffer

IDS Bulletin, 1986, vol 17 no 3, Institute of Development Studies, Sussex

from greater seasonal variation as average intake declines. For those who are at slight risk of undernutrition, with intakes of dietary energy between 2,200 and 2,700 kcal daily, this intake is very weakly correlated with income per consumption unit; they also show a strong negative link between low intake and seasonal instability.

This suggests that the severity of nutrition risk among the ultra-poor is linked to both hunger and seasonal instability. However, it also suggests that the apparent degree and indeed presence of caloric inadequacy among moderately poor people — who seem at first glance to have nutritionally borderline intakes of calories — is really due largely to *choices*, corresponding to differences in requirements, rather than to severe hunger (which one would expect to be income-linked in its intensity within the group counted as being at slight risk) or to average year-round income. The capacity to keep out of ultra-poverty may partly depend on adjustment mechanisms which permit persons *within a group*, who have relatively low average of intake to requirements, to adjust more effectively in seasons when that intake declines, because of falling intakes, rising requirements or both. Such adjustment seems to work for the group of persons at slight risk of undernutrition, but not for the group at high risk, as the above relationships indicate. Those at high risk overlap fairly closely, in these northern Nigerian villages, with those following the 'two 80 per cent rule'. A related finding in Matlab, Bangladesh, is that landless mothers showed both lower average dietary energy intake and greater seasonal fluctuation than did mothers with land [Chambers, Longhurst and Pacey 1981:59].

What of seasonality in labour income, the largest part of most poor people's incomes? Age- and sex-specific participation rates, real wage-rates, and unemployment all tend to fluctuate seasonally, and to do so most seriously for casual workers, females, and the ultra-poor. In the Indian National Sample Survey in 1977-78, adult female participation rates fell nine per cent in rural areas, but six per cent in urban areas, from the July-September, 1977, seasonal peak to the April-June, 1978, trough; adult male rates fell by only three per cent and one per cent respectively. These comparative patterns are confirmed by State and village data, especially for casual workers [Lipton 1983b].

There are interactions between seasonal fluctuations in participation rates and in employment. The latter are also worst for the poorest people, since these are residual workers; in slack seasons, small farmers can adequately supply their labour requirements with family workers, and tend to lay off casual (landless) employees first — especially women — so as to minimise search and supervision costs of labour. (Such employees are also likeliest to be under-nourished, and hence to show low labour-productivity, in the slack season.) In the 18 poorest households in four villages in Gujarat, adult-days in the workforce, as a proportion of all adult-days, fell from 38 per cent (peak) to 32 per cent (trough); in the best-off eight households in these villages, all with no participating female workers, the corresponding proportions of adult-days remained steady, at 43-45 per cent, from peak to trough [Lipton 1983b:35]. These patterns are broadly confirmed in northern Nigerian villages.

The policy implications, in respect of building up slack-season female employment (for example with public works schemes), require caution. We find a serious slow-down in weight gain, among children aged less than 18 months, in the slack season in Shubh Kumar's study in Kerala, India — but this slow-down happens only among children whose mothers are in the workforce but outside the home enterprise, i.e. the poorest, who must rely on casual employment rather than self-employment [Kumar 1977]. Indeed, extra female income appears to assist slack-season child nutrition only if earned in the family enterprise [Kumar 1977:33].

Due to 'disguises' such as slack-season expansion of cattle care and domestic work, unemployment fluctuations are understated even in carefully collected village-level data. However such fluctuations remain significant, and affect the poorest worst, partly because — as we have seen — in slack seasons employees from poor households are 'crowded out' by the self-employed on small-to-medium family farms. This also happens in bad years; in the 1974-75 drought, in six villages of Gujarat, there was a fall of 55 per cent in family labour use from the previous year's level, but of 88 per cent in casual labour [Lipton 1983b:57]. However, generally, slack-season labour supply (as measured by the workforce participation rate) falls less than demand (as measured by the proportion of participants finding employment), so that real wage-rates fall alongside both (given that the elasticity of labour supply is not much below that of labour demand). Casual labourers, the most likely to be in ultra-poor households, tend to experience most acutely this seasonal conjunction of low employment, participation, and wage-rate.

What compensatory seasonal policies might exist? Irrigation, and seasonal compensatory employment schemes like Maharashtra's Employment Guarantee Scheme, often appear to raise employed time most for women, casual workers, and people from low status-groups [Lipton 1983b:84-5]. Also, price compensation may be possible. Matlab data show rice prices highest, and household cereal stocks lowest, when seasonal

wage-rates and employment are least, and this is confirmed for Bangladesh [Chambers, Longhurst and Pacey 1981:55, 89-90]. Modern varieties of cereals are often associated with some declines in the seasonal variability of outputs, because they often do best in irrigated conditions outside the main (rainy) cropping season. The resulting price stabilisation across seasons (which can be supplemented by public food grain releases in seasons of scarcity, if output growth due to modern varieties has permitted stockbuilding, as in India) can reduce seasonal vulnerability for the poor — which helps them even in parts of the country where the modern varieties have not prospered, but can be purchased, at less inflated prices than previously, in slack seasons or bad years.

III Is Sub-Saharan Africa Different?

SSA generally has more extreme seasonality, but less inequality *among* the rural poor, than other developing areas. Seasonality is generally more extreme than in Asia in comparable semi-arid tropical zones, partly because there is less irrigation in SSA, partly because its porous, sandy soils retain less moisture. Offsetting this, the tropical rainforests of SSA may suffer from even less seasonality than elsewhere, because these are in general less exploited, at least than their Asian counterparts — and larger proportions of rural people depend on rainforest cultivation in Africa than elsewhere; but population growth and shortening fallows render this compensation less and less important as time goes by. Everywhere, water control seems to be less in Africa — below three per cent of crop land is irrigated, as against over 30 per cent in Asia. Moreover long distances and bad transport systems impede seasonal corrections by way of movements of inter-regional (price-compensating) grain, and even of labour. At least since 1960, experience suggests that African climates are less predictable, more prone to greater harshness in bad years, and more liable to successive bad years, than Asian climates. All this reinforces the harm done by a *given* degree of seasonal instability.

Moreover, in much of SSA, seasonal (and other) variations impinge more directly on poor people than is the case in South Asia, because a larger proportion of poor people retain usufructuary rights over cultivated land, and fewer have non-agricultural employment income. Furthermore, tribal tenure rights deny poor African farmers the 'last resort' of their Asian counterparts in really bad times, *viz.* mortgage. For all these reasons it is not surprising that African smallholders are much more prone to use intercropping to reduce risks than are Asian smallholders, and also to select crops with low seasonal specificity (roots and tubers in many cases), or low vulnerability to moisture stress (millet, sorghum), as compared with their Asian counterparts who try to select wheat or rice as main crops, soil and water permitting.

However, population growth in sub-Saharan Africa is eroding many of the differences — favourable and unfavourable — between its regions and similar ones in Asia. Slash-and-burn cultivation is less and less possible. A growing proportion of rural people comprises (a) landless or near-landless labourers, residual employees if in agriculture and hence especially vulnerable to seasonal and other fluctuations in the demand for labour; (b) farmers with individual claims on land rights, able to sell or mortgage land in time of stress. Crop-mixes are shifting (with urbanisation, food aid, and research biases) towards maize, rice and wheat, with more specific dated water requirements, and therefore more seasonal vulnerability, than the older crops and mixed-cropping systems.

As Africa's person/land ratio gets closer to Asia's, the 'Africa-damaging' differences in respect of vulnerability to seasonal stress should also be reduced. But the latter reduction requires public spending in support of the farm sector, in response to the new factor ratios. Such spending is constrained by urban bias much more extreme than in Asia; by severe shortages of funds for recurrent public outlays; and by foreign and other pressures towards 'price purist', expenditure-reducing public-sector policies. Hence there is rather little spending on the water-management, or even on the improvement of intra-rural road systems, that might reduce seasonal vulnerability in Africa.

Bad seasonal impacts on poor people, like other 'agro-health' issues, urgently need research on how to adapt responses to rapidly rising person/land ratios. What are the counter-seasonal options in the context of a continent-wide shift from area-expanding to yield-expanding technology? The latter, in South Asia, has actually increased the coefficient of variation of yearly food output at national levels, but this is due to the concentration of (rising) output in a few nearby areas, dependent partly on irrigation but partly also on rainfall, and therefore covariant. Increases in fertiliser use, and most shifts towards modern seed varieties, increase 'worst-case' output-per-year for any given farm — even if that rather unimportant number, the coefficient of variation of national output, goes up. The damage done by an unexpectedly bad season should therefore be reduced by this sort of research-linked intensification. But neither the increases, nor the improved levels of food reserves associated with a shift to modern varieties, can be achieved without substantial spending on agricultural research and on input supply and delivery, in most areas probably including at least micro-level irrigation systems.

IV Some Possible Areas of Remedy

I should like to follow up the above remarks with something which is at best a set of notes towards a research agenda, that may stimulate others. The question is: how can one reduce the extent to which seasonality leads to increases in ultra-poverty? Several forms of adaptation to seasonal stress, by people already at risk, are possible.

First, food behaviour could be adapted. In an unexpectedly bad season, it may become possible for different groups of poor people to raise their ratios of consumption to income, of food to consumption, or of cheap (e.g. reserve-crop root) consumption to food. It may become possible for the potentially ultra-poor to escape their fate by adapting the timing of work, or of meals, or the places of work, to reduce the amount of calories required and/or to improve the conversion efficiency of food into work, although experts disagree about the extent to which individuals differ, over time, in their metabolic rates per kg — or can adapt their rates to increase food-to-work conversion efficiency in times of nutritional stress; how much adaptation is possible, among whom, for how long, and what measures might be taken by individuals or societies to improve benign adaptations to nutritional stress? It may also be possible to improve the intra-family food distribution in times of seasonal stress. Some of these strategies are doubtless adopted by poor people seeking to cope with bad seasons, but not all people adopt the best strategies in each bad season; perhaps some can learn from others, or can be helped by outside systems to do so.

Second, households in seasonal stress may be able to respond by adapting their use of factor inputs. Work timing, duration, type, or search behaviour may be adaptable between peak and slack seasons, or among household members in seasons of nutritional stress. If assets are owned, it may be possible at some cost to shift probable income from assets into the more stressful, or less secure, part of the year. Plainly, in environments where there are no major long-term trends of change, poor households are likely to learn such adaptive techniques by themselves — they must, to survive. But few environments are as static as this, and indeed policy itself does much to change them, often in ways that destroy traditionally learned methods of seasonal coping. Also, many of the poorest children do *not* at present survive seasonal stress; and many of the more adaptable adults either migrate or enrich themselves enough to reduce its impact, leaving the burdens to fall on those who remain in the potentially ultra-poor groups.

A third possible area of adaptation concerns seasonal migration. Often, seasonal migrants are the poorest and most oppressed of groups. Yet anti-poverty policy has seldom made effective contact with them. Further, Indian experience suggests that seasonal migration is a major outlet for people — e.g. landless or near-landless labourers moving from Bihar to the Punjab for work — who would otherwise be much poorer; policies that subsidised or otherwise encouraged migration of labour, instead of mechanisation to displace labour, could have major beneficial seasonal effects. Problems of schooling and health for children, whether they accompany the seasonal migrants or are left behind, need careful attention, however.

Fourth, it would be worth looking at the possibility of adapting methods of seasonal financial-cum-land management. When a really bad year comes along, in the most difficult seasons, many people are pushed over into ultra-poverty by being compelled to sell or mortgage the little land they have. Can alternative and less onerous methods, at least providing some effective competition against the small number of local moneylenders, be found in such circumstances?

Finally, it would be worth asking whether common property resources, such as access to grazing, water, thatch grass and fuels, are — or can be rendered — less 'seasonal' than private property resources. Work done by Jodha in Rajasthan confirms that common property resources are a much larger part of income for the very poor than for the better-off — but that income from common property has been eroding rapidly in the last 15 years or so [Jodha 1983]. The analysis of common property management and protection is among the many parts of our subject that needs to take on a seasonal tinge, if the access of very poor people to basic food requirements in difficult times is to be safeguarded and improved.

These are admittedly scrappy 'thoughts of a dry brain in a dry season'. Perhaps there is an analogy between seasonal studies and women's studies. In both cases the impact and effectiveness of social scientists will be greatly reduced, if we make a little ghetto for seasonal studies or women's studies. In the case of seasons, our entire analysis of the economics, sociology and politics of agriculture and the rural economy — and of its relations with the city, about which I have said almost nothing here — needs to be permeated with an awareness that impact on the very poor matters most in the seasons of greatest risk, and is somewhat less important in the more well-favoured times of the year.

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Women and Seasonality: Coping with Crisis and Calamity

Janice Jiggins

I Introduction

Over the last few years, a great deal of evidence has been amassed on the impact of seasonal adversities on women, children and their families. Attempts have been made to differentiate the varying impacts on households and, within households, on women and children in different income classes and to build dynamic models of the 'screws and ratchets' which push manageable seasonal stress toward the break-down limits of livelihood systems.

What is attempted here is an exploration of the contribution of female production, labour and domestic domain services to the management of inter-annual and intra-annual uncertainty, the steps in the sequence of deterioration under accumulating stress, and of the options open to women and their children through and beyond the point of family disintegration, when managing seasonalities becomes a matter of individual physical survival.

The evidence of female mortality and morbidity rates, from some areas at particular times, suggests that the wastage of females may be countenanced in times of acute stress as necessary to the survival of social systems as a whole, however distressing at the level of family survival. It establishes the extreme end of a range of situations in which poor rural men and women act and react to expected inter-annual and intra-annual fluctuations, interspersed with shocks whose advent is always latent but whose timing and severity is unguessable.

The management of uncertainty is inherent in small producers' and labourers' livelihood systems: not surprisingly, these are characterised by flexibility, the maintenance of a range of options to meet expected fluctuations in resource endowments, entitlements to food, work and income, climatic variation and the unreliability of government services. If it is true that the less flexible the livelihood system, the harder it is to manage seasonal stress and sudden shock, then it is important to understand how and what different members of a household contribute to that flexibility.

Such an exploration leads to consideration of how members of households assess probabilities and how they express risk preferences. It has been fashionable, for example, to assert that small producers prefer to minimise risk by aiming for inter-annual yield stability around the minimum necessary to meet subsistence needs. The concentration on yield stability *per se* may be diverting attention from a more dynamic calculus in which household members complement each others' contributions to livelihood stability across seasons by maintaining the capacity to transfer resources in and out of the sub-systems which together constitute their livelihood.

In some enterprises, one family member might be happy to make a high risk-high pay off investment if assured that failure could be covered, or another to make a high input-low return investment if that return were deemed essential but could be gained in no other way. This calculus is likely to change over time. As in a commercial business, both risk preferences and probability assessments are likely to become more conservative after a run of bad years, as assets and room for manoeuvre dwindle and as investments made in the course of a run of good years have to be paid for out of shrinking revenues.

As households head into the bottom of the cycle, it becomes a fine run thing for many of them to maintain the flexibility to ride out the bad years. The need to concentrate time and effort on essential high input-low return activities (such as fetching water from distant river beds in the dry season), may absorb household resources to the point of no return; households here must enter into new livelihood systems closer to the point of destitution, or disintegrate.

It is because men and women make separate if complementary contributions to the maintenance of

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livelihood flexibility within the framework of expected inter-annual and intra-annual uncertainty, that not only the timing of a sudden shock but the gender of its victim(s) is important. The death of children from measles at the beginning of the agricultural season might provide greater room to manoeuvre to a couple seeking their daily living from an uncertain and gender-ascribed wage labour market or, on the other hand, remove essential labour at a critical moment from a female household head farming on her own account. The death of a husband for a relatively well-off woman in a tenant household might lead to her forced acceptance of the position of unpaid agricultural worker for her brother-in-law; the death of the wife, on the other hand, might offer her husband the opportunity for re-capitalisation of his farming activities through remarriage and the acquisition of a second dowry.

The options are various, the strategies complex and, it seems, as yet we understand very little about how these operate over time for households in different income groups or for individual household members. The following section explores briefly some of the ways in which women are contributing to the management of expected seasonal uncertainty and the maintenance of livelihood flexibility. Sections III and IV attempt a progression through time in the face of relentless seasonal adversity.

II Uncertainty and Flexibility

Although neither the timing, distribution nor intensity of seasonal stresses may be known in advance, their advent and the range of probable fluctuation are accepted as normal occurrences by the rural poor. Among the range of possible responses, seven which tend to be particular to women are outlined here in brief.

(i) Switching Tasks and Responsibilities ascribed by Gender

In many rural societies, specific tasks and areas of responsibility are ascribed by gender. Where these are rigid, it might be that households — particularly low income households — find the management of seasonalities harder than in societies in which there is some scope for men and women to take over each other's tasks and responsibilities as need and opportunity arise. Contrast the following two examples. In an area of Tanzania in which only women cook and carry water, dry season water-carrying absorbs a great deal of female labour time. Men welcomed a proposed village water facility because, they said, 'Water is a big problem for women. We can sit here all day waiting for food because there is no women at home' [Wiley 1981:58].

In contrast, a Javanese case study reports greater scope for a more flexible response to gender-ascribed tasks and seasonal opportunities: 'Men, for example, sometimes stay at home to babysit and cook a meal while adult women and girls are off harvesting, or trading at the market' [White 1985:132].

In a study of the pastoral Orma along the Tana River in Kenya, Ensminger (1985) presents data which show only slight variation in the amount of time spent on or in the pattern of male and female activities between the seasons, except that, in the dry season, women do slightly less work such as cooking and milking and men spend more time in stock-watering and well-digging. Although young girls may take on some of the tasks associated with (male) herding, in general — at a time of maximum nutritional stress — men's dry season work increases somewhat whilst women's leisure time increases. Asking why there are 'relatively few age/sex cross-overs of labour allocation between seasons' (page 14), Ensminger finds that her data do not satisfactorily support explanations based on reproductive rationality, differential physiological efficiencies, social reproduction needs nor redistribution.

Indeed, it would seem that it is partly the *social perception* of the scope for switching rather than 'objective' assessments of capacity or returns which determines how flexible households can be in assigning seasonal labour tasks. In a study of labour market behaviour in South India, Ryan and Ghodake (1980) attempt to relate the effects of season, sex and socioeconomic status and speculate that differential labour market opportunities would support the economic rationality of skewed intra-household food distribution toward adult males but, as Schofield (1974) points out, we simply do not know if this presumed rationality leads to food being seasonally distributed independent of the task and sex of the operator: '. . . are women fed more when weeding and men when ploughing? In this case, commonsense would suggest that available food is so distributed to the workers that the non-work force section bears the brunt of seasonal variation in food supplies' [Schofield 1974:26].

Where male and female farming are partially separated within the household livelihood system, the answer to the question of the intrahousehold pattern of income and food distribution in relation to women's labour productivity, as Jones (1982) has demonstrated for a Cameroonian case, may lie in calculations of the intrahousehold rate of compensation rather than market opportunity costs.

Another factor may be the degree to which own-account production is the main livelihood source. One

study in Cajamarcan in the Andes found that in landless households depending on non-farming income-generating activities for the major part of their livelihood, a 'flexible sexual division of labour [in agriculture] appears to be required by economic necessity', whereas in landed households, agriculture is predominantly a male activity [Deere and de Leal 1982:88].

(ii) Diversifying Household Income Sources

It is common in development studies to see female income referred to as supplemental and for it to be subsumed within estimates of household income. Neither practice seems particularly helpful. For growing numbers of households headed by women, women's earnings form the main cash source; in households where male and female responsibilities are separated, women are obliged by the terms of their marriage contract to find the cash needed to fulfill their assigned responsibilities; amongst the poorest households, women's earnings may form an equal or larger share of household income; a greater portion of the income accruing to women than to men tends to be spent on household welfare and consumption needs. For all these reasons, in terms of seasonal analysis, the sex of the income-earner and the intra-household distribution of income and responsibility is thus likely to be more important than total household income as an indicator of the household's capacity to maintain itself in the face of seasonal adversity.

A number of studies do, in fact, show that women make careful judgements of the balance of advantage between, for example, maintaining food stocks and converting a portion to beer-brewing and selling as the agricultural season progresses [see Saul 1981 on sorghum beer-brewing in Upper Volta] or between allocating their labour to food production and processing for domestic consumption or to marketing [see Kebede 1978 for the balance between enset (the 'false banana') production and the *chircharo* system of trading among the Gurage in Ethiopia].

There is, further, growing evidence of the close correlation between female income-earning and child-bearing: the higher women's income, the lower the number of pregnancies [Evenson 1985:27]. The causal relationship appears to be mediated through the monetisation of women's time. If we have evidence that changes in agriculture lead to an increase in women's time input with no increase in — or even loss of control over — their income, then we can expect that the adverse seasonalities associated with maternal and child health will, in fact, be exacerbated and may be contributing to the kinds of family breakdown outlined in Section IV.

Maggie Murray/Format

Women in Rwanda combining farming with child care.

(iii) Changing the Intensity and Mix of Multiple Occupations

There are good records of women manipulating the intensity of performance and the mix of occupations associated with their multiple roles in order to cope with seasonally urgent tasks. In general, it would appear to be their domestic domain roles which are squeezed rather than production or income-earning, though, as one would expect, the balance of net advantage may be different for women in households in different income classes [for a Philippines example see Illo 1985:85-7]. For example, surveys among primary school children in the Mochudi District of Botswana during the ploughing season showed that nearly one third of primary school children were caring for themselves without adult help in the month of February whilst parents were absent at the lands [Otaala 1980]. Cooking may be reduced to once a day or every two days during peak farm labour periods or staples substituted by snack foods which can be eaten raw [Bantje 1982a, Table 2; Jiggins 1986]. Ryan and Ghodake [1980] note for four South Indian villages that it is the hours women work in the domestic domain or as unpaid farm family labour which tend to fluctuate seasonally rather than the hours of waged work.

(iv) Household Gardening

The domain of the household garden provides a further element of flexibility in the livelihoods of those with access to land. Studies from Grenada, Zimbabwe, West Africa, Jakarta, South East Asia and Peru emphasise the importance of household gardens under women's care as a source of early-maturing varieties of staples to carry families over the hungry season till main crops mature, as reserve sources of plant materials should main crops fail, as conservation sites for special or preferred varieties and as testing grounds for new varieties or practices [Brierley 1976; Callear 1982; Eijnatten 1971, Evers 1981, Ninez 1984, Stoler 1978]. A study in Kalimantan in Indonesia recorded an average of over 40 different species of vegetable, spice and fruit crops in household gardens [Watson 1985:198]. Local cultigens, semi-wild and protected wild species, together with small stock and poultry, may add to the diversity and richness, constituting a complex biological coping mechanism responsive to intra-annual and inter-annual climatic and labour time variations, meeting specific seasonal end-uses which cannot be provided by field crops, however abundant [Jiggins 1986].

(v) Food Processing, Preservation and Preparation

The choice of crop mix, plant characteristics and amount of time devoted to cultivation is not determined solely by consumption preferences nor are food purchases determined only by income; they are intimately associated with the technology available to women for domestic processing, preservation and preparation. These technologies in turn may be linked to the seasonal availability of different types of fuel for cooking and space heating [Foley et al 1984:34] and the differential fuels available to women in different income strata through the seasons [*ibid* 36]. Vidyarthi [1984] shows from data for one Indian village, the use of dung and firewood by women in bullock-owning households and an increasing reliance on crop residues by poorer women, who use spiky millet stems through the end of the *Kharif* season in November, then pigeon pea stems through the end of *rabi* in April (which give the best sustained heat of all residues), and then a weed, *Ipomea fitulosa*, which gives a smoky heat and must be gathered, cut and dried for a month before use, and gathered wood. He estimates that agricultural residues may form around 40 per cent of all fuels used by poorer women.

