Since the 1970s the Sahel has been portrayed as a place of actual or threatening disaster, where people suffer from and in turn cause environmental degradation and desertification. This book goes beyond these stereotypes to describe the ways in which farming households in the Sahelian region organise themselves economically to secure their livelihoods.

Drawing on four years of field research with farmers in the Sahelian region of north-east Nigeria, and building on work with these communities over several decades, Working the Sahel looks at how people in the semi-arid conditions of the Sahel cope with their harsh environment, and in particular examines the ways in which they organise their labour to manage fields, crops and other resources.

Working the Sahel analyses the diversity, flexibility and adaptability that are the critical attributes of successful Sahelian systems of resource management. Reporting on studies of four village communities and their natural environments, it examines the ultimate cause of much environmental variability in the Sahel: the rainfall and its characteristics. The authors look at how farmers manage biological resources, crop and non-crop biodiversity and soil fertility, and transform the landscape through agricultural intensification. They show how gender, age and the division of labour interact, and how women and children make essential contributions to household viability. The authors conclude with an examination of differentiation between households, and try to define poverty in a rural Sahelian context, as well as placing issues in a broader policy context.

Working the Sahel presents important new evidence to indicate that the ‘crisis’ of degradation in the Sahel can be contained, and indeed is being contained in some areas, through the work of rural communities themselves.

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   Michael Redcliff and Ted Benton
The farmer waits for the precious fruit of the earth, being patient over it until it receives the early and the late rains.

James 5:7
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While a book of this kind draws most immediately on specific research activities, it also draws on much longer and deeper roots. This work is the latest episode in Michael Mortimore’s long engagement with northern Nigeria, and an association with some of the villages where the research was carried out that spreads back more than a quarter of a century. We would like to offer our sincere thanks to the Village Heads and the people of those four villages for their patience and hospitality. For each of us their generosity with time and resources remains salutary and quite wonderful. In return, we offer the hope that the research reports their understanding of their landscapes and livelihoods honestly and accurately, and perhaps that it will help others to understand their situation better. We have limited faith in formal ‘uptake pathways’, let alone in the capacity of researchers to ignite positive developmental change through their writings. The most effective pathway for innovations in northern Nigeria remains, as always, the ideas and hard work of local people, and we are honoured to have been allowed to glimpse them at work.

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This book is the tip of an iceberg, both in terms of the vast amount of research done by all our collaborators, and the huge amount more that remains to be
understood about people and nature in the Sahel. The drylands of West Africa are not homogeneous, but wonderfully diverse; not a place, but a kaleidoscope of places, each changing very fast, each the home of people who are active and reflexive agents of change. We hope that our discussions will be seen as starting, and not seeking to close down, debate about those places, and the choices that those people face about the future.

Michael Mortimore and William M. Adams
Milborne Port and Cambridge
1
INTRODUCTION

*Mai ha’kuri ya kan dafa dutse ya sha romonsa*
*(A patient person will cook a stone and drink its broth)*
*(Hausa proverb, Abrahams, 1949)*

**The Sahel: beyond crisis**

The *Sahel crisis* was discovered by the outside world during the great Sahel drought of 1969–1974. It has been with us, in one form or another, ever since. This was the first major African famine to dominate the media headlines in the North, and it provoked an anguish, both in scientific and in aid circles—whether bilateral or multilateral donors, or charities—which was itself new, creating a sharp discontinuity with the optimistic outlook that had tended to prevail during the 1960s, the post-independence era.

Hitherto, the impoverished but productive societies who inhabited the Sahel of West Africa, using mainly hand or simple animal-powered technologies, had produced enormous exports of groundnuts and cotton for the world markets. They had contributed large shares to the GNPs of their countries. Indeed, without them several national economies would not have been viable. In addition, the Sahel produced food grains (cereals, principally millet and sorghum, and legumes, principally cowpeas) and meat for growing numbers of urban consumers. In the coastal belt, where foreign investment was concentrated, the port-capitals spearheaded national drives to achieve economic development by import-substituting industrialisation. They needed labour, and this too the Sahel could supply, sometimes in the form of permanent migration, but more usually by means of short-term circulation of dry-season labour. The cocoa plantations of the forest, and the mining areas (for example, the gold fields of southern Ghana and the tin fields of central Nigeria) added to the employment opportunities available under the colonial economic systems.

