NATURAL RESOURCES SYSTEMS PROGRAMME

PROJECT REPORT[1]

DFID Project Number

R8258

Report Title

Informing the policy process: Decentralisation and environmental democracy in Ghana. Scientific report.

Annex A of the Final Technical Report of project R8258.

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Date

2006

NRSP Production System

Forest Agriculture Interface

[1] This document is an output from projects funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

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1. INTRODUCTION

This study is concerned with environmental management at the interface between government and rural communities in a district setting in Ghana. This interface occurs at the level of local government, since in Ghana, most government agencies are incorporated in some form or other into the structure of district administration. The study focuses on the use of information in policy formulation and planning and the use of information within the institutions of local administration. It examines the ways in which information is institutionalised, assimilated and communicated at the district level between officials and citizens, and between the district and the national levels. It investigates the relationship between information and planning: the types of information that are used in planning; and the extent to which evidence, dialogue and consensus form part of policy planning. Planning is closely related to the capacity to generate and use information. Without a policy and strategy on information, it becomes difficult for information to be used in policy planning in a methodical and structured fashion. The relationship between planning and information is critical for more responsive natural resource management.

Information systems refer to the ways in which information is recorded, managed and communicated. Information can arise in a number of ways. It can arise out of a process of dialogue and consultation in which it takes the form of a two way (forward and backward) communication between different hierarchically organised policy levels. It can also take the form of a one way communication of prescriptions to be adopted by the recipients of the information. In the context of decentralisation, information can be used to construct dialogue between local government actors and rural interest groups as a means of building consensus and policies that meet the needs of the majority of rural constituents. The exchange of information in this context promotes appropriate and sensitive policies which gain a large rural support base and backing. However, it often requires considerable time and technical competence to build this type of forum, and requires a well developed transport and communication infrastructure to facilitate backwards and forwards communication. The corollary of this is the development of policies that seek to impose decisions on rural people with minimal participation from them, which may have major implications for their livelihoods. Rural people are often encouraged to comply with policies defined by external experts and central government. The danger here is that policy prescriptions may not reflect the complexity of local conditions and end up alienating rural people from development initiatives.

This work is mainly based on case studies of environmental management policy initiatives in a single district. However, we attempt to link the policy processes within the district to national policy processes. Therefore, a study was also carried out at the national level of perceptions of natural resource issues among national level policy makers. The objective of the national level study was to explore the extent of national sensitivities to issues arising in the districts and rural areas. This examined the extent to which policy makers have access to specific data from rural areas, or choose to build their perceptions on what may be termed “conventional wisdom”, assumptions based on preconceived notions of rural conditions. The study assesses the extent of flows of information and feedback on natural resource issues from the local level to policy makers and the perceptions of national-level policy makers of information flows.

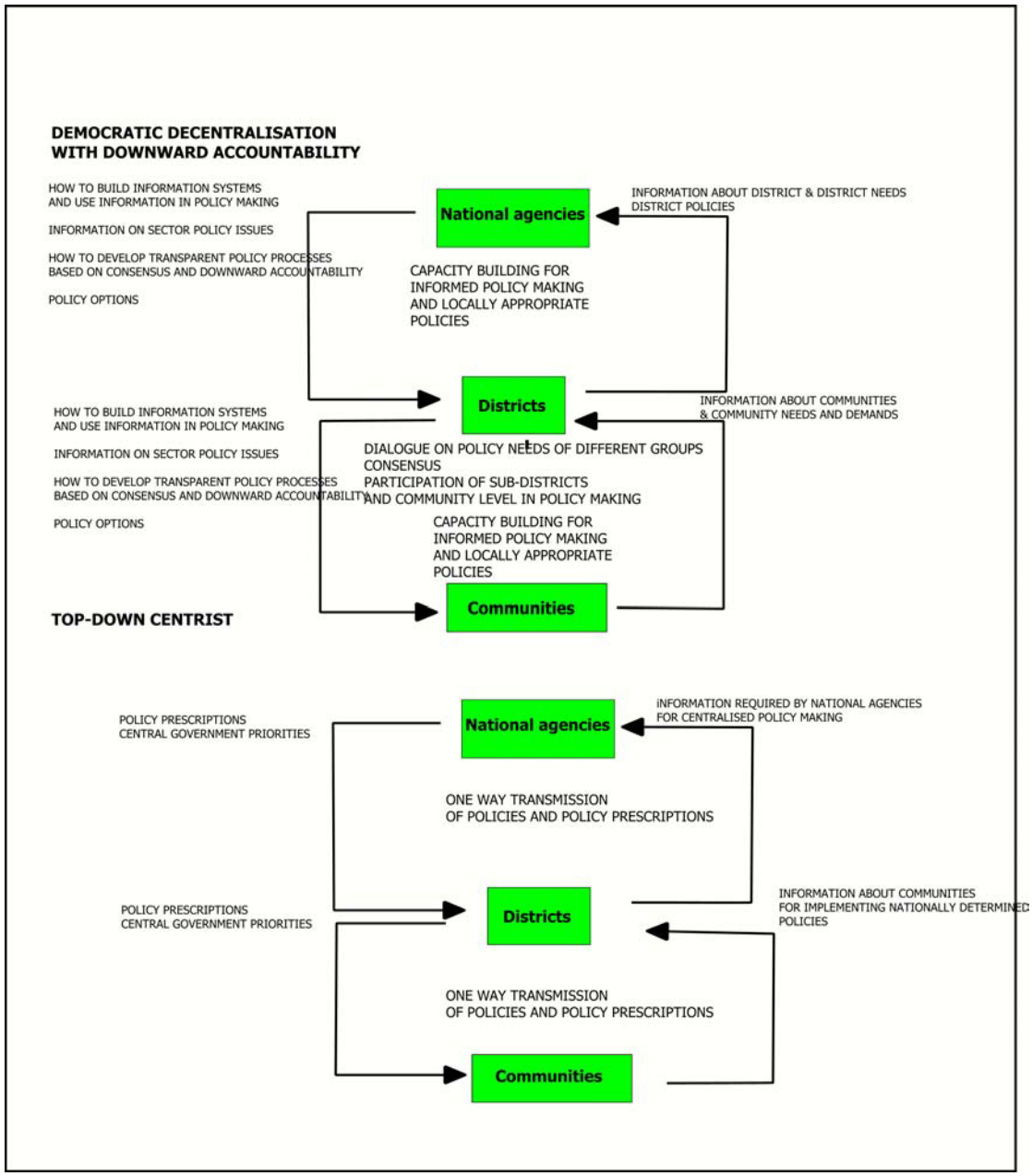


Figure 1.1 The role of information in national policy structures

Where national policies are informed by feedback, evidence and consensus the national level is more likely to demand information and empirical evidence from the district level and build the capacities of lower level administrative units to collect, manage and communicate information. Where policies are largely based on over-centralised planning, dogmatic prescriptions are more likely to be transmitted down the administrative hierarchy with little demand for feedback. Over-centralised planning processes at the national level will also translate into top-down planning processes at district level with little downward accountability or attempt to create transparent planning processes which are justified by evidence and data. Thus, the communication of information is closely related to planning processes.

The study of information flows should reveal constraints in development planning. Conversely, particular sets of interventions that enhance the communication of information should result in improved planning processes or reveal institutional constraints and bottlenecks. The study of the generation, use and attitude to information in development planning should reveal institutional and structural constraints in planning processes which prevent the emergence of policies that meet the needs of the vast majority of rural people. Where information systems fail to develop feedback or to reflect the conditions that exist within specific localities, policies will be characterised by a lack of attention to the aspirations of local people and local-level developments. They will fail to harness the available human resources and capabilities within rural areas and they will result in development priorities that alienate a large part of the rural population.

The Kintampo Districts

The study is based on what was known as the Kintampo district when research commenced. However, not long before the general election of December 1995 the Kintampo district was officially divided into two new districts, Kintampo North and Kintampo South. While most of the research was conducted in Kintampo North, some of the communities in which research was carried out fell into Kintampo South.

The Kintampo area is situated in the centre of Ghana in the northern part of the forest transition zone of Ghana. The dominant vegetation is characterised by savanna parkland, with dense and numerous small trees, which do not form a closed canopy, interspersed with grassland. The vegetation is characterised by mosaic formations, in which dry semi-deciduous high forest species may occur in gallery forests along watercourses, and dry savanna woodland interspersed with grassland patches dominated by *Andropogon* species occur on the slopes. This makes for complex natural vegetation patterns. The grassland mosaics are often erroneously viewed as the product of land degradation or deforestation. Since the early twentieth century there have been many controversies about the extent to which this environment is natural or derived savanna, resulting from the impact of human cultivation.

The population density of Brong Ahafo lies at about 45 people per km^2 which is low in comparison with other areas in Ghana and well below the national average. Brong Ahafo has the third lowest regional population density in Ghana (see table 1). Within the Brong Ahafo region the population is unevenly distributed. The areas to the south, in thicker forests, tend to have higher population densities than the northern transitional zone. In the 1994/6 period, the Asunafo district had a population density of 78 people per sq km, the Jaman district had a population density of 64 people per sq km and the Kintampo district had a very low population density of 19 people (Brong Ahafo Regional Co-ordinating Council 1996). Contrary to national environmental perceptions, population pressures on the land are low. Farmers are able to fallow land for long periods and fertile farmland is widely available.

Table 1.1 Population densities of regions in Ghana

Region	Total Population	Proportion Urban	Population Density
Western	1,924,577	36.3	80.5
Central	1,593,823	37.5	162.2
Greater Accra	2,905,726	87.7	895.5

Volta	1,635,421	27	79.5
Eastern	2,106,696	34.6	109.0
Ashanti	3,612,950	51.3	148.1
Brong Ahafo	**1,815,408**	**37.4**	**45.9**
Northern	1,820,806	26.6	25.9
Upper East	920,089	15.7	104.1
Upper West	576,583	17.5	31.2
All Regions	18,912,079	43.8	79.3

Source: 2000 Population and Housing Census, Ghana Statistical Services, 2002.

Table 1.2 Population density within Brong Ahafo for 1994/96

District	Total population	Area (km^2)	Proportion Urban	Population density
Dormaa	135506	1368.0	25.9	39.0
Asunafo	171539	2187.5	15.2	78.4
Asutifi	81292	15000.0	25.0	54.2
Jaman	115228	1300.0	28.5	64.0
Berekum	115157	1062.0	38.3	108.0
Sunyani	166911	2488.0	78.0	67.0
Tano	134255	1500.0	89.0	42.6
Wenchi	257989	7619.0	16.3	44.8
Techiman	143000	669.7	49.0	213.0
Nkoranza	127877	2300.0	28.5	55.6
Kintampo	**136000**	**3771.4**	**14.7**	**19.0**
Atebubu	141181	6720.0	40.0	21.0
Sene	111088	7071.4	.	7.0
Brong Ahafo	2948961	39557.0	32.6	44.0

Source: Brong Ahafo Regional Co-ordinating Council (1996) *Brong Ahafo Region Regionally Co-ordinated Development Programme of District Development Plans.*