Huss-Ashmore details these links carefully for female-headed households in highland Lesotho [Huss-Ashmore 1982:156]. In Mokhotlong the type of fuel used and the time spent getting it vary according to the seasonal availability of dung. Slow-cooking protein sources are not used equally through the year but are depleted during the cold season when the slow burning compacted dung is available. 'During the summer the population relies heavily on wild vegetable protein sources, which require more time to locate and gather but which can be rapidly cooked', using the horse and cattle dung picked up on the high pastures and kindled with quick-burning resinous and woody shrubs [*ibid* 157]. It is fuel seasonalities and not crop availability which determine which foods are eaten and the food preparation equipment used at different seasons.

Women also attempt to cope with crop seasonalities through food processing, to extend the storability and shelf life of perishables, from simple sun-drying of leaves and vegetables treated with soda ash, to more elaborate transformations such as those involved in the making of *Kenke* and *gari* (cassava products) in West Africa or *chuno* (potato products) in the High Andes.

(vi) Social Organisation

An apparently growing phenomenon is the formation of multi-generational, multi-locational networks of households headed by women. Only some of these are the result of family breakdown — women may be choosing to have children without what they perceive to be the burdens of marriage [Kerven 1979]. They appear to be an emergent form of social organisation designed to spread risk and optimise seasonal management strategies in areas of high gender-specific migration, marked seasonality, and marked gender-specific livelihood opportunities [see Kerven 1979 for Botswana examples; Phongpaichit 1980 for Thai examples].

Another strategy in areas where there is a developed labour market is for women from poor households to associate in specialist labour gangs to take advantage of seasonal cropping patterns. They may travel over a wide area, moving with the season from contract to contract, with gangs known for their speed and skill gaining premium rates. In a ten-member Sri Lankan gang documented in 1979, which moved from the wet zone to the irrigated dry zone twice a year to carry out paddy transplanting, six were married women, of whom two were separated from their husbands [ESCAP/FAO 1979:28-40]. The four resident husbands worked as casual labourers. The other women lived with their families, of whom only three had even a tiny plot of high land for cultivation. Their ages ranged from 26 to 55 years and they worked as casual estate labourers the rest of the year. Their transplanting earnings were spent on daily living and family needs; their own clothes and jewellery; furniture and pilgrimages. The high preference for turning their earnings into an easily convertible store of value under their own control, as a hedge against a crisis and calamity, has been noted in many studies [Jiggins 1983].

Yet another mechanism is to develop semi-formalised women's groups based on existing forms and principles of female association. Yet these might not be as useful as might at first be supposed in the maintenance of the poorer members' livelihoods through seasonal stress. In a study of women's groups in Kenya, members were asked to identify those who were 'famine resistant' or 'famine-prone' i.e. who would or would not be able to stand even a mild harvest failure or livestock disease. Famine-proneness turned out to be associated with illiteracy and household headship [Muzale and Leonard 1985:19]. Resurveyed after a year of drought, the membership was found to have dropped to those previously identified as 'famine-resistant'. The famine-prone had left the groups long before the groups suspended activities due to the drought and were not expected by those who were left to return.

> 'Participation in women's groups at the initial stages represents a form of long-term investment. At that stage, the groups do not yield material benefits for individual use in the family. Joint welfare funds, friendship, production information and skills are all the benefits that group participation is able to produce at the individual level at the initial stages. Women operating within small resource margins in a harsh environment are not likely to be able to undertake this form of investment on a continuing basis. If the groups' policies continue to demand contributions well into periods of environmental stress, poor women will be excluded' [*Ibid*:20].

Yet another mechanism — though possibly the reference is eccentric — is the practice of what might be termed 'seasonal polygamy': men contracting marriage with additional wives at the beginning of the crop season and divorcing them again afterwards, in order to optimise household labour resources when they are needed and to minimise the post-harvest draw down of household food stocks [Bantje 1982a:16].

(vii) Gift-Giving

Hidden within rural life is the special advantage that single, widowed and divorced and separated women may have to solicit and accept gifts from men in a relationship which falls short of prostitution in many respects but which women may skillfully exploit as a gender-specific coping strategy, even in societies in which propriety deems it a protective rather than exploitative relationship. Documentary evidence, unsurprisingly, is meagre. One example from Tanzania records a women's comment: 'We just look this way and that way for help. You see, I am a woman' [Bantje 1982b:7].

III Dealing with Relentless Adversity

Given the kind of flexibilities described above, what gives way as families move into deepening poverty in the face of relentless adversity, such as several years of bad harvests? It seems we do not have sufficient information as yet to write about generalised patterns of how women adjust (nor of the effects of family adjustments on women) or to define precisely the parameters within which they occur. The following cases from the South Asian region, then, are only illustrative of the kinds of things which seem likely to happen.

A study of the sequential responses of deepening poverty in villages in two areas of Bangladesh, *viz.* Comilla and Modhupur, distinguished between female wage-earning households and those without female wage-earners and, within the former category, the position of widowed/divorced/separated women and married women [Begum 1985:221-41]. At some point in a run of bad harvest years, in smallholder households in which women did not work for wages, males sought or held non-agricultural wage jobs which at a pinch could compensate for loss of farm earnings. In smallholder households where women took wage work, men had no such alternative job and began to

> '. . . lease out and perhaps sell land. They may also sell productive assets (e.g. bullocks) or consume productive inputs (e.g. seed). They may place male children in permanent jobs where they receive food and shelter. Finally, women may perform wage labour. The involvement of rural women in wage labour seems to be the last step in a series of family adjustments to economic crises that is taken only when the alternative is the effective breakdown of the family unit' [*Ibid*:232].

Households that had female wage earners also were more dependent on children's earnings. In particular, the higher percentage of labour participation of female children from female wage-earning households was found to reflect their acute poverty [*Ibid*:233-4].

There is an indication that the ability to support livelihoods through gleaning is dependent on the characteristics of the rice varieties grown. Among a number of differences between survey sites, the study pointed to the importance of the rice varieties grown as an index of the availability to women of harvesting wages, gleaning and post-harvest threshing employment.

> 'The long strawed broadcast *aman* rice grown in Comilla was less uniform in length. Consequently, some crops remained unharvested in the fields. On all land but that belonging to the poorest households, it was a prerogative of the women and children from poor landless households to glean

the fields. They would then obtain access to a neighbour's *dheki* to dehusk the rice' [*Ibid*:235-6].

Women wage-earners from landless households were found to take almost a third of their earnings in the form of gleaning, begging and charity. There is some indication from a Sri Lankan study that petty thieving in cash or kind forms another kind of supplemental income for women in landless households under stress, particularly for those (not the poorest) who still have access to small scale consumption credit from traders or neighbours and who are pressed by their creditors to repay at times of seasonal stress [Risseeuw 1980:166].

The implication of the Bangladesh case, that whatever women's personal earnings or assets, these are consumed *before* the point of family breakdown, is also indicated by data from a case study of workers in the plantation sector of Sri Lanka. Women's earnings are 'eaten away by other people', their jewellery pawned or sold by their menfolk to cover debts and raise new credit, and their food intake reduced disproportionately as debt repayments cut into current income [Kurian 1981:134].

Another Bangladesh case illustrates how a woman from a poor household may be shuttled back and forth between her marital and natal home as seasonal crisis leads into greater poverty [Nath 1979]. Her parents are keen to marry her off, to relieve what is seen as a consumption burden but, similarly, suitors, poor themselves, are reluctant to take a wife without a dowry in compensation. Unable to pay the full dowry at one go, the bride is sent home whenever dowry payments fail — or the husband might demand more as his own problems worsen. The birth of a daughter or economic crisis in the natal or marital home then leaves the wife as an unwelcome presence in either household, neither accepting responsibility, until she finds herself abandoned by both.

Food aid disbursements and Food for Work (FFW) schemes offer seasonal relief for some women who are approaching or who are beyond the point of family breakdown. Studies of the Employment Guarantee Scheme in Maharashtra, India [Institute of Social Studies 1979] and the Food for Work programme in Bangladesh [World Food Programme 1979, Rahman Khan 1979] record unexpectedly high proportions of women turning up for work. Nearly half of all the women surveyed in Bangladesh FFW schemes were found to be the main income earners for their families and of these, more than two thirds were widowed, separated or divorced [WFP 1979].

IV Desperate Measures

Crushed by poverty to the point where there is no flexibility left for surviving seasonal stresses or faced by sudden disaster, a man may decide to push his wife and children out of the house or to walk out on them. Greenough infers from the high percentage of adult women (56 per cent) applying for relief and the fact that a quarter of all adult applicants were living away from their spouses in a study of more than 3,000 relief recipients in Bengal during the 1943 famine, that the deliberate separation of spouses is a common response to crisis. He further quotes a survey of street-dwellers in Calcutta during the 1943 famine which similarly suggests that 'the exclusion of women from domestic subsistence' was the major direct cause of their arrival in Calcutta [Greenough n.d.:5; Greenough 1982]. The turning points in six of the case histories he presents are summarised in Table 1.

Beyond the point of family breakdown caused by deepening poverty and sudden shocks such as the death of a husband, or flood, there are a number of last desperate measures women may take — or be forced into taking — to save themselves and their children. Briefly, they might be listed as follows:

(i) migration, often involuntary, after they have been pushed out of the marital or natal house or the husband has abandoned the family [Scott 1984:50; Obbo 1980; Jahan 1979; Rahaman 1981]. A large number of involuntary women migrants turn to begging and vagrancy. Jahan [1979:270] remarks of the Bangladesh situation: 'The basic cause of [female] vagrancy is poverty, destitution brought on by the death/disability of male guardians or crop failure in densely populated areas.'

(ii) either just before or shortly after family breakdown, efforts might be made to place (especially male) children in others' households where they will work in return for food [Rahman Khan 1979] or they are left outside an orphanage, or they are bought and sold in return for food, or, in worst case situations, simply abandoned [Rahaman 1981:136].

(iii) changes in the character and intensity of gathering or cultivation of wild and semi-wild foodstuffs, preferred species giving way to famine foods which become a major or even the only food source [Rahaman 1981]. Anecdotal evidence from famine relief workers suggests that often it is women who preserve knowledge of the whereabouts and preparation of these foodstuffs.

(iv) failing all else, prostitution, for adult women and female children, may be the last resort. A study of 273 prostitutes in Dhaka [Jahan 1979:270-4] and the case material from Bengal adduced by Greenough (1982) suggest that it is impoverishment, made unsupportable by flood or famine, and the loss of male guardian or

Table 1

The Fate of Women during the 1943-44 Bengal Famine

Cases	*Original Household Status*	*Main Livelihood*	*Crisis*	*Debt*	*Distress Sales*	*Deaths*	*Alternative Livelihoods*
A.							
1. Sankari Addy Hindu	1 acre smallholder Recently married (18 year)	Betel vines	Flood Famine				Driven out to beg for food. Lived on gruel at free kitchen for 1 month. Left to find more food. Fainted on highway. Taken into hospital. Husband remained on farm to tend betel vines.
2. Alfalijan Moslem			Crop Failure Famine		1. Hut 2. Utensils 3. Labour 4. Everything but clothing	Mother died when she was young, father soon after her own marriage. Only son died after 10 weeks of famine	Husband divorced her, then abandoned her to join the army. Wandered from free kitchen to free kitchen.
3. No name	Farmer. Well-off for first 12 years of marriage	Agriculture 2-room hut, cowshed, kitchen. 2 bullocks. Some agricultural tools.	Crop Failure	100Rs June, July August	1. Bullocks, roof sheets, windows and doors; day labour. 2. utensils, ornaments, furniture. 3. Mortgaged last room.	10 years old eldest child after weeks eating only boiled vegetables. Within 3 days, 2 further children.	Husband unable to bear the calamity and left. She was collected by her mother and brought back to her father's village.
B.							
4. Sinhabala Mandal Hindu	½ acre owned by husband. Household of self, daughter, husband, his elder brother/ wife/6 children, father-in-law	Day labouring Cow	Famine		Brass and bell-metal utensils, Cow	Father-in-law after eating inedible food. Husband, of malaria, after returning from search for food. One nephew.	Ate wild vegetables. Father claimed her but made her sell the ½ acre in return for a room at his house. Some years later, married off her daughter and was joined by her son-in-law.
C.							
5. Puntibala Sing	Crippled father, mother, step-mother, self, husband		Flood		All possessions	Husband, father, step-mother, by drowning.	Protected by wealthy village man for 4 months. Returned to protection of neighbour who was poor. Ate wild foodstuffs. Left to seek food. Begged at office of a landlord. Given food, shelter, a room by the market. Violated. Began life as prostitute under landlord's protection. Eventually formed own brothel.
6. Angurbala Sing	Father a share-cropper	Agriculture	Cyclone. Father's house destroyed. Later found husband's house destroyed.			Mother and sister, when father's house swept away. Husband, when own house swept away.	Returned to father. Lived on charity/ government relief. For 4 months under protection of wealthy man. Fled before raped. Contacted former female villager (who was already a prostitute) for assistance. Fell into operator's hands. Father given agricultural work far away. After 5 years, opened own brothel.

Notes: A. Wives deserted by or pushed out by husbands.
B. Better-off wife able to survive disaster.
C. Wives who lost everything and ended up in prostitution.

Source: Constructed from case notes presented in P. R. Greenough: 'Some notes on peasant prostitutes recruited in times of famine', Wid notes, Mucia Wid Network, Land Tenure Centre, University of Wisconsin, Madison, n d., pp4-7.

spouse (through death, divorce or desertion), which are the main causes leading women into involuntary prostitution.

A Reconsideration of Seasonal Uncertainty and Calamity

The largely descriptive information presented here perhaps allows us to make a preliminary sketch of the role women play in the maintenance of livelihood in the face of seasonal uncertainty and calamity, to begin to frame more discerning questions concerning risk preferences and probability assessments, and to look again at the valuation of women's labour time.

In Table 2, a very simple summary is attempted of the particularly female options open for the maintenance of livelihood in the face of seasonal crisis and calamity, for two categories of poor households, landed and landless. It is fairly heroic, ignoring all regional and continental differences in the social organisation of production and gender relations. Nonetheless, it suggests a number of patterns which might turn out to be general.

One feature which stands out is the resilience of female-headed household *networks* to seasonal stress and calamity; far from being among the 'most vulnerable', more critical study of the advantages of their organisational and economic flexibility may show that they are the 'survivors'. In this light, it may be that the prevalence of such networks in sub-Saharan Africa is a very rational and positive response to harsh and prolonged environmental crisis.

The Table also suggests that it might be possible to construct a matrix of male and female risk preferences and probability assessments, for households in different social classes and at various stages of decision-making, in the sequence from crisis to calamity.

Finally, it suggests that a good deal more thought has to be given to the valuation of female labour time. Not only is it not constant along the domestic domain — public domain continuum nor in relation to the value of male labour time, but it would seem on the face of it to fluctuate in relation to the importance of women's livelihood contribution through the sequence of crisis to calamity.

Table 2

Seasonal Crisis and Calamity: An illustration of female options

	Seasonal Crisis		*Calamity*	
Extent to which:	*Landed*	*Landless*	*Landed*	*Landless*
Male/female tasks and responsibilities can be switched	Only under real pressure	Yes	Yes	Yes
Domestic domain tasks can be squeezed	Only under real pressure	Yes	Yes, at the cost of family welfare, especially child care	Yes, to a point where (male) children are placed elsewhere or children are sold or abandoned
Female income-earning is possible	Moneylending, food processing and trading; petty manufacturing; wage labour less common	Food processing and trading; wage labour common/frequent but not always available	via loans, mortgages, sale of assets	via begging, prostitution and FFW
Female production is possible	Fields; gardens, ponds; poultry; small stock; trees; cows	Trees; small stock, cows; CPR; gleaning	Garden species may be less drought-prone, etc Gathering of famine foods	Greater pressure on CPR Gathering of famine foods
Female social organisation gives returns	FHH Networks: positive. Semi-formal/formal groups: positive	Labour gangs: positive	FHH networks: children of both sexes can be protected	Brothel-keeping
Female assets can be disposed of (jewellery, pots)	Last resort	Common, frequent	More, higher value	Few, low value
Provision of company or sexual favours in return for gifts is socially sanctioned	FHH only	Accepted as sometimes necessary	Protection by male kin. Remarriage (if still young) Prostitution. FHH Networks may exploit to survive	Prostitution

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Food Shortages and Seasonality in WoDaaBe Communities in Niger

Cynthia White

Introduction

This article deals with a Fulani group, the WoDaaBe, in central Niger and is based on fieldwork done between September 1979 and April 1983.[1]

The WoDaaBe live in a part of the Sahel with low annual rainfall (200-300mm) and high absolute and relative seasonality. Rainfall distribution is extremely variable in time and space. There are four main seasons: a cold dry season (November to January), a hot dry season (February to April), a transition season as erratic rainfall begins (May to July), and a hot rainy season (August to October).

The WoDaaBe do not cultivate. They raise cattle primarily and have some sheep and goats. Donkeys and male camels are used for transport of baggage and people. The WoDaaBe live in rudimentary camps, which they move frequently in search of pasture and water for the animals. In the dry season they use permanent deep wells for watering the herds, or shallow wells that are re-dug by hand each year. At this time of year, camps are moved every few weeks.

In the rainy season however, the WoDaaBe move every few days as rainfall moves north and they try to keep up with a northward advancing front of high quality green grass. The spatial distribution of rainfall, and hence pasture, is scattered and unpredictable. Animals can drink at surface water pools at this time.

Production is organised at the household level. Herds are managed by individual households and labour comes from within the household. There is no dependent class.

Seasonal Work Patterns

Pasturing and watering are the two most time-consuming tasks in WoDaaBe herd management, although there are many other less demanding jobs to be done. Figure 1 shows how the total labour allocation of adult WoDaaBe men to livestock tasks stays high and quite constant throughout the year, varying around 5 hours per adult man a day; there is a peak of 6.5 to 7 man hours a day in the transition period between the hot season and the rains, between May and July in both survey years, and a low point of about 3.5 man hours a day in the immediate post-rains period in October. The dry season is a time of prolonged high work hours. Adult men rarely work less than five hours a day at herding from December until the rains are well under way in the following July. Pasturing and watering alternate with each other as the main activity, with the emphasis shifting from one to the other according to the season; watering is clearly much more energy-demanding than pasturing however, and is at its peak at a time when food is often scarce in WoDaaBe camps. Pasturing work, while less arduous, nevertheless requires a continuous presence and considerable skill and knowledge.

An interesting point is the peak in livestock work at the start of the rains. This is a critical time for the health and long term well-being of the animals. The WoDaaBe supervise them carefully to make sure that they graze the proper mixture of different vegetation

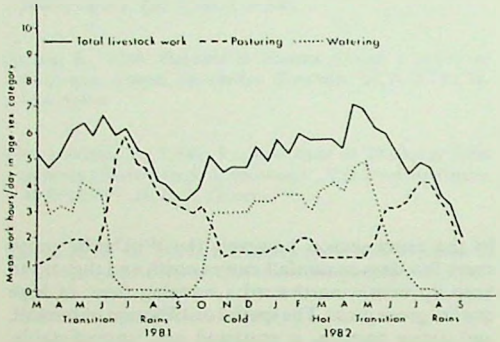
[1] Quantitative data on labour use and household budgets were collected from November 1980 to September 1982 on a sample of 19 families forming 16 production units. The small size of the sample was imposed by the difficulties involved in collecting accurate longitudinal data amongst extremely mobile and scattered households at long distances from each other, and was compensated for by the collection of less detailed data and qualitative work done on a much wider range of WoDaaBe groups in different parts of Niger's pastoral zone.

The detailed quantitative data were collected twice weekly by four WoDaaBe field assistants. Because there are no WoDaaBe who have been to school, the assistants recorded data in tifinar, the phonetic script used by the Twareg (the other nomadic pastoral group in the area) and were taught to write numbers. Each member of each household was asked about all of his/her activities during the preceding three or four days. Everything entering or leaving the household through sale, purchase, loan, barter or gift was recorded, including prices, quantities, age and condition of animals, and the market used. In the camps I went over each of the data sheets with the enumerators, clarifying questions, and cross-checked information by observation and discussions. Full research results are written up by White in Swift (ed) 1984:292-430; 462-529.

IDS Bulletin, 1986, vol 17 no 3, Institute of Development Studies, Sussex

Figure 1

Seasonal distribution of work devoted to all livestock tasks by WoDaaBe men aged 15 to 40 years



types and pasture areas to ensure rapid recovery from the dry season. This is crucial for the animals to get the maximum benefit from the short wet season green pasture. The transition season is also a time when some plant species are at a toxic stage of the vegetative cycle. Animals must be watched carefully as whole herds have been known to be wiped out by bloat when they have grazed toxic growth.

The peaking of most cattle calving just before or in the early rains means that there is more work then looking after the young calves at their most vulnerable moment.

Women help men with pasturing and watering and have other regular tasks, such as milking and moving camp, which continue throughout the year. Milking labour drops off in the dry season when the animals are producing little milk. Striking and pitching camp peak in the rainy season when camps are moving most frequently. Women's main labour activities however are pounding and cooking cereals and fetching domestic water (Figure 2). Both are most time-consuming in the dry season.

Camps are up to 20 km from the wells in the dry season and women spend long hours collecting water and helping with watering. At the height of the dry season they do not return to their camps from the wells until the evening when they have to pound cereals and cook. Because animals' milk production decreases as the dry season progresses, households must use greater quantities of cereals at this time.

Children make an important labour contribution, particularly in the transition and dry seasons (Figure 3). Boys spend most of their time watering throughout the dry season. Average person hours spent per day watering animals in the dry season was even higher in the 6-14 year age group than for adult men. Girls help with a wider variety of tasks, in particular fetching domestic water, which drops in the wet season and rises in the dry season.