Thus both regional and global markets were integral to the Sahelian economies, and while the intensity of these market relationships reached a peak in the 1950s, shortly before independence, they had deep historical roots in old migratory and exchange systems. The idea of a Sahel buried in isolation from the
rest of the world and preoccupied exclusively with subsistence is an illusion. Nevertheless, Sahelian households, generally speaking, continue even today to set the highest priority on subsistence, using mainly family labour to fill their granaries, if possible, during each shortlived and fickle rainy season. This is the basis of economic security and the precondition for social reproduction, even as markets penetrate everyday aspects of life, monetising not only material goods but social transactions such as the exchange of labour, and natural resources such as land and fodder.

Then came drought: up to seven years of rainfall below the average, culminating in regional crop failures in 1972 and 1973, the decimation of livestock holdings, the abandonment of settlements, the displacement of pastoral groups, accelerated migrations, and changes in natural habitats, such as the succession of annual grasses in place of perennials, and the reactivation of sand-dunes previously under vegetation. Up to six million people were said to be threatened with starvation. Productive systems were said to have ‘collapsed’ or ‘broken down’. It was ‘the quintessence of a major environmental emergency’ (Raynaut et al., 1997:1). Compulsory resettlement was advocated, as it was believed that whole ecozones were incapable of supporting such populations again; indeed, they were diagnosed, in a post hoc scientific rationalisation, to have already exceeded their ‘carrying capacity’ several years before. Proposals were brought forward for planting a barrier of millions of trees along the southern boundary of the Sahara to stop its further advance; or to zone land use

Plate 1.1 Preparing groundnut ridges in the early rains on the annually cultivated fields of the Kano Close-Settled Zone near Tumbau.
into areas suitable for livestock breeding, stock fattening and crop production, which would have had draconian implications for rural Sahelians.

The Sahel Drought brought an international identity to a biogeographical zone, seemingly marked out from the rest of Africa, threatened by natural disaster and brimming with human misery. In a growing literature on environmental crises, the Sahel had a privileged, if unenviable place. The grounds of its distinctiveness shifted, however, from those of ecology or rainfall to that of a geopolitical entity, a region whose chronic poverty and dependency on food aid came to define the terms of its engagement with the rest of the world (Somerville, 1986). To foster the flow of aid, coordinate the requests of its member countries and maintain the political links that were necessary, the CILSS (Comité permanent Inter-état de Lutte contre la Sécheresse dans le Sahel) and the Club du Sahel were set up in West Africa and Europe respectively. Increasingly, the membership of the CILSS (which was composed of the formerly French colonial territories now Senegal, Mauritania, Mali, Burkina Faso, Niger and Chad) came to define public perceptions of the region, and even those of the international scientific community. In this book, we use a biogeographical definition, including a substantial portion of northern Nigeria and smaller portions of north Cameroon and Ghana.

Scientists settled down to analyse and debate the causes of the disaster, quickly exposing a divergence between, on the one hand, a view which saw in it

Plate 1.2 Product of smallholders’ labour: half a million tons of groundnuts await export in the Kano ‘pyramids’ of 1967.
the consequences of rainfall failure—and, as became more clear with the passage of time, a quasi-permanent decline in average rainfall—and, on the other, a view which saw its roots in colonial export agriculture and structural change. The first view led naturally to a negative evaluation of what were seen to be the consequences of uncontrolled population growth: the ‘inappropriate’ land use practices of overcultivation, overgrazing and deforestation. The second view placed the blame for these forms of degradation squarely on export agriculture which, driven by monetary taxation, coercive production and the monetisation of the economy, weakened self-sufficiency and economic autonomy in rural communities and made them vulnerable to depressed prices. The first view was given expression in the Plan of Action to Combat Desertification which was approved by the United Nations Conference on Desertification in 1977, proposing mainly technical interventions which, by and large, had a disappointingly small impact on incomes and welfare in the Sahel (United Nations, 1977; Sinclair and Fryxell, 1985; Swift, 1996; Warren, 1996). The second view, inspired initially by Marxist interpretations of economic change (Copans, 1983; Watts, 1983, 1984), also failed to produce solutions. Both are now generally agreed to have placed too much reliance on simplistic and generalised hypotheses of ecological change. By contrast, more recent research shows hitherto unsuspected ambivalences in processes of ecological change, and has begun to uncover the enormous diversity and complexity of Sahelian production systems and their interactions.