Figure 1.2 The Kintampo districts of Ghana

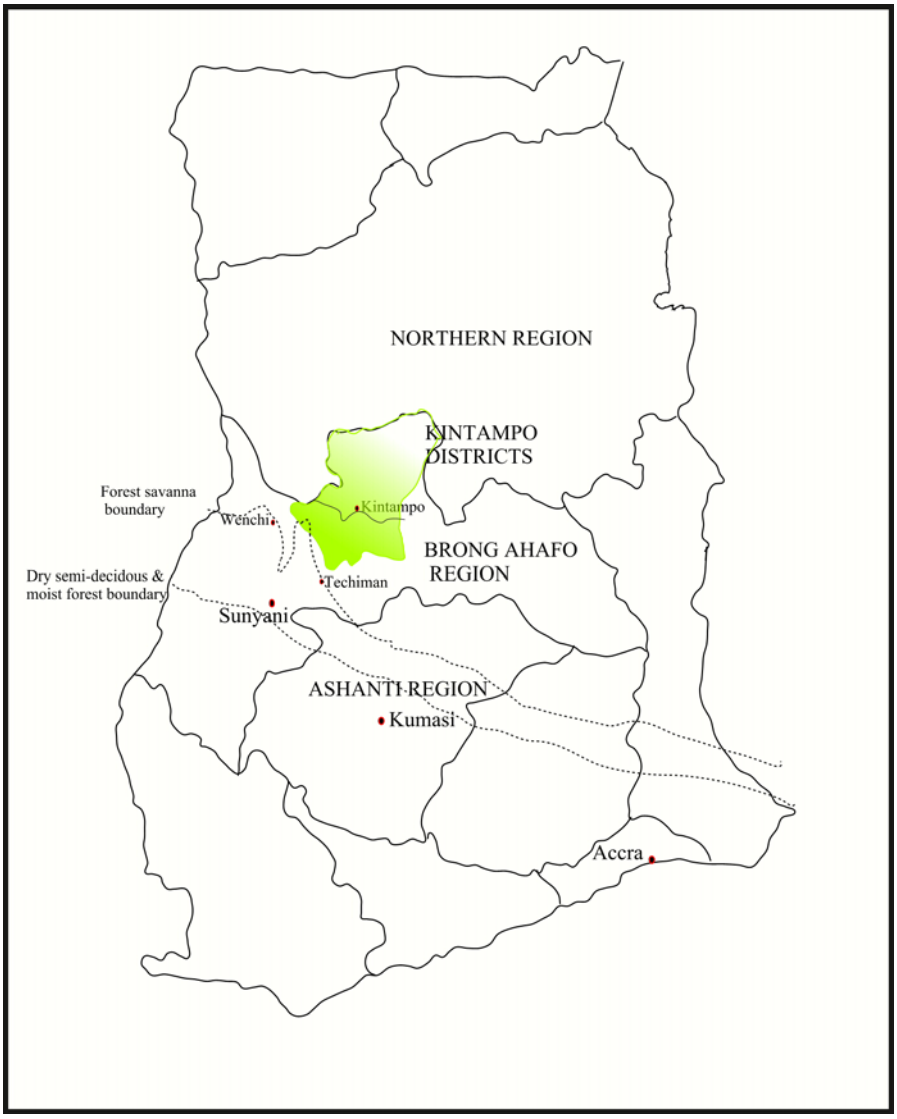
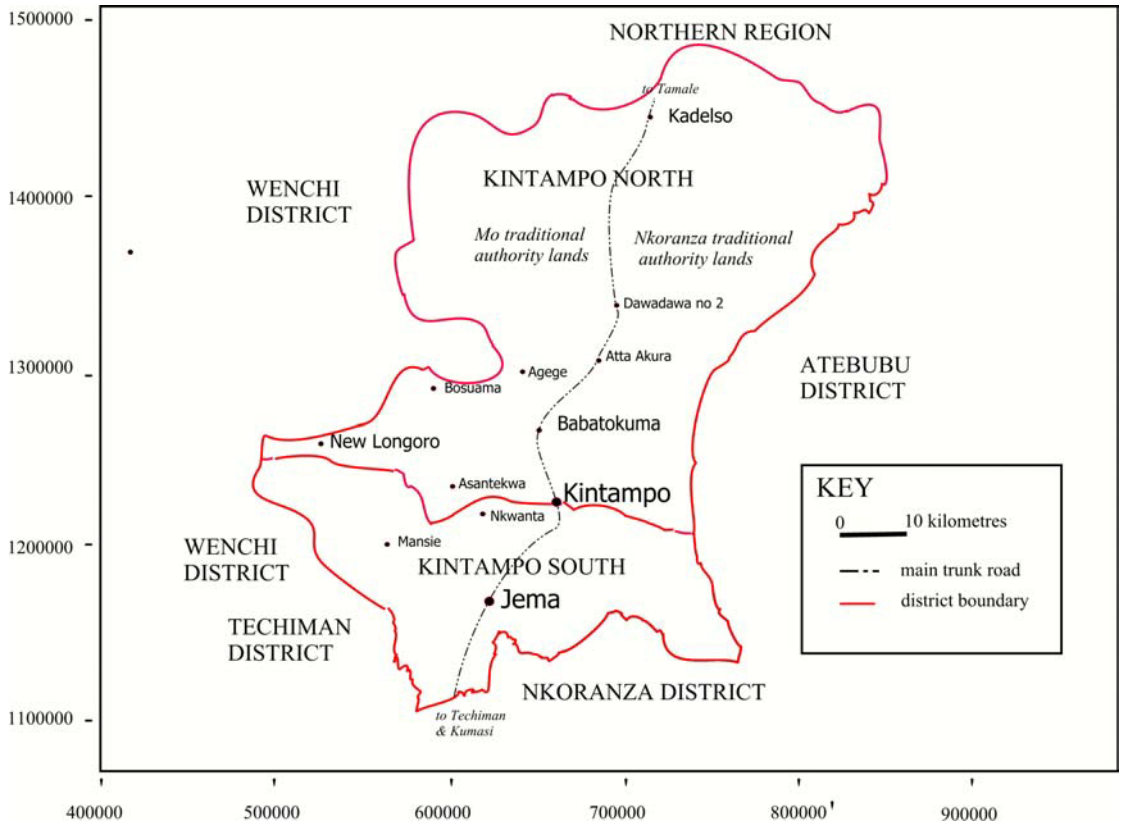


Figure 1.3 Settlements in the Kintampo districts



The availability of land has also encouraged migration of farmers into the northern transition zone of Brong Ahafo, particularly from the Upper West and Northern Regions. Migration is not necessarily the result of people moving from high population zones, since these two regions have lower population densities than Brong Ahafo. Factors encouraging migration, include the relatively better rainfall within the Kintampo district with bimodal rainfall, and conflicts over the political control of land in the northern region between Konkonba, Nanumba and Dagomba people which have resulted in many Konkonba farmers moving into the Kintampo district. As a result of migration the Kintampo districts are characterised by a heterogeneous population with many migrant farming communities. Some of these migrant communities are third and fourth generation communities. Migrations have a long history in the area. The town of Kintampo has a large section of Malian Dyula (Wangara) people, the descendants of the Malian settlement dating back to the 15th century in the Bono area.

The dominant autochthonous peoples consist of the Mo people who occupy the West of the district and the Bono (also known as Brong) people who occupy the West. The major Kintampo-Tamale road is the boundary which divides the Mo and Bono (Nkoranza) lands. After the road was built in the colonial period, many settlements developed along the road, on both sides of the road. This frequently means that the lands in the settlements fall under two different traditional authorities, with those one the western side falling under the Mo chieftaincy and those on the western side under the Nkoranza traditional authority. These chieftaincies coexist uneasily, each unable to establish hegemonic claims to control the major administrative town of Kintampo and the various other settlements located on the main trunk road. Although there are

generally good relations between the various ethnic groups, periodica violent conflicts break out as rival chieftaincies attempt to establish claims of control over contested lands and settlements. These uncertain claims exist because prior to colonial occupation the boundaries between these states were not clearly defined and contested. The states and people's of the area (since not all of them, were organised in states) were conquered by the Asante, but were engaged in wars of resistance, which often meant they retreated to areas outside of Asante control. The present state boundaries were largely created under colonial rule in a rather arbitrary fashion. For instance, the creation of the Northern Territories along the border of the Volta River, resulted in the Mo people being divided regionally, and new paramount chieftaincies were created, dividing the Mo that existed in the Northern Region from those that came under the Ashanti Region (now Brong Ahafo) to the south. Paramount chiefs were also invented and elaborated by many groups in the colonial period

The Brong Ahafo region is one of the most important food producing areas in Ghana. The market of Techiman is the largest wholesale market in Ghana. The major crops produced in Brong Ahafo include maize, vegetables, cowpea, yams, cassava, and groundnut. Charcoal is also an important farm commodity in the northern transition zone. The Kintampo area is an important producer of yams, groundnut and charcoal. Recently new plantation crops have been introduced including mango, cashew and teak, and a stratum of wealthy farmers have emerged (including migrants) who are investing within this sector and establishing medium to large estate farms. Although these plantation crops do not as yet contribute significantly to the wealth of the area, they are the main focus of agricultural policy, which promotes them as non traditional export crops. The major produce of the area receive little support from the agricultural services. The agricultural services are under-resourced and are little able to meet the needs of the vast majority of farmers within the Kintampo districts. The most important farm commodity within the Kintampo districts is charcoal, and this provides most of the revenues that are raised in the rural areas by the districts. Charcoal production receives little support or encouragement from the district authorities and charcoal producers are often maligned as one of the most serious perpetrators of environmental degradation. There have been moves in the past to ban charcoal production within the district, and chiefs are allowed to ban charcoal in their settlements. In several settlements chiefs have banned charcoal production.

Land tenure and land administration

Land in Brong Ahafo is controlled by chiefs and family heads. However, in practice it is controlled by traditional authorities with tacit support from the state. The present arrangement is largely the product of recent political history. Prior to independence the lands of Brong Ahafo came under Ashanti. In the political struggles following independence, in which the Convention People's Party perceived the chiefs in Ashanti as being hostile to their interests and in support of the main opposition party. Many interest groups among the Bono and other people within the area expressed interests in exerting their own independence from Asante domination. As a consequence, the new region of Brong Ahafo was created. The lands in this region were vested in the state to manage on behalf of the chiefs. As a result of this arrangement the administration of land is carried out by an alliance of chiefs and state organisations. The Office of the Administration of Stool Land is involved in the collection of annual land rents from migrant farmers and these are shared as royalties between local government and chiefs. The Office of the Administrator of Stool Lands takes 10

percent of the revenues for administrative purposes and the remaining revenues are shared between the local landowning traditional authority (stool) who gain 25 percent of royalties, the paramount traditional authority of the area take 20 percent of the royalties and the District assemblies gain 55 percent. However, in their search for land and other natural resources, migrant farmers approach the chiefs or their caretakers and directly negotiate for the land. Any fees, "drink payments" and other customary fees are paid directly to the chiefs. These contractual arrangements are often not openly disclosed to the Office of the Administrator of Stool Lands or to other state organisations. In some circumstances both chiefs and the Office of the Administrator of Stool Lands independently collect revenues from farmers.

Within the Kintampo districts it is fairly easy for migrants to acquire lands. The cost of land is not particularly high in comparison with other areas. Sharecropping tenancies are not common, in contrast with the dry semi-deciduous forest areas to the south. In most instances lands are acquired for "token" annual payments after harvest during the traditional state annual festival. The Office of the Administrator of Stool Lands collects ¢50,000 annually from migrant farmers, involved in small scale food crop production. Large commercial farmers, mainly establishing timber, cashew and mango plantations, however, gain their lands on different conditions and are subject to an annual lease payment.

Local farmers, from the area, do not pay anything for their land. As locals they have rights to farmland based on clearance and management of fallow within a cycle of rotational bush fallowing. The dominant land tenure systems are based on a communal tenure system rather than on family lands, since land is readily available. Citizens have the right to clear land where other farmers are not farming and to manage fallow land within a cyclical system of fallow recuperation and cultivation. However, as the population increases this frequently gets transformed into a family land system, with younger farms soliciting farms from their parents and taking over the farming areas of deceased members. This is not because there is an overall shortage of farmland, but that the available farming land lies at some distance from the settlement.

When citizens wish to establish commercial tree plantations, they need to solicit permission from the chiefs, pay some customary fees, and register the land with the Office of the Administrator of Stool Lands as a lease. This is in recognition of the fact that the land is being removed from general circulation for a long term capital investment, which will bring significant profit to the individual farmer.

In the past there was a clear division of labour in which men specialised in yam and women in groundnuts. The men opened up new land for yam cultivation and made mounds in the new plots. After the yams were harvested they moved onto new land and their wives cultivated the old farm planting groundnuts. The main constraint for women to gain access to land was the labour involved in clearing a farm. In recent times, this division of labour has been breaking down as men add cassava, maize and groundnuts to their repertoire of crops. Increasingly they extend cultivation on their plots. As a result of this women can rely less on their husbands to provide them with land. Husbands frequently divide their old farms into two, retaining some portions for their cultivation of other crops and allocating the rest to their wives. This results in women experiencing more difficulty in getting access to land now than in the past, as agriculture becomes more commoditised. Women are sometimes forced to extend cultivation on the same plot of land over a number of years to make up for less land.

Other women are making their own farms rather than relying on their husbands, and hire labour to clear the land.

While local farmers have rights to farm land freely, other natural resources have become subject to political claims and control. Timber trees growing on farms are not recognised in state law as the property of the farmer who nurtures them, but are recognised to be the property of chiefs. They are vested in the state and its Forestry Service to manage on behalf of the chiefs and given out to concessionaires. The chiefs receive a portion of the stumpage fees as royalties. In off reserve areas this follows the same formula as that for Stool Lands revenues. Farmers have no rights to the timber trees on their land or to revenues from the exploitation of these trees. This is justified on the basis of customary arrangements, but these "customary" arrangements are modern and were created in the 1950s (Amanor, 1999).

Other natural resources are contested. When these resources become valuable, chiefs often claim rights to control them or revenues from them. However, local farmers claim rights to exploit the natural resources on their farms as a right of citizenship, and reject attempts by chiefs to extract revenues from them. Chiefs can only successfully gain revenues by given out permits for the exploitation of natural resources to migrants, without any rights to land or natural resources in the area. In the case of charcoal, as will become evident, this has led to many conflicts between local youth and chiefs. In some instances chiefs attempt to exert control over charcoal resources by introducing local byelaws that ban the production of charcoal. In some instances they have been encouraged by NGOs. Within some settlements in Kintampo, an NGO the Northern People's Empowerment Movement, which is largely based in the Mo settlements in the Northern Region, has encouraged chiefs to introduce bans against charcoal in return for gifts of livestock. These claims to extend ownership over resources by chiefs are giving tacit support by the state and local government, which rarely intervene to introduce checks and balances against the chiefs.

Decentralisation

A three tier structure of decentralisation exists in Ghana. This is based on regional coordinating units which a re responsible for coordinating the plans of districts within the 10 regions in Ghana; decentralised districts with democratically elected Assemblies that are responsible for developing policies and plans for the district; and sub-district Area Councils which are responsible for developing local plans and raising revenues from the area under their jurisdiction. The framework and legislation governing decentralisation provides for community participation in development planning and downward accountability. However, this is contradicted by central government's control over district plans. The process of central ratification of district plans and byelaws seriously compromises the ability of districts to plan according to their needs. District byelaws have to be submitted to the Attorney General's Office before they can be ratified and plans have to be approved by the Ministry of Local Government and Rural Development before they are implemented. Central government also appoints the District Chief Executives (DCEs) and one third of local councillors. The decentralised departments within the districts still tend to be nationally coordinated under their various sectors, and central directives compromise their ability to devise creative programmes which responds to the needs of the districts. Beyond collecting local revenues, the roles of the sub-district councils are

poorly developed, and the districts frequently are able to control the resources of the Area Councils, which are often used for district budgeting rather than released to the Area Councils in a timely fashion. While the Regional Coordinating Councils are responsible for enabling district capacity in planning, they are frequently under-resourced and serve as a conduit for transferring top-down prescriptions of central government to the districts.