Figure 2

Seasonal distribution of domestic labour by WoDaaBe women aged 15-40 years

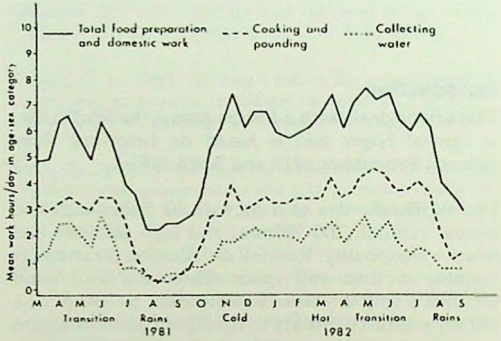
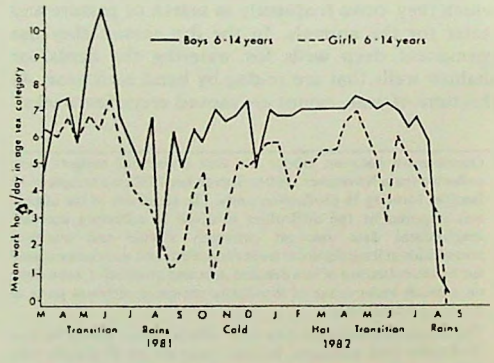


Figure 3

Seasonal distribution of time spent by WoDaaBe children on all productive tasks



Although labour inputs are quite high throughout the year, dry season labour is far more arduous. Well digging and cleaning, watering animals and walking long distances to wells in extreme heat contribute to stress at a time when both food and water are scarce. Drawing water from wells and lifting it to watering troughs is back-breaking work. In terms of energy

Table 1

Milk available to WoDaaBe households in different seasons

	August 1980 (rains)	*November 1980 (cold)*	*February 1981 (hot)*	*May 1981 (transition)*	*September 1981 (rains)*
Milk production (litres/lactating cow)	2.35	1.35	0.64	0	n.a.
Milk consumption (litres/person)	n.a.	1.37	0.66	0.37	2.43

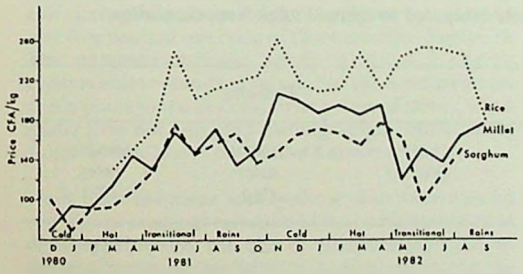
requirements, it cannot be compared to wet season pasturing labour, which, although time-consuming, requires more knowledge than strength.

Dry Season Food Supplies: Cattle Sales and Cereal Prices

High dry season labour demands coincide with household food shortages. As the grass dries out after the end of the rainy season, its protein content and nutritional quality decline. Grass is most scarce around water points and this, combined with the long distances most animals must walk to wells, reduces milk production (Table 1). Households must increasingly supplement their diets with cereals as the dry season progresses. Cereal prices, however, are rising at this time (Figure 4).

Figure 4

Mean monthly cereal prices paid by WoDaaBe sample households



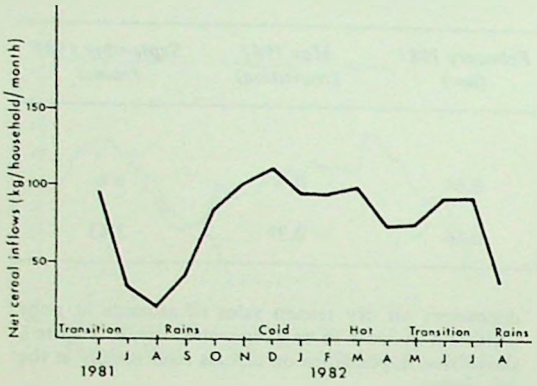
The WoDaaBe's only source of cash with which to buy cereals is the sale of their animals, which are in particularly poor condition in the dry season and fetch low prices in the market. Poor families with small herds and therefore inadequate milk supplies are most dependent on dry season sales of animals in poor condition in order to buy expensive cereals. Figure 5 shows that dependence on cereals rises steeply in the dry season.

An analysis of all cattle sales in a sample of 14 WoDaaBe households over a period of just under two years (from November 1980 to September 1982) indicates that sales of very young males and reproductive females were occuring, with a peak in sales in the dry hot season. Calf mortality is high in the first year and drops substantially thereafter. The value of animals, particularly males, rises sharply with rapid weight increases over the first few years of their life and reaches a maximum at about five years for males. Because of the low marginal cost of herding additional animals, and the absence of economic cost to the herder for the use of grazing land, it is clearly in the herder's interest to hold onto young male animals until they have achieved a substantial part at least of their maximum value. As females provide milk and the future reproduction of the herd, any sales of productive females before they approach the end of their reproductive years seriously jeopardises the continued production of the herd.

Table 2 compares a computer simulation of the optimal age/sex distribution of sales with actual sales in 1981-82, and shows that a high percentage of males are being sold before they are five years old. Even more serious is the large number of sales of reproductive females (26 per cent of all cattle sales). This pattern of sales is the clearest indicator of a downward spiral of poverty, in which household herds are too small to provide for household consumption. Inadequate milk supplies mean a greater dependence on cereals. The needs to obtain cash to buy cereals necessitates further animal sales. Once old females and adult males have been sold, increasingly young males must be sold to meet cash needs. Herders are then not only losing the potential economic benefit of the

Figure 5

Net monthly cereal inflows to WoDaaBe households



animals' weight gain, but, also, a larger number of young animals must be sold to buy the same amount of cereals. When the sale of young females begins, the milk supplies of the household herd are further reduced, and the vicious circle is completed.

The dry and transition seasons are crucial to this process. Milk supplies are lowest in the dry season, and the need for cereals is highest at this time. Cereal prices are high and the condition of animals is poor, so a larger number must be sold to obtain the necessary cash to buy cereals. If household cereal requirements can be reduced in the dry season, allowing a few more animals to be held in the herd until the following rainy season when their condition improves considerably and they have grown a lot more, there is an important saving, both in terms of numbers of animals and value per animal.

The only way the WoDaaBe have of reducing dry season cereal consumption is to send household members away at this time on migrant labour. Increasing numbers of WoDaaBe are leaving their camps in the dry season to go to Nigeria and other countries, where men work as watchmen or sell traditional medicines and women earn money braiding hair or mending calabashes. Prostitution is not mentioned openly, but there is some evidence that it takes place when women are well away from their communities.

Detailed household budget studies show that the WoDaaBe were not able to earn enough money to return to the camps with savings. They could barely cover their subsistence costs while they were away and sometimes contracted debts for transportation. Their absence however reduces cereal requirements in the camp, and reduces the need to sell animals in the dry season. In the sample households, average direct savings attributable to cereal consumption foregone as a result of the absence of migrant labourers were equivalent to the value of a one or two year old male or female calf. But as the labour graphs show, the dry season is the time of peak labour demands, and the absence of migrants aggravates dry season stress on the household members who stay behind.

Anthropometric data collected by Louis Loutan on 54 WoDaaBe families between August 1980 and September 1981 (a sample that overlapped with my own) show the effects of this dry season stress

Table 2

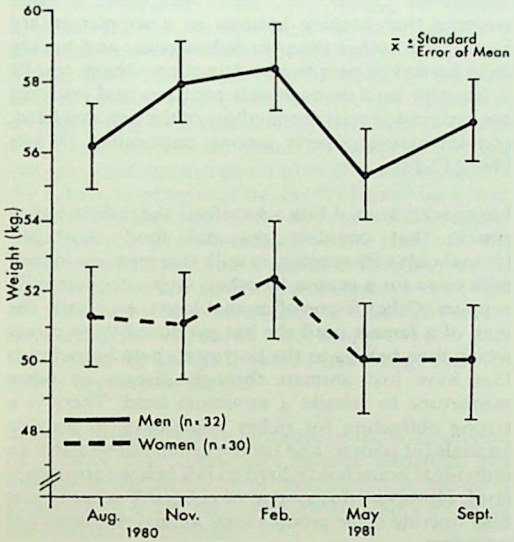
Age-sex structure of cattle sold by WoDaaBe sample compared to optimal sales from simulation

Males			*Females*		
age (years)	*optimal sales (%)*	*sample sales (%)*	*age (years)*	*optimal sales (%)*	*sample sales (%)*
<3	18	32	<4	—	19
3-5	27	9	4-9	—	7
>5	12	11	>9	43	22
	57	52		43	48
(n)		(65)			(59)

(Figure 6). Between February and May 1981, the mean weight loss was 5.3 per cent of body weight for men, and 4.6 per cent for women. Of the sample of 55 men, three lost 14 per cent of their body weight. Although women lose less weight than men, they recuperate less rapidly during the rainy season [Loutan and Lamotte 1984:946].

Figure 6

Seasonal changes in the mean weight of adult WoDaaBe men and women



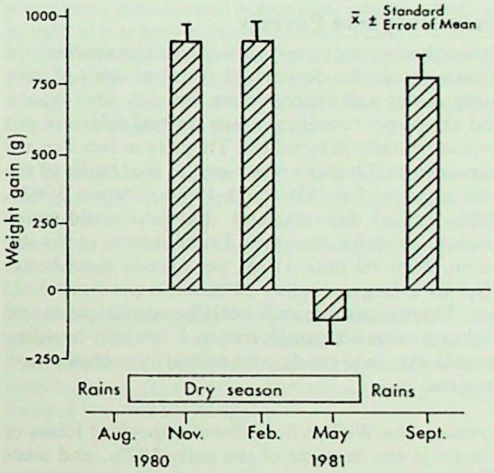
A more sensitive measure of the fluctuations in nutritional status during the year is obtained by calculating the gains in weight of children between one and five years at intervals of three months (Figure 7). The sample's average yearly gain of 2.4 kg is comparable to standard values, but the measurements again point to the dry season as a time of stress, when under fives not only stop gaining weight, but actually suffer weight loss [Loutan and Lamotte 1984].

Data from the same survey show that there was no significant seasonal variation in the overall number of diseases. However the rate of incapacitation due to illness did vary across the year. As Figure 8 shows, the rate of incapacitation peaked in the dry season when 45 per cent of people of work age (12 years and older) were confined to bed at least once [Loutan 1982:84]. Because of full labour force participation and the year round necessity of constant herd surveillance to avoid animal loss, any incapacitating disease will have an important impact on a household's independence and productive capacity. This is especially true in the dry season.

All of these factors demonstrate that, in contrast to agricultural societies, it is the dry season and the transition between the dry and rainy seasons that is the most difficult time of year for WoDaaBe pastoralists. It is important to note that although labour demands drop slightly in the short rainy season, they remain quite high throughout the year for all age and sex categories. There is no real slack season when alternative work can be done outside the pastoral economy without affecting pastoral productivity.

Figure 7

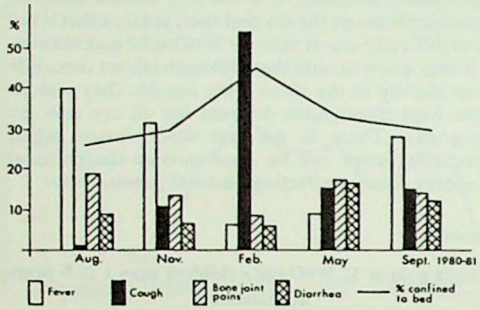
Weight gain in 32 WoDaaBe children ages 1 to 5 years by trimester



But this is only part of the picture. Seasonality, through a coincidence of stress factors in the dry and transitions seasons, clearly does reinforce poverty among the WoDaaBe. It is in the dry season that they are obliged to break into their capital case, directly reducing future food availability and productive capacity. it is important to note that in fully pastoral societies, the loss of the reproductive elements of the herd through either sales or death, not only diminishes short term food availability (milk) but also reduces long term food sources as well as the reproduction of assets essential to production. Animal loss beyond the threshold at which the herd can reproduce itself is equivalent to the sale of land for agriculturalists. It has an irreversible effect on production, and recovery requires substantial capital inputs to which the WoDaaBe do not have access.

Figure 8

Seasonal variation in the prevalence of the four commonest illnesses among the WoDaaBe (per cent of illness events in preceding 3 months)



Seasonality and Poverty

Although seasonal stress is crucial, its impact does not in itself create the downward spiral of sales of very young males and reproductive females. Dry season food shortages requiring many animal sales are not environmentally determined. They are in fact a recent phenomenon. Dupire's work on the WoDaaBe of the same area in the 1950s and 1960s [Dupire 1962a, 1962b, 1962c] demonstrates that household herds were sufficient for year round subsistence. In the dry season, reduced milk yields per animal were better offset by a larger number of animals per household herd. There was more milk both for consumption and to obtain cereals through barter. Even non-breeding animals were sold rarely, and primarily to obtain cash for taxes.

However, the WoDaaBe suffered important losses of animals in the drought of the early 1970s, and since 1974 households have not been able to reconstitute herds that are viable for year round subsistence. They are now obliged to resort to migrant labour or herding animals belonging to outside investors as stop-gap measures in order to survive. Neither of these strategies, however, permit herd reconstitution. Salaries from migrant labour barely cover the subsistence of the migrants themselves and cannot contribute to that of the rest of the family left behind, much less provide money for animal purchases.

Neither is the herding of animals belonging to non-pastoralists a solution for the WoDaaBe. Traditionally, compensation for this labour was paid in animals and gradually permitted poor families to obtain a herd. Now the WoDaabe get nothing from the owners but the milk of the animals they are tending. However, investors tend to have a large proportion of males for their greater commercial value. Because there are now so many poor WoDaaBe looking for animals to herd, they can no longer negotiate the terms on which this work is done. Although the herder gets some milk for his labour, he still has to rely on sales from his own inadequate herd for cash. Furthermore, small herds and consequent migrant labour and herding outsiders' animals make it difficult for the WoDaaBe to use the full range of their normal risk aversion strategies (such as mobility, herd splitting, animal loans, the use of traditional rather than public diesel pump wells).

Labour shortages caused by food shortages impose detrimental labour short-cuts. And there is clear evidence that keeping animals as a supplementary investment, rather than for subsistence, and having them herded by people who do not own them, results in harmful herd management practices and resource use, reduced overall productivity of the national herd, and increasing poverty among pastoralists [White 1984:512-18].

Large-scale animal loss also affects the redistributive system that counters seasonal food shortages. Households with temporary milk shortages are loaned milk cows for a season by others with adequate milk supplies. Other forms of animal loans, especially the loan of a female until she has produced three calves which then belong to the borrower, help households that have lost animals through disease or other misfortune to rebuild a minimum herd. There is a strong obligation for richer households to provide animals for poorer, and for the group not to allow an individual household's herd to fall below subsistence level. However, this system of collective security can only operate if the group's total animal resources are sufficient.

A particularly bad drought year has therefore created the conditions in which annual dry seasons are now surmounted only with great difficulty. But once again this is only a partial picture. There have always been times of substantial animal loss in the Sahel through drought or disease. Large-scale irreversible animal loss is no more environmentally determined than annual food shortages. The long term evolution of political and economic conditions is such that the WoDaaBe are marginal to the political process in Niger. In this they are similar to nomadic pastoral peoples in other parts of the world.

Many factors have contributed to make the WoDaaBe economy more vulnerable: the colonial conquest, the imposition of cash taxes, an increased dependence on the market, and the greater political weight of agriculturalists. Important to this process has been the expansion of areas cultivated by farmers. The extension of agriculture was initially a response to

pressure to produce cash crops through the imposition of cash taxes by colonial governments, and continued as increased cash needs, reduced soil fertility, abandoning fallow, land sales, and population pressure pushed agriculturalists north into increasingly marginal areas beyond the normal ecological limit to rainfed cultivation [Watts 1983]. This northward movement of agriculture reduced pastoralists' precious dry season forage reserves and drought fall-back zones, making pastoralism more vulnerable to drought.

Before 1974 the WoDaaBe were able to recover from large-scale animal losses by resorting to various alternatives. For example after the 1890 rinderpest epidemic, when the WoDaaBe probably suffered even greater losses than in the 1968-73 drought, they were able to rebuild herds primarily through agriculture and gathering wild plants. They were able to subsist and invest surpluses in animals until they had become fully pastoral again in about 10 to 15 years. Because of the extension of agriculture, the WoDaaBe have been gradually pushed north into more arid zones, and in 1974 they did not have access to arable land, or to the plants they had been able to gather in the past. Nor did they have any alternative forms of employment. Niger has no industry to speak of and the WoDaaBe do not have marketable skills. In 1983, nearly 10 years after the preceding drought, herds were being depleted rather than reconstituted.

While it is important to be aware of the combination of factors that create dry season hardship, the overwhelming difficulty of this period is merely a symptom of other more important factors affecting the WoDaaBe economy.

At the time of the February 1985 Seasonality workshop the WoDaaBe's remaining animals were dying because of the failure of the 1984 rains. A year later, in February 1986, most have no animals or other resources and are dependent on sporadic government grain distributions that are insufficient for subsistence. There have been no changes in government policy that make their present prospects anything but dismal.

The policy implications of this scenario are clear. Minimum viable herds at the household level must be built up if pastoralists — 17 per cent of Niger's population — are not going to be a continuing drain on limited national resources. A viable herd allows families to support themselves and make optimum use of fluctuating resources that can be used for little else. A viable pastoral sector, based on herder-owned animals, contributes to the domestic demand for meat and provides exports for a country with few sources of foreign exchange.

Given the large sums of money that are being invested by the government and donors in short term stop-gap measures that do nothing to improve the long term situation, or on schemes that will not operate if herders themselves do not have viable herds, the process of herd reconstitution could well be begun through outright grants (animals are available for purchase in the markets). Subsequently there should be a credit scheme by which females are bought and loaned to needy families for several calvings, and are then either loaned to another family or sold to repay the initial debt. This is a system that has proved to be effective, particularly among WoDaaBe who scrupulously respect the terms of this arrangement based on a traditional system that has important social and economic implications for them.

To speed the process of herd reconstitution and to improve its longer term effectiveness, the impact of dry season decapitalisation can be countered by a short-term cereal credit scheme by which cereals are bought at low post-harvest prices and then sold at cost in the dry season when cereal needs and prices are much higher, and animals are in poor condition. By reducing dry season animal sales this has an important impact on household economies.

All of these interventions and other related measures can best be implemented through an institutional framework whereby herders are organised in associations that give them more bargaining power in the political process.[2]

To counter the impact of large-scale animal loss in bad years, a famine early warning system, including measures to reduce the collapse of livestock prices and simultaneous cereal price increases, must be implemented [e.g. see Swift 1985].

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Household Food Strategies in Response to Seasonality and Famine

Richard Longhurst

Poor rural families plan for food shortages both seasonally and for unexpected inter-seasonal events. This rather obvious fact of life is not often incorporated into planning of agricultural development activities. Comparatively little is known about the insurance mechanisms which families employ to ensure their household food security: their nature and resilience and how far different types of families use different mechanisms, and how rural development policy might strengthen them. This article will review these issues and also try to assess the effectiveness of means of overcoming regular seasonal contingencies in response to famine conditions. With a few notable exceptions (e.g. Jodha 1975; Campbell and Trechter 1982] there is little empirical evidence on these questions; on the other hand there is sufficient to indicate the diversity of what might be called 'household food strategies'. The evidence is examined with particular reference to northern Nigeria where there has been some research related to these issues [Norman 1974; Matlon 1977; van Apeldoorn 1981; Longhurst 1986; Watts 1983].

A Seasonal Coping Strategies

There have been several attempts to categorise what families do in response to seasonal food shortages. They can be described in two groups relating to production, such as diversification, root crops, exploitation of vertisols (soils with long retention of surface water and incorporation of organic matter from the surface), livestock enterprises and bush collecting; and those which are social adjustments such as reciprocal economic exchange, gender-linked allocation of farming tasks and varying modes of household integration [Moris 1985]. To these might be added the biological 'strategies' of body adaptations: adapting patterns of energy expenditure, drawing on body fat stores and changing the composition of the diet. Generally, in northern Nigeria, as in many other parts of sub-Saharan Africa and in Asia as well, four sets of strategies can be identified which are at the command of rural families. These are choice of cropping pattern, drawing on stores and assets, developing and exploiting social relationships, and diversifying off-farm income opportunities. Each will now be considered in turn, in the context of research carried out in the village of Dayi in Hausaland in northern Nigeria [Longhurst 1984, 1986]. The village is located in the mild sub-arid Wooded Savanna ecological zone which receives 750-1000 mm (24-40 inches) of rainfall distributed over a period of 120-140 days starting at the beginning of May and finishing at the end of September. The main crops grown by area are sorghum, millet, cotton and groundnuts. The agricultural year starts in April, the last month of the dry season when farmers take their compound and latrine waste out to the fields as manure. Thereafter the operations in general are: early ploughing and planting (May), first weeding (June), second weeding (July), late ploughing and harvesting of the early grains of maize and early millet (August), harvesting of groundnuts (September), harvesting of late grains of sorghum and late millet (November-December) and harvesting of cotton (December-January). If the rains have arrived on time and in sufficient quantity the labour peak is that of first and second weeding in June and July. Moslem Hausa women do not normally work on farms, being secluded.

(a) Choice of Cropping Pattern

Farmers generally give priority to the food crops of sorghum and millet in terms of allocation of their labour and better, manured land, which is why efforts to encourage farmers to plant cotton and groundnuts when the rains first come, in order to achieve higher yields, have failed. Millet matures in 90-100 days, compared to the 150-day duration of sorghum, but it is lower yielding (about 2-300 kg/ha compared to 750 kg/ha for sorghum). However, the expected finding that the poor would plant millet because they had more urgent need of harvested food product did not materialise. Many poor farmers planted sorghum and worked as farm labourers to get cash for food before harvest. Indeed, a higher proportion of

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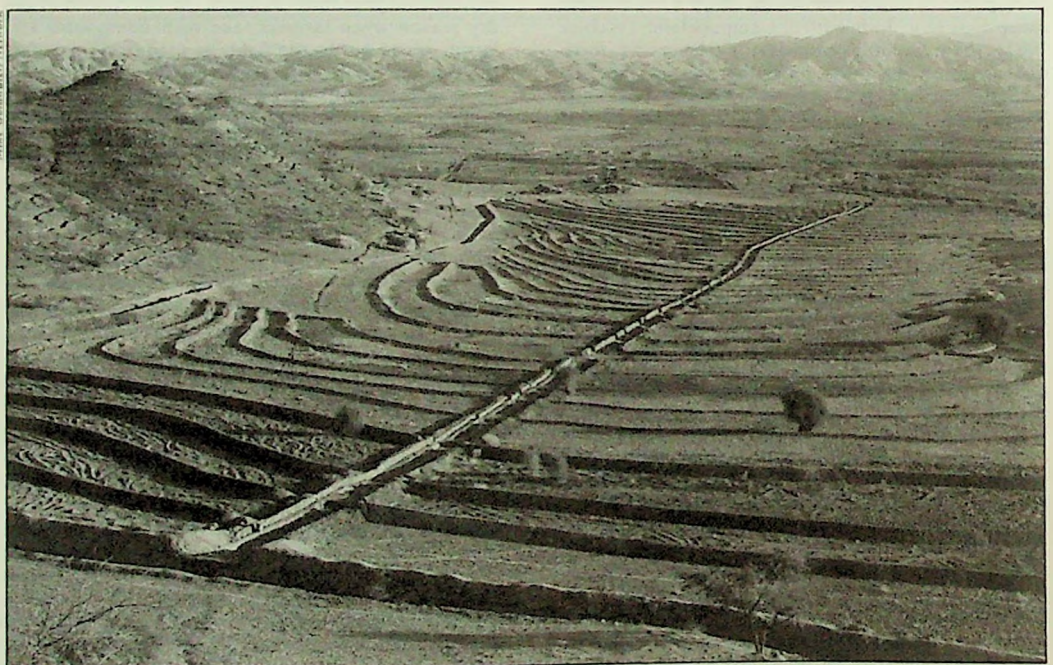
plantings of millet was found among the richer farmers who used it as an intercrop for their cotton. Therefore labouring with sorghum later was regarded as a more effective seasonal food strategy for the poor than early food in the form of millet but nothing to follow.