Another major drought cycle occurred in the early 1980s, renewed uncertainty in the rainfall returned (with El Niño) in 1996–1997, and there is general agreement that mean rainfall has declined by as much as one-third in some areas of the Sahel since the 1960s (Hulme, 1992). Many failures among development projects and programmes meanwhile forced a reevaluation of perceptions of degradation (Nelson, 1988) and of orthodox technical approaches to containing the ‘Sahel problem’. A recent review of activities managed by the World Bank, for example, led to the conclusion that

the traditional dryland management projects supported by the Bank and other donors have had mixed success, and call for a ‘new’ approach signified by a more profound understanding of the rationality of traditional [sic] practices, greater reliance on local community institutions, more open-ended and flexible programs, greater participation of all stakeholders in shaping the interventions, and the provision of an enabling environment that provides market-driven incentives for change.

(Bojö and Chee, 1997:v)

Yet notwithstanding such failures, the Sahel has produced some surprises. Population growth rates have been maintained, if more slowly than in the humid zone, nevertheless at about 2 per cent per year (IUCN, 1989). Food sufficiency in most years, and in most countries, has recovered. Between 1980 and 1990, food
imports fell from 21 to 14 per cent of consumption in the region, and food production increased in all the countries of the CILSS except for the Gambia and Cape Verde (Cour, 1994); though following poor rainfall in 1995–1996, the situation has deteriorated, at least in Niger (Club du Sahel, 1998). Some areas have dramatically increased their output of food crops for internal markets. Lowlands where irrigation, or flood-recession farming, is possible have received increased investment from small farmers (Kimmage, 1991a; Adams, 1992; Kimmage and Adams, 1992; Hollis et al., 1993). Live-stock holdings recovered quite quickly (in four to six years) after major periods of drought-induced mortality. Numbers have increased in some areas, such as southern Mali from 1982 to 1993 (Bade et al., 1997:4), and northern Nigeria (RIM, 1992), where there has been a significant shift from cattle to small ruminants (de Leeuw et al., 1996). The density of livestock has been found, in aerial surveys, to correlate quite specifically with population density, contrary to expectations (Bourn and Wint, 1994). Notwithstanding rapid urbanisation (within as well as outside the Sahel), rural population densities have continued to increase, notably in the hinterlands of major cities, where there is now evidence of significant intensification in smallholder farming (Snrech et al., 1994). This intensification, however, is not of the type promoted by the cotton corporations and agricultural development programmes, namely dependent on the use of inorganic fertilisers, but is dependent primarily on the use of organic manure and additional labour per hectare.

The geopolitical definition of the Sahel as a group of formerly French colonies is at variance with the ecological reality of a ‘greater Sahel’ which includes a vast and populous area in northern Nigeria (Chapter 1), where more ambivalent diagnoses, and scenarios for the future, have been offered. Indeed a ‘present trends scenario’ for the Sahel as a whole has been challenged (Giri, 1988). Dryland Africa as a whole, and the Sahel in particular, have been repeatedly portrayed in international literature as places where production systems have failed to achieve sustainability, where human over-use of nature has caused degradation, where population growth and drought threaten a Malthusian crisis, and where development interventions have themselves struggled and failed to yield sustained benefits (Commins et al., 1986; Watts, 1989; Morgan and Solarz, 1994). In the Sahel, crises of environment, development intervention and governance seem to vie with each other in the severity of the threat they are claimed to offer to prospects for sustainable development (Adams, 1990). However, in fact both agricultural and pastoral systems have proved surprisingly resilient in the Sahel, and their productivity has been sustained to a remarkable degree.

The ‘Sahel problem’ remains a transnational issue, though institutional responses at the national level (erosion control, afforestation, agricultural and other development programmes) have dominated efforts to solve it. Whether at the local, national or international level, many interests besides those of farmers and stockraisers (bureaucracies, businesses, donors, researchers) are implicated
in what are, in effect, prolonged environmental negotiations (Mortimore, 1993c). Nevertheless, ‘desertification’ was not included in the original agenda for the Rio Earth Summit (1992). Debates about sustainable development, there and at other international fora, have been extensive (Chattergee and Finger, 1994; McCormick, 1992). After the Earth Summit, the International Convention to Combat Desertification has revived official anxiety, and the preparation of national action plans is receiving donor assistance in several Sahelian countries. Thus far, they have had little impact on the attempts of Sahelian producers to achieve sustainable livelihoods and to maintain the sustainability of their environmental management, or on outsiders’ understanding of their success (or failure) in doing so.