In natural resource management the top-down nature of this structure often leads to the implementation of policies that are ill-suited to the district and poorly reflect prevailing conditions. For instance, natural resource policies within the Kintampo districts fail to take into consideration the very low population density within the district and the low pressure on natural resources. They portray a situation of crisis, resulting in resource depletion and the need to impose drastic regulation to control land degradation. Thus, shifting cultivation is portrayed as leading to soil exhaustion and deforestation within the district. Charcoal burning is also identified as a major cause of deforestation and from the late 1980s several initiatives have been taken by the district and chiefs to control and ban charcoal production. The presumption is that these two activities are poorly adapted to the growing population pressures within the district and create pressures on natural resources. However, in reality there are large areas within the districts that are not exploited or settled.

These two sectors, charcoal burning and yam farming under bush cultivation, form the central focus of this work. The study examines the groups involved in these two activities, their perceptions of their livelihoods and of government policies, and how information is used to construct policies within these two sectors in government institutions. The study also examines critically how environmental policies are constructed and implemented within districts. It examines ways of building up more democratic inclusive environmental policies based on deliberation and more informed use of data. It examines how innovatory systems of information collection can be created building on the close linkages between sub-district political structures and their interfaces with the communities and interest groups that make up their constituents.

Research Methodology

In the first generation of participatory research methodologies, the researchers were committed to soliciting the views of the local community and enabling the community to participate in the research. Chambers (1983) advocated that researchers draw upon the local knowledge within communities as a way of ensuring that projects were relevant to local people and that research could quickly inform policy makers of local needs, rather than having to wait for surveys to be analysed and written up by academics over a long time period.. A number of rapid survey methods were developed (e.g. Participatory Rural Appraisal) that enabled the researcher attempts to tap into the socio-cultural knowledge of the community and represent their needs directly to policy makers. This representation takes place outside of the national institutional structure of development, and is dependent upon the intervention of the researcher. In practice, problems emerge with the representation of the community in this approach, since it ignores power relations and social differentiation within the community. Far from being homogenous organisations, communities are made up of groups with conflicting interests and perspectives with different access to power. Frequently, the individuals who emerge as representatives are those who represent the

interests of the more privileged sectors within the community. A second problem is one of association; the community is defined by the researchers and their research interests. The researcher can easily impose their own interests on the community. Those sections of the community who are willing to cooperate with the researchers are identified as *the community*. When extended to development projects this form of participation results in the community of interest electing their own representatives and their representatives are empowered to extend the programme of the community of interest to the whole community, consisting of a settlement, groups of settlements or an administrative unit, many of whose inhabitants have not participated in any decisions concerning the project.

This has become evident with the mainstreaming of participation into government policy frameworks, such as in community forestry in Africa during the 1980s and 1990s. The rationalism for developing forestry agency community participation programmes is to win "community support" for government policies. Participation was constructed as obligation rather than as a right or as empowerment. Community forestry rarely involves a radical transformation of access and control of resources to communities. All too frequently it involves getting a section of the community to police forestry resources on behalf of the forestry service in return for access to benefits. This in effect divides the community into those who support government policies who become defined as the community, against those opposed to policies, who become defined as "free riders", or find their livelihood activities criminalised.

In Ghana, the 1994 Forest Policy[2] enshrines community participation as a central tenet of forestry policy. However, the Forest Policy also transformed management of off-reserve areas to the Forestry Service from the districts. In the same year the Forestry Commission introduced legislation banning the cutting of timber on farms with chainsaw. Chainsaw timber, an important livelihood activity for rural youth, became criminalised and farmers were not allowed to process timber on their own farms or sell it, which became the exclusive right of concessionaires. Following this the Forestry Service created Community Forestry Committees (CFCs) which were responsible for policing the boundaries of forest reserves and preventing illegal timber harvesting. This occurred at a period in which Forestry Guards were being retrenched and the services they performed were given out on contracts to the CFCs. In this case participation is clearly a contractual arrangement between sections of the community and the Forestry Service to carry out services which have been defined by the Forestry Service. The CFCs do not address issues of local empowerment or grievances against forest laws. Thus, the local 'community' emerges as an identity constructed from political interests and alliances.

A similar problem lies in the construction of community participation within the framework for sustainable development articulated by the World Summit for Sustainable Development in 1992. The report of the Summit upholds community participation as a central tenet for achieving sustainable environments, in which the community is involved in monitoring the actions of "free riders" and sections of the community whose activities degrade the environment (UNSED, 1992). The report of the summit also identifies poverty and the rural poor as one of the main causes of land degradation and deforestation who need to transform their methods of production. This framework encourages powerful section of communities and modern and

[2] Republic of Ghana Ministry of Lands and Forestry, 'Forest and Wildlife Policy', November 1994 (http://www.fcghana.com/publications/laws/foresty_wildlife_policy/index.html).

traditional elites to gain greater control of natural resources in the name of environmental management. In many instances in West Africa this has resulted in pastoralists losing control over grazing grounds, and the politically weak being increasingly marginalised, branded as destroyers of the environment, and blamed for degrading natural resources (Leach and Mearns, 1996).

Cook and Kothari (2001) have characterised this type of participation as a "new tyranny", as a way of securing local legitimacy for policies, plans and projects developed externally with minimal input by the recipients. A World Bank evaluation of participation in 189 World Bank supported projects found that the dominant level of participation involved one-way communication of information, rather than more consultative forms of participation based on shared decision making or transfer of control over resources (Operations Evaluation Department World Bank 2000).

These weaknesses in participation have resulted in some researchers focusing on social movements, as the main levers through which the poor can make their demands and create pressures for environmental management. They point to a number of cases in which social movements have made demands against state interventions that have negative impact on the environment (Escobar et. al., 2004; Gadgil and Guha, 1994; Yearley, 1994) However, other researchers have argued that social movements do not necessarily represent the rural poor, and that several social movements that have been presented as poor people's movements, women's movement, and movements of the marginalised are dominated by middle-class interests. They are controlled by a core of political elites who organise within the community to represent their interests as those of the community (Jackson, 1994; Watts, 2000). Thus, all the problems that characterise the organisation of participation from above or by outsiders also apply to social movements.

A third approach focuses on conflict. This approach argues that conflict plays a significant role in the day to day management of resources and that communities are often characterised by conflicts between different groups rather than by homogeneous consensus and cooperation (Leeuwis, 2000; Hesse and Trench, 2000; Mosse, 1994). This has resulted in a new approach to participation based on process-oriented social learning, in which various stakeholders come together to negotiate a solution. However, the literature on conflict and participation tends to focus on internal conflicts between groups rather than conflicts between groups and the state, as state agencies marginalise particular groups by introducing policies that undermine their livelihoods, as well as by linking up with local elites. The literature on community conflicts often underestimates the impact of power relations and political alliances. More powerful "stakeholders" are able to negotiate settlements within their favour, or the balance of representation among community stakeholders reflects power relations and gives undue representation to the most privileged stakeholders at the expense of the poor and marginalised. In many instances in stakeholder negotiations, secondary stakeholders (including local elites and bureaucrats) with no direct livelihood involvement in the resources are more highly represented than primary stakeholders.

A fourth approach has been to focus on advocacy and human rights. This attempts to hold the state accountable to local people by focusing on the ways it meets its commitments to human rights in specific circumstances. This includes issues concerned with legitimate representation, public accountability, rights to services and information. This is often combined with a capabilities approach (Sen 1990), which examines inequalities in distribution of wealth and popular perceptions of well being.

However, people cannot exercise their rights unless they participate in the process of democratic decision-making, and the ways in which their knowledge and aspirations and their livelihoods are respected or marginalised will affect their access to rights. Thus, a rights based approach needs to be combined with participatory approaches.

A fifth approach places participation within the context of governance (Gaventa, 2004; Mohan and Hickey, 2004). At the heart of this problem of participation lies the issue of representation. To be truly representative participation must be conceptualised as a governance issue, as a form of citizenship which empowers local people to make decisions about policy and development and to represent their interests to policy processes, rather than being represented within policy processes by agendas which they have not constructed, but which have constructed them. Thus, the objectives of participation must be to transform existing policy practices which cause social exclusion.

An entry point for a more participatory process potentially lies in the interaction between government and communities that is the system of local governance rather than local government administration (Anderrson, 2004). The objectives must include the creation of a more engaged citizenry which is confident to articulate its needs and a more responsive and effective state that can deliver policies which meet the needs of the majority of rural people.

Several researchers have pointed out that that democratic decentralisation frequently opens up spaces for local elites to exert their interests to the detriment of the rural people and rarely achieves downward accountability (Crook and Manor, 1998; Ribot, 2002; Agrawal and Ostrom, 2001, Blair, 2000), This, however, does not mean that decentralisation or local government is irrelevant. Decentralisation is part of the national political system, and the failings of decentralising are part of the failings of a national system and the structure of its administration. Since decentralisation occurs at the intersection between government and civil society, and since the contact for the majority of people with the state is at the level of local government, the failings and successes of government policies are most tellingly revealed at this level. It is important to distinguish between local government administration and the system of local government. The latter includes the interfaces between local government and citizens and between local government administration and central government.

The divide between government and civil society is not monolithic as is often assumed. Government is hierarchically structured and decentralisation is a product of these hierarchical relations. At the lowest levels of decentralisation, dominant actors in the policy process may be frustrated by the lack of resources and logistic support provided to them and their inability to implement policies. Their social linkages do not only extend to local elites but into the various community organisations and networks. They may genuinely attempt to represent their communities, particularly if they originate from poor and marginalised areas. They may be frustrated in this endeavour by their lack of ability to effectively represent community interests and they may view the whole structure of government and local government critically, as something badly in need of reform. At higher levels of decentralisation the dominant actors become more divorced from the community level, more likely to subscribe to centrally generated policy prescriptions and elite concerns. However, they are still confronted by the practice of administration and its failings and have valid perceptions on the policy process and ways it can be strengthened. To get things done they often exploit informal ties with other actors in the administrative process and

within communities, relying on capabilities, endowments and social capital at the community level. The challenge for decentralised natural resource management is to build appropriate institutions that can generate effective cooperation and communication between actors at different levels of governance with varying interests and access to information, power and resources (Andersson, 2004) and find spaces within institutional setups in which new approaches can be built (Keeley and Scoones, 2000).

It is important to learn more about participatory governance, how participatory governance functions and fails to function, and how spaces for enhanced participation can be built into existing governance frameworks. Important areas to examine in this respect include the following:

- The creation of new associational space and incentives which will enable marginalised groups to articulate their needs, place them to local government, and link up with other groups with similar aspirations and objectives;
- The creation of space for dynamic processes of learning based on interaction, reasoned deliberation, compromise and consensus building.
- Strengthening of institutions of governance to make them more receptive to the needs of people and better able to access these needs.
- Bridging the knowledge and authority gap between technocratic expertise and local practice and involvement
- The development of state-society synergy in which government and citizens participate in the joint production of services and policy (Evans, 1996; Shnurr, 1998; Anderson, 1998).

The role of information

The nature of information in planning and communication between local government actors and citizens should reveal much about the nature of participatory democratic processes in local government. In highly top-down and centralised systems of governance, policies are decided by national-level organisations and transmitted as prescriptions to the districts. Districts have limited opportunities to devise their own policies and the imposition of national prescriptions undermines their own capacity to collect, generate and deliberate over information before implementing plans. At the other end of the spectrum local governments prioritise their own plans based on institutionalised information they have collected on the localities under their administration, and use this to prioritise plans for various areas and sectors. Planning is developed in consultation with various interest groups who put forward their perspectives and demands and policy is developed on the basis of consensus building.
In between these two lie other configurations and variants. Local government may have the ability to devise its own plans based on its own information, but these plans have to be ratified by central government agencies. This places pressure on local government planning to comply with national priorities. Local planning capacities may be poorly developed and this can result in lack of accountability and transparency and the pursuit of rent-seeking activities by local level functionaries and bureaucrats. Policy decisions may be based on 'informalisation', and this may lead to close consultation with local elites, who will be in a position to influence district planning agendas.

A second important feature is the capacity to deal with new information and assimilate it into policy frameworks, particularly when this runs against the grain of current policies. Again a number of responses exist including the following:

- Assimilation of new information into existing datasets and deliberation on the new information resulting in changing policy frameworks at the local level.
- Referral of new information to higher up administrative bodies for policy deliberation at a higher level. This would be indicative of a system of decentralisation in which districts have weaker independent policy-making functions but are able to provide feedback to the national level.
- Rejection of the new knowledge because it does not fit into existing policy frameworks. This could reflect a situation in which elite interests dominate at the local level, or where prescriptive policies transmitted by the national agencies are dominant and policy-making is highly centralised and top-down.

The ways in which knowledge is processed at the local level should reveal the ways in which it is embedded in institutions and in power relations.

Information and knowledge are rarely presented as the perspectives and interests of particular groups. They are usually presented as universally true, and discourses and discursive practices are created to affirm their validity. An apparatus is developed to reaffirm the validity of the knowledge that is generated and confirm its truth. This knowledge is not only generated at the national level but frequently is the product of an alliance between national agencies and international agencies, in which the international agencies give theoretical and political shape to the national policy agendas and give international backing to data and figures generated at the national level. This alliance allows controversial claims to be presented as objective, scientific and technical, while in reality they are often based on assumptions and questionable data. This includes such data as estimation of deforestation rates or the cost of degradation (Fairhead and Leach, 1998; Keeley and Scoones, 2003). However the institutional sanctioning of these claims often gives them a respectability that enables them to be unchallenged. These are often reified through training workshops at different levels of the policy hierarchy, through academic and policy papers, and through the mass media. These policies can be successful in that particular groups of people begin to accept and even articulate dominant discourses on degradation when their own practices and knowledge suggests evidence to the contrary. For instance, Fairhead and Leach (1996) found that farmers in the Kissidougou area of Guinea subscribed to the dominant discourses of deforestation, when in fact they were aware that their environment had been gaining in tree cover. Since beliefs are often influenced by complex political factors, this means that it is by no means easy to change information systems and policy frameworks. There will be many academics and policy experts who will believe that the very beliefs and information systems that we are attempting to change are right, and that our perspectives are wrong, and who will be irritated by the results of our research.