This leads to the questions: does the poorer farmer intercrop more? Is he 'forced' into adopting a particular cropping pattern which may be low yielding, farmers having to, say, minimise the variance of yields so that there is a spread of harvested material in response to variability in rainfall? Evidence is mixed because the strategy of mixed cropping is rational both in terms of profit maximisation and risk minimisation [Norman 1974]. Again in Dayi there was little difference in the incidence of mixed cropping between rich and poor except at two extremes. The very rich who have access to tractors and oxen with which to weed crops have advantages leading to sole cropping. At the other end some of the poor, the old and the eccentric put larger numbers of crops — seven or more — onto one field. If they are not sure of their capacity to earn cash on off-farm work or farm labouring during the season, but confident ultimately of family support, they will aim for early seasonal food. In particular, for this poor group there is dependence on gathered foods and intercropping of food crop varieties such as pumpkin, green maize and bambara groundnuts that can be consumed direct while working in the field. The poor plant less (non-food) 'cash' crops (in terms of area planted or production per consumption unit) but all socioeconomic groups will grow cotton as part of a broader diversifying strategy of obtaining cash, in addition to labouring and petty trading. However, it is reasonably clear that the incidence of crop mixtures at village level does increase as the length of growing season shortens at more northerly latitudes [Longhurst 1977].

In the area of Nigeria where this research was carried out, root crops had declined as a means of meeting seasonal hunger and only two per cent of the area of the cropped areas of the village under study was devoted to cassava. The use of *fadama* land, which are areas seasonally water-logged or flooded such as low-lying areas adjacent to streams and depressions, is also an important seasonal mechanism where they exist. Mostly, they are in the hands of the richer farmers who use them to grow high value crops such as vegetables for sale in urban areas, or perennial crops such as sugar cane. However, *fadamas* do tend to be neglected in the wet season so that in years of poor rainfall they can be employed as a seasonal mechanism by planting additional crops. At the end of a poor wet season it is



Mike Goldwater/Network

Counter Seasonal Measures: the Shawata Flood-spreading project in Tigray Province, Ethiopia.

often possible to plant a rapidly maturing variety of maize in the *fadamas* [Turner 1984]. They can also be used in the wet season by growing rice.

Secondary crops are also important, providing nutrients in the period before (generally fixed) cereal harvests, in addition to diversifying diets and making them more palatable. They can be divided into four groups of crops, in increasing order both of labour requirements per calorie eaten and of firmness and consistency of intention to harvest [Longhurst and Lipton 1985]. The latter characteristic is important in the analysis of the role of secondary crops as seasonal food crops and as buffers against famine. These groups are:

(a) Gathered crops, including wild vegetables occasionally cultivated, such as species of *Cassia* and *Lorathus*, leaves of the baobob (*Adansonia digitata*). In a seasonal, rather than a famine context, such crops are important as relishes and salads and for non-food products such as medicines, rather than providing sustenance.

(b) Crops mixed into fields of staples such as legumes, pumpkins and melons, and grown partly for soil fertility (especially nitrogen fixation) or canopy effects. In good years they may not be harvested, or snacked in fields. Cowpeas are often planted with sorghum but in Dayi were not harvested; other crops are left for cattle.

(c) Cultivated vegetables in home gardens near the compound, even inside compound walls where they will be tended by secluded Moslem women. Such vegetables, being intensively watered and manured, can mature early and have a seasonal role but generally they supply micronutrient rather than energy sources.

(d) Non-staple root crops grown as a contingency reserve and which do eventually get harvested. Plots of cassava are found in villages of northern Nigeria: labour requirements, including harvesting can be spread during the year. The village-level cultivation of cassava plots was a requirement of the colonial administration in Nigeria [Watts 1983].

In northern Nigeria secondary crops (seeds, nuts and legumes, vegetables and fruits), constituted 5.7 per cent of energy intake year-round in nutrition surveys in Zaria [Simmons 1976] and 7.4 per cent in Malumfashi [Longhurst 1984]. These crops provided 11.2 per vcent and 12.1 per cent of protein intakes respectively. A recalculation of Simmons' data enables the seasonal breakdown which shows that the contribution of these secondary crops to energy intake is at its highest in the (cereal) pre-harvest period of August-September (8.6 per cent) compared with the post-harvest periods of October-November (4.7 per cent) and December-January (6.6 per cent) [Longhurst 1985]. The sample sizes are too small to break them down further in terms of rich and poor. For some these crops will be significant dietary sources.

Farmers in northern Nigeria, as in other parts of the world, are able to exercise a degree of sequential decision-taking: intercropping on the farm, adjusting the amount of time and effort they put into them depending on how the rains progress. For example, millet can be planted as the rains start and farmers can follow up with cowpeas and sorghum according to the distribution of rainfall and their success in off-farm activities. There is an adaptive flexibility in cropping patterns that enables a spreading of risks in response to uncertain rainfall, control of microclimate, maximum use of the growing season, spreading of labour requirements, opportunity to make changes in direction (such as replanting with more drought resistant varieties) and to get cash from crop sale as well as food.

(b) Drawing on Stores and Assets

Families build up stores of assets, livestock, grain and body fat which they run down in the wet season. Research from the Gambia and Ghana shows that adults lose about five to seven per cent of their body weight during the wet season when energy expenditure usually exceeds energy intake [Longhurst and Payne 1981]. Body weight is at its highest when intense farm work begins and declines through the wet season as energy work requirements exceed intake.

Farmer food grain storage in northern Nigeria is very effective, with losses from compound granaries as low as four per cent [Giles 1965]. Also, some research has shown that in good years farmers are not forced back into distress selling of grain post harvest when prices are low. Indeed, farmers can make grain purchases post harvest if they know they do not have enough grain to last until next year and it would be cheaper now than later [Hays 1976; Longhurst 1986]. Grain appearing on the market at this time derives in part from the harvest of one or two years earlier. Hays' study of grain storage and marketing in three villages found that 11 months after harvest, there remained in store on average 18 per cent of the millet and 13.5 per cent of the sorghum. Therefore farmers may have greater flexibility in other parts of the world in timing the seasonal sales of grains. In Dayi, cash from cotton sales could be used to meet tax and similar obligations in December. In common with other parts of Africa, small stock are built up in numbers and then are sold off in years when food is short; it is the women who mostly own and invest in small stock: Watts (1983)

reports that almost half of the small livestock sold during the 1973-74 drought belonged to women. However, running down more durable assets such as jewellery and selling of farms is more characteristic of famine than a normal seasonal phenomenon.

(c) Cultivating Social Relationships

Several complex forms of social relationships exist which can be regarded as an insurance policy against outright poverty. In a Muslim society various redistributive mechanisms already exist, such as the grain tithe (*zakat*) and in all villages there is active giving of food for many reasons, not only to support the poor. Patron-client relationships are common, with men providing regular farm labour for rich farmers in return for wages and food. Patrons will give additional support if food shortages turn into famine. In addition there are complex gift-giving relationships which occur between men and between women. There is a contribution system known as *biki*, in which one person makes a gift of cash to another in the expectation that it will be returned and even doubled at a later date. When contributions reach an impossibly high level they are reduced by mutual consent. Contributions are also made in times of need. Women develop friendships (*kawa*) with other women, usually from very early on in life, with whom a formal gift-giving relationship occurs.

Relationships between families, in addition to those that exist within families (such as the male labour and food sharing institution of *gandu*) are intensified during seasonal shortages.

(d) Diversifying Off-farm and Income Sources

Those who have a seasonal off-farm work are those who are not discomfited by seasonality. Trades such as blacksmith, butcher, provisions trader and carpenter find steady demand for their services. The detailed labour activity surveys carried out by Norman and his co-workers in Zaria showed that time devoted to occupations other than farm work remains constant throughout the year, being 6½ days per month in the cultivating season and 7-9 days in the 'slack' season [Norman 1972]. Of the average number of working days of adult males, 61 per cent were spent on the family farm. There is a great range of secondary occupations in Hausaland and seasonal difficulties are most easily weathered by those who have access to one or several of these. The type of work that men do is in large part inherited, which forms the basis of an occupational class distinction, although most have a 'closed shop' or guild aspect which restricts entry. Therefore the poor have less opportunity than the rich to employ this form of counterseasonal strategy. Women, although secluded, are active entrepreneurs and also contribute by trade and loans to overcoming seasonal shortages of food.

This section has looked at seasonal strategies; in the next section famine-related responses are described and discussed. Many are extensions and diversifications of those described here and it has been on occasion difficult to draw the line between the two. In this context the research by Campbell and Trechter (1982) in North Cameroon proves most pertinent, as one aim of their study was to examine the behavioural differences in coping strategies between expected and unexpected food shortages. They have categorised response mechanisms by seriousness of the shortages, if men or women are involved and by level of nutritional status in the family. Three levels in the development of shortages are proposed: first, the seasonal food shortage period (*soudure*) when actual food supplies are scarce or non existent; then second, when food might be available for purchase, but inaccessible to people for economic reasons; the third type of shortage is famine, usually precipitated by a natural disaster: at the stage of *soudure* (a three-month period from June/July to September/October), slaughter of livestock, especially small stock is the most common response, reported by both men and women. In a better off village the extent of these activities was less than in the two other villages studies. Women appeared to have a greater diversity of responses, suggesting that they are more directly concerned with food shortages in the *soudure*; some of these responses are directly related to the *soudure*, such as reducing meal portions or not eating for a whole day, whereas others would be employed during any period of difficulty, such as buying food or selling labour. It appears that men play a subordinate role to women in coping with food shortages, as the latter reported receiving gifts or loans of food and money from neighbours and relatives. In the poorest village, alteration of eating habits, after selling livestock, was most common. The villagers there did not possess other resources with which to trade. Gifts and loans between families were an important *soudure* mechanism: a sharing of poverty with the knowledge that all families can be vulnerable to food shortages at any time.

The coping mechanisms for the second stage of food shortages — those of an economic and distributional nature characterised by a breakdown in the ability of cooperative efforts and liquidation of capital assets to deal with the deficit — as reported by both men and women were significantly different from stage one (*soudure*) mechanisms. These were family assistance, wild foods, food purchases, migration, selling stock, special planting (of crops planted specifically as an insurance against a bad year) and selling food. Selling livestock and borrowing food or money were less

important. Again women and men might carry out different actions but both are equally involved in combating the deficits. Women plant special foods and use food reserves, while migration was reported by the men. Gathering wild foods and migration are regarded as onerous and unattractive measures. In an effort to identify any behaviour patterns which indicated a transition from *soudure* to stage two, Campbell and Trechter stratified the sample of families by their level of nutrition as measured by calorie intake. The lowest quartile had a mean calorie consumption of 63 per cent of requirements; the highest had a level of 138 per cent of requirements. The families with the lowest intake were regarded as being in a stage two situation and the data indicated that they did behave differently from better nourished households. Women would miss meals for an entire day and men would migrate. Poor families collected wild foods while the better nourished families resorted to borrowing food or money.

Distinguishing between normal seasonal stress and famine therefore has its difficulties, although many would agree with Currey's description that famine is 'like insanity, hard to define, but glaring enough when recognised' [Currey 1978: quoting Taylor] and with Seaman and Holt (1980) that it is 'easily recognised and quite distinct from even the extremes of poverty' (p.284). Seasonal shortages for some produce famine conditions for others, especially the poor. The greatest difficulty is in deciding where the threshold point lies between the two. The next section discusses those strategies used by families in response to these more severe food shortages.

B Famine Coping Strategies

Several definitions of famine have been proposed, both by those who study it and by those who suffer from it. From the former group there are 'widespread food shortages leading to a significant rise in the regional death rates' [Blix, Hofvander and Valquist 1971]; 'The community syndrome which results when social, economic and administrative structures are under stress, and are further triggered by one, or several discrete disruptions which accelerate the incidence of many symptoms, or crisis adjustments, of which one is epidemic malnutrition' [Currey 1978:87] and 'It is an abnormal breakdown in access to food which leads to mass starvation among vulnerable groups or classes of people' [Cutler 1985]. Local cultures in Bangladesh define three types of famine: scarcity is *akal* (when times are bad); famine is *durvichkha* (when alms are scarce) and nationwide famine is *mananthar* (when the epoch changes); in northern Nigeria there are about a dozen terms for different degrees of famine-hunger or *yunwa*. What do these definitions and other observations tell us? A definition based on food shortages [following the work of Sen 1981] is incomplete, may even be wrong and the extent of significant levels of mortality with a famine over and above 'normal' death rates, especially in an impoverished area due to starvation, is subject to difficulties in assessment. Famines are not usually a matter of already bad times getting worse, but apparently lead to changes in community and family structure that cannot easily be reversed. This might be in the form of action taken by communities — mass migration, disintegration of families, sale of assets, even children, or sharp increases in prostitution. In other words these are events which do not normally take place and occur after normal response mechanisms have been exhausted. Chambers' (1981) useful distinction between normal seasonal events as 'screws' which drive people into poverty from which they get temporary (usually dry season) reprieve, and 'rachets' which are circumstances that lead to irrecoverable loss of resources could apply as an analogy between seasonality and famines. However, the ability of people to overcome the effects of famine should not be underestimated. The causes of famine are several, including drought, floods, disease and war all overlaid on poverty. However, in terms of physical phenomena drought is usually associated with most famines, and forms the basis of the discussion here.

Responses to famine start with a diversification and intensification of existing activities. Then there is the following sequence of events [based on Jodha 1975, Watts 1983]:

(a) Domestic mutual support; intensification of 'fall back' activities by household members including gathering of foods; restructuring of current farm activities to maximise effective availability of products, including a variety of salvage operations.

(b) Minimisation of current commitments through suspension or cancellation of resource allocation including grain loans and tax relief.

(c) Disposal of inventories of home-produced foods as well as purchased foods stocked for some planned use such as marriage; village charitable relief, grain purchase and patron support.

(d) Sale or mortgage of assets with a sequence based on liquidity and productivity of assets with a preference towards mortgage rather than sale.

(e) Short or long term migration, possibly taking animals.

(f) Famine relief from state or patron assistance.

(g) Possible return, recovery, replanting and reconstitution of reserves.

A second typology of responses relating to social factors has been suggested by Dirks (1980). There are three stages: alarm, resistance and exhaustion, and this typology does provide complementary information to that described above. A famine that begins under cover of expected seasonal fluctuations does not at first generate alarm. Thereafter there is increased activity, even hyperactivity, and intensification of work (which has in some instances converted a food shortage into a famine, especially when hoarding has occurred): markets become glutted with perishable food, movements of people, general irritability, hostility and political unrest occur and the performance of ritual tends to increase. At the stage of resistance, an energy conserving strategy ensues; with sustained undernutrition hypoactivity occurs, social ties erode and social interaction is reduced.

Individuals drop friends and extended kin from food-sharing rituals, restricting reciprocity to close relatives. Competition intensifies and theft increases. Exhaustion is marked by the collapse of the family unit, with the elderly the first to be pushed out; children may forage in gangs. At this stage further adjustment is not possible without external relief.

The stages of (a) to (e) above which are those of household response show a mixture of the normal (in respect of expected fluctuations) and abnormal (in respect of contingencies). Some of the normal are not used by the rich in good seasons; some of the abnormal are used by the poor in every season, so deepening their impoverishment. In this section we pick out three strategies which might be used more in famine conditions rather than average seasons. These are gathering of foods, migration and sale of farm land and other assets. It should be pointed out however, that knowledge in this area is limited. Even in normal times information about sales of assets, transactions between individuals with respect to loans and remittances to and from migrants, is sensitive and difficult to obtain. During a famine there are both ethical and organisational questions to carrying out research, but given the need to obtain solid empirical information to prevent the recurrence of famines, and the costly and usually tardy response of the aid donors, sensitive investigations are very much needed. Such research will require a great deal of rapport between investigator and subjects, suggesting that the research framework should have been m place prior to the onset of famine conditions. This research would require a high level of commitment.

(i) Gathering of Foods

Some foods are specifically designated by local people as 'famine foods'. These are usually foods growing wild: vegetables, nuts, berries and parts of trees. In normal times they are consumed only by the very poor and their consumption is usually a sign of shame. Therefore in the Bangladesh famine of 1974-75 people consumed banana tree, wild arum (*Araceae* spp), plantain saplings (*Musa paradisica*), leaves and rice husk [Currey 1978; Rahaman 1978]. In the Bihar famine of 1965-66 a higher consumption of green leafy vegetables was found in severely affected villages due to extensive use of wild leaves. Wild tubers were consumed in drought-affected parts of Andra Pradesh. In the famine in Karamoja, Uganda during 1980, 41 per cent of the population was subsisting on wild weeds, fruits and seeds collected in the bush, or had consumed no food all day [Biellik and Henderson 1981]. These woody fruits and seeds had little nutritional significance but could temporarily stave off the worst physical effects of hunger. In northern Dafur, Sudan, in 1973 most people collected the seeds of wild growing grasses [Holy 1980].

In northern Nigeria there is a wide range of these 'famine foods', which include those gathered day to day as relishes and supplements to soups. Two crops cultivated in anticipation of drought or famine periods are cassava and bambara groundnut. The response of the household is to diversify food sources. More use is made of tree products such as the African locust bean (*Parkia* spp) and shrubs, especially *Borassus flabellifer, Vitex cienkowshi, Fiens theanengii* and *Maerua angolensis.* Other foods including green leafy vegetables are collected, such as species of *Corathus, Cassia* and *Adansonia digitata.* Trees, with deeper rooting systems, are able to provide food both in dry seasons and during droughts.

There is very little information available in quantitative terms on how important gathered foods become during a famine. In a poor tribal group in India during a normal pre-harvest seasonal shortage, gathered foods contributed 12 per cent of energy intake before harvest compared to two per cent post-harvest [Pingle 1975]. In Mali a berry from the shrub *Boscia senegalensis* becomes the staple food of poor RimaiBe households, making up the evening meal in addition to a midday meal of millet [Martin 1985].

(ii) Migration

The sight of large numbers of people on the move is the major indicator that a famine is occurring. Again, in northern Nigeria these movements are an intensification of the migration of normal times, that of the dry season *cin rani.* Whole families migrate rather than just males. From one village in Niger, the number of able-bodied males migrating increased from 37 per cent in 1969/70 to 75 per cent in the drought year of 1973/74, looking for work in the large Nigerian towns of Lagos and Kano [Faulkingham 1977].

There is a vast array of different classes of migratory movement ranging from 'normal' movement for economic advancement with eventual return, to that of moving for survival to places where free food might be distributed. Cutler (1985) has documented how when outright famine conditions occurred in Ethiopia the flow of people to roadsides, towns and camps increases dramatically over a short period: those crossing the Sudan border rose from 300 per day in September 1984 to 3,000 per day by the end of November. Nevertheless many of these people intended to return with the onset of rains. The effectiveness of migration as a famine strategy depends on the spread and extent of famine (migrants of course can export high food prices and hence food shortages with them) and the effectiveness of relief efforts.

(iii) Sale of Farmland and Assets

Most families will prefer to mortgage rather than sell farmland, although in northern Nigeria the pledging is often the forerunner to outright sale. Among pastoralists, sales of livestock are more common, even inevitable. As more assets come onto the market, prices fall so that the rich, who may not be suffering but even by taking advantage of the poor, can acquire land and animals at advantageous prices. For livestock there is an order of sales, with small stock being sold first followed by older and male animals. Breeding stock are kept until last. Household foods and farming equipment are sold just prior to migration.

This brief review of these response helps us a little in understanding the hierarchy of responses as outlined by Jodha and Watts. Jodha's empirical research in Rajasthan investigated curtailment of commitments and sale of assets, inventories and outmigration as the drought year progressed. Two-thirds of the households had sold assets and over one quarter had outmigrated between the dates of declaration of scarcity and the commencement of relief work (about six months). Curtailment in current consumption (such as reducing family food consumption, non-milking of animals to permit milk for calves) is resorted to in the early phase of the scarcity period, together with sales of inventories such as fuel wood, dung cakes, timbers, ropes, mats and wool. Once these are exhausted, mortgaging and in a few cases (about 8 per cent total) sale of assets begins. This begins with unproductive assets such as ornaments and utensils. Jodha's research shows that relief measures have to be implemented before assets — as sources of future income — are sold, and that such indicators are signs of true distress rather than adaptive responses such as curtailment of consumption, which can return to normal after the famine has passed. Similarly Mortimer (1985) has shown that in northern Nigeria, there is a wide range of adaptive responses similar to curtailing consumption, engaged in by ½-¼ of the population. These activities include labouring, consumption of famine foods and firewood selling. There is then a second group of responses engaged by ¼-⅓ of the population which bite into economic resources i.e. selling property, land, and animals, taking out of loans.

C Conclusions

The descriptive material presented here enables only a partial answer to the questions posed at the beginning of the article. Rural families can extend their normal seasonal mechanisms to meet a drought inspired famine but the poorest of families have to begin early in disposing of their assets and resources. The effect of both severe seasonality and famines is to accentuate income disparities between families. The active role of women in countering drought and famines has been shown; in many parts of the world they are responsible for gathering foods and managing small livestock. The resilience of coping mechanisms has not been well documented but it is obvious that with increasing population pressure, and the erosion of common property resources and cultivatable land, such mechanisms are losing effectiveness. Nonetheless Cutler (1985) has documented how families in Ethiopia survived as many as six years of poor harvests before having to migrate in 1972-74, and about four years prior to the famine of 1983-84.

Measures to improve rural welfare must not undermine the mechanisms that have been described here. Promoting sole cropping at the expense of mixed cropping, removing trees in favour of cultivated crops and neglecting secondary crops, especially cassava in semi arid areas, are all examples of destructive policies. New strategies are required to develop these coping mechanisms with a bias towards those who use them and live by them. This requires strengthening the food crops used in periods of drought by conservation and breeding programmes; a better understanding of the efficiency of household grain storage so that community stores could be established with similar effectiveness to moderate food price rises to provide reserves in times of acute shortage. An essential part of both famine prevention and relief is to develop an early warning system based on household indicators of stress, to provide resources so that families are not forced into disintegration and migration. Finally, a promising area of policy related research concerns the interplay of seasonal organisations [Fortmann 1985] and credit availability to avoid asset sales or assist in reconstitution. This might well be linked to the experimental programmes of international agencies and national governments to provide 'cash-for-food'. Such projects have given cash — sometimes linked to

community development works — to families affected by famine to avoid them disintegrating and to enable them to enter local credit markets. This cash might be obtained from sales of food aid.

What is required is a new approach to thinking about these problems related to rural poverty: not a 'back-to-nature' way which gives excessive weight to traditional mechanisms but one which uses them as the first step in developing more effective ones.

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Biomass, Man and Seasonality in the Tropics

Colin Leakey[1]

Introduction

'Biomass' has become one of the modern clichés. Most things discussed beneath its shade were in existence long before the word was invented, and many have been forgotten. Nevertheless, considering the seasonality of biomass and its use by man, it creates a good frame of reference for addressing problems of the human condition in the tropics. I welcome the opportunity to contribute to the discussion.

I shall not attempt a rigid definition of biomass, for definitions can constrain thought, but will point out that by biomass I am referring to structured organic matter, living or dormant, and sometimes even dead, and comprised within the plant kingdom, the animal kingdom and micro-biological organisms. Biomass has become important in recent discussion, and particularly since the inauguration of the International Biological Programme (IBP), because its production, primarily through photosynthesis and thence by transformation in food chains, is a good measure of renewable resource potential.

The IBP was set up in 1964 to explore and define 'The Biological Basis of Productivity and Human Welfare' and because of the recognition then that the security of rapidly expanding human populations called for more rational management of natural resources.