In the study of pastoral production in African arid environments, a revolution has meanwhile occurred in the way in which livestock management and grazing practice are understood. It is now widely agreed that in such variable environments, where rainfall and pasture resources are both temporally and spatially unpredictable, the rationale of indigenous herding is opportunistic, rather than being based on the minimal supporting capacities of pastures; and furthermore that this is the most efficient way of using such resources to support the multipurpose herds required for maintaining pastoral families (Sandford, 1983; Behnke and Scoones, 1991; Behnke et al., 1993; Scoones, 1994). In other words, it is better to take advantage of good years by building up the herds through breeding, even though when bad years come, heavy losses must be sustained. It is not very useful, therefore, to speak of ‘carrying capacities’ of rangeland, as they vary from year to year. Neither is it helpful to perceive of ecosystems as equilibrial in nature when, in fact, they sustain enormous shocks from year to year (Ellis and Swift, 1988). Rather their ability to sustain themselves under variable rainfall (disequilibrium) behaviour testifies to their resilience.

In the era of the El Niño oscillation of the 1990s, with its worldwide repercussions on weather, disequilibrium is not a surprising idea. Holling (1973), who first defined the ‘unstable but resilient’ ecosystem, later showed that when the time-frame is lengthened, any ecosystem may be vulnerable to extreme or ‘surprise’ events, whether they emanate from outside or within the system, as ‘accidents waiting to happen’ (1987). Disequilibrium has entered debates on the management of natural forests and parks, such as Yellowstone.

For farmers, risk taking is also a way of life (Mortimore, 1998). Every year the seed is sown, and much back-wearying labour expended, for a probability of return that would be so low as to discourage many a farmer in a more temperate clime. Food security depends on accumulating reserves against harvest failure, and on swift adaptations to changing conditions. With hindsight, it is now apparent that the disaster that took the world by storm in 1972–1974 was not unprecedented, and that Sahelian farming systems contain in-built risk compensating mechanisms. Many of the surprises sprung by the Sahelians after 1974 are attributable to these resources. They include, of course, access to the employment and trading
opportunities referred to above, both in Sahelian towns and outside the region. Today, in many areas of the Sahel, more people maintain a hold on livelihoods, at greater population and livestock densities, than before the drought of 1974.

These realities suggest that there is much to be learned from a better understanding of Sahelian production systems. The diversity of these systems, which is becoming more and more apparent, discourages generalisation of the kind which has misled in the past. Raynaut (1997) and his collaborators have provided a painstaking documentation of this diversity. We agree that a priority is to identify representative types of system, on the basis of case studies analysed in some depth. Such studies can achieve several things. They can provide an understanding of the natural complexity which African smallholders learn—by inherited, collective and individual experience—to manage. They show how natural resources are ‘socially constructed’ out of the knowledge and capabilities of indigenous peoples, using in an incremental way new technologies that are useful to them, rather than being brought into existence through the technical assessments of outsiders. If continued over a period of several years, and set in their context of longer term environmental change, case studies can put present practice into time perspective—a perspective which approaches that of rural families. They can also help focus attention on the capabilities (as well as the incapacities) of productive systems—their adaptability, flexibility and sustainability under present conditions of change (Mortimore, 1989; Adams and Mortimore, 1997).

Most intriguing of all, case studies provide a method for putting the hypothesis of a Sahel crisis to the test. For this is incumbent on us. For a quarter of a century, a diagnostic paradigm of environmental and developmental crisis has been accepted in scientific and policy debate about the Sahel with little question. It is now clear that it began its course on the basis of highly debatable (if not wrong) assumptions and predictions. Evidence for degradation there certainly is, but its interpretation is often ambiguous and its dimensions disputed (Warren, 1996). The processes involved have been oversimplified (Leach and Mearns, 1996b). Furthermore, its power has been linked to the scale of analysis. Degradational scenarios depend heavily (though not exclusively) on global or regional assessments or projections (Warren and Khogali, 1991). It is often a subject of comment that studies at the micro-scale tend to lead to less alarming perceptions of ecological change. While problems are acknowledged by smallholders, they are very often not the problems which environmental science wishes to highlight. What is the reason for such incongruities?