In examining information systems this study focuses on four different scenarios:

1) A situation in which there was little data available for policymakers. The main focus in research here included the following:
    - to determine how low level decentralised agencies could effectively collect information;
    - what appropriate tools could be generated to enable information to be collected at the community level with the participation of communities;
    - how information about localities would help policy makers to develop more sensitive policies, a better appreciation of the

interests of various groups within the area under their jurisdiction, and more capacity to engage in learning, deliberation, consensus building and representation to higher administrative bodies.

This case study was developed in relation to the Area Councils, the lowest level of administrative decentralisation (See Annex B and E).

2) A situation in which a particular interest group felt maligned in the policy world, where their livelihood activities were presented in policy frameworks as promoting deforestation and unsustainable land use. The main focus here was on the following:
    - How could the group effectively network to articulate its positions and present evidence to policy makers that its activities did not degrade the environment?
    - To what extent would policy makers listen to them and incorporate their perspectives into policy processes?
    - How would policy makers respond to their representations and deliberate on the new information presented?
    - What were the available channels through which representations could be made and how effective were they?

    This case study was developed in relation to charcoal burners (see Annex C)

3) A situation in which a significant group of farmers felt marginalised and was unable to place it needs to government services, and call upon development services to find solutions to problems they faced. The objective here was to find out:
    - Ways in which farmers could develop a programme and place their demands to government services effectively;
    - the ability of development services to respond to particular demands of citizens and their capacity to network in new ways to arrive at solutions and place the local demands to higher level national agencies;
    - The main constraints in research and development services which resulted in the marginalisation of the farmers and a lack of support for their activities.

    This case study dealt with yam farmers. Although they were the dominant farmers in the district, they received very little support from extension agents and research services (see Annex D).

4) A study of perceptions among national level policy makers and NGOs, about natural resource issues in the rural areas, and the implications this has for decentralised natural resource policy-making (see Annex G).

With the exception of the perception study, the other case studies involved a series of interventions which were made to observe institutional responses and capacities to change. They, therefore, constituted a programme of action research.

Action research

The programme of action research sought to improve information systems for natural resource management within the Kintampo district and strengthen capacities to manage information within the existing institutional structure. The aim of this was to enhance technical aspects of information management, the two way exchange of information between policy makers and resource users, and the incorporation of consensus building into more inclusive policy processes.

The main objectives of the programme were to:

- Identify appropriate levels within the process of decentralisation in which information gathering and analysis can be developed to enhance the management of information about natural resources and its use in policy processes; then to build linkages between the Area Council, communities and the district administration to create an information system on natural resources for the district;
- Build networks of resource users who would come together, analyse their situation and develop a programme of demands that could be put forward to policy makers
- Build platforms in which natural resource user networks put forward their demands to policy makers, and dialogue on appropriate policies occurs, resulting in more consensual processes of policy makers. The building of platforms would provide cases where the knowledge of networks of producers of their situation and their information needs are put before policy makers, and policy makers communicate the information they have at their disposal to citizens.

In addition to facilitation local information capacities, research also analysed the institutional context in which the information systems were being developed. This included qualitative and quantitative research on the livelihood interests of various groups, including farmers, charcoal burners, women, migrants, and youth; the nature of social and political organisation and associations within settlements and groups; and the perspectives, knowledge and controversies and conflicts that arose among community interest groups.

A number of surveys were also carried out in select settlements on charcoal burning and yam farming. Experiments were also conducted into the nature of regeneration on farm and fallow land, which measured rates of coppice regrowth in cleared farms and individually cut trees. This was carried out in collaboration with members of the community. The results of these surveys were presented to the groups at workshops to inform the networks of our insights and to solicit confirmation, and further insights into our findings among the groups.

It is important to back up action research with a focus on building networks, with more formal research techniques. This acts to make sure that data is being collected and recorded to analyse the situation, and also acts as a check to make sure the perspectives presented in the networks are representative and are not those of a dominant clique able to impose themselves in wider social gatherings and meetings. The challenge in carrying out action research is to provide networks with knowledge that builds their capacity to undertake actions and reflect on these actions. The researchers need to record the perceptions of the networks of this knowledge, and the

ways in which knowledge is institutionalised within government and civil society organisations. The challenge is to provide credible research findings that are not compromised of their academic integrity, but whose complexity can be understood by the research partners since it deals with their way of life and since they are involved in the generation of knowledge as research partners. The objective of this particular understanding of action research is to provide knowledge that can be integrated into local institutions and informs social processes within these contexts. Thus, action research provides a context for understanding the assimilation and use of knowledge and information in institutions.

The organisation of research

The research was organised into four distinct sectors or branches. The first branch was concerned with information technology, information systems, building geographical information systems and remote sensing. This branch came under the remote sensing expert in the team, Opoku Pabi, who was mandated to work with the Area Councils and the district authority. The main support for his work came from building up links with the Area Councils and the districts. The researcher was responsible for training members of the Area Council, and selected community members from the Area Council in survey work, data entry and management of GIS. Although other members of the team worked in the same office as those entering the data for the Area Council Surveys, they did not help them in entering the data, since part of the exercise was to access the capacity of the Area Council to manage information.

The second branch of the research was concerned with building networks of charcoal burners and farmers, conducting surveys on charcoal burning and farming, carrying out other informal qualitative research, organising workshops and mobilising the networks and monitoring them in various settlements. Five different researcher assistants were involved in this work at different times, including one gender specialist (Dede Narko-Baako, Maxwell Kude, Mame Esi Konduah, Kofi Gkapoh and Eric Osei).

The third branch of the research focused on investigating rates of regeneration on farm by measuring growth of trees and coppices and by in-depth interviews with farmers on their farm. This fieldwork was mainly carried out by Tontieh Kanton - with the help of a local farmer/hunter/charcoal burner from the settlement of Asantekwa, with an exceptional knowledge of trees (Patrick Nsiah). A second team made up of charcoal burners worked at Mansie. However, they were unable to keep up the schedule of measuring and monitoring the regrowth of trees. A botanist from the herbarium of the University of Ghana (K.Y. Amponsah) was also recruited to spend a number of days in the field identifying the botanical names of the majority of trees that occurred on farms.

The fourth branch of research focused on interviewing policy makers at the national level in Accra. The research was carried out by Cecilia Luttrell and Jeeba Jehu-Appiah, the communication specialist of the project.

Identifying research partners

Research began with the search for partners, at the lowest level of local government, to be engaged in the process of collecting and managing information on natural resources. The main criterion for focusing research on the sub-district level of local government was recognition that this formed the main interface between communities and local government. The Area Councils (as the sub-districts are called) are the lowest level at which citizens elect representatives for administrative purposes, who have a secretariat and plan development initiatives and regulations for their constituents. The Area Councils consists of a number of settlements who elect Unit Committees. Representatives from different Unit Committees make up the Area Council. Area Councils have between 10-15 members representing the area. The population of an Area Council may lie in the region of between 10,000-15,000 people. There are close links between Area Councils and the populations they represent, and the Area Councils have an intimate knowledge of the people in the communities under them. Logistic concerns were also important. An Area Council consists of a sufficiently small unit in which a small research team can effectively collect comprehensive data relatively easily. It is also relatively easy to combine work with an Area Council with work with the communities under the council. An Area Council is an ideal sized unit in which to develop participatory research and information systems in which there can be exchanges of information and feedback at the interface of local government and civil society.

We began by trying to identify a suitable Area Council with which to work in the transitional area of Brong Ahafo. After visiting several Area Councils within the Kintampo and Wenchi districts, we identified the New Longoro and Babato Area Councils as the most suitable candidates. The main criteria in selecting an Area Council were:

- Evidence that it was active and functioning, as reflected in regular meetings and an operational agenda;
- Interest in natural resource management and expressed interest in taking part in conducting a survey and engaging in the entry and management of the data, and willingness to commit resources to this;
- Willingness to share the results, and engage in dialogue with the communities and groups of natural resource users in the area.

The New Longoro and Babato Area Councils were selected. Work began in New Longoro and was later extended to Babato.

The selection of these two Area Councils, meant that research was going to be located in the then Kintampo District. Therefore, the Kintampo District Assembly and its administration became a research partner. A District Reference Group was set up in the district Assembly consisting of the Deputy Coordinating Director, the Planning Officer, the District Forestry Officer, a representative from Ministry of Food and Agriculture, and the District Environmental Health Officer/Chairman of the Environmental Committee. The District Reference Group played a consultative role, helped identify relevant environmental issues, helped organise district workshops and identified important participants to be invited to workshops, and played a role in integrating the information system into district structures. Other important actors who were regularly consulted in the district included the District Chief Executive (DCE) and the Presiding Member (PM). The DCE is appointed by government to run district

administration and to see that district policies conform to those of the government. The Presiding Member is elected by the District Assembly, to chair assembly meetings and ensure that the interests of the Assembly members are represented in the administration. The reference group helped us to understand the structure and institutional framework of district natural resource management and provided us with consultation on institutionalising the information system within the district.

The project began to build a district database in which the results of the survey conducted by the Area Council could be incorporate. This involved synthesising all existing data that could be found at the district, regional and national levels and within specialised agencies. The project also devised ways of sifting information from the partial records of the activities of the district administration.

A major area of interest that emerged in discussion with the district reference group and the Area Councils was in charcoal burning, the major source of revenue of the district, but an activity surrounded by considerable political controversy. Therefore, the project decided to focus on charcoal burning. A second research activity was developed on agriculture. This eventually came to focus on yam cultivation, the major crop within the district. The third group of research partners were groups of yam farmers and charcoal burners within select communities in the Area Councils in which we were working. It became evident that the way to build these networks was to engage in research activities around these groups: to investigate issues that emerged from their perspectives and to report back to these groups on the research findings.

Research began with general discussions with farmer groups, youth groups and women's groups organised around livelihood interests in different settlements. In some cases these groups already existed and functioned. In other cases they developed from meetings with the project. Out of these discussions networks began to develop, and the project supported community members and groups to organise meetings and networks in other settlements. Two social surveys examining charcoal burning and yam farmers were initiated in settlements in the New Longoro area, to collect statistical data and place the perceptions of the small networks we were working with within a broader context. While these originally included seven settlements, we eventually focused on three, Mansie, Asantekwa and Nkwanta. After this was completed the survey was extended to another three settlements in the Babato Area Council, in which we had started working. In addition, joint research was established with a small number of farmers and charcoal burners on farms and fallow, collecting very detailed information on the nature of regeneration. The findings of the research were discussed in group meetings and at workshops organised within the project headquarters in Kintampo. The charcoal burning networks rapidly expanded to encompass a large number of settlements representing the district, and extending into Area Councils in which we were not working. The project became known as the DEAR (Decentralised Environmental Action Research) Project and the project centre became the DEAR Centre. A common programme of demands was worked out by the charcoal burners and this was presented to the District Assembly and Area Councils at a district platform.

In contrast to the charcoal burning networks, the platform organised for yam farmers was not concerned with articulating a set of demands for policy changes, but demands for information on technologies and organisations that could assist the farmers.

The main objective in building information systems within the district institutional structures was to promote more informed policymaking based on deliberation, consultation and evidence. The objective of building networks of users was to create demands on policy makers, to ensure that the perspectives and demands of end users were represented in the formulation and implementation of policy. Research was interdisciplinary involving the collection and synthesis of socio-economic, institutional, ecological and spatial data at different levels within the landscape.

Figure 1.4 Meeting with Nsokor Area Council (Wenchi District)

Table 1.1 Main research activities and products of the DEAR Project

Research activity	Relevant levels	Relevant partners	Research products
Survey of activities related to natural resources	Area Council	Area Councils	GIS database of Area Councils, tables and maps; report on main institutional issues
Synthesis of existing information at national, regional and district level	District	District administration and departments and Assembly Members	Partially complete GIS of district including datasets on Area Councils surveyed; report on main institutional issues
Updated map of district using remote sensing data and GPS	District	District Administration, departments	Administrative and settlement map of Kintampo North and Kintampo south District
Analysis of land cover change within district using remote sensing	District, Area Council, Region and National level	District Administration (Planning Department)	Report on land cover change, map of land cover within district.
Socio-economic survey of charcoal burning	National agencies in forestry and energy sector, District, Area Councils, Charcoal burners and farmers	Charcoal burners	Report, workshop reports, info sheets, poster
Study of regeneration in farm and fallow land	National agencies in forestry and energy sector, District, Area Councils, Charcoal burners and farmers	Charcoal burners and farmers	Report, workshop reports, info sheets, poster
Socio-economic survey of yam farming	Agricultural department, Crop Research Institute, NGOs, Regional Ministry of Food and Agriculture	Farmers and Agricultural Department	Report, workshop reports, info sheets, poster
Workshops creating platforms between producers and policy makers	District, Regional, national agencies and NGOs	District and natural resource users	Workshop proceedings
Perception study of policy makers and NGO activists in Accra	National policy makers and NGOs	National bureaucrats; Parliamentarians; NGO staff; journalists	Research report

What lies ahead

The second chapter of Annex A examines the national policy process in relation to natural resource management. It examines the ways in which assumptions and

conventional wisdom affect policy agendas and the abilities of policy makers to examine their policies critically.