The renewable energy potential (for heat or work) occupies the greatest part of the biomass literature [Montalembert 1983], but since biomass potential also provides limits to food production potential (in spite of this potential rarely being reached or even approximated) the biomass concept provides a frame of reference for considering the competing demands for food and fuel energy.

Annual Versus Seasonal Data Sets

Most are aware of some advantages of data compression, but compression of seasonal data to annual data in relation to crop production has long been recognised as unfruitful, though it is surprising how often one sees annual data uncritically tabulated or quoted.

Much environmental data of significance to man's ecology is quoted in the form of monthly means, and such figures for many parameters are quite useful. The production of new biomass through photosynthesis depends of course on a concurrence of suitable temperatures, and, on occasion, the duration per day of solar radiation, which varies seasonally to a greater extent the further one departs from the equator, and on soil moisture. The latter depends on rainfall and loss of water from the root zone. The root zone in turn depends upon the depth of rooting which different species are able to exploit.

Photoperiod and Seasonality

The adaptation of many indigenous plants that reproduce by seed involves a precise timing of seed production and dispersal which maximises the chance of satisfactory re-establishment in the succeeding season. This is largely achieved by what is called photoperiodism. The length of dark period (night length) determines when flowering, and hence seeding, occurs. Under natural selection, genes or gene combinations determining that precise photoperiodic adaptation are selected in each latitudinally adapted sub-population of species. Frequently, under man's selection in research stations or under less sophisticated selection, it has been considered advantageous to eliminate photoperiod sensitivity and to develop strains that can be sown and cropped under wider latitude conditions. It is implied in this selection that agricultural practices will make less necessary the naturally selected adaptations for survival. It has to be questioned, when satisfactory agricultural husbandry conditions can not in fact be met, whether dismantling naturally evolved mechanisms of adaptation are as beneficial as has sometimes been supposed.

[1] I wish to acknowledge the assistance of Susan Leakey.

Moisture Regime and Seasonality

Mean seasonal data, unless used critically, may obscure the biologically very important variation of reliability/unreliability of rainfall at particular times of the year. Manning (1950, 1955) was probably the first to point this out, and present an approach using 'confidence' limit parameters based on statistical analysis of year to year variation in rainfall in the same calendar periods. Other workers for the Cotton Corporation brought the analysis forward into the computer age [Walker and Rijks 1967] — an important early example of the use of computers in agricultural support. The environmentalists at ICRISAT have made great strides in the analysis of rainfall reliability as well as seasonality in semi-arid areas, for example, in Niger [Sivakumar, Virmani and Reddy, undated].

The treatment of climate in the conference on seasonality held in 1978 [Walsh 1981], while good in some respects seems to me to step backwards by not commenting on the overriding effect of lack of reliability over climatic characterisation based on seasonal means. A seasonal classification based on monthly means, and through these an analysis of the numbers of wet and dry months (averaged across years) is likely to be a much better predictor of potential useful biomass production when applied to deep rooted plants (such as most natural climax vegetation) than to shallow rooted ones often resulting from the deflected successions, far removed from climax, which result from man's activities in the environment. (As I sit writing this in my study I am looking at an Australian calendar with a photograph of a magnificent, totally green gum tree in a landscape where there are no living shallow rooted annuals.) Once man becomes a significant part of the ecosystem he himself must develop flexible strategies to cope with the increased unreliability of biomass potential production which he produces if he is to survive. It could be claimed (although this is a somewhat broad generalisation) that by encouraging agriculture based on shallow rooted crops typical of temperate agriculture, those who intended to assist in the development of food security have used a strategy which is likely to do just the reverse.

Plant Life-forms and Seasonality

The concept of the diversity of life-form in higher plants as a basis of adaptation to climatic seasonality has a long history in classical botany. One of the most famous names is that of Raunkiaer, who in 1910 distinguished groups of plants according to the modes of protection and size of the meristem (buds) which would enable them to make the most effective use of the conditions of moisture and temperature allowing growth to occur. This is not the place to review Raunkiaer's life forms in detail, but he envisaged a different 'biological spectrum' of plant life forms characteristic of and adapted to different climates [Skene 1924]. The discussion of life-form in relation to seasonal production of biomass that man might use for his welfare is something which nutritionists and agronomists may wish to revive.

Geophytes

Geophytes, in Raunkiaer's classification, comprised that group of plants whose perennial 'life form' allows for seasonal protection of the vegetative meristem from which growth will be resumed to be in an underground position — for example, in an organ such as a bulb or tuber. The protection of vegetative buds as an aspect of classification of plant types is interesting also in relation to biotic pressures on biomass. Although it may not have been stated in such terms, the recognition of the value of cassava as a famine reserve crop in Africa during the colonial agricultural period depended upon the combined value of unpalatability of the parts of the plant above ground to locusts, and there being a high proportion of the plant biomass underground where it was in any case protected from predators.

Within the framework of 'modernised agriculture' there has been all too little work on the development of new food resources based on combinations of biological, as opposed to technological, factors of storability. This reflects a continuing concept that modern agriculture ought to be made labour-saving, technologically efficient and increasingly capital intensive. Root crops, through lack of sufficient attention by plant breeders have not lent themselves to mechanised modernisation. While the potato in temperate countries has received sufficient attention for it to be treated as a large-scale mechanised farm crop, it is still severely limited to cultivation on a small range of soil types. Efforts in the tropics to turn cassava into a simply mechanised crop have been recognised as a worth-while research goal by only a select few, and the resources allocated to this task have not been great.

In much of tropical Africa there is no clear distinction, even under favourable climatic conditions, between agriculture and gathering of indigenous plants for foods as contributions to regular food supply [Tallantire and Goode 1975; Jerome et al. 1980]. In some desert and semi-desert areas, staple food is regularly harvested from naturally occurring geophytes [Malan and Owen-Smith 1975], just as was apparently the practice in earlier times in the south western USA [Nabhan and Felger 1980].

Unimproved and neglected wild plants that continue to provide famine reserve food from their underground

storage organs, for those with the knowledge and skills to find them, are not even discussed in most academic agricultural training — or only to a minimal extent [Irvine 1952]. There are many such plants awaiting study.

Most of the swollen rooted and tuberous species, which can potentially sustain man by their stored reserves in seasons unfavourable for above-ground food production, contain toxins.

As with cassava, it is probable that many of the geophytes could be selected or bred for low levels of toxicity. This could well deprive them of their ability to resist predation by man's competitors in the ecosystem. Man's intelligence has allowed him, rather than his competitors in the food system, to use otherwise toxic plants in times of famine by learning how to de-toxify them. This is an important alternative strategy to that of breeding or selecting 'sweet' versions of the species concerned, and is an aspect of the chemurgic[2] approach to food suggested by Pirie (1962). Of the geophytes, a substantial list of species of many genera and families are known to be used, or have been used, successfully as man's food. Many of these grow in harsh climatic conditions of highly unreliable as well as seasonal rainfall. The geophyte habit is an adaptation to the unreliability of primary production, of which primitive man long ago recognised the value to himself. Could not modern man do the same?

Phanerophytes

Phanerophytes are the life-form of perennial species which include trees and shrubs in which the buds (meristem) which remain dormant as a means of surviving the non-growing season are carried well above ground. People continue to use a much greater number of trees than geophyte species for food, though most of the trees that are used today provide sweet pulpy fruits of one sort or another, or nuts and oil-bearing seeds. The hiving-off of phanerophytes from mainstream agriculture, either into pomological horticulture or into silviculture, can be seen in retrospect to have been a disservice to research support for man's food resources. Even the modern invention of the term 'agro-forestry' [King and Chandler 1978] which may yet provide a theatre for a tree food strategy has, until now, failed to achieve much more than encouraging foresters to think about the relationship between *their* trees and the agriculturalist's crops.

[2] Chemurgy implies finding ways to make effective use of what grows naturally as an alternative to manipulating the environment by agricultural technology in order to grow desired species that would not thrive naturally.

The benefits of phanerophytes in 'agricultural' systems have been most apparent in equatorial rainfall areas, where the problem of superceding indigenous perennial crop-based systems with mechanised therophytic agriculture have been those of access to the land by machinery and the problems of soil management, including erosion. Regrettably, it has been far easier to till the land made available by destroying trees in semi-arid environments with highly unreliable rainfall. The use made by unschooled indigenous people in such environments of trees for food is only just beginning to be appreciated, and the productivity of such systems measured.

The publication of the proceedings of the arid lands conference at Kew (KICEPAL — Kew International Conference on Economic Plants in Arid Lands [see Wickens et al. 1984] may prove a turning point in economists' and planners' perceptions of the future role of tree crops far beyond the plantation agricultural concepts of the equatorial tropics. If, as examples, one were to pick only a handful of important resource species whose role had been neglected, it would include *Parkia biglobosa*, the African locust bean, which provides a weaning food from the orange-coloured pulp of the seed pod, and a widely used and nutritious condiment from its fermented seed; *Adansonia digitata*, the baobab, of which the white pulp around the seeds of the large fruits is an important starchy food for many; *Phoenix dactilifera*, the date palm which is cultivated far beyond is traditional range by the use of suitable genotypes; and *Ficus sycamorus*, the tree fig. There are many other food trees however, equally deserving of greater attention. Some of these phanerophytes, moreover, have advantages of what superficially might be considered perverse phenology. Such trees and shrubs expand their tender, fresh flushes of leaves during the dry season and drop their old leaves during the wet season. Perhaps the most famous of these is *Acacia albida*, which, on account of this, can provide both useful browse for cattle in the dry season and plenty of light beneath its canopy in the wet season to allow the growth of therophytic crops. It is unfortunate that this much-favoured tree species has seeds which, although superficially palatable, are also potentially dangerously toxic to man since they contain the same unusual free amino acid as *Lathyrus sativus* [Qureshi et al. 1977].

A second example of an important food shrub with new leaves developing in the dry season in West Africa is *Moringa pterygosperma* (the ben tree) which is very widely grown around the edge of house compounds, and whose leaves provide one of the most important dry season pot herbs. Better known than the human food trees, but I believe insufficiently appreciated, are the forage trees such as *Daniella oliveri*, whose leaf

production in the dry season provides most of the dry season feed for the cattle of the Fulani. The extent to which this is overlooked can be judged from the fact that Sandford's recent book makes no mention whatever, in a chapter on the use of trees as livestock food [Sandford 1983].

Therophytes, including Ephemerals

Therophytes comprise those plants in which the dormant bud is enclosed within seeds as a means of surviving the non-growing season. Many traditional edible seed producing species are largely overlooked in agricultural project planning, but some may have great potential in marginal areas [Dendy, Emmett and Oke 1975]. Within this life form can be distinguished 'ephemerals', species with extremely rapid life-cycles which are able to germinate from seed and pass through a complete life-cycle to the production of new seed on the minimum amount of water, and in the shortest time. Hardly surprisingly, such species do not figure in lists of useful crop plants where yields are measured in quantity per unit area regardless of the length of the growing period (as mustard and cress is not compared with alfalfa as a forage crop!). There *has* been an interest since the emergence of the biomass concept, and the International Biological Programme is taking more interest in yield as a function of duration of life cycle as well as area, but this does not seem to have moved far enough to considering the potential role of highly ephemeral species as crops.

Even with the widening of the number of species of 'millet' now being studied by ICRISAT, I understand [Willey 1985 personal communication] that no serious attention is being given to the one or more (depending on your taxonomic viewpoint) species of *Digitaria (Digitaria exilis*, etc.) sometimes called 'hungry millet' in West Africa. Yet the importance of this millet in those communities where it is regularly grown is rated very high. On the contrary, agricultural research emphasising yield per unit area must, if anything, have tended to favour selection of cultivars of crop species requiring longer periods of moisture availability. In eastern and south-central Africa, specifically in southern Tanzania, northern Zambia and northern Malawi, the farmers themselves have conserved and continue to grow ultra-early maturing varieties of both finger millet, which is an indigenous crop, and maize. Where maize is concerned, genetic resources of the early introductions by the Portuguese are in many areas much better adapted than the white, semi-dense varieties introduced from South Africa by the missionaries early in the 19th century. Governments usually want to 'flush' these out with new varieties.

The Uses of Plants by Man

The potential conflicts between biomass use for food and biomass use for energy are widely discussed. Less fashionable is the use of plant resources for drugs in the wide sense, including the local medicine man's pharmacopoeia and the widespread use of simple stimulants. These have important seasonal aspects.

Pharmacognosy

Knowledge about the medicinal properties of plants and how to recognise them is what is covered by this scientific subject area, that is of rapidly renewing interest [Trease and Evans 1978]. Until about 50 years ago, collections from wild plants, or occasionally from species specially cultivated, provided a large proportion of the world's medicine. The synthetic chemical industry and, more recently, micro-biological contribution to the pharmaceutical industry have both had potentially adverse effects on the rural economy of man. This arises from what is taught by those from the towns, and increasingly accepted as true by rural people, that medicinal contributions to health arise from the urban sector. Whether they are paid for, or provided free, may make a financial difference, but in either case the change serves to make rural living more dependent on urban industry. The early years of this century saw most 'native medicine' discounted as little more than quackery, but the emergence of some recent drugs, such as reserpine from *Rauwolfia serpentina* through the proper investigation of this long-standing Indian native medicine, and other similar developments, has done much to re-establish the credentials of traditional medicines. Sub-Saharan Africa has probably had far less attention devoted to its indigenous plants and their uses than most of South Asia, South East Asia and Latin America [Miller 1980].

Five substantial volumes of great detail about Sri Lankan medicinal plants are a tribute to the wealth of economic resources that are often overlooked and that compilation of information provides a very commendable model [Jayaweera 1981-3]. There are some important local economic collecting activities involving the uncontrolled exploitation of unmanaged resources, but so far in sub-Saharan Africa there have been few systematic attempts to study and develop local resources for medicinal use.[1] A start was made in Uganda, from about 1965-70, with the Natural Chemotherapeutics Research Unit (with which I was pleased to have a marginal involvement). In Senegal, [Schissel 1984] a parallel attempt was made to that in Uganda, but with half-hearted minimal support. Local area studies of indigenous medicines have appeared [Lindsay and Hepper 1978; Oliver 1960] and there is a network being established under the auspices of the Ethiopian Pharmaceutical Association [NAPRECA 1984] with the intention of trying to

[1] Since this was written *Medicinal Plants in Tropical Africa* (1986) by Bep Oliver-Bever has been published.

stimulate appropriate research and development work, but there is still little evidence of any widespread understanding among planners of the benefits that could arise from such activity, still less the potential scale of economic benefit by liberating sub-Saharan Africa to a substantial extent from dependence on the drugs industry of the North.

Even where economic activity is still recognised in the collection of wild plant products, such as the Sudan where the collection of gum Arabic is the second largest foreign exchange earner in the country, this industry and its product can be threatened when it becomes convenient to the North to do so, both by regulatory restrictions and the threat of synthetic substitutes. If southern Africa could set its sights on training its chemists and developing its chemical and pharmaceutical industry to use indigenous resources effectively, they would provide useful openings for the seasonal economic exploitation of neglected biomass.

Stimulants

The well-fed North, adequately and often over-nourished throughout the year, regards year-round adequacy of nutrition as the obvious goal of nutritional planning. However, seasonal constancy in diet and plane of nutrition should be regarded as very much the abnormal situation in relation to man's place in time and space in the world eco-system. Much more normal is a food calendar with periods of ample nutrition separated by periods of malnutrition. The biomass of the human population itself, as well as that of game animals and domestic livestock, has a natural periodicity. As an extension of this view, but one into which I will not digress, would be the suggestion that high infant and adult mortality as a periodic phenomenon is also historically the norm. In almost every society where there are substantial seasonal changes in food availability, the use of appetite suppressants, which divorce hunger from malnutrition and allow hard work to be carried out while burning reserves, has been commonplace. This has been an alternative strategy, though sometimes carried out parallel with food storage, to avoid the limitation of nutritional seasonality.

Large numbers of plants are used around the world in this way, but among the four best known which will serve as examples here are betel nut from the Areca palm throughout south-east Asia; khat, the chewed leaves of *Catha edulis* [NAPRECA 1984] in Arabia and coastal eastern and central Africa; coca, the leaves of *Erythroxylon* supp. in the Andes, and Kola in West Africa. Coca-Cola presumably recognised the value of these last two species in its original formulation. The beverage plants that we have taken into northern culture are from the same group of natural stimulants. Cocoa and coffee were both used indigenously by sucking or chewing the pulp around the ripe seeds as a much simpler source of 'pep' before their alkaloids were used and extracted in a more marketable and now well-known form. Whatever the undesirable side-effects of concentrated extracts from any of these traditionally exploited biomass species may be, it ought to be recognised that the use of plants by man to allow himself to adapt to the rigours of seasonal and uncertain food supplies, is deeply culturally embedded in our species.

Natural Resource Choices and Economic Paradigms

Real investors who spend their own money, and even those surrogates, the planners, who decide on the spending of other's money, are, as we all understand, concerned for the quick buck. The net present value of benefits must exceed the net present value of costs if there is to be a high rate of return. I would need longer to argue the point, but will now assert that to plan for short-term benefit automatically biases planning against long-term benefit. When Keynes said that 'in the long-run we are all dead' he had not thought about the evolutionary philosophy of 'the selfish gene'. More people recently have begun to consider the world which their descendants will inherit, and to realise that those who inhabit the earth today, even though soon dead, have a moral obligation to the future. This should lead us towards a new development philosophy based on the net future, rather than net present benefits, which might have startling consequences for decision-making.

For example, anyone who has had the experience of suggesting that from a resource point of view it might be interesting to encourage the planting of trees as a contribution to development, whatever economic product may be in view, will have met the objection, often insurmountable, of the relatively long time-lapse before benefits begin to accrue. Anyone working on lesser-known crops will have met objections that to give attention to them instead of to crops in which there is a strong research background is not feasible. Both these views should be questioned and challenged if we are to make an effective change of direction from a development path which has not demonstrably improved the human condition in sub-Saharan Africa.

Population Control in a Seasonal Environment

Dyson and Crook, in a very interesting contribution to the 1978 conference [Chambers et al. 1981] drew attention to the considerable degree of seasonality in births and deaths. Their study did not, however, take account of the probably substantial use made of plant products for contraception, and even more

importantly, for securing abortion [see Fig. 5.1, page 136]. Most studies on ethnobotany or 'native medicines' include specific reference to large numbers of species used for controlling fertility. Perhaps there should be more sociological studies to identify the circumstances and frequency with which such plants are used, particularly whether their use is now diminishing with the increasing movement away from traditional cultural practices. Kokwaro (1976) for example, lists no less than 28 species used in East Africa for securing abortion. The distinction between abortifacients and contraceptives is a subtle one that need not detain us here. What is clear is that artificial intervention to modify the birth-rate is a long-standing practice. It would be interesting, in time, to learn whether man has had a long history, hitherto overlooked, of attempting to match population to carrying capacity.

Conclusions and Suggestions

Of all the world species, man is perhaps the one who has evolved to occupy the largest number of niches. It is reasonable to assume that this success in colonisation has been a result of his intelligence, which both enables him to adapt to the food supplies that are available, and only later to develop the distribution of food supplies between niches, so as to exceed the carrying capacity of each. Man's ability to respond to climatic seasonality within any broad geographical area will have included migrations to follow the availability of food which survives in nomadism, periodic fluctuations in population in response to food resource and disease, which continues in the disasters of today, but perhaps above all, in the extraordinary range of food species which he has learnt to use. At the present time nomadism is increasingly unacceptable to politicians, with forced migration, curiously, being regarded occasionally as a political necessity which may be far less humane. Massive natural fluctuations in population becomes increasingly unacceptable too as modern communications media lead to its extent being understood, by those areas where carrying capacity is more stable, while at the same time we create the means of extinguishing a large part of the human race. The third historical factor of food diversity we can, and should, encourage. Agricultural research should be much more concerned to widen the food base, in particular by making use of a greater range of plant life forms as food resources.

If is encouraging that in the Third Lomé Convention signed recently (see *The Courier*,[4] January 1985) article 42 of the Convention is devoted to recommendations that are broadly in line with those suggested by this article.

[4] An official monthly publication of the European Community. The January 1985 edition sets out the conclusions of the Third Lomé convention.

Article 42

If a return to the natural balance is to be expected, a 'drought and desertification control' component in particular must be incorporated into all agricultural and rural development operations, such as:

1. — extension of agro-forestry systems combining farming and forestry research and development activities to produce plant species that are more adapted to local conditions;
   — the introduction of suitable techniques aimed at increasing and maintaining the productivity of agricultural land, arable land and natural pastureland with a view to controlling the various forms of erosion;
   — the reclamation of land that has deteriorated, by means of reafforestation or agricultural land improvement, combined with maintenance schemes involving, as far as possible, the people and authorities concerned in order to safeguard the progress made;
2. — the encouragement of measures to economise on wood as an energy source by stepping up research, application of, and information on, new and renewable sources of energy such as wind, solar and biomass energy, and by the use of improved stoves with a greater heat yield;
3. — the development and management of forestry resources by setting up at national or regional level, forestry management plans aimed at optimising the exploitation of forestry resources;
4. — the pursuit of ongoing campaigns to educate the people concerned to be aware of the phenomena of drought and desertification and to train them in the possible ways of controlling them.

The purpose of this *Bulletin* is to identify and sharpen practical policy implications of the recognition of the inevitable continuation of climatic fluctuation, seasonal trend changes and massive unreliability, and to point to practical measures that might ameliorate their effect.

1. Within the general terms of Article 42 of Lomé 3, it is now suggested that, rather than 'agroforestry systems combining farming and forestry research' we should cease to make, as far as possible, the traditional distinction between agriculture and forestry. Specifically, we should put far more effort into the silviculture of food.

2. We must recognise that the productivity of agricultural land, under low rainfall, depends very much more upon exploiting the diversity of life-forms adapted over millions of years to the environment instead of basing so much of our planning of food production on seed crops from therophytes.
3. We should educate politicians and planners trained in one set of environmental circumstances to learn about and to understand more of the realities of the ways in which man has come, through evolution, to be able to live in other environments.

Going beyond the terms of Article 42, and more contentiously, I believe we should recognise that a low infant mortality and a low adult death rate detract from the flexibility which has enabled human population to survive in harsh areas through rapid changes and responses in population to meet changes in carrying capacity.

Very much greater attention should be given to traditional medicines and social plant products and the modernisation and potential improvement of their use, rather than allowing or encouraging greater dependency for health care on remote industry.

Finally, we should avoid setting our expectations of what can be achieved by intervention far beyond any reasonable possibility of success. As an alternative, we might pay more attention to trying to avoid interventions which have a high probability of making matters worse.

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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.

[1] 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 not known 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.

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Seasonality in a Savanna District of Ghana – Perceptions of Women and Health Workers

Gill Gordon

These notes on seasonality arise from a rapid rural appraisal carried out for UNICEF in the Dangbe district of Ghana in July and August 1984. The appraisal focused on UNICEF's GOBI-FFF[1] strategy and addressed the following questions:

— What do mothers know and do about growth monitoring, diarrhoea, breastfeeding and weaning, immunisation and family planning? How have they adapted their practices to changing economic and household situations and to new knowledge?

— What do health workers know and do about the GOBI-FFF activities? How is their ability to implement the strategy affected by the economic situation in Ghana?