Poor families have to manage their constraints—of labour time and energy, of soil fertility, of livestock, of biodiversity, of livelihood options, and above all, of rainfall—if they are to survive (Netting, 1993; Mortimore, 1989, 1998). In their modes of management there is much wisdom, as is evidenced by the simple fact of their survival in such challenging circumstances (and in particular, during the past 25 years). There are also many failures, and the reasons for these need to be understood. We confess ourselves to be fascinated by the exercise of these skills,
by people who have too often been dismissed as agents of ‘indiscriminate’ deforestation, nutrient mining or other environmental sins. We therefore sought to devise an empirical approach for uncovering some of this behaviour in small numbers of households in several widely different communities in the Nigerian Sahel. It is clear that the management of natural resources must deal effectively with both the variability of the rainfall and the ever-increasing density of the rural population (which translates into an intensifying scarcity of land, whether for cultivation or grazing). These forms of adaptation are therefore uppermost in our research design.

In the next chapter we shall sketch the conceptual basis of the present study, using a model of constraints and responses in which diversity, flexibility and adaptability are posited as critical attributes of successful Sahelian systems of resource management. A central place in this scheme is taken by labour, which, as it is related to historical population growth, tends to substitute land for labour as the most limiting factor. The method of this study is then described. We shall then introduce our four village communities and their natural environments (Chapter 3). In Chapter 4 we examine the ultimate cause of much environmental variability in the Sahel: the rainfall and its characteristics. Data from the four villages are used to show how farmers manage this variability. In Chapter 5, we investigate how farmers manage their biological resources, and in particular, crop and non-crop biodiversity, maintain soil fertility and transform the landscape. Chapter 6 is a systematic investigation of the evidence for agricultural intensification, in space and in time. In Chapter 7 we will examine the diversification of household income activity from crop production through livestock to off-farm activities and distant places. In Chapter 8 we show how gender, age and the division of labour interact, and how women and children make essential contributions to household viability. In Chapter 9 we look at the forms of differentiation between households, and try to define poverty in a rural Sahelian context. Finally, in Chapter 10, we place our findings in a broader policy context.

The Sahel

As we have suggested, the Sahel is a diverse, unpredictable and harsh environment in which to pursue a livelihood, if judged by living standards which westerners (and many other Africans) have come to take for granted. These characteristics also severely limit the scope of the economic and technical assistance which governments and other agencies can provide. It is imperative to understand as far as possible the indigenous experience, knowledge and skills whereby the natural resources are managed.

Sahelian ecosystems differ from those of humid and sub-humid Africa not only in the quantified variables such as rainfall and temperature but also in the intensity of the adaptive challenge which they pose for their human communities. In seeking an understanding of the day-to-day decisions made by
small farmers and stockowners in the Sahel, the unpredictability of the rainfall (variability), and the scarcity of it (aridity), dominate.

The Sahel is a zone of grassland, scrub and thorny bush lying between the Sahara Desert and the wetter savannas to the south (Grove, 1978). The term has come to include, however, the semi-arid Sudanian savanna woodlands, which once formed a continuous zone to the south of the Sahel proper. The single short rainy season decreases in length from south to north. In the south, the rains can arrive as early as May and end as late as October; in the north they may not arrive until July and yet end in September. A lengthening dry season provides Koechlin (1997) with a basis for identifying four bioclimatic sub-zones from northern Sudan to sub-desert (Table 1.1).

Average rainfall, however, is a poor predictor of actual precipitation as it is subject to a coefficient of variation of 25–30 per cent. Older people can recall several calamitous failures of the rainfall during their own lifetimes.

The limitations of averages are well known. Variability occurs on four different dimensions, all critically important for farming (if not always for livestock) operations: (1) average rainfall varies over space, from south-west to north-east, as it does throughout the Sahel, predisposing ecosystems to certain crops and varieties; (2) actual rainfall varies in space over quite a short range, even between different plots farmed by the same family, as the distribution of showers is unpredictable (an intensive shower may, furthermore, contain quite a large proportion of the year’s rainfall); (3) total annual rainfall varies from year to year (coefficients of variability reach over 30 per cent in the Sahel), dramatically changing the conditions for plant growth; and (4) rainfall is distributed very unevenly during a single season, so that a satisfactory total may nevertheless be poorly timed with regard to the growth cycle of plants, for example, when a sharp drought occurs during early growth, or in the grain-filling phase.