The third chapter looks at the structure of decentralisation within Ghana and the contradictions within this structure of a participatory framework with downward accountability and central government control over the processes of decentralisation.

The fourth chapter examines how information and communications function within the present system of decentralisation and the implication of centrist controls over policies and policy prescriptions for information flows. It critically examines how the policy process makes use of information and manipulates information for political goals, and the implications of this for planning.

The fifth chapter examines the potential to build new innovatory information systems that involve communities in collecting information and which build upon the linkages between sub-district structures and community organisations and networks and the capabilities within communities. It provides an account of the attempts of the project to build information systems within the Kintampo district, and analyses the main constraints and potentials within existing institutional structures.

The sixth chapter charcoal burning contrasting how the problem of charcoal burning is constructed by policy makers with the perceptions and conditions within settlements. It examines the importance of charcoal to rural livelihoods and also its impact on the environment. This is achieved by detailed research into the main species used for charcoal, their scarcity or abundance, and the nature of their regeneration.

The seventh chapter examines land cover change using remote sensing data between 1990 and 2000. The chapter shows the complexity of processes of land cover change. It shows that cover change follows the clearing and regeneration of land within farming systems. While there are complex patterns of multidirectional change and inter-conversion between different land cover types, there is little evidence of a marked deterioration in land cover of land cover change, which could be attributed to a distinct process of land degradation. There is no evidence of drastic transformation of woodlands into open lands by charcoal burners or farmers. The seventh chapter examines yam production systems within the Kintampo area. It argues that the main constraints do not relate to declining soil fertility under increasing population pressures, but a complex set of factors including high cost of seed or sets, low market prices, high risk, and a market demand for a limited range of varieties that do not reflect the process of adaptation of planting materials and environments taking place on farmers' fields. The little research on yams that is taking place constructs yam resource development with a narrative of the need to replace shifting cultivation with permanent cultivation, which is at variance with the low population pressures within the Kintampo districts and large areas of uncultivated land.

The final chapter (Chapter 8) reflects on the research process, the extent to which natural resource policies are influenced by political factors, and the potential of identifying spaces in which a more democratic and popular participatory approach to development can be built based on the communication of information upwards and more consultative policy processes that reflect needs rather than top-down policy prescriptions. This examines the potential spaces which are opened up by the conflict

between adherence government adherence to popular democracy, participation and poverty alleviation and more top-down, technocratic and centrist policy frameworks.

2. NATIONAL LEVEL PERCEPTIONS OF NATURAL RESOURCE POLICIES

This study focuses on environmental policy in Ghana's transitional Brong Ahafo Region. Earlier research undertaken in this region in 2001-2 ('the Scoping Study') had underlined the way in which environmental policy was driven by crisis narratives which, *inter alia*, served to draw authority away from the resource users towards the political centre (R7957 FTR, 2002; Amanor and Brown, 2003). The technocratic emphasis in this policy reinforced its centralising tendencies, and justified the intervention of central actors and the dominance of crisis narratives.

Preliminary interviews for the 'Scoping Study' had given little suggestion that national environmental policy was, to any appreciable extent, 'evidence-based'. Centrist narratives provided a hegemonic discourse at national level – not only in the upper echelons of government, but also among the NGOs and media groups. This had justified the focus, within the research design, on attempting to build up solidarities from the grass-roots level, rather than use central actors as champions for the poor. In terms of pro-poor policy development, a clear conclusion to be drawn was that policy development at the centre was most unlikely to filter down to the local level. Resource users needed to be empowered to champion their own interests in the policy domain. Central to that empowerment was the ability to bring relevant information into the policy debate.

However, there was felt to be a need to investigate policy processes in more detail at the national level during the full study, both to test the proposition further, and ascertain the extent to which divergent views were held and acted upon. Findings of this study are included here (see also Annex G), as they underline the unpropitious policy framework for environmental action at the local level, and provide justification for the chosen 'bottom-up' strategy which forms the main subject matter of this report.

Evidence in natural resource management

The types of information that are used in natural resource management at the national level and the extent to which policy makers hold to received knowledge, assumptions and crisis narratives affects the extent to which natural resource policy at lower levels of the administrative hierarchy can be consultative and participatory. If national level policy makers assume that there is a crisis in the way rural people manage natural resources they are likely to demand the use of drastic policy interventions and coercion to control the situation.

Research was carried out on the perceptions of actors working at the national level in Ghana to illuminate environmental policy development at national level in fields of relevance to the study. The research focused on two motifs which have the power to act as symbols to rally environmental networks – positively or negatively – in the manner described by Hajer (1996). These were *charcoal production* and *wild fire*.

The views of individuals from various categories of decision maker were sought – including civil servants of environmentally-oriented ministries, parliamentarians, journalists and other media representatives and environmental NGO personnel.

It was found that perceptions were by no means uniform at national level, and that widely divergent views were held regarding both the state of the environment and the agencies that might be held culpable for any negative effects. This underlines the complexity of attempting to arrive at policy interventions that are both evidence based and acceptable to all stakeholders. It was notable that the types of agencies which are often seen as the potential champions of the poor – the NGOs – were generally the most hostile to their interests, the least interested in evidence and the most willing to attribute 'blame' to them for the allegedly parlous state of the natural environment. By and large, local communities were seen as potential allies and supporters for NGO interests which were already well-defined – and concomitantly, where community interests diverged from those of the NGOs, it was the latter that tended to take precedence. The heavy urban bias of most environmental NGOs, and the estrangement of those with a national voice from those working at the local level also point to the difficulty of promoting pro-poor development through the medium of evidence-based policy.

Likewise, few parliamentarians give evidence of significant interest in green environmental issues, and they lacked the consultative mechanisms which might have encouraged a more evidence-based agenda to emerge. NGOs (even those with understanding of environmental matters) were not seen by parliamentarians or other governmental decision makers as an important constituency.

Interestingly, there were a significant number of individuals in the technical ministries who had clearly thought about the issues in question, and were able to summon up evidence to substantiate their views. Several of these persons sought to promote a more complex view of environmental change than is current in most policy fora in Ghana, and saw themselves as champions of the interests of the poor. However, there was a clear disjuncture between the levels of understanding of such persons, *qua* individuals, and public policies on the environment, suggesting that the problem is ultimately concerned with the ways in which policy is developed at national level, and consensus between dominant interest groups is reached.

Clear evidence was provided by this study of the extent to which policy is formed within a political context, and is ultimately supportive of the interests of the political order. A middle-class bias was pervasive, and revealed both in the analysis of the situation and the remedies offered to correct its deficiencies: as regards the former, the 'blame factor' was much in evidence when describing the responsibilities of the poor for the alleged environmental crisis, and is used to justify intervention by the elite in their lives and livelihoods; as regards the latter, there was a strong emphasis on technical solutions which could be delivered by central agencies. Even those who championed the interests of the poor tended to see them as needing external training and other support if they were to master their environment. While this was not necessarily a healthy situation, it should be noted that it was very much in line with the prevailing biases in policy processes, which are heavily oriented to the assimilation and diffusion of messages in a top-down way. Government and NGO leaders alike spent much of their time trying to second-guess the interests and opinions of their external donors and to deliver packages which the latter might regard with approval. Neither was there much pressure to adopt a more challenging attitude

in other quarters; the environmental media have little interest in complexities of rural environmental issues, for example, preferring to concentrate on the urban environmental issues favoured by their predominantly middle-class clientele, rather than championing the interests of the poor

International agencies and donors frequently held these same assumptions. The environment was seen as a policy sphere concerned with regulation of natural resources rather than building a democratic culture and consensus. Donors were often willing to support initiatives that bring in chiefs to enforce regulations on rural "subjects". Donor supported programmes to strengthen district capacity in natural resource management often focused on regulations and their enforcement. For instance, the UNDP 21 Programme in Ghana focuses on strengthening district natural resource management. One of the major outputs of the programme has been proposed byelaws for districts to enact. This does not refer to the need to establish processes of consultation with the users of natural resources nor the problems of mediating livelihood concerns. The preamble in the project document states:

> It has been recognised that degradation of the environment and the misuse of irrational use of resources will result in loss in the long term and could furthermore undermine the objectives of development that is sustainable improvement of human welfare…..The causes of environmental degradation are many and these could be in the form of direct causes. Some of the direct causes are poor farming practices, overgrazing, charcoal burning, destructive logging, deforestation (UNDP/ Ghana Capacity 21 Programme: 2001:1)

It is concluded:

> National environmental law is therefore a mechanism for translating environmental and sustainable development policies into action at the national level. At the Districts, this is reflected in the District Assemblies promulgating byelaws to give meaning to the national legislation that would have been put in place for environmental and sustainable development (UNDP/ Ghana Capacity 21 Programme, 2001:3)

Such initiatives undermine the capacity of districts to develop their own planning procedures for natural resource management, and undermine initiatives to build planning procedures, and information systems around which dialogue and consensus building can take place to develop appropriate policies.

Conclusion

In summary, the overall picture of an unpromising policy arena at national level is borne out by the study, though the situation is by no means entirely uniform. Decision-making on the environment at national level is fairly complex in character, with evidence and narratives being drawn on simultaneously to back up the position of various interest groups and agendas within the decision making process. There is strong support in this situation for the view of Keeley and Scoones (2003) that evidence does not lie at the centre of policymaking, but rather that narratives tend to be established first and these are then legitimated by scientific 'facts'. Information is used to reinforce existing dominant perspectives within the institutions and to facilitate the implementation of predefined interventions.

3. DECENTRALISATION AND ITS IMPLICATIONS FOR DEMOCRATIC POLICYMAKING

The framework for decentralisation in Ghana originates in the 1950s, in the transition to independence. Prior to this, local government consisted of native authorities that were run by paramount chiefs. These were unpopular among the commoners and youth and during the 1940s and 1950s an anti-colonial movement grew, rooted in dissatisfaction with the lack of democracy and accountability within the native authorities systems (Amamoo, 1958; Rathbone 1996). These prompted reforms, which led to a system of democratic local government to replace the native authorities. However, chiefs were still given a role in local government and one third of the representatives were to be appointed by the chiefs in consultation with central government. This concept has continued to survive the various forms of reform to local government, although the one third appointed members are now usually appointed by the government in consultation with chiefs. This is usually justified on the grounds that the representatives elected by rural communities have low levels of education and lack the necessary skills for administration. It is, therefore, necessary for government to make appointments of skilled people within the district to raise the capacities of the district to carry out administration and planning.

During the 1980s a comprehensive programme of local government reform was initiated by the Provincial National Defence Council (PNDC), under the leadership of Jerry Rawlings, in which 110 district assemblies were created in Ghana This envisaged the system of decentralisation as representing democratic reforms in Ghana. This was opposed by donors who put pressure for the government to introduce a system of parliamentary democracy. With the introduction of parliamentary democracy, the PNDC transformed itself into the National Democratic Congress and won the first two national elections under the Third Republic in 1992 and 1996. This has resulted in the existence of two parallel structures of democracy existing. With the establishment of a parliamentary system, much less emphasis has been placed on decentralisation, and much of the legislation related to decentralisation has failed to be implemented. These two parallel structures sometimes work against each other to extend power at the expense of democracy (Hutchful, 2002). For instance, government uses its ability to appoint the DCE and one third of the representatives to ensure that it is able to impose its policies on the districts. District funding is controlled by the DCE and the MPs receive their allocation for use in the district through the assembly. When an MP is elected from an opposition party, the DCE can hinder the work of the parliamentarian and constrain their access to funding. Processes of democratic representation can become hampered in the district. Thus, it is important to understand the linkages between the legal and conceptual framework of decentralisation, and the institutional structures and the political networks.

The legal framework for decentralisation makes provisions for democratic participation of rural people in policymaking. Decentralisation is based on a three-tier structure of Regional Co-ordinating Councils, District Assemblies, and Town Councils in Urban areas and Area Councils in rural areas.

The District Assembly

The District Assembly is the highest planning authority in the district. It makes and implements plans for the district, which are ratified at assembly meetings. The Local Government Act of 1994 (Act 462), the National Development Planning Commission Act of 1994 and the National Development Planning (System) Act of 1994 establish the framework for development planning. The District Assemblies are empowered as the legislative body for local or district level planning to prepare district development plans. PNDC Law 207 defines the basic activities of the assembly as consisting of the following:

1. Developing a comprehensive plan for economic, social and spatial development within the district;
2. Integrating various sector plans;
3. Preparing a district development plan and annual budget;
4. Mobilising the natural, human, and financial resources within the district and protecting the environment;
5. Promoting social development and productive activities;
6. Initiating programmes for the development of basic infrastructure and provision of municipal works and services within the district.

The District Assembly is headed by a DCE, who is appointed by the president. However, the DCE can only be appointed with the prior approval of at least two thirds of the assembly. The DCE can also be removed by two thirds of the assembly passing a vote of no confidence. The DCE has the power to appoint one third of the assembly members in consultation with traditional rulers and other interest groups. The DCE chairs the Executive Committee, and coordinates the activities of the various sub-committees within the district. He is the link between central government and the district, and conveys and explains the policies of central government to the district, and ensures that district plans converge with government policies. In his work, he is assisted by the District Coordinating Director, DCD, who is the technical director of the district, an employed civil servant responsible for the coordination of policies and plans. The members of the district assembly elect a Presiding Member, who chairs the meetings of the Assembly, and represents the interests of the Assembly members in the district administration.