— What is the potential for individuals and organisations in the community to become involved in GOBI activities?

— What other important interventions are required to enable parents to protect the health and growth of their children?

Methodology

Data were collected from a variety of sources. Resource constraints often made it necessary to share transport with health workers and to hold group discussions with women gathered at clinics all over the district, rather than in a random selection of villages. However, several villages from each of three types were visited and over a half of the women in group meetings were attending the clinic for the first time.

Seventy-four mothers of pre-school children were interviewed in their homes using a semi-structured questionnaire. Questions covered the occupations of household members; who provided most of the food for the children; problems with farming and trading and how these might be tackled; strategies for managing childcare and work, changes in childrearing since their mothers' generation and reasons for these changes.

Discussions were held with 15 groups of women, ranging in age from 18 to 60 years, in 10 villages. A check list of questions was used to stimulate discussion, which was recorded. The optimal number of women was 15 to 20, although it was sometimes difficult to exclude other women who wanted to join the group. Larger groups made it difficult to keep to the point and give everyone a chance to talk. Men were excluded because they invariably dominated the discussion, criticised women's contributions and attributed their problems to ignorance and negligence rather than resource constraints. Focus group discussions lasted for at least an hour and often longer because requests for information were responded to fully, and issues explored further as they arose.

Health workers at district and village level were interviewed individually and in small groups.

Health service statistics were analysed from child welfare clinics, outpatient departments, community clinics and hospital admissions.

Seventy-five mothers attending the malnutrition clinic were interviewed to elicit their views on the reasons for the child's poor growth and their socio-economic situation.

Setting

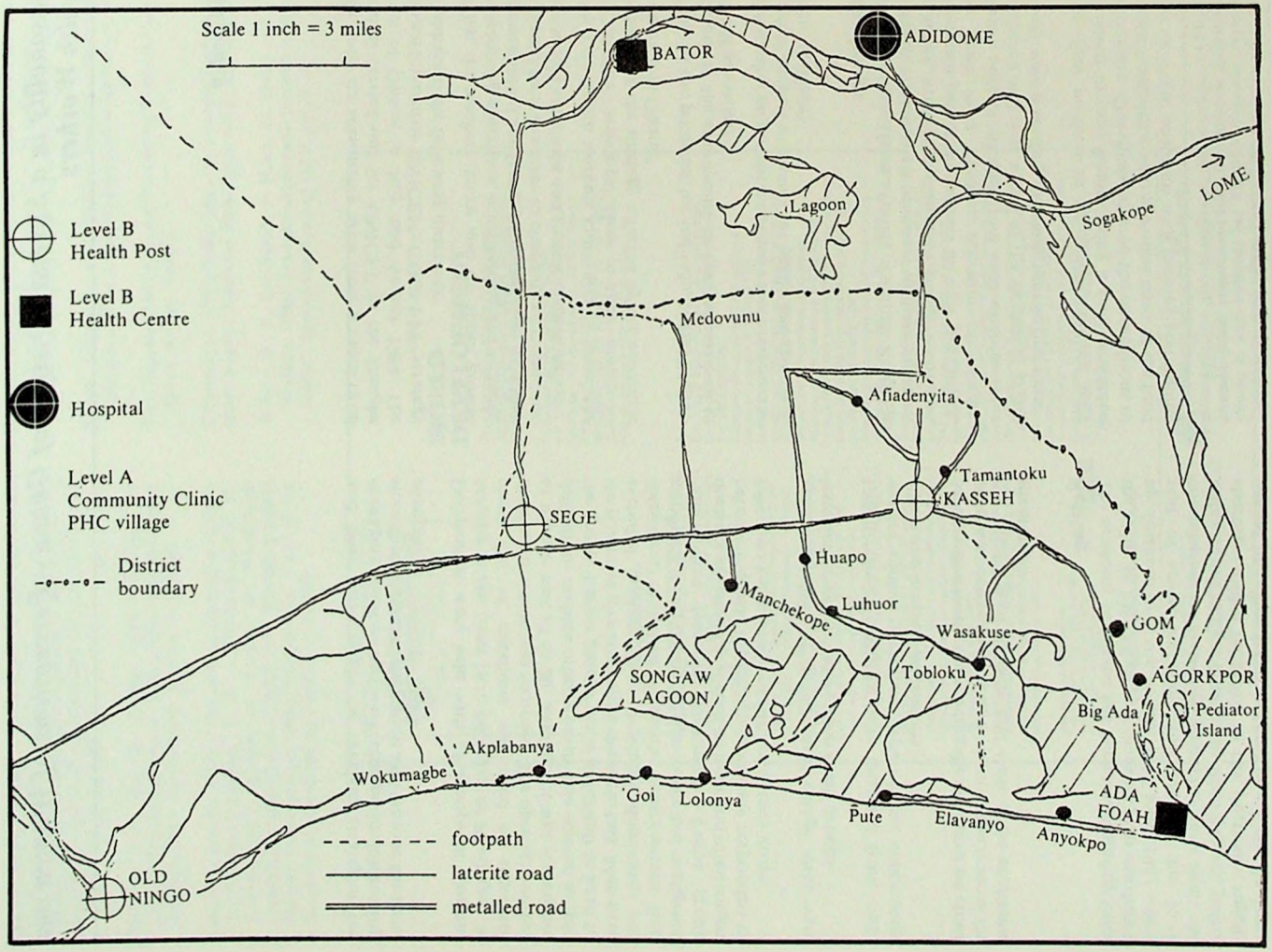
The economy of Ghana has been deteriorating since the 1970s. In 1982 a four year recovery plan was drawn up, financed by a conditional IMF loan. 1983 was a year of severe hardship and hunger, due to a combination of factors — drought, bush fires, the influx of one million Ghanaians from Nigeria, petrol shortages and a reduction in the electricity supply caused by falling levels in the Volta Lake. In June,

[1] GOBI-FFF is an acronym for growth monitoring, oral rehydration, breastfeeding, immunisation, food supplements, family planning and female education. UNICEF has identified these as priority activities for improving child survival and development globally.

IDS Bulletin, 1986, vol 17 no 3, Institute of Development Studies, Sussex

Fig. 1

Map of Dangbe District



coconuts, groundnuts and water became the staple foods and jokes were made about 'Rawlings necklace', the protruding collar-bones of even those professionals who could not find a way to leave the country. The price of food rocketed, and emergency food aid was brought in until August 1984. Normal seasonal fluctuations in food prices were no longer relevant as staggering rises occurred from week to week as prices were allowed to find their own level.

Dangbe district has a population of around 70,000 with a male:female ratio of 100:110. The district lies in the coastal Savanna belt, with a bimodal rainfall pattern, from March to July and September to October. There are three main types of villages in the district:

— coastal villages, where the men fish and the women smoke the fish for sale. Cassava, tomatoes and shallots are grown in the sandy soils.

— inland villages on lagoons or on the Volta River, with sandy soils. Fishing and the cultivation of cassava, tomatoes, sugar cane and shallots are the main occupations.

— inland villages in the north of the district where groundnuts, beans, maize, pepper and tomatoes are grown in the more fertile soils.

The Household Economy

Forty-eight per cent of the households visited were headed by women, the majority because the husband lived in another town, or with another wife. In these households, the women provided most or all of the food for her children. In the other households, the contributions of members to the food supply, and the strategy employed to ensure survival depended on the season and the ecology of the village. The majority of women aim to farm and trade, but deteriorating soils, unreliable rainfall, a lack of agricultural inputs and plant disease, makes trading a more attractive option. In the preharvest season the majority of women would invest extra cash in their trades. They were extremely interested in ways to acquire credit. One group said that it was difficult to run an informal credit scheme where women paid in a fixed sum each month, because at certain times of the year women would be unable to pay. During the clearing season, more women may have preferred to invest money in tractor hire, fertilizer and seed.

In coastal villages men catch the fish and women purchase it from them through an agent. The women then smoke the fish and sell it using the profits to feed themselves and their children. The supply of fish is affected by the season and the activities of trawlers from the USSR and other countries further out to sea. When the sea is rough the fishermen stay at home. Fish catches decline in the dry season and families move up the coast to Lomé or Tema to follow the fish. According to the community clinic attendants (CCA), many children return from these journeys with malnutrition and infections, because they have lived in temporary accommodation with poor quality care.

An improved fish smoker has enabled women to increase their profits by reducing firewood consumption and improving the quality of the product. The smoker improves fuel efficiency by increasing the capacity of the oven, which means that groups of women need to pool their baskets of fish in order to utilise the extra capacity, particularly in times of seasonal shortages. Dangbe women appear to be willing to cooperate in this way, but a group of Ewe women admitted that they were too competitive and mistrustful to work together. When fish became scarce, men could command exorbitant prices because 'if one woman refused to pay, another was ready to jump in and pay even more'. In a village further along the coast, the improved smokers were often underutilised because of inadequate fish supplies. Seasonalty of supplies and migration need to be taken into account when new processing technologies are introduced. Inadequate supplies of raw materials, related to season, are a major problem with improved food processing technologies in Ghana [ILO 1984], and result in new equipment being overcapitalised and underutilised.

Wasakuse is an inland village on a lagoon, with sandy soils. Women aim to farm and trade in order to maintain a constant source of food and cash. Several years of droughts and deteriorating soils are severely limiting their economic opportunities. The cassava, tomatoes and shallots were clearly failing by the end of July 1984. The water level in the lagoon had sunk so low that fishing was no longer viable and the women could not fry fish for sale. The sale of pigs and goats was the only source of income and disease had undermined even this. Women thought that around half the families in the villages would migrate out of the district northwards to the forest belt around Akosombo to farm by the end of August. They would live in temporary shelters, remote from health care, and the women expected this to have a negative effect on the growth and health of young children.

Further north, farmers grow a mixture of crops, often maize, cassava, beans, groundnuts, tomatoes and peppers. During the preharvest season, the women's trading activities support the household. After the harvest, the husband may contribute a larger amount of food from his farm. Men have greater access to tractors for clearing, fertiliser and land. They are more likely to belong to a farmers' association and see an

extension officer. However, trading in the preharvest season is competitive and time-consuming. Purchasing power in the community is low, many women sell the same commodity, and supplies of raw materials, for example, maize, are expensive and difficult to obtain. Kenkey[2] sellers in one village formed an association to buy maize cheaply in bulk and ensure a regular supply. Many other women traders expressed a need for credit which would enable them to secure supplies of raw materials for their trade.

Seasonality and Primary Health Care

Primary healthcare is expanding rapidly in Ghana in the form of community clinics. These are staffed by community clinic attendants (CCAS) usually young male farmers from the village. They are expected to treat patients at the clinic and promote healthy behaviour in the village on a part-time basis, for a salary of around C600.[3] (A doctor's salary is C1,500.) The salary comes from the sale of drugs to patients, administered by the village health committee.

The CCAs had several problems with their work, which would exacerbate in the farming season. They complained that health activities were seriously interfering with their farming. Not only attending to patients but the many journeys to Ada Foah for supplies and advice was time-consuming. Moreover, demand for curative care was at its peak in the rainy season when farmers tasks were not pressing.

Income accruing from the sale of drugs was precarious because people had no spare cash at this time of year and often promised to pay later. Also, the health committee functioned poorly or ceased altogether as members migrated or became overwhelmed with their own concerns. Drug supplies and payment became unreliable.

The financial advantage to many CCAs clearly lay in the farm rather than the clinic. Several CCAs requested bicycles to enable them to return to the clinic earlier from their distant farms.

The CCAs are expected to be part-time health workers but in fact those employed by the Ministry of Health are also obliged to supplment their inadequate income with farming, trading, private practice or donated foods. If many health workers farm, they will also be unwilling to work a full day attending to the extra numbers of patients at the clinics. They will be most tempted to appropriate aid foods when foods are scarce and expensive in the local markets, at the time when they are most needed by their malnourished clients.

[2] Kenkey is a fermented boiled maize product eaten as a main meal with fish.

[3] 56 Cedis = £1.00.

Seasonality and GOBI

Growth Monitoring

At present growth monitoring, advice on breastfeeding and weaning, and immunisations are offered at Maternal and Child Health (MCH) Clinics in 16 locations, once a month. Food supplements are also given to selected mothers, according to criteria laid down by the Catholic Relief Services (CRS), which change from time to time. Treatment for diarrhoea is available at any time from the community clinic or the health post, but not the MCH Clinic.

The costs and benefit of clinic attendance as perceived by the mother are likely to vary seasonally. In the rainy season, women are busy with trading and farming, and this may involve travelling for a period of time. Money for fares and fees is scarce. With high costs, the benefits must be worthwhile. Women said that a good chance of a reasonable amount of desirable food was the most attractive benefit offered by the clinics in the hungry season. Mothers and health workers agreed that it would not be worth attending the clinic for weighing and advice only because most mothers were aware of their child's progress and needs.

Thirty-nine per cent of the children attending the malnutrition clinic had never attended before, and over 60 per cent of these had mothers who had migrated to Asosombo, or travelled long distances with their work. Twelve per cent of the malnourished children had not been weighed for several months before reporting to the clinic. (This means that malnutrition had *not* been prevented by growth monitoring in half of the children.) Several of the migrant mothers said that they had returned to attend the clinic because of their concern over the child's poor growth and failure to respond to treatment away from home. The question is whether they could be helped to monitor their child's progress more efficiently in order to pick up faltering growth earlier while they are out of contact with the clinic, and also, whether they could afford to respond to smaller monthly fluctuations in weight, given the needs of the rest of the family.

Seasonal variations in weight for age should have shown up in the monthly statistics collected for CRS, Accra. Unfortunately, these data are not kept at district level for local use, and, CRS rejected five out of 12 months in the previous year as unreliable. Two few deliveries were carred out at health units to analyse seasonal trends in birthweight.

However, there is plenty of anecdotal evidence from health workers and focus groups that seasonal stress has an important effect on nutritional status. CCAs, nurses and mothers said that children returning from seasonal migration along the coast and northwards

present with malnutrition and infections because of poor quality care and rough conditions. The hungry season, when palmnuts, groundnuts and fish are scarce, was a time of poor growth in children.

In Wasakuse women said 'in the season of plenty, children eat fish stew every day and grow well. In the lean season there is not much of anything and everyone must eat pepper with their cassava. Whatever their age, there is no discrimination, then, the children stop growing'. Numbers attending, the malnutrition clinic increased over the rainy season in 1984, partly because of a lack of food, and partly because of the sequel to a measles epidemic.

Oral Rehydration

Death from diarrhoea can be prevented if children are given plenty of fluids as soon as the diarrhoea starts, and treated with oral rehydration solution (ORS) at the first sign of dehydration. Carers can be taught to make up a solution using salt and sugar, or use a UNICEF sachet of ORS at home.

Seasonal trends in the incidence of diarrhoea did not show up in health service statistics, but one would expect more cases to occur in the rainy season. It is important to teach everyone responsible for daily childcare, whether grandmother, mother, daughter or migrant mother, to make up and give rehydration fluid correctly at the first sign of diarrhoea. If the mother does not have time to sit with the child offering sips of fluid, the carer must do it. If migrant families are far from a health unit, they need to carry their own supply of sachets or salt and sugar. People need to recognise signs that the child is becoming dehydrated in spite of the fluid and that they must seek more help.

Breastfeeding and Women

Women individually and in groups described how breastfeeding and weaning practices have changed since their mothers' generation. Children are now given supplementary foods, particularly maize gruel, much earlier, and breastfeeding stops earlier. Only six percent of the mothers practised the exclusive breastfeeding recommended by UNICEF for the first four months of life, and 22 per cent had introduced pap before the child was one month old. Individual mothers stated that they personally had given a particular child pap at two weeks because it was not satisfied with breastmilk only. In the focus groups, many women laughed at this reason, and said that women in general gave pap early because they were anxious to return to their trading and farming. They wanted the child to become less dependent as soon as possible. One group of health workers also believed that the very short rest women were able to take after delivery, anxiety, lack of traditional support from men, and a poor quality diet were resulting in a decline in breastmilk production.

If this economic explanation of early supplements is correct or partially correct, one can expect seasonal stress to exacerbate the problem, when women are anxious to start work at their farms and trades.

One of the CCAs advises mothers to take their young children with them to the farm with an older sibling. They can make shades against the sun, and feed them on the farm. Some women and health workers give a different explanation for the earlier supplements and cessation of breastfeeding. They believe that mothers have learnt about breastmilk substitutes — beverages, homemade weaning mixes, baby foods — through the health service, the media, school and travel. They are aware that they do not have to be glued to the baby day and night for months, that there are alternatives which free a mother from total responsibility for feeding. This knowledge of breastmilk substitutes also enables these mothers to contemplate weaning at one year rather than waiting for two or three years as their mothers did.

Unfortunately, the extent to which mothers are able adequately to substitute for breastmilk depends on the time, cash and foods at their disposal. As one woman said 'the poorest mothers are under the most pressure to go back to work early, work long hours, travel, and wean the child. But they are the least able to afford good breastmilk substitutes'.

Health workers advise mothers to add fish powder or groundnut paste to the maize pap, and sell packets of fish powder at the clinics. Mothers appreciated the convenience of this, but in the hungry season the price of fish rose so steeply that the sales had to stop. (Other programmes involved in marketing weaning food have run into similar problems with seasonal scarcities of raw materials, at a time when the weaning foods are most needed.) Health workers at one health centre finally stopped giving advice on feeding to mothers because they themselves could not afford to buy the food for their own children.

The majority of women continue to breastfeed for around 18 months, but the loss of a source of high quality protein and fat will be felt, particularly in the hungry season. Nineteen per cent of the children attending the malnutrition clinic were cared for by the grandmother or aunt because their mother had migrated. These children had been weaned at around one year, and were reported to be miserable, anorexic and frequently sick. If their mothers were pushed into leaving the district by seasonal stress, this would further add to the problems of the child and guardian because food would be scare and the guardian busy.

A further 19 per cent of the children at the clinic had mothers who travelled frequently with their work. Again, the hungry season would be a time when mothers were under pressure to travel while conditions were least favourable for the child at home.

Seasonal Patterns of Disease and Immunisation

Statistics from the outpatient department at Ada Foah Health Centre did not show any seasonal trends. Malaria is endemic in the district, and accounts for more outpatient visits, hospital admissions and deaths than any other disease.

There are epidemics of measles and whooping cough, but these are not reflected in outpatient statistics because the clerks record symptoms rather than diseases. Measles might be entered as fever, diarrhoea, cough or rashes depending on the mother's initial complaint.

Mothers who are aware that immunisation is sometimes available at the MCH Clinic are more likely to attend when cases of measles or whooping cough increase in the area, or at times when epidemics are known to occur. At this time the risks to the child of catching a severe illness are perceived to outweigh the risks of acquiring an abscess of hepatitis from an unsterilised needle, or of 'catching another disease, which one can't afford to treat' at the clinic. A measles epidemic had occurred at the beginning of the 1984 rainy season, when women were least able to spare time from planting.

Malnutrition was associated with measles, whooping cough or diarrhoea in 63 per cent of the children attending the malnutrition clinic, and 72 per cent of the malnourished children seen in the home. Respiratory tract infections also increase during the rainy season.

Policy Implications

Seasonal stress emerges as an important dimension both in primary health care and in the ability of women to manage their economic and reproductive roles in Dangbe district. Although specific questions on seasonality were not asked, groups of women and health workers repeatedly brought the topic up in discussion.

The impact of seasonality, and therefore the policy implications, vary with the type of village. Children in coastal and inland or riverside villages with sandy soils appear to be at high risk of malnutrition because many families are obliged to migrate. Children in inland villages with more fertile soils do not have to cope with the stress of migration.

This rapid appraisal provides some pointers to seasonal stresses, but development workers within the district need to study these with the community in greater depth, and then look for ways of reducing this impact or at least of protecting child health wherever possible. This study would involve discussion with groups in the different types of village, using a check list of questions which might include the following:

— which families migrate and why?

— do families migrate in groups?

— where do migrant families live, what do they eat, what health services do they use, and what problems do they encounter?

— what are the reasons for many children becoming thin and sick when they migrate?

After analysis of the problems, groups would go on to look for ways to improving the situation. These might include:

— measures which reduce the need to migrate: for example, irrigation; fish ponds; crop varieties suited to dry sandy soils; improved small animal husbandry; action to enhance soil fertility; credit technology and marketing to increase women's trading profits; dry season gardens.

— measures to improve living conditions for migrant families.

— measures to protect the health of young children. For example:

  — immunise children before they migrate;

  — teach parents how to give coconut water or prepare oral rehydration solution and supply ORS sachets;

  — make antimalarials available;

  — teach someone in each group to weigh or measure children;

  — discuss ways of best preparing a diet suitable for young children;

  — encourage families to seek out and use the nearest health facilities.

Further discussion and study is needed on the operation of the primary health care programme in relation to season. The conflicts of interests between farming and health work need a serious response otherwise the viability of the new programmes is in jeopardy. Bicycles for the CCAs; actions to stabilise their pay and to reduce their need to travel for supplies and supervision in the rainy season; an exploration of ways to share the health work between CCAs, and for community members to contribute to the CCAs

farms; and the selection of at least some non-migrant members on the health committees are some possibilities.

As far as possible MCH services should be carried out in the community, and young or elderly childminders should be encouraged to attend.

Women might consider setting up daycare centres in the rainy season.

The health service should respond to an expressed need for family planning to enable women to achieve a longer birth interval and a smaller family size, and to avoid pregnancy during periods of economic stress.

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Access to Food, Dry Season Strategies and Household Size amongst the Bambara of Central Mali

Camilla Toulmin

The Bambara village of Kala lies on the northern frontier for regular crop production in Mali (see Map). With a long term mean rainfall of 600 mm per year, this region forms part of the southern Sahelian zone. Rainfall is concentrated in the three months from July to September and intensive work in the fields must be done during this short period to ensure a harvest. Rainfall is highly variable in its distribution within the year, between neighbouring villages in a given year and from one year to the next. Expected rainfall levels have been falling over the last 20 years; levels ranged from 350-450 mm per year over the period 1980-83 before falling to the exceptionally low total of 250 mm in the drought year of 1984.

Farmers have adapted to this risky environment in several ways. Two millet varieties of different cycle length are grown and it is rare for both varieties to fail in the same year. Oxen ploughteams have been widely adopted as they enable farmers to cultivate a very large area of land per worker. Surplus grain is stored in granaries or invested in livestock — cattle, sheep, goats, horses and donkeys — which can then be sold in years of food shortage. Within Bambara society, there are also a variety of mechanisms through which grain is redistributed (described in greater detail below, which help individual households suffering crop failure.

The lower rainfall levels of recent years have brought a shift in resources towards an increase in area under short cycle millet, as this has a greater chance of reaching maturity during the short growing season. However, this variety of millet only performs well on manured soils. Farmers have therefore needed to gain access to more dung in order to increase the area they cultivate with this crop. Much of this dung comes from relationships of exchange established during the dry season between farmers and livestock-owners, the latter gaining access to water for their stock from the farmer's well in return for stabling their herds on the farmer's field each night. Wells have become crucially important assets to farmers if they are to produce a regular grain surplus. Diagram 1 shows the growth in private wells dug in the village, from which it can be seen that by 1981 there was a total of 29 private wells. The dry season of 1983 witnessed a further 16 wells dug. However, these wells are far from evenly distributed between the 29 households in Kala. The largest domestic groups not only were the first to get a well dug but they have also dug second and third wells, thereby gaining access to large quantities of dung for their fields. This strong correlation between household size and levels of asset-ownership is discussed further below.