The designation, Sahel, tends to mask the diversity found within the region. In fact, it is spatially quite heterogeneous, and the complex interactions of society with environment demand a closer engagement than many studies have so far achieved achieved (Raynaut et al., 1997). At the micro-scale, diversity in the ecosystems is matched by diversity in agricultural practice and this in turn is linked to diversity among households (Piters, 1995). Diversity is also found in the economic strategies of households, migration, and the way these have an impact on women (David et al., 1995). It is a major finding of our own study.

The area of north-east Nigeria which is the subject of this book is properly a part of the Sahel. It contains, in the Kano Close-Settled Zone, higher population densities than any of the CILSS member countries, but it faces a similar range of environmental problems. It is regarded, both by the Nigerian Government and by aid donors, as a region facing environmental degradation (having the European Community funded North East Arid Zone Development Programme), and has suffered a decline in annual rainfall, which, if averaged over the years 1961–1990, amounted to 8 mm per year (Hess et al., 1995).
We hope, therefore, to reintegrate northern Nigerian experience into a debate which has been largely preoccupied with the francophone Sahel, on which there is a large and specialised literature covering many aspects of development policy and practice, founded in a substantial number of empirical studies. The relatively scanty Nigerian literature lacks the strong thematic focus of this corpus on Sahelian agricultural development, much of it sponsored in recent years by the Centre de Cooperation Internationale en Recherche Agronomique pour le Développement at Montpellier (for example, Bosc et al., 1990, 1992). Perhaps because of this, and the special conditions affecting northern Nigeria’s political

<table>
<thead>
<tr>
<th>Sector</th>
<th>Annual Rainfall (mm)</th>
<th>Dry Season length</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-desert sector</td>
<td>200–250</td>
<td>10 months or more</td>
<td>Dry steppe</td>
</tr>
<tr>
<td>Sahelian sector</td>
<td>250–550</td>
<td>8–10 months</td>
<td>Transitional steppe/ savanna</td>
</tr>
<tr>
<td>Sub-Sahelian sector</td>
<td>550–750</td>
<td>7–8 months</td>
<td></td>
</tr>
<tr>
<td>Northern Sudanian sector</td>
<td>750–1000</td>
<td>6–7 months</td>
<td>Sudan savanna</td>
</tr>
</tbody>
</table>

*Source:* Koechlin (1997)

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**Population density and farming systems**

In sub-Saharan Africa, population densities were, until recently, low by comparison with those of Europe and South or East Asia, except in some important but relatively small areas. The reasons for this state of affairs, in the continent where *Homo sapiens* originated and multiplied for millennia, and where evidence for culture is extremely old, are still imperfectly understood. They may have something to do with the special characteristics of African ecosystems, with the widespread occurrence of potentially negative factors such as aridity, variable rainfall, a scarcity of surface water, acid soils, and insect or parasite populations that are hostile to the health of humans or domestic animals. Whatever their explanation, the historical outcome of these low densities was that labour was (and in many places continues to be) the most limiting factor of agricultural production. Rural Africans struggled for millennia to evolve strategies for subsistence and environmental management that were effective with low labour inputs (Iliffe, 1995).

Economic history was centred on the reproduction, social control and productive management of labour, in order to harvest natural or husbanded wealth from the vast resources of land, water and natural vegetation. Many scholars have recognised that labour scarcity acted as an historical constraint on the creation of wealth in Africa. It was only when, in particular circumstances of history and geography, the productive capacity of labour could be concentrated under the control of a political hegemony, or into a small area, that this constraint could be broken. For example, the ancient kingdoms of Ghana, Timbuktu, Songhai and Kanem-Bornu achieved shortlived wealth through the political control of primary production and trade in extensive areas; at other times and places, dense rural populations grew up under the protection of centralised rule, for example, in the Hausa emirates, under the powerful chieftaincies of Yorubaland, or (paradoxically) under acephalous political organisation among the Igbo (Connah, 1988; Iliffe, 1995).