The assembly consists of assembly members, two thirds of whom are elected by rural constituents. The assembly members are responsible for representing the interests of their constituents and reporting to them on the decisions of the assembly. The assembly meets quarterly to make and evaluate policies, and set targets for the district.

The Executive Committee of the Assembly coordinates the plans of the district and recommends these integrated plans to the assembly for ratification and adoption. The sub-committees identify the economic resources and potentials of the districts, develop an information base, identify opportunities and constraints and consult with other sub-committees about integrating plans before submitting them to the Executive Committee for integration with other plans. The sub-committees consist of administrative staff, departmental staff and assembly members. The assembly members are usually in the minority. After the plans are ratified by the assembly, they are implemented by the departments.

The Executive Committee and the various sub-committees report to the assembly on activities they have been charged to conduct, and the assembly ratifies their

recommendations and sets new targets for them. The work of the various committees must be validated and agreed by the assembly.

Representing the communities

The districts are divided into electoral areas, each of which elects an Assembly Member to the District Assembly to represent their interests at Assembly meetings. The Assembly Members participate in the meetings of the Assembly and vote to ratify policies. The work of assembly members is voluntary: they are not paid,

Legislation on decentralisation has a strong focus on participation. Under Section 3 of the National Development (System) Act, it is obligatory for a district authority to conduct a public hearing on any proposed district development plan and to consider the views expressed at these hearings before the adoption of proposals as a district development plan. However, a clear set of procedures defining the form these public hearings should take is not laid out. In most instances this does not occur. The assembly members do not meet the communities before going to assembly meetings and do not report back on the minutes of these meetings. There are no transport provisions or allowances for assembly members to meet the communities or to organise meetings of the communities under their jurisdiction.

The assembly members represent the interests of their constituents to the district assembly at assembly sessions. The rural citizens are often in a quandary in electing members to the assembly. Whom should they elect? If they elect educated members of the community, who often do not live locally but in the district capital where they work, they often do not represent their interests but concur with the elite concerns of the "enlightened" within the assembly. If they represent poorly educated local residents who support their interests and demands, they may feel constrained and shy to articulate these at assembly sessions. Within the assembly sessions, elite concerns usually find their way though. As issues become controversial or subject to debate, the bureaucrats, technicians and officials often change the language into English and use technical vocabulary beyond the comprehension of the more grassroots assembly members. This use of authoritative discourse usually ensures that the policies of the government and the interests of the elite become established as the policies of the district. The main contribution of the assembly members, the democratically elected representatives of the people is to make pleas for infrastructure projects, such as public toilets (KVIPs), school buildings, and clinics to be located within their settlements. The assembly persons rarely have the capacity to discuss policy issues, since they are not informed about policies within the district and have not discussed them with their constituents.

Below the assembly members are Unit Committee members, who may represent small settlements, groups of minor settlements or wards within small towns. The Unit Committees are responsible for the day to day administration of the settlements. Several Unit Committees come together to constitute an Area Council. An Area Council usually consists of 15-20 representatives, of which one third are appointed by the DCE. The Area Council is a sub-district administrative unit, the lowest administrative unit with a hired administrative staff. The Area Council is responsible for collecting revenues within the area under its jurisdiction and in making development plans for the sub-district. Again, there is a strong participatory element in the legislative framework. The National Development (Systems) Act empowers a sub district to prepare a local action plan and requires the sub-district to conduct a

public hearing prior to the adoption of the proposed plan. In practice this does not occur, for the Area Councils rarely have the finances and logistics to organise regular Area Council meetings, let alone to meet the communities. Area Councils have the right to receive 50 percent of the revenues they collect. The other 50 percent goes to the district. However, the revenue collectors are appointed and paid by the district administration. They submit the revenues they collect to the district administration. The district administration frequently uses up these revenues on its own expenditures, and there are considerable delays and backlog in releasing Area Council revenues (see Annex B). Therefore, Area Councils experience great difficulty in paying their office staff (who then stay away), paying the office rent, and financing transport and refreshment costs for council meetings. Area Councils are rarely fully functional or operational. They are beset by many problems, which arise from the district administration undermining their functions. The district administration frequently views the Area Councils as unwanted competition, making a drain on resources they would otherwise control.

The departments

For the district to carry out its responsibilities and operationalise its plans, the Local Government Act makes provisions for all government sector departments to be organised into 12 district departments under the assembly. However, many of the departments have resisted decentralisation. The enactment of a civil service charter preparing the way for decentralisation has also been slow. Most personnel within the departments are paid through the central structures of their ministries rather than by local government and most of them operate under centralised ministry command structures rather than those of the district assembly. One strategy of evading decentralisation is for departments to transform themselves into service organisations. This is the strategy taken by forestry, which moved from being the Forest Department into the Forest Service Division. The forestry sector has argued the timber is a strategic national resource that needs to be managed by a central organisation for the national benefit rather than by decentralised department. Since the mid 1990s, the Forestry Service has strengthened its control over natural resources. The 1994 policy placed the management of off-reserve forest resources into the hands of the Forest Service, when before they were being managed by districts. Since the mid 1990s, there has been a transformation in the management of off-reserve forest resources and commercial concessions have expanded into farmland. Previously, local resource users, such as chainsaw operators, wood carvers, and mortar carvers got permits for the exploitation of individual trees from the district assembly. Following the 1994 Forest and Wildlife Policy, management of off-reserves come under the Forestry Service. The felling of timber by small-scale operators with chainsaws has been banned, and many farming areas have being given out as concessions, which prevents local producers from exploiting natural resources legally. The Forestry Service has initiated a programme of collaborative forest management, which builds Community Forestry Committees around forest reserves. These operate outside the structure of decentralisation. However, other environmental issues outside of timber come under the management of the district, who are responsible for forming environmental committees. This in effect enables forestry to cream off the most lucrative resources from timber, while giving responsibility to the districts for bearing the burdens of managing unprofitable forest resources.

Most departments are only partially decentralised. Salaries, emoluments, allowances and operational finances are all centrally controlled and dispersed down the structures

of the relevant ministries and departments. Although programmes are implemented within the context of district decision-making, they tend to be handed down to the districts by central departments. Through externally funded projects, workshops and consultation meetings at the regional and national level central agencies are able to hold considerable control over the districts and to define their development programmes. Local level staff defer to their "official" policy narratives and policy prescriptions of their agencies, which are assimilated through the numerous workshops that they attend. Staff who attempt to adapt the agendas to local conditions are likely to be considered recalcitrant and insubordinate. They may find themselves transferred to unpopular destinations or dropped from the lists of those who visit workshops. Workshop allowances are extremely important for district personnel and are one of the ways in which they "make it through the month" on their paltry salaries.

While much has been made about the ways in which "street level bureaucrats" at the interface with communities are able to distort and adapt central government agendas to local political situations, this seems to be exaggerated. The origins of this approach lie in the work of Arce and Long (1992); particularly their account of 'Roberto', the *tecnico* in Guadalajaro, who makes alliances with local elite to sign a petition demanding a balling machine in return for promising a prominent local politician a cherry project. Roberto, is considered a difficult case by his superiors. He has been transferred from unit to unit, and eventually finds himself in a special unit for insubordinate staff, despite having an influential father. Roberto rather illustrates the perils of being headstrong and developing one's own agenda.

In one of the workshops the DEAR project held on information systems within the district, a facilitator was used who had worked on the defunct DFID-funded 'Brong Ahafo District Support Programme' (BADS). The facilitator kept on stressing the needs for members of the district assembly to hold the administration accountable. Talking to department officers after the meeting, they were of the opinion that it was all very well him talking about accountability, because he had been working with DFID. However, if they were to raise these types of issues in their departments they were likely to meet with trouble.

The Regional Coordinating Council

The role of the Regional Coordinating Council (RCC) is to build the capacity of districts to implement policies; to ensure that policies are in line with national regulations and government policies; to monitor and evaluate district planning procedures; and ensure the districts perform their functions and roles. The RCC do not make policy, but ensure that districts are able to carry out their policy functions and to coordinate district policy frameworks with national objectives.

To carry out this role the RCC must have considerable knowledge of the conditions in the districts and the planning processes within the districts. It must be able to determine the main constraints and bottlenecks in policymaking within the district, and find way of strengthening participatory policy processes to ensure that policymaking within the districts converge with the demands and needs of the electorate. It must be able to make an analysis of what obtains in the district and make recommendations to government for the resources that are required for building planning capacity within the districts. In reality, the RCCs do not have this capacity. They are severely under-resourced to meet these objectives. As a result, they tend to transmit national policy frameworks and requirements downwards without making

demands and recommendations to national agencies for the types of interventions that would be required to strengthen the capacities of districts to introduce planning and policy processes that meet the requirements of the legal and constitutional framework for decentralised local administration. The RCC are caught in the contradictions between participatory local government and central government control over policies.

Conclusion

The constitutional framework for decentralisation within Ghana is well thought out. It provides a popular democratic framework for administration based on participatory democracy. The roles and functions of the various units in decentralisation provide a sound framework for the devolution of power:

- democratically elected sub-district structures responsible for the day to day running of their areas with community participation in planning processes;
- democratically elected representatives from settlements representing their settlements at Assembly sessions in which they set targets for the administration, ratify the planning recommendations of the various committees and sub-committees of the assembly, and represent the interests of their constituents;
- departments responsible for implementing the decisions of the assembly;
- a regional council responsible for building capacities within the districts and checking the accountability of the assembly.

However, the necessary mechanisms have not been created to ensure that the various organs of decentralisation carry out their functions and roles.

Decentralisation is also beset by two contrary tendencies. The first attempts to establish a participatory democratic framework with downward accountability. The second ensures that the plans of local government reflect the development goals of the government. The second principle undermines downward accountability and promotes political networking within the district to ensure that the government can impose its policies. This results in the DCE, and the administration and technical departments imposing the agenda of central government on the district. The tendency is for each higher level of decentralisation to undermine the level beneath it rather than build its capacities. The district administration undermines the Area Councils by failing to release its revenues and not facilitating its obligations to develop local area plans. The RRC imposes policies on the districts and does little to build its capacity to develop independent planning. Policies are highly centrist and transmitted down the administrative hierarchy as prescriptions. They do not facilitate processes of democratic dialogue and consensus building.

4. THE ROLE OF INFORMATION IN DECENTRALISED NATURAL RESOURCE MANAGEMENT

The constraints in decentralised administration become more evident when the role of information in policymaking is examined. Information has four different significances in policymaking. Information is the data that is collected that enables policy makers to prioritise and create suitable policies for specific areas under their jurisdiction. Information is also communicated to citizens to enable them to understand what policies are about and exercise choice about the policies they want in their life and to participate in policymaking. Information is here concerned with promoting dialogue, consensus, the exercise of democratic rights and informed citizens capable of taking policy initiatives. In the third context information is about conveying needs to higher organisations to enable capacities and capabilities to be realised so that institutions can engage in the policy process. In the fourth context, information is about transmitting to citizens what government wants them to do. Here information is conveyed as a set of prescriptions that people should comply with irrespective of their perspectives and views, and occurs as an authoritative discourse in which the policy makers know what is best.

Information can arise through a process of communication and exchange between different hierarchies in the policy process, going down to citizens engaged in livelihood activities. Alternatively, policy makers can rely on experts and consultants who analyse the situation and make recommendations for implementation by higher level policy bodies. These different approaches result in different perceptions of the policy process. At one end of the spectrum, policy is seen as the rational implementation of decisions arrived at by experts and technocrats that know best and arrive at their conclusions the dispassionate reflection. At the other end of the spectrum, policy can be seen as a process of negotiation and bargaining between different interest groups, resulting in a consensus (Keeley and Scoones, 2003). In the analyse below, the main focus is to examine how knowledge of natural resource situations is arrived at and implemented in policies, and the perspectives of different groups and actors within the policy process of knowledge, information, and communication.

The role of information in policymaking

In recent years government in Ghana has addressed the role of information in policymaking. In the early formulation of decentralisation, there was little consideration of information. However, the rapid expansion of information technology and the increasing recognition of the importance and value of information in transactions require that government creates easily accessible and transparent information to promote private investment. District bureaucrats are only too aware of the failings of information at the district and recount numerous incidences of donors, potential investors, experts and technocrats visiting, and requesting information about the district that they were unable to supply. The stories often end on a sad note of how in exasperation the visitors left, never to come back again.

At present, there are several initiatives to strengthen information within the policy process. Most notable are the attempts to build the capacities of the District and

Regional Planning Coordinating Units (DPCU), which can be found in the *Guidelines for Operationalising of District and Regional Planning Units* (National Planning Commission (NPC) and the Ministry of Local Government and Rural Development (MLGRD), 2004). The DPCU is responsible for coordinating the planning within the district across the various sectors. Its functions include providing technical advice to the assembly; "collating all data relevant to planning within the district" (NPC and MLGRD, 2004: 4); managing a database on district development processes, activities, projects and programmes across the various sectors; and collecting information from the various departments. The DPCU is responsible for collecting data on education, health agriculture, water and sanitation, the environment, poverty, disadvantaged groups, etc. They are required to update this regularly - either quarterly or annually based on the nature of data and cost implications. The District Assembly is responsible for providing the DPCU with the required logistics to electronically process, store and retrieve data. The District Assembly is also required to submit data to National Development Planning Commission, as it shall direct. The DPCU is responsible for building a database that responds to the needs of the district assembly, the National Planning Commission and the Ministry of Local Government and Rural Planning.

The DPCU is also responsible for assisting sub-districts to strengthen their planning processes and help them to "review and validate their development priorities for incorporation into the overall Annual Action Plan and Budget" (NPC and MLGRD, 2004: 9). To achieve overall district development the DPCU is required to hold quarterly meetings with the Area Councils to dialogue on local development issues and inform the Area Councils on the planning and budgeting decisions of the Assembly. Within this structure, the Area Councils are responsible for submitting "monthly reports and data to the DCPU Secretariat through the District Coordinating Director" (NPC and MLGRD, 2004:13).