While the climate imposes a heavy risk on producers, due to rainfall variability, there are also other large risks to which people are subject and against which they attempt to protect themselves. This second class of risk is largely demographic in nature and consists of high levels of mortality, paticularly among children, varying levels of fertility and the vulnerability of all producers to sickness and disability. Many Bambara live in large, complex domestic groups containing men who share a common ancestor, often as many as five or six generations in the past, living with their mothers, sisters, wives and daughters. Men continue living and working together over several generations before the household divides, giving these large groups a solidity and permanence which transcends the importance of any particular individual.

The Large Bambara Household

Table 1 presents data on the distribution of households by size in Kala, from which it may be seen that 85 per cent of the population live in complex households, the mean size of which exceeds 24 people. These are very much larger groups than are found in other West African village studies and this paper will outline both the advantages which these large groups reap and the internal structure of such groups which allows them to minimise conflicts of interest between their members. Large households face certain advantages in crop and livestock production which include:

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Map South and Central Mali

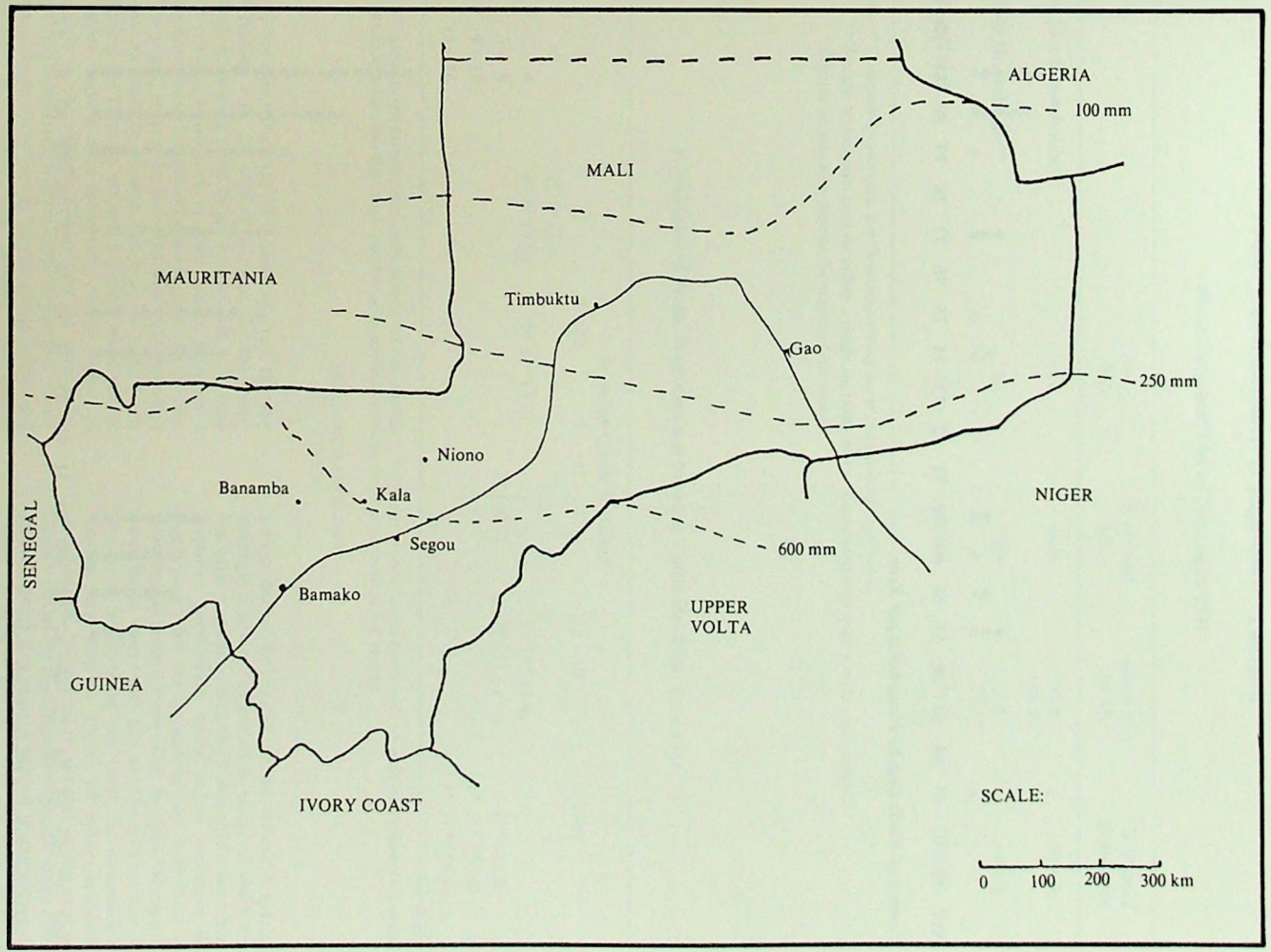
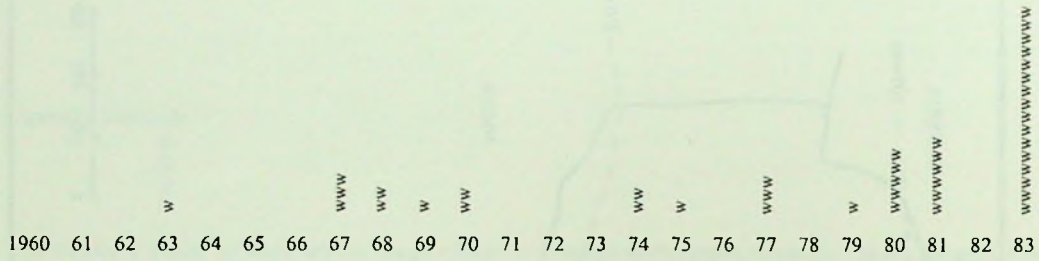
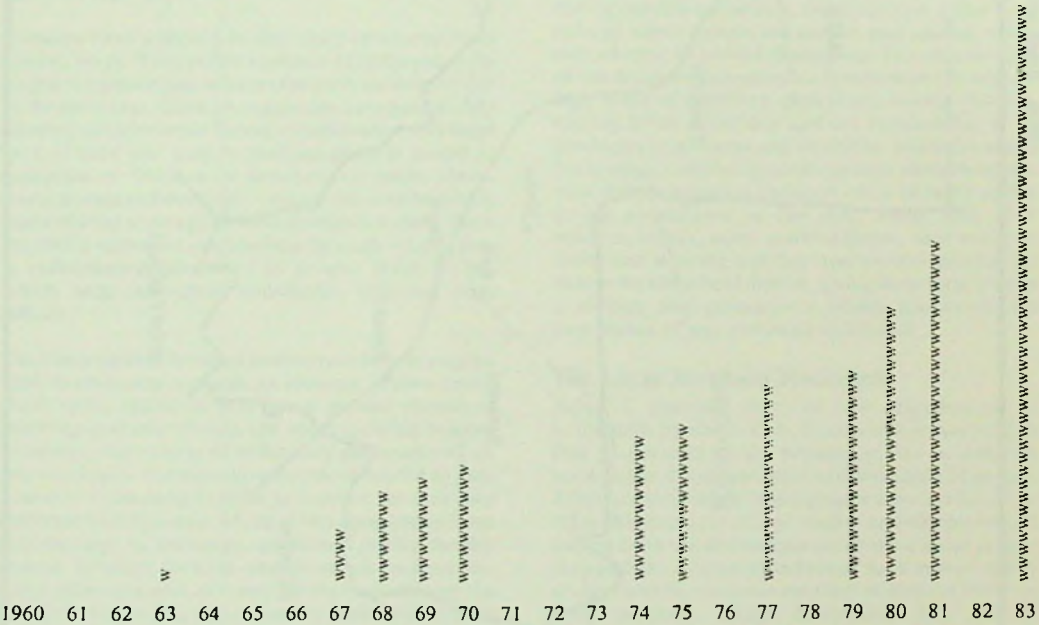


Diagram 1 Well-Digging by Households in Kala, 1960-83



Number of Wells Dug by Households per Year



Cumulative Total of Private Wells Dug

Table 1

Mean Household Size by Type, Kala 1981

	No. of hhs.	*% of total hhs.*	*Mean size of hh.*	*% of total population*
Complex Households*	19	66%	23.8 (12.9)	85.6%
Simple Households**	10	34%	7.6 (3.8)	14.4%
Village Total	29	100%	18.2 (13.2)	100.0%

Note: * Complex households are those containing more than one married man.
** Simple households contain either a single married man or unmarried men with a widowed mother.
Figures in brackets denote the standard deviation.

Table 2

Distribution of Wells, Workoxen and Breeding Cattle Holdings: Kala 1981

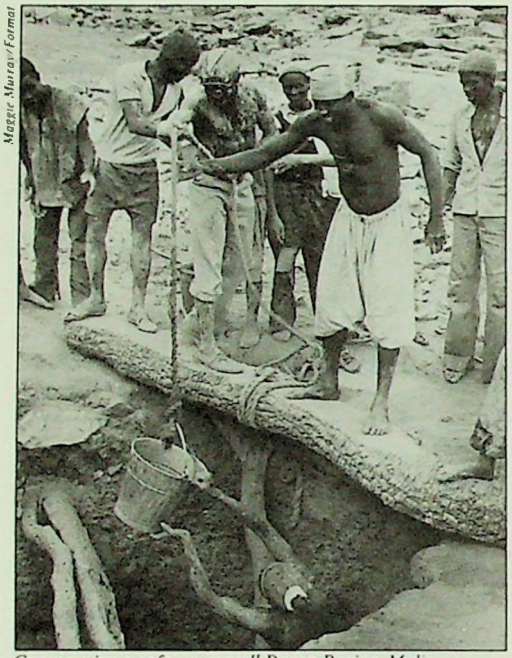
	Breeding Cattle Holdings				
	0	1 - 10	11 - 20	21 - 40	>40
0	2° 1* (2.6)				
1 - 4	4° 5* (4.9)	1° 5* 1** (5.1)		1* 1** (7.9)	
5 - 8			2* (10.7)	1* (11.6)	1** (14.9)
9 - 12					1* 1** (16.1)
13 - 16					1* 1** (16.9)

Note: Figures in the matrix refer to the number of households. °, *, ** refer to those households with no well, one well or two wells. Figures in brackets are the mean number of household workers for that element in the matrix.

HOLDINGS OF WORK OXEN

(a) the diversification of income sources, thereby reducing risk to overall income. In the rainy season, women from larger households have time to plant a small plot of grain which provides a supplement to household grain supplies. In the past few years, several households have also detached one member to engage full-time in petty trade during the farming season, a period when village traders have a near monopoly on the supply of goods in the village. Out of the six permanent trading businesses, five are in the largest and richest households for whom it represents an additional source of income and avenue for wealth accumulation. In the dry season, labour is spread amongst a number of activities, some of which are essential to maintaining the household's farm and livestock production while; others represent an opportunity for the household and individual to supplement income from other sources. Women in households where they are not the sole woman in charge of the cooking can share the housework, leaving time free to devote to money-spinning occupations. Migration by several young men to town is easier for the larger households, since a few of their peers can remain behind in the village to water cattle and prepare for the next farming

season. (b) economies of scale which operate in the process of generating a surplus for investment in productive assets. It is easier for larger households to finance investment in large indivisible assets, such as an oxen ploughteam, as they have at their disposal an absolutely larger volume of resources. Similarly, larger households have found it easier to invest in digging a well because they can mobilise their own labour force to get the well dug rather than having to hire a well-digger.



Maggie Murray-Format

Constructing a safe-water well Dogon Region, Mali, West Africa.

Large households are also better able to protect their members from demographic risk; they are less vulnerable to the illness or death of one of their members and they are likely to exhibit less variation in dependency rates than a nuclear household. They can also safeguard the investment made in acquiring a woman as wife through the practice of the levirate, an institution whereby a woman is inherited by the younger brother of her dead husband. In a small household, there is less likely to be an inheritor present and the woman will pass out the household's control when she remarries.

The result of these advantages faced by larger households is that they can build up a larger agricultural surplus to be invested in assets such as wells, oxen ploughteams and a breeding cattle herd. Table 2 shows the distribution of the three main assets between households in Kala from which it may be seen that there is a strong positive correlation between ownership of the different assets. Household size increases regularly as one moves from the top left to bottom right-hand corner of the table. Small households are those most likely to be with neither a well, work oxen nor a cattle holding, whereas the largest holdings of these assets are associated with the largest domestic groups. In addition, larger households tend to be absolutely better-off, as may be seen from Table 3, in which cattle holding per household member is shown. This greater level of livestock wealth per person for the larger households gives them greater ability to finance tax and bridewealth payments and to purchase grain in years of poor harvest.

The advantages of large household size have been described above. The disadvantages likely to arise from the organisation and management of such a large group (such as labour-incentive problems and disputes over the allocation of labour time and other resources) are minimised by specifying clearly the rights and obligations of the individual to the joint estate. Typically these consist of each household member being required to work on the household's fields from the first sowing of grain in June or July until the harvest is finally stored in January. In addition to work in the field, women have domestic duties to fulfill and men must water livestock. Workers are allowed to retire from household production and to devote themselves to their own interests by their late forties or early fifties, women tending to retire earlier than men, the exact moment depending on the household's access to labour with which to replace them. In return for their labour, household members normally receive food, have their taxes paid and in the case of men, they can expect the household to finance much of their marriage expenses.

Household Organisation by Season

Bambara household production is markedly different in the two seasons of the year. The intensive farming season, during which household members work and eat together, is followed by less cohesive patterns of production and consumption once the harvest is stored and the dry season arrives. The Bambara language makes a clear distinction between the two patterns of organisation, the joint production for the household estate being termed 'foroba' while the individual pursuit and enjoyment of wealth is termed 'suroforo'. 'Foroba' means literally 'big field' and refers to the large field cultivated by the household as a whole. 'Suroforo' means 'night field' and describes the small plots farmed by individuals at twilight once

Table 3

Distribution of Cattle Holdings by Household, Kala 1981

Herd Size	*No. of HHs*	*Mean Herd Size*	*Mean HH Size**	*Cattle/ HH member**
>40	5	78.4	31.1	2.52
21 - 40	4	31.3	22.0	1.57
11 - 20	1	20.0	11.5	1.74
1 - 10	16	4.1	9.7	0.42
0	3	0.0	4.0	0.00
Village mean	29	20.8	14.6	0.94

Note: *Household size is calculated here using adult equivalents, in which those over 15 are taklen as 1.0 and those under 15 as 0.5.

Table 4

Characteristics of Food Deficit and Surplus Households, Kala 1980 and 1981

	*Deficit households**	*Surplus Households**
No. of HHs	15	14
Mean HH Size	12.7	23.4
Mean No. of Wells/HH	0.6	1.3
Mean No. of Cattle/HH	5.1	37.6
Mean Yield of Millet/HH Worker**	1169	1733

Note: *Deficit households were those that ran out of millet before the harvest in both 1980 and 1981. **Worker refers to an index aggregating those of different age and sex by a system of weights.

work on the household field is finished for the day. The 'forobal' harvest is housed in a single large granary managed by the household head and from which grain is taken for household meals, tax payments and certain other joint expenses. Small 'suroforo' granaries are found by each married woman's hut and the grain from these provides her with the means to cook the occasional special meal for her husband and children and the income for necessities and treats, such as clothing, soap, sugar and sweets.

Despite its roots in the distinction between the two kinds of field, the 'foroba'/'suroforo' dichotomy applies in many other areas of Bambara life, such as livestock holdings, some of which are owned by the household whereas others are the property of a smaller group or of an individual. The basis for the division of activities, income and wealth between these two forms of ownership rests on household members having certain labour obligations to the joint household estate, after which they are free to pursue their own interests. In the dry season, once the millet is safely stored, there are few demands made upon the individual's time. Household duties are limited to watering the herd early in the morning and clearing new land, both tasks performed by young men, while women continue with their daily domestic tasks of fetching water, cooking food, caring for children and washing clothes. Once these tasks are accomplished, men and women can work on their own account. Men pursue a variety of activities which include fortune-tellers, going on migration to town, weaving cotton cloth, hunting and making ropes. Women's sources of income consist of plaiting other women's hair, spinning cotton, dyeing cloth, collecting bush fruit and preparing snacks for sale. Both men and women also often have a petty trading business during the dry season.

Eating Patterns by Season

In the rainy season, food is prepared and consumed by the joint work-group, it being carried out to the field in mid-morning. The household does its best to ensure that people are properly fed during this time of intense physical exertion, as the future year's supply of grain will largely depend on the speed and care with which sowing, weeding and harvesting work is carried out. A hurried, often cold, breakfast allows the men and girls to leave the village soon after dawn to start work in the field. Women stay behind to prepare the midday and afternoon meals, before setting out around 10 a.m. with their bowls of thick millet porridge, 'to', its consistency being thought to provide the strength

needed by those who spend the day weeding. In mid-afternoon, the workforce sits down to a calabash of 'dege', a thin fermented gruel, lightly spiced and mixed with a little soured milk if available. Most households prepare a hot dish of 'moni' porridge in the evening, a light meal with which to send the household to sleep. A few households however would have a second dish of 'to' prepared for the evening to satisfy their members appetite and keep up their enthusiasm.

Once the peak weeding season is over, the pace of activity slows. With the millet harvest safely stored in January, many people disperse to visit relatives elsewhere or go to towns to earn cash. Many households continue to provide meals each day but a thin millet gruel is substituted for the thick 'to' porridge at midday. Women take grain from their own stores to prepare an alternative dish for their own nuclear group, so that they can eat something more tasty than this thin, watery dish. Those households where grain is in very short supply aim to conserve their stocks during the dry season by a variety of means. People leave to work and stay in neighbouring settlements, thereby reducing the burden of feeding them on the household granary. Such households also shift onto women the task of finding enough food for immediate kin. In such cases, women's granaries change from being an alternative source of food to providing the basic food ration for those remaining in the dry season.

Food Deficit Households

Table 4 compares the characteristics of grain surplus and deficit households in the village of Kala. Deficit households are those which ran out of grain before the next harvest in both 1980 and 1981. From this table, it may be seen that 15 out of the 29 households in the village suffered a food deficit in both years.

Many of these deficit households are of small size and own few productive assets. They have lower than average labour productivity because they have less access to dung and to ploughteam services, both of which are essential to ensure the regular production of a millet surplus. Often with not enough grain to eat, these households have been less able to invest in productive assets, such as wells, nor do they own cattle other than work oxen, which would be available for sale in years of food shortage. Certain of the households which ran out of grain early also had a very unfavourable ratio of consumers to workers, so that despite average yields per worker, the harvest was not large enough for the household's food needs. In one extreme case, the household had run out of food in May, before the end of the dry season. Part of this deficit was attributable to the household's general poverty — no well, ploughteam cattle or other livestock owned. However, the severity of the food shortage was due in large part to a major share of the previous harvest having been sold to finance the digging of a well using hired labour. The household opted for a period of grave food shortage in order to build up future productive capital in the form of a well which, it was hoped, would provide dung for the fields and raise yields of the short cycle millet. This household's food needs were met during the forthcoming rainy season by a variety of strategies which included sending the son to work for another household in exchange for grain, collection of bush fruit and begging of grain and bran from this and neighbouring villages.

Access to Food

The household's food needs are met from various sources, few farmers have stored grain from harvests in prior years from which grain was taken for household meals. Women's granaries provided a major addition to food stocks in many of the smaller, poorer households. The stocks held by elderly women are especially important in this respect as these women, being free from work in the household field, can cultivate a substantial field of their own. Apart from the harvest of private fields, women also acquire grain from harvesting and winnowing fees and from gifts received from relatives at harvest-time. It is common for men and women, but particularly the latter, to travel to neighbouring settlements at harvest-time. They help carry out the harvest and they winnow the grain, receiving in exchange a calabash of millet. Women's granaries can contain a considerable quantity of grain; while a busy young wife may have only 100-200 kg of millet, older, retired women often have more than 1,000 kg at their disposal.

Food supplies are supplemented for some by sending one of their family to work for another during the rainy season, the wages for this labour being paid in the form of several measures of grain.

Cash may also be used to buy grain, as when migrants' earnings are used to purchase sacks of millet or when assets have been sold. During several weeks of the dry season food may also be procured by collecting various bush fruit, such as bere (*Boscia senegalensis*) and baobab. Official systems of redistribution exist in the more Islamicised villages of the region, one tenth of the harvest being set aside as 'jaka', or tithe, to be given to other members of the community. In Kala, a similar proportion of the harvest is redistributed, though in a less formal manner. Women in Kala appropriate large quantities of grain at winnowing time, both for themselves and for payment of winnowing fees to those women helping them. Direct gifts between households are rare, a few cases occuring

at major festivals when a particularly devout man made gifts of 30-40 kg to poorer neighbours. Lewis (1979) also notes the low incidence of such direct gifts in his study of a strongly traditional Bambara village to the south of Segou. He attributes the absence of such flows to the importance attached by villagers to egalitarian ideals and the consequent desire to avoid relations of dependence between poorer and richer households. If grain is channelled through women, help is given to poorer members of the community but at lower cost to men's pride.

The poorer households in Kala gained a significant proportion of their food needs from sources other than the previous harvest. However, while non-harvest sources play an important part, these households are often less able to exploit them fully. For example, many of these grain deficit households contain a single woman of working age who has little time to cultivate a field of her own. Women in the five smallest households were the only ones in Kala not to have a private field of their own. With their small workforce, the household can less readily send out of its members to work elsewhere during the farming season, in order to earn millet, without seriously affecting its own ability to farm. In the dry season, the daily demand for labour to water plough oxen limits how much time can be spent on migration and thus the amount of cash available from this source with which to purchase food. Larger households are better placed to tap the range of incomes available, as there is a sufficient workforce for some to remain in the village to perform essential dry season tasks while others can go off looking for work. The few assets owned by food deficit households also limit the cash which can be raised from their sale. Owning no cattle other than work oxen, these animals cannot be sold to buy food without diminishing the household's ability to farm. In addition, sheep and goats, largely owned by women, are usually few in numbers in these small grain deficit households, as few women can build up enough of a surplus to invest in these stock.

Dry Season as Adjustment Period

The dry season presents different opportunities to different households. Those which have had a poor harvest must both enable their members to survive during these months and generate sufficient income to purchase the food needed to farm the following season. Hence the common strategy of those in greatest distress is one whereby the compound empties once the meagre harvest is assessed and people scatter to pursue their luck elsewhere. By contrast, those in grain surplus households can use this period of relative freedom from household labour obligations to generate private income and accumulate their own sources of wealth.

In years of poor harvest, the strategy followed by a household depends on a number of factors, such as the extent to which other producers have been similarly touched, the ownership of livestock and the consequent demands on dry season labour, and the depth of links with other producers in this and neighbouring villages through which help may be sought.

The measures taken during the dry season will intensify the more widespread and sizeable the harvest failure. If only a few households have had a poor harvest, they can obtain a significant supplement to their stocks from grain distributed at harvest-time and from gifts made to women. In 1980 and 1981, the millet harvest in Kala was better than that in many other villages and, consequently, households in Kala received a stream of visitors at harvest-time and in the dry season that followed. In all, more than 80 men and women came to pass several weeks in Kala during the dry season of 1981. Most of these visitors were from settlements no more than 50 km away and they stayed with a household with whom they were able to establish some sort of kin link. Such links were often fairly distant; one man remarked that in years when his harvest had been a success, he got to know this more distantly related kin very much better.