According to an indigenous view, growth in the population could only be a blessing, whether at the level of the household, the community or the state. More people meant more crop production, more time for tending livestock, and more opportunities for diversifying activities outside primary production. Non-agricultural communities, dependent on hunting and gathering from the natural ecosystem, had cause to control their own reproduction, unless territorial expansion was possible. Nomadic pastoralists, whose herds were found, in years of drought, to exceed the supply of fodder and browse, had to ‘slough off’ refugees to neighbouring regions whence agricultural expansion had excluded them. But for crop producing communities, a demographic strategy of high fertility was a necessary condition for escaping the bondage of underpopulation, as theorised by Boserup (1965, 1990).
In other continents, technological revolutions in agriculture substituted capital for labour on an increasing scale, after 1750 in Europe, and since 1945 in many south and east Asian countries. Productivity came to depend, to an increasing extent, on capital investment. The application of capital to agriculture released (or expelled) a majority of the population to feed urbanisation on a grand scale. Ploughing and carting with animal energy are, of course, much older than this; but with the major exceptions of Ethiopia and South Africa, sub-Saharan Africa was affected little by them until after 1945, and even today, change is slow and uneven (Pingali et al., 1987; McIntire et al., 1992). Paradoxically, the use of animal energy makes the fastest progress where population densities are high or rising. The introduction of fossil energy to replace labour, outside enclaves of commercial farming, is conspicuously slow.

In most countries of sub-Saharan Africa, therefore, agricultural capitalisation has lagged significantly behind the rest of the world. In all but a very few of them, more than half the population (and in some, more than three-quarters) live in rural areas and practise some forms of primary production (farming, livestock husbandry, fishing, hunting or collecting). In these productive systems, even where some mechanisation has occurred, labour continues to be the key to productivity, and most of this labour continues to be family labour. The social institutions whereby this labour is controlled and managed continue to determine the distribution of benefits from agriculture, even in rapidly evolving systems where market crops are grown (Berry, 1989).

Changes

There have been some fundamental changes in the relationships between population, labour and natural resources. First, improvements in public health, coupled with some advances in incomes, welfare and diet, have brought about a fall in mortality rates and an increase in the rates of natural population growth during the second half of the twentieth century. However, rather than reduce their fertility, households in sub-Saharan Africa have embraced the larger family with enthusiasm, seeing in it their opportunity to increase the number of workers and diversify the sources of income for the household. Only in the last few years have falling levels of fertility been highlighted in the literature (Blacker, 1993; Gould and Brown, 1996).

Second, increasing numbers of claimants to land and other natural resources have raised labour to land ratios to levels (in places) which were previously unknown, and the demands they make on soil fertility, biomass, faunal populations and surface or groundwater are believed by many to compromise the renewability of these resources, at least in the medium term (Turner et al., 1993).
Third, some pre-colonial institutions of social control have been eroded, as the autonomy of the individual vis-à-vis the household, and of the household vis-à-vis the community has been strengthened, having negative implications for the use of collective labour and the management of common property resources.

Fourth, urbanisation and the growth of markets, which have both gathered increasing momentum during the last two decades, together with improvements in transport infrastructures and in the real costs of travel, have widened the economic opportunities available and the geographical horizons that can be exploited by rural individuals (Snrech et al., 1994).

Given such far-reaching changes, what is the position, as we approach the centenary of colonial intervention in much of Africa, of the rural household? How does it manage its endowment of resources—natural, economic, technological and social? In particular, what is the position of labour in the strategic and tactical (short-term) choices made by households as they confront the many challenges facing them? How far have increased numbers of people per hectare provided an opportunity for productive transformations of natural landscapes or for enhanced livelihoods for rural households, and to what extent have they induced degradational trends or impoverishment? Our transect allows us an opportunity to look at these themes at a micro-scale, and longitudinal analysis will permit them to be understood in a time perspective.

The thesis of this book is that, on the basis of the evidence analysed here, the ‘Sahelian crisis’ of degradation can be contained, and that in doing so, the resources of rural communities themselves will play a much larger part than is usually assumed. Pre-eminent among these resources is the labour provided by a growing population which, in drawing on a wealth of indigenous technical experience and the best of introduced practices, can create, through an incremental and ‘indigenous’ intensification of agriculture, more sustainable production systems. Gradualist rather than transformational expectations should therefore underpin the policies of governments and donors, policies which need to be founded both on an improved understanding of the diversity and the dynamics of primary production systems, and on a recognition of the need for unimpeded economic integration between the Sahel and West Africa as a whole.
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