The roles and responsibilities of the district in information management are clearly defined, but the guidelines do not address the issues of how this capacity is going to be realised within the current constraints within districts and Area Councils. How are Area Councils, which cannot even pay their small administrative staff or support meetings, going to be able to supply the DPCU with information and provide plans for incorporation into the Annual Action Plan of the district?

Beyond the logistic constraints, this approach to information is instrumentalist. It treats information as data - facts and figures to be processed by technicians and technocrats into plans. It does not examine the information needs of various sectors and of the citizens. It responds to the needs being created by the introduction of information technology into central government institutions, which need data to process to activate their new computer-based information technologies. It does not address the participatory linkages created in the framework for decentralisation, the role of information in these, and the rights of citizens to information about policies. It does not examine the information needs of local government institutions for planning.

Information constraints in natural resource planning

When we examine the role that information plays in particular policy sectors, we can gain a better picture of the constraints in planning processes. Natural resource management involves balancing two concerns: ensuring that resources are used wisely and efficiently so that they continue to exist for the benefit of future generations; and

ensuring that there is a fair distribution of resources so that people can use resources to gain a livelihood, reduce poverty and create wealth. The principle of sustainable development is often used to narrow down access to resources by claiming that the rural poor destroy natural resources and that they need to be protected for posterity. The blame factor is used to justify placing resources under the stewardship of government and power elites within the community, who are empowered to control both resources and people and limit access to resources of other less powerful groups (Leach and Mearns, 1996; Hajer, 1996).

The overprotection of resources at the expense of people narrows down the livelihood options of people, criminalises popular livelihood strategies, and impoverishes communities. However, this also erodes the legitimacy of state policies, as the rural poor perceive these to be anti-poor and against their interests. The rural poor become alienated from policies and they evade them and resist complying with them. Policies become ineffectual and the state attempts to introduce repressive measures to implement them.

In reality sustainability must be based upon notions of the common good, and this can only result from dialogue and establishing consensus between different interest groups, and need for detailed information about the changes that are occurring in the natural world and their implications for people. Debates over natural resources should be about how they are used to achieve a meaningful life for people. Controls should essentially be about ensuring equitable access to resources and preventing people from capturing resources for their narrow interests at the expense of others. The capture of resources by individuals for their own narrow and short-term interests usually results in the lack of long-term sustainability. Emphasis in sustainable development frameworks should be on promoting equitable access and the right to a livelihood, rather than controlling access in the name of the undefined rights and needs of future generations. Emphasis on rights to access and livelihoods do not mean promoting a free for all. They rather promote management of the environment based on evidence and consensus-building.

Natural resources are the subject of competition between different interest groups, who attempt to gain control of these resources and exclude others. Control over these resources enables one group to establish domination over another. Control is often established by blaming other groups for violating moral codes, and destroying the environment. Blaming other groups is used to justify control and appropriation of resources. Environmental rhetoric can be used to empower particular political interests who gain control of the resource. Since the rhetoric is a political device, the policies are based on political interests rather than evidence. This creates a dangerous situation in which policies do not correspond to the realities of what is happening at the interface between nature and society, but reflect political factors and alliances. This has serious consequences in a situation of dynamic change, since the models of the environment are rooted in political factors that prevent an understanding of the changes occurring.

Sen (1999) argues that development is about the substantive freedoms of people - the capabilities of people to exercise choice in adopting a lifestyle that they have reason to value. The focus in poverty reduction should be on the livelihoods and actual living of people and their perspectives of their lifestyle. Since the capabilities of people are based upon value systems and a diversity of needs, they ultimately require a way of making policy in which public discussion and social participation are central. It is

important for rural people to be able to make inputs into policy and their participation ensures that their demands are met by holding politicians accountable to meet their needs, through elections. Political freedom also ensures that people play a *constructive* role in the definition of their needs and capabilities and the creation of policies that reflect their needs. They become responsible in seeing that these policies are implemented. Development is essentially about encouraging citizens to make informed choice. Therefore, ensuring the political and civil rights of rural people, by creating platforms in which people can engage in open debate, criticism and dissent, is central to the process of generating information on natural resources. Provisions for this are made in the Ghanaian National Constitution and the legislation on decentralisation.

The approach to natural resource management that dominates the Kintampo district administration is rooted in the political control of resources rather than a search for consensus. This was very evident when we started meeting with our Reference Group in the district administration. The dominant view was that the way to go about things was to hold a workshop and invite the chiefs since the rural people were "stubborn" and "difficult" and the chiefs "know how to control them". The general perspective in the district administration is that the natural resource situation in the rural areas is one of anarchy and that the administration needs to make interventions to put controls in place, or find suitable political allies to assist them in achieving this. However, the district administration has very little information on natural resources. Most of the information that technical staff have consists of hearsay, informal opinions and anecdotes about certain events, and national policy prescriptions. The hearsay is used to confirm the validity of the national policy prescriptions, and the state of anarchy in the rural areas. There is little evidence of a systematic collection of information from different sources on natural resource issues, which can then be used in policy deliberations and consultations. The technical staff has very limited access to literature on natural resource management.

Even very basic data is missing within the district. Before the DEAR project began working in Kintampo, the district had no up-to-date map of its settlements and boundaries. Existing maps were based on the last survey department maps, which were created in the 1970s from aerial photographs. Since the 1970s, there has been a large influx of migrants and the creation of many knew settlements, which did not appear on maps of the district. The district does not have access to the information on the district generated by the 1990 Population Census. The problem of the use of information in natural resource management policy is illustrated by the approach to bushfire management.

Institutional arrangements for managing bush fire

Bush fire management has received high priority from the government. The framework attempts to introduce bans against the use of fire in the dry season, and discourages the use of fire in farm clearance by making it illegal for farmers to use fire in farm clearance without the supervision of Fire Volunteer squads. The Fire Volunteers are community based organisations, trained by the Fire Service, who are empowered to control fire within communities and arrange for the prosecution of people who violate the byelaws. The framework for bush fire control treats fire as a national security issue, and fire comes under the supervision of the National Fire Service and the National Disaster Management Organisation (NADMO). The

framework for the management of fire does not take into consideration the different roles of fire in the different ecosystems in Ghana, and the evidence that much of the savanna and transition zone are ecosystems that have adapted to fire, in which the dominant trees are resistant to fire and often depend upon fire for several functions, including reproduction. The human populations in these ecosystems have also adapted to the fire and have developed several techniques for managing fire. These include early burning, in which the undergrowth is burned during the early part of the dry season, before it becomes dry. This enables a controlled burn, which prevents fuels building up in the vegetation that can cause serious fires at the height of the dry season. Early burning also has the advantages of promoting of flush of new green shoots during the dry season, which prevent fires and can be used for livestock. Pastoralists frequently use early burning to create dry season pasture. Other farmers use a combination of early and late burning, burning the new flush of green vegetation later in the dry season to again promote a fresh flush with the onset of early rain season drizzles. Many farmers also create fire belts around their farms. Some use fire to create these fire belts since the flush of new vegetation also protects the farm from fire. Weeding farms in the dry season also protects them from fire[3].

Although there are many techniques for controlling fire, the influx of new populations and development of multiple livelihoods often complicates issues around fire. While many strategies exist for controlling fire, the use of fire is also central to many livelihoods particularly during the dry season. It is used to clear farms, in charcoal burning, palm wine tapping, honey collection, hunting, in cooking on the farm, and by pastoralists to create dry season flushes of grass. Within fire zone ecosystems, it is difficult to banish fire, and fire is likely to occur during the dry season. However, groups often use the outbreaks of dry season bush fires to attempt to blame other natural resource user groups with whom they are involved in conflict and competition over natural resources.

Fire management has also been complicated by the development of tree plantations within the transition zone, including cashew, mango and teak. Fruit tree plantations are highly vulnerable to fire, and this forms the most problematic risk factor for potential plantation developers. Teak plantations have fire resistance, but the dry leaves of teak frequently encourage the spread of fires during the dry season.
Within the Kintampo District Assembly, many of these issues are well known to the technical officers and field agents of government departments. However, they do not enter into policy deliberations on fire. The policy on fire is centrally defined by government and disseminated to the district through the Regional Coordinating Councils. The task of the district is to implement a policy that bans the use of fire in the dry season, after a particular date in the year, which coincides with the onset of the dry season. This date does not take into consideration the various adaptive strategies of farmers, pastoralists and other natural resource users that result in particular patch mosaics of vegetation. Before the onset of the dry season, the district is expected to implement an educational campaign that informs the citizens of the does and don'ts about fire. The problem with this campaign is that it does take into consideration the intricacies of fire management within the district and the existing knowledge of rural people about fire. It assumes that people know little about fire and its central messages are extremely simple. When taken to the communities the anti-bush fire

[3] While it leis beyond the scope of this work to go into ecological aspects of bush fire management strategies, overviews for Ghana can be fund in Amanor (2002). Laris (2002) provides useful information in a study in Mali. This section focuses on the institutional arrangements for managing fire within the districts.

campaign meets with apparent support. It receives the backing of the chiefs who are empowered to introduce byelaws against fire, and of the elite farmers who invest in plantation development. However, the policy of banning the use of fire during the dry season interferes with many off-farm livelihood activities which occur in this period. It also interferes with early burning strategies that aim to contain fire by fire. Many rural citizens find that anti-fire policies conflicts with their livelihood strategies so they attempt to evade the regulations. The policies are frequently poorly implemented, the logistics are put in place too late, and there are insufficient resources to cover the district. As the dry season progresses fire naturally breaks out in various parts of the districts, sometimes creating damage and at other times being contained by popular management strategies. However, every instance of a fire outbreak is taken to reflect on the poor management citizens of rural people, and on the need to introduce further controls. At the height of the dry season, the Regional Coordinating Council usually arranges for military units to be sent into the rural areas to police the rural use of fire. The military descend on villages with the help of NADMO and catch people going to farms with matches, or in the act of setting fires. Very few prosecutions are made in the courts, but quite often, goats and other farm commodities are carted away by the security personnel. The influx of security personnel makes little difference to the outbreaks of fire during this period. However, they discredit policymaking and local government among the rural people, who regard them to be unjust, unrealistic and lacking transparency. The policy makers essentially muddle through. They introduce desperate actions that assume the posture of taking a tough stance. They blame the rural people for the failings of their policies. Relations between the rural people and local government become increasingly hostile and the people do not comply with policy makers. Thus, problems that emerge in the management of fire cannot be effectively addressed. The main constraints in the management approach to fire include poor information on the ecology of fire management, lack of consultation with rural people, unwillingness to build policies on existing local practices and knowledge, lack of a consensus building management policy that encourages responsibility and involves different groups in building a consensus on appropriate management policies.

District information on fire is undermined by national policy frameworks that demand that districts implant policies of banning fire. This undermines approaches that attempt to gain a better understanding of fire management in specific ecologies, the role of fire in various livelihood strategies and the threat of fire to particular livelihoods. The constraints are often exacerbated by international agencies and donor programmes, which give support and tacit approval to programmes that attempt to, suppress and ban fire.

Information in policy hierarchies

The process of building information systems for policy involves four different processes:

1. collecting and updating information;
2. synthesising data;
3. analysing data for policy formulation;
4. managing and communication of information and definition of information needs.

The collection and updating of information involves both qualitative and quantitative data. It involves both a process of consultation with groups and communities to find

out their policy interests and of independently collecting data on these groups to verify their existence, composition, size, economic interests, livelihood strategies, spatial location etc. This latter can be achieved through carrying out surveys. The former arises through linkages within the existing system of decentralisation and consultations between sub-districts, communities and districts. The Assembly Members and Area Councils have an important role to play in ensuring that information on policies reaches their constituents and that the conditions within their constituencies are taken into account in policymaking.

The district assembly is responsible for overall multi-sector planning within the area under its jurisdiction. Higher up policy bodies tend to be sector based and discipline bound, collecting more specialised information. The district needs to collate specialise information collected across various fields into a form in which it becomes relevant for district planning. The various departments have an important role to play in making information available from their fields for district planning. However, because of the resistance of the departments to decentralisation, most departments are coordinated into national ministry and department structures that have their own autonomous programmes that they are responsible for implementing. Many of these programmes are projects that operate at the national level. The district departments are required to conform to these national projects and much of their information flows are determined by these. Most of these projects operate independently within the districts and jealously guard the information gathered within these projects, which becomes self-contained rather than contributing to building district related information. There is poor communications between the various sectors and poor integration of information. Because of this, much of the information within the district fails to be incorporated into district planning processes and district information systems. Much of the information exiting within the district is carried out of the district within departments, to higher up organisations, where it is never processed into a profile of the district.

For instance, revenues collected by the Office of the Administrator on Stool Lands from migrant farmers within the Kintampo district, are sent to the regional office where they are processed to calculate the royalties owing to chiefs. The district office does not keep records of the breakdown of these into the various paramount chieftaincies or the settlements in which they were collected. The regional office does not send records back to the district on the annual breakdown of revenues collected on land. Yet such information would be useful in identifying the influx of migrant farmers into the district and the main areas in which migrants are concentrated. Similarly, at the Area Council level, revenue collectors do not compute the revenues collected from different settlements within the Area Council, but merely record the total. Yet, this information would be useful for the Area Council in identifying the main economic activities within different settlements within the local council. At the district level, the revenues accruing from different commodities in the different Area Councils are not collated annually, although the information exists. This would be useful of knowing the importance of various natural resources and commodities in the different Area Councils. The district is merely content with recording the total revenues it gains from the various Area Councils.