In a year such as 1984, when drought burned the millet crop of most villages in the region, by early September almost all young men had left to go to the cities as soon as it was clear that the harvest had failed. The start of the harvest in mid-October witnessed the movement by many women to the few villages whose crops had performed relatively well. These women planned to spend two or three months harvesting and winnowing grain and earning millet in return.

Thus, the highly localised distribution of rainfall in this region coupled with differences in soils and access to dung mean that harvests vary considerably from village to village in a single year. Shifts in population from grain deficit to surplus areas provide some access to food for those in need, while enabling those with large harvests to get the grain winnowed and stored with greater speed.

Changing Strategies for Deficit Households

Methods of coping with food shortage in this region have adapted to changing circumstances over the past couple of centuries. When Mungo Park travelled through the region in the 1790s, he noted the destitution of many families and the common practice of pawning a child to a richer neighbour in exchange for grain. The child eats with and works for his new family but will return home when his parents are able to redeem him by repaying the original sum. This

system was quite widely practised even until fairly recently, a woman from one household in Kala having been pawned as a child during the difficult years of the 1930s.

The institution of domestic slavery povided cheap labour both to till fields and to carry out domestic tasks until its formal abolition in 1905. As the master was responsible for only some of the slave's food needs, owning slaves afforded some measure of protection from food shortages. A further means by which communities coped with harvest failure in the pre-colonial period was by raiding other villages. Huddled within an encircling mud wall, these villages tried to protect themselves from the threat of raids from stronger neighbours. However, the use of sieges and other tactics allowed local warlords to capture and plunder other settlements in a manner similar to the larger-scale military manoeuvres of the 18th and 19th century kings of Segou. One old man in Kala, interviewed by a colonial officer in the 1920s, described the difficulty they now faced, following the French conquest and pacification, as villages in need could no longer raise a force to supplement their reserves by seizing others' grain.

In the 1930s, a series of poor harvests coincided with annual invasions by locusts throughout this region. The collapse of world market prices for many traditional commodities, such as shea-nut butter and kapok fibre, badly hit villages in the Segou region who relied on the sale of these products for money with which to pay taxes. Harvest failure, tax demands and the requisitioning of grain forced people throughout the zone to sell assets and to earn money on migration. Refusal to pay taxes was sternly dealt with: on one occasion the administration rounded up and carried away all Kala's womenfolk, who were only released once the missing sum had been found. Both livestock and gold were sold during the 1930s to find the money for taxes. One Commandant of Segou noted a flood of gold had been traded in 1933-34 and he attributed this to the heavy pressure on villagers to meet tax payments in these years of penury. Several villagers from Kala told of the liquidation of their entire cattle holdings during this period in an attempt to raise cash.

Migration by young men became an important means to earn cash from the 1920s onwards. Initially they travelled to the groundnut growing areas of western Mali and eastern Senegal and to the gold mining regions on the border between Mali and Guinea. Old men from Kala and neighbouring settlements can still intone the names of those villages through which they passed on the north-long trek to Senegal. The rising economic prosperity of Ivory Coast now attracts most of the young men from this region who plan to go on long distance migration.

Conclusions

Households in this region of marginal and high risk farming have long needed strategies for dealing with food shortage. Certain activities such as raiding can no longer be practised. Others such as migration have grown in importance. Households differ considerably in their ability to feed their members, the larger domestic groups being less vulnerable to chronic food shortages. These differences arise not only out of variation in the ownership of productive assets used in farming but also from differences in the household's ability to diversify its income-earning activities. The dry season is the main time available for such diversification. Grain deficit households must spend this season finding food for the farming season to come, whereas those in the larger grain surplus households can use the dry season to accummulate private sources of wealth. Redistribution of grain within the community remains of great importance to those who have suffered a poor harvest. People may try to limit the demands made upon them by importunate relatives, by converting surplus grain into livestock holdings, but the basic duty to provide hospitality and help to those in need continues to be a strong element within Bambara society.

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Seasonality and Poverty: Implications for Policy and Research

Richard Longhurst, Robert Chambers and Jeremy Swift

Approaches to Seasonality

The papers in this *Bulletin* illustrate how acute the seasonal stresses placed on poor rural people can be, and how much they differ between groups and environments. Diverse groups such as pastoralists, culivators, the landless and women have different repertoires of response to cope with regular seasonal stresses, and use them with varying degrees of success. They find it harder to deal with unexpected fluctuations in food supply or incomes, or sudden losses of livelihood or family member, as can occur through unanticipated domestic or economic events. For regular seasonal stresses, coping mechanisms are many and include depleting food stocks, eating less, changing the composition of the diet, migration, exploiting common property resources, switching occupations, selling assets such as livestock, and changing cropping patterns and farm operation. These strategies are often versatile and complex and little understood by outsiders. The most striking aspect of how people cope with seasonality is its diversity. There are agronomic, nutritional, economic, demographic and social mechanisms which are called into play, and the human body itself also has a range of biological adaptations in the face of stress.

These articles and other research in the past few years qualify and refine the original wet-dry seasonal scenario [see Chambers, Longhurst and Pacey, 1981]. Four aspects stand. The first is the significance of quite short recurrent periods during the year, often a matter of a few weeks and sometimes just a few days. Examples are transplanting rice among Lambardi and Koya tribals in India, when women are overworked, children neglected and births peak; planting, weeding and harvesting peaks with some crops especially in unimodal short rainy season agriculture; and the transitional period from dry seasons to rains when pastoralists' workloads are intense, cereal prices high and herds vulnerable.

Second, the inter-seasonal effects of a succession of bad years can swamp the 'normal' seasonal pattern. The build-up to the 1984/85 famine in Eastern Africa and the Sahel was preceded by several years of poor rainfall during which rural people's sequence of coping mechanisms described in several articles in this *Bulletin* were brought into play and progressively weakened. Selling assets became less effective as prices, for instance for livestock, fell dramatically. In Ethiopia, cereal prices continued to rise after harvest when the normal seasonal effect would have been for them to fall [Cutler 1985]. Similarly, after a succession of bad years migration will not follow normal seasonal patterns.

For some, contingencies may overlap with the combination of seasonal and household life cycle stress. People in the households are especially vulnerable. These households include those with several small children, or composed of old people, or having to cope with a major life cycle event such as overcoming death of a productive member or meeting the expenses of a marriage.

Third, different groups, especially children, women and men experience and perceive the seasons differently. Stress is 'handed on' from men to women and children, as vividly illustrated in the paper by Jiggins. For the Indian tribals studied by Gillespie (1986), July transplanting was perceived as bad by women, and winter guarding of crops as bad by men. There are similar differences between large farmers, subsistence farmers, and the landless. Grain deficit households search for food while surplus households accumulate wealth. In Mali, as elsewhere, differences in asset ownership enabling some Bambara, at the expense of others, to diversify income earning activities.

Fourth, seasonality can be a major dimension of adverse economic change. In sub-Africa, in particular, it is part of the process of impoverishment which is making people more vulnerable. Increasing population, scarcer land, changes in resource ownership and access and declining land quality together amplify

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seasonal fluctuations and shortages of both food supply and agricultural incomes. The pastoralists of Central Niger are probably typical of many others in losing land to agriculturalists, being increasingly forced to sell off their young cattle and herd cattle owned by non-pastoralists for low wages, and holding herds whose numbers and composition are no longer viable. As they and others lose assets and become poorer, they become less and less able to cope with bad years and also more vulnerable to regular seasonal stress.

For these four reasons, seasonal analyses and counter-seasonal measures have to be more sensitive and more differentiated — in timing, within seasons, in response to previous bad years, in helping vulnerable groups, and in slowing and counteracting impoverishment. With deepening poverty, seasonality also becomes even more significant as an adverse factor, and as a point of entry for analysis and action. It is of especial relevance to sub-Saharan Africa with its long-term decline in per capita agricultural production, directly and distressingly linked to poverty and development. It is important not just to enable people to struggle out of poverty, but through various measures to strengthen and add to their coping mechanisms so that their vulnerability does not increase. Seasonality, even more than before, is a critical dimension in rural programmes. Counter-seasonal interventions can moderate adverse seasonal effects, but the best season-proofing is not to be poor, and the best counter-seasonal policy is one which successfully targets resources to enable those who are vulnerable to become less poor.

Implications for Policy

Seasonality needs to be keyed into existing policy, technology development, and support for vulnerable groups. It needs to be repeated that poverty and seasonality are interlinked and that without poverty there would be fewer, or no, adverse seasonal effects.

Regarding general policy, three points can be made. First, seasonality-related policies should seek to strengthen and add to — not weaken — the many ways in which people cope with seasonal stress and reover from it.

Second, analysis and action have to be decentralised and differentiated, in timing and targetting: seasonalities vary, and include short crucial periods, local environmental diversity, especially in hinterlands away from more uniform and developed agricultural areas of deltas and plains, and differential vulnerability and impacts for children, women and men. These all require a versatile repertoire of possible counter-seasonal interventions; blanket measures applied widely are unlikely to be very effective. Third, it is crucially important that awareness is increased: that urban-based, season-proofed professionals become more aware of what rural people know only too well about how adverse seasonality affects them and how they try to handle it. Far greater knowledge and appreciation is required of the pattern of income earning and food acquiring activities of vulnerable people, especially when urban-based professionals are least likely to travel at the times of year when things are worst for rural people.

In the area of agricultural research and technology development, it is basic to recognise the complex measures adopted by farmers to exploit the seasons while moderating risk. Crop diversification, mixed cropping and serial cropping are all means whereby farmers cope with uncertain rainfall. Different varieties within a crop allow staggered dates of harvesting to provide a flow of harvested material and income over an extended period and spread risks and smooth labour peaks. Agricultural technologies that allow people greater choice of activity and timing should be considered. In the context of seasonality in sub-Saharan Africa this requires giving more support to crops which can be harvested flexibly, such as root crops and some gathered foods, and to those varieties of cereals and legumes that are counter-seasonal in impact. For example, development of quick-maturing millets would reduce risks in drought-prone areas and shorten the hungry season. The seasonal perspective in agricultural research adds support to two criteria in agricultural research: yield per unit time in addition to per unit area; and the timing of activities and especially harvest in relation to household resources and needs. Emphasis on livestock such as cattle and sheep, which in the Sahel provide milk in the rainy season when farmers' food stocks are low, can be important for the same reason, while camels and goats may play a similar role for herders in their hungry dry season.

Seasonal stress is often most critical for groups who are vulnerable anyway. These are the poor and those at vulnerable stages in the household life cycle, and within the poor, women and children. For the poor, this indicates allocation of agricultural research resources for the crops they grow. For women and children, linkages can be made between the allocation of a woman's time, her welfare and that of her child.

Technology in the domestic domain (processing, preservation and preparation) could well ease seasonal work bottlenecks for women. Technology in agriculture can have an important impact on vulnerable group health by spreading work peaks or increasing returns to women's crops and livestock and their income. In most countries there is a complex

sexual division of labour and appropriation of product from farm work. Women do have activities, the products of which both contribute to the communal cooking pot and to their own incomes. The latter in particular can have a significant impact on child nutrition, especially seasonally when malnutrition is worst. A direct seasonal intervention as discussed in the Editorial, would be provision of child care facilities even for a short period, when women are working in the fields in the rainy season. This should improve both child health and agricultural productivity: a linkage which illustrates the value of a seasonal mode of analysis.

The more strictly economic domain offers several means of mitigating adverse seasonal effects. One is a better integration of markets. In sub-Saharan Africa where market integration is poor, this is especially important. There is scope for improved roads and other physical infrastructure, and better information and communication for the more accurate prediction of prices for foodgrains and livestock. Another measure, of benefit to the landless and pastoralists, is price stabilisation of foodgrains at reasonable low levels during the dry season and early wet season. Yet another is official intervention in the livestock market when bad conditions threaten a slump, to maintain livestock values and the livestock to grain exchange ratio. Again, if other assets or products are sold, such as firewood or charcoal, these can be bought and stockpiled, with the advantage that they may store better than livestock, and do not deplete herds. (Credit schemes need reassessment together with extension, to make marketing chains less risky, especially for livestock). Recovery from a bad season also deserves imaginative support, and loans for the replacement of major capital assets such as cattle would enable pastoralists to recover more quickly. There is probably a major role for financial intermediation through more flexible and widespread credit schemes and possibly banking, especially for those pastoralists whose economy is more market integrated. Grain stores and cereal banks, facilitated by targetted credit, could also be important for both farmers and herders.

Seasonal fluctuations in food availability are often seen to be most marked in drought prone or semi-arid areas. In periods of acute famine, families turn to the bush for foods and livelihoods. A natural resources policy to protect common property resources, especially trees, is essential. Trees act as important seasonal buffers, as shown in this *Bulletin*, providing food, forage for livestock, firewood charcoal, medicines, and other products. All of these can be converted into scarce seasonal income for those who own or have access to the trees. Pilot and experimental tree fodder projects by and with pastoralists (including trials with tenure and insufruct arrangements) deserve to be undertaken. Seasonal grazing and browse reserves may also have a role to play as long as they ar genuinely under the control of the local community.

The occurrence of acute seasonal food shortages turning into a famine before effective relief measures can be taken might be avoided by decentralised diagnosis. This will require the identification of appropriate indicators and the establishment of a household or village level response mechanism. As indicators, Campbell and Trechter (1982) have suggested hunting and gathering of wild foods, and migration, as being relatively easier to monitor with eating behaviour of households less easy to judge. Unexpected price rises and drying out of river beds might be easy to monitor. Generally the head people in a village are aware of local conditions even to the extent of knowing what is going on in households. This is particularly true of societies where avoidance of outright indigence by sharing of resources is a custom. At the local level such knowledge might be used to provide advance warnings of the onset of severe shortages if channelled into an appropriate institutional framework.

Overall, to reduce seasonal and inter-year fluctuations in food supply, production systems have to be less risky, for both women and men. Many technical interventions increase variability and risk, especially when they depend on poorly functioning markets. Reducing the risk of adverse seasonal effects requires diversification, wider choice of crop, livestock and income-earning activity, marketing infrastructure and support, and for poor households multiple sources of food and income.

Implications for Research

Within many of the policy options mentioned above there is need for research to better define how poor people's production activities could be strengthened. In other words, seasonal coping strategies require more investigation: what are their limits (especially in the face of population growth and on marginal land)? How far are they reversible? And how might development efforts strengthen them? In allocating research resources it is now possible that less needs to be spent on describing seasonal patterns. We should use an analytical framework that builds and tests short interdisciplinary hypotheses about causal chains. These would link among other factors, particular seasonal events, random bad years and trends in the political economy. Some of the best lessons might be empirical, from implementing counterseasonal policies and seeing how seasonally vulnerable people are affected and respond. Important lessons could be learned from analysing the many famine early warning systems now being set up in dry Africa.

Seasonal factors are not new to on-farm research and farming systems research generally, but need to be further integrated in them. Farmers have priorities for different types of crops according to their vulnerability to seasonality. They allocate their land, labour and other inputs according to these priorities. This also has implications for the sexual division of labour and control of product in the household which in turn has further seasonal implications.

Institutions also play a part in counter-seasonal strategies. Basic research on financial institutions for the management of inter-seasonal and inter-annual risk, i.e., insurance, banking, credit and redistributive taxation, might bring benefits. In particular, rotating credit associations are present in most rural communities and are a local means of saving and meeting cash needs. The effective introduction of more extensive financial networks would require an examination of the working of these local institutions. Local organisations can also be used to build institutions for management of common property resources of seasonal importance: trees, rangeland, water, fish and wildlife. Our information on such institutions is poor.

Finally, more should be known about how seasonal deprivation influences people in their attitudes to innovation, risk-taking, and planning ahead. These might be described as psycho-physiological factors. For example, is expected seasonal deprivation a factor inducing people to the strategy of having many children? Might a lower birth rate be expected where fluctuations in food supply, even for poor people, are not severe?

This selective agenda of policy and research needs show that seasonality matters especially for the poor and vulnerable, and that policies and projects can have components which reduce seasonal adversity. It is especially — though not only — in those parts of the world which are remote, semi-arid, or arid and with uncertain rainfall that seasonality has become and must remain a prominent dimension of policy and research.

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patron de cultivos de los granjeros africanos. En la medida en que la presión demografica se intonsifica en Africa, se requiere gasto fiscal para apoyar al sector agricola y para reducir el impacto de la mala estacion en los ultrapobres. De especial importancia son las politicas para apoyar a los migrantes, para proveer credito rural y para manejar los recursos comunitarios.

Mujeres y estacionalidad: enfrentando la crisis y la calamidad
Janice Jiggins

Este articulo examina la contribucion de la produccion de las mujeres, asi como su trabajo y servicios en la esfera doméstica, en el manejo de las tensiones estacionales, las crisis y las calamidades. Los subtitulos pertinentes son: cambio de tareas y responsabilidades adscritas según sexo; diversificación de las fuentes de ingresos del hogar; cambio en la intensidad y combinación de ocupaciones multiples; jardin del hogar y recursos comunitarios; procesamiento de alimentos, preservación y preparación; organización social, entrega de regalos. Proporciona un analisis de la adversidad y calamidad que destaca la recuperacion de la interconexión de los hogares dependientes de jefes de hogar mujeres y plantea nuevas preguntas relativas a la preferencia por riesgos, la evaluación de probabilidades y la valoracion del tiempo de trabajo de la mujer.

Escasez de alimentos y estacionalidad en las comunidades WoDaaBe de Niger
Cynthia White

La información sobre los pastores nomades de Niger central, demuestra claramente que la estacionalidad, a través de una coincidencia de factores tensionales en las estaciones seca y transicional, refuerza la pobreza de este grupo. Aunque la dureza de la estación seca es importante, solo constituye un síntoma de factores politicos y economicos más cruciales que afectan la economia de WoDaaBe.

Estrategias de alimentacion hogareña para responder a la estacionalidad y el hambre
Richard Longhurst

Las familias rurales tienen una serie de estrategias para enfrentar las fluctuaciones estacionales e interestacionales de la disponibilidad de alimentos. Para los hogares con tierra, la mas importante consiste en la elección de patrones de cultivos para dispersar los riesgos e incluye cultivos mixtos y produccion de cultivos secundarios, especialmente raices. Otro mecanismo estacional reside en la venta de pequenos bienes y animales, el uso de productos almacenados y el desarrollo de relaciones sociales de apoyo. El trabajo remunerado fuera de la granja constituye uno de los mejores amortiguadores en contra de la tension estacional. Si una mala estacion se prolonga en una sequía o si subitamente cae el poder de compra, las actividades mencionadas se intensifican aún más, pero las familias son forzadas a desinvertir recursos, debiendo vender bienes productivos, ademas de constreñir el consumo de alimentos y emigrar. Si la inversion en áreas rurales y en la produccion de alimentos reconociese estas estrategias, el severo impacto del hambre podría evitarse.

Biomasa, ser humano y estacionalidad en el trópico
Colin Leakey

La investigación agricola vinculada a politicas gubernamentales tendientes a incrementar la disponibilidad de biomasa para proveer alimentos, forraje y medicinas requiere una revision. Al ignorar los arboles y alimentos asociados, las politicas no han satisfecho las demandas de alimentos en las zonas áridas y el énfasis puesto en el incremento del producto por unidad de área, ha acentuado la estacionalidad de la producción al favorecer la seleccion de especies de cultivos que requieren largos periodos de disponibilidad de humedad. El uso de plantas para medicamentos, estimulantes y control de fertilidad, tambien tiene importantes efectos estacionales, no obstante, la atencion que ha recibido hasta la fecha es minima. La clasificacion de Raunkiaer, basada en las formas de proteccion y el tamano de los brotes de las plantas, permite un analisis de su real uso de humedad y temperatura, proveyendo un marco de trabajo para vincular la producción estacional de biomasa con las necesidades humanas.

Arboles, estacionalidad y pobres
Robert Chambers y Richard Longhurst

Los arboles desempenan un papel significativo en la ocupacion estacional de las personas pobres, tópico que ha sido descuidado debido a la falta de entendimiento de la forma en que los pobres aseguran su ingreso y a la ignorancia de los múltiples roles de los arboles. Estos juegan un importante papel estacional por sus caracteristicas físicas: raíces profundas con acceso a la humedad y nutrientes durante todo el año, producción de frutas y semillas distribuida en largos periodos, acumulación de existencias en la forma de madera y varios efectos ambientales beneficiosos. Los arboles estabilizan, protegen y apoyan las ocupaciones de los pobres rurales, pudiendo disenarse politicas que refuercen este importante rol.

Estacionalidad en un distrito de la sabana de Gana. Percepciones de las mujeres y de los trabajadores de la salud
Gill Gordon

Los hogares de un distrito costero de Gana, tratan de mantener una disponibilidad de alimentos constante, trabajando en la agricultura, la pesca y el comercio. El comercio de alimentos procesados es altamente competitivo en la estación lluviosa. Muchas familias migran temporalmente cuando se producen condiciones adversas en la agricultura o el comercio. La tension estacional reduce la habilidad de las mujeres para cuidar de los hijos y hacer uso de los servicios de salud. Los trabajadores de la salud de la villa, consideran que su trabajo agricola es de mayor prioridad que sus tareas de salud, en el periodo de mayor demanda por sus servicios. Este articulo sugiere medidas para reducir el impacto de la tension estacional sobre los hogares y los trabajadores de la salud.

Acceso a los alimentos, estrategias de la estación seca y tamaño de los hogares entre los Bambara de Mali central
Camilla Toulmin

Este articulo describe la variación estacional en la producción y organizacion hogarena de un pueblo agricola Saheli. Una vez que la cosecha esta almacenada, las responsabilidades domesticas disminuyen y el individuo puede optar entre una serie de actividades remuneradas. Los hogares superavitarios de granos pueden usar este período para construir sus fuentes privadas de riqueza. Los hogares deficitarios de granos deben usar los ingresos de la estacion seca para ayudarse hasta la próxima estación agricola. La distinta capacidad para hacer uso de la estacion seca acentua las diferencias en el tamano y riqueza del hogar.

Estacionalidad y pobreza: implicaciones para la politica y la investigación
Richard Longhurst, Roberts Chambers y Jeremy Swift

Hay una gran diversidad en la forma en que diferentes grupos de personas son afectadas y enfrentan la estacionalidad. Se requiere un mayor entendimiento de esta diversidad para que la intervención de politicas y proyectos fortalezcan la posicion de las personas pobres del campo. A veces, los períodos dañinos pueden ser muy cortos, menoscabando generalmente los esfuerzos de las familias para acumular recursos y proteger su salud. En el subsahara africano, la estacionalidad adquiere claramente una mayor dimension en el cambio economico adverso, la declinacion en la disponibilidad de alimentos y la creciente inestabilidad en la oferta de alimentos. Como resultado de ello, la estacionalidad se ha constituido en un punto de entrada mas significativo para el analisis y la accion. Se requieren politicas que tengan a los grupos más vulnerables como objetivo, que refuercen los mecanismos para enfrentar la estacionalidad y que reflejen un enfoque descentralizado y diferenciado cronologicamente.

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