At the national and regional level there is little attempt to make information available to the districts or to build the capacity of the districts to manage information and determine their information needs. The national and regional levels merely make demands upon the districts for information that they need.

Within Brong Ahafo, an information systems management unit has been established within the Regional Coordinating Council, the Management Information Systems Project. This is a project which was initially supported by DFID under the Brong Ahafo District Support (BADS) Programme, and then by GTZ. The objectives of the programme was to engage in a process of numbering of all houses within all settlements within Brong Ahafo, and then to conduct a census on all the dwellings in the region. The rationale behind this is the collection of information for introducing property taxes within the districts. The questionnaires were developed by the regional MIS who are responsible for the analysis of data. The district authorities are responsible for the inputting of their data, and for nominating relevant personnel within the Area Councils to act as enumerators and carry out the numbering of houses. The MIS is responsible for seeing to the harmonisation of the data and that a uniform classificatory system is introduced for settlement numbering in all the districts. The districts have little role in defining the data they consider significant, and the data they want collected in their areas. The content and structure of the information system is determined at the regional level. Analysis of data is only carried out by the MIS. Ultimately, the system empowers the regional MIS to control the management of data and does little to address the capacity of districts to collect, analyse and manage information. The collection of data works within the information needs of a specific project within the region. It fails to engage the community level in participating in information gathering. It also focuses on a highly controversial topic (property taxes), which may alienate communities from information gathering and create future suspicion.

The RCC has a central role in building the capacity of the districts to manage information. This should include collating existing data on the districts within the region, placing demands on central government to provide information *for* the districts; determining the capacity building needs of the districts to build their information systems; organising training; and placing demands on central government for logistic support to enhance information and planning capacity building. These roles are poorly developed within the RCC at present, which tends to act more as conduit for central government demands for information from the districts and for the extension of department-based project into the districts. The RCC submits a regional coordinated development programme of district development plans to the government. However, the profiles of the districts within the *Brong Ahafo Regional Co-ordinated Development Programme of District Development Plans for 1996-2000*, do not reflect processes of consultation within the districts with civil society organisations and communities. The major development problems in Brong Ahafo are predictably seen to be rooted in:

- illiteracy and lack of education provision;
- "poor adoption of appropriate technology and science and inadequate extension services" (Brong Ahafo Regional Coordinating Council, 1996:18);
- and environmental degradation which results from "bush fires, illegal timber felling, water and air pollution, improper waste management, charcoal and fuel wood production, poor farming practices and non-compliance of existing bye-laws" (Brong Ahafo Regional Coordinating Council, 1996:19).

These "problems" are not analysed in any greater detail, and merely mirror assumptions made at the national level. They do not list any positive achievements and capabilities of the people that can be built upon. They do not provide a favourable framework for any development initiatives, since they present an overwhelmingly

negative scenario of backwardness among the rural people and a lack of financial resources for local government to counter this. Perhaps, most tellingly, this document is not widely circulated within the district. Our copy was acquired at the regional offices, and we provided a photocopy on request for the Kintampo District Administration.

At the national level, within research and policy organisations, there is a tendency to commodify knowledge and develop applications that can be sold commercially. Examples include results from the last population census, and from initiatives carried out by the Environmental Protection Agency and Ghana Environmental Resource Management Project (GERMP). In some instances, the products of research have not been released since the agencies who contributed data are disputing ownership and rights to specific shares of sales. This has three negative impacts:

1. Information becomes expensive, particularly for organisations such as district administrations, as national agencies price their research products at comparatively high prices on the national market;
2. Information becomes closely guarded as a valuable commodity rather than shared;
3. National agencies stress the expert nature of their knowledge rather than attempting to develop information products that fit into existing institutional capacities and facilitate communication. The research products also fail to engage with people at the local level. They focus on making technical prescriptions based on notions of ideal land use or rational land use planning.

This commoditisation of knowledge is often portrayed as meeting criteria for sustainability. While it may create financial resources for the particular organisations that have managed to control the data and gain funding for the initiative, it acts as a constraint on building information flows within policymaking circles, a vital activity which needs to be sustained to develop more responsive policymaking and planning.

Conclusion

The centrist, top-down characteristics in national policymaking and its control over decentralisation tends to have negative effects on the development of information systems based on a two way flow of information. Information is centrally controlled and determined and information is processed centrally to produce prescriptions and regulations that are transferred downwards with little debate, deliberation and upward communication of needs and demands. Higher administrative bodies place demands on lower bodies to provide them with the information they require. However, the lower level administrative bodies frequently have a limited capacity to collect and manage information and often struggle to provide the information required from them on an ad hoc basis. Information is frequently collected though informal ties as the need arises rather than in a structured and methodical way which is institutionalised. There is little attempt to build the capacity of districts to manage information and use it in planning. This largely results from the limited role that districts can play in developing their own independent plans that reflects the needs of constituents. There are pressures to merely introduce centrally defined government policies and prescriptions as district policy. Policy processes are crippled by the pressures of the DCE and bureaucrats to rubber stamp government policies rather than develop appropriate policies to the needs of the district. This prevents creative approaches to development of information systems in the district and constrains officials from developing their own initiatives. These failing result in an inability of districts to

project themselves and to take advantage of the many funding opportunities and potential investments that originate from sources outside of government.

As information technologies become more widely available this results in increasingly glaring deficiencies in planning and information management functions within the districts. Information technologies cannot be disseminated without the building of district capacities to process and communicate information. They have limited applicability without a framework of two-way exchange of information

Decentralised information systems and planning can be strengthened and enhanced by transforming the roles of the RCC, and making them largely responsible for realising capacity in information management and planning at the district and sub-district level, and building their capacities to realise this function. Unfortunately, in recent years, the focus of donors on central financing through the Ministry of Finance, and pressures on governments to comply to international policy prescriptions have tended to strengthen centrist top-down approaches to planning, and have undermined the role of the RCC and the districts in building decentralised planning and policy-making capacity.

5. BUILDING DECENTRALISED INFORMATION SYSTEMS

One of the objectives of the DEAR Project was to devise an appropriate information system for natural resource management within the district which would provide the basis for planning based on evidence of conditions within the district, and which would promote a consultative process of natural resource management with community participation. This information system needed to be relevant to the requirements of district natural resource management, usable within the districts, while at the same time promoting participation of communities and user groups in policymaking. To meet these requirements the information system needed to be rooted within the institutional frameworks within the district, and build upon existing capacities and capabilities. It needs to fit to the existing resource base of the district.

An information system is here defined to constitute an institutionalised process for collecting, analysing and updating information for policy-making decisions. The information system needs to be created around institutional linkages for the collection of data by different actors at different levels of the policy hierarchy, and incorporate feedback processes, which allow different actors to gain access to the processed data and information that they need for making decisions and articulating policy demands. The information system needs to store various types of data on the district which can readily be accessed by different actors in the policy process.

To meet these conditions, the information system needed to be based on an analysis of the existing framework of information generation and use within policymaking institutions. In addition to facilitating the creation of an information system, the DEAR project needed to synthesis a methodology and recommendations for the creation of information systems in other districts. We needed to reflect on and analyse the implications of the various interventions we made at different stages. Thus, the main output of this component of the project is an analyse of the information constraints in natural resource management in the district and a strategy for creating

decentralised natural resource management information systems rather than a database on the Kintampo district. This chapter documents the main experiences of the DEAR Project in building decentralised information systems and the main recommendations that emerged from these activities.

Policy needs

Information and the gathering of data are viewed quite differently in policy and research circles. Social researchers often work from a case study approach. The validity of the case studies are tested and applied to larger populations through statistical sampling. In contrast, the administrative policy maker needs comprehensive data on the whole area under their domain before they can begin to make decisions. While policy can introduce pilot projects in a few communities to test a methodology for scaling up, this approach cannot be applied to information on which decisions are made. Policy decisions are based on information about the whole population and all the settlements under the policy domain. Policy is widely seen as the art of allocating scarce resources to localities based on assessing their needs and developing priorities, in ways that can be justified as transparent and based on a set of criterion. Policy needs to refer to data that applies to the whole area under its jurisdiction and does not prejudice its decision-making criteria and lead to allegations that it favours one are over another area. Thus, collecting data on a single settlement or a number of settlement, or developing ideal types of participatory data collection methodology rooted in the notions of an abstracted community or communities has little relevance to policymaking bodies. To be able to make recommendations for the implementation of information systems in policymaking, one needs to start with a policy domain and work out the institutional framework for the information system for that whole domain.

The last caveat limited the policy unit for interventions in creating an information system to the lowest policy domain. Given the size of a district and the resources available to the project, the creation of a comprehensive information system at the district level was not practical in the limited duration of the project. The project, thus, decided to work at the sub-district level. While the Area Councils provide effective domains for which comprehensive data can be collected by a small research team, they do not carry much political weight. A strategy needed to be worked out where the results of the work within an Area Council became relevant to a whole district, and could be scaled up and taken up by the district in its demands for resources and support from central government. A strategy needed to be worked out through which the work within an Area Council could be scaled up to all the Area Councils in a whole district with the District Administration rather than a research team coordinating the process. The lessons learned in building an information system in one Area Council needed to be developed into a methodology and strategy that could be easily applied to a second Area Council and managed by that Area Council. From this experience of scaling up, the pathway for developing a district wide information system based on the participation of all Area Councils would become evident. An added advantage of this approach is that it promotes participation at the lowest level of administrative decentralisation and the emergence of a more bottom up approach. When districts have worked out a feasible strategy for enhancing the use of information within the district, and building a relevant information system, they can begin to demand support from the Regional Coordinating Council. The regional level can then place demands on national level organisations based on concrete experiences. The building of a showcase information system within a district is likely

to have a knock on effect. If it has been achieved within the institutional structures and capabilities of one district, it can thus be applied to other districts, given the political will.

Advantages of working at the sub –district level

Area Councils have serious resource constraints, resulting from poor support from government, lack of revenues, and a lack of a highly skilled administrative staff. However, what they lack in technical capacity is often made up for by a commitment to local development among the largely voluntary personnel that make up the Unit Committees under their jurisdiction, who nominate representatives to the councils.

Area Councils are significantly small units with populations often in the region on 10,000-15,000 people. Area Councils are rich in social networks. They can easily mobilise Unit Committees, which deal with groups of hamlets, small settlements, and wards within larger settlements. The Unit Committees deal with small population sizes often in the region of between 500 -1,500 people. At this scale most people are familiar with each other. The social networks that exist within an Area Council combine a detailed knowledge of the people within specific localities and the natural resources with which they work. Area Councils contain detailed local knowledge of their areas. However, this knowledge and the capabilities of the people within the area are rarely mobilised for the gathering of information. The dominant form of community mobilisation is fro community labour for infrastructure and social amenity projects. Nevertheless, an important feature of Area Councils is that they can rapidly mobilise knowledge of the area contained in social networks. This contrasts with the districts, where the administrative staff are distanced from the rural people, often originate from other areas, are frequently transferred to other districts, and often lack detailed knowledge of local conditions. A strategic framework for information gathering, and a methodology are the main requirements for Area Councils to be able to collect information from their constituents.

National data sets often fail to develop comprehensive information for localities. They often contain general information that is so coarse as to have little relevance to the needs of Area Councils. Thus, Area Councils need to collect information from the local population for their policy needs, rather than rely on national datasets. This was particularly evident at New Longoro, where the Area Council had develop a sketch map of the council and its settlements based on the recollections of members rather than on national data sets, which did not accurately depict the existing settlement patterns within the area. The Area Council had also designed its own survey to collect data on its constituents. The social resources and capabilities of Area Council became evident once we had worked out a strategy and methodology for carrying out a natural resource census of the area. Within six weeks after initiating the survey, completed forms had been returned for more than 80 percent of the Area Council.

The “thickness” of the social networks within Area Councils became evident during the inputting of the data, particularly when those inputting the data were familiar with the particular settlement they were working on. In some instances, the data processors became aware that not all the people in the settlement were covered or that some of the data was inaccurate. They sent back the forms to be amended or corrected.

The survey was implemented by the Area Council working under its own initiative. The research team mainly provided technical advice, training and some financial

support. The financial cost for carrying out the survey was minimal and well within the finances of a district. This was largely because of the transaction costs were absorbed by the social networks of the Area Council and those who agreed to carry out the enumeration for a token financial reward.

There was also interest in the survey among the communities in the Area Council. Visitors to the DEAR Centre in Kintampo, and participants at meetings were interested in viewing their entries in the database.

Data collection

The design of the questionnaire was based on the existing layout of the questionnaire developed by the New Longoro Area Council. This consisted of a spreadsheet format entered in a foolscap exercise books, with columns above for the main questions and a line across denoting individual respondents. This design is easier for enumerators to handle than separate questionnaires. It is also easy for the Area Council to file. Each Unit Committee can be given exercise books in which to enter the data they collect. In the case of the natural resource survey we initiated in collaboration with the New Longoro Area Council the questionnaires were printed out on A4 sheets, but the spreadsheet layout was maintained with each question represented by a column in the spreadsheet and each respondent by a row.. This also made data entry much easier.

The first stage in designing the questionnaire was to hold an Area Council meeting in which natural resource issues were discussed. We then discussed the types of questions that were relevant for the survey. The questionnaire was printed out and another meeting organised with the Area Council to go through the questions. New questions were added and some removed. At the meeting, it was decided that only people over 18 would be questioned. All members of households in the various settlements under the Area Council over 18 years of age were to be included in the exercise. Where house numbers were allocated in settlements these were entered on the forms.

The questions were concerned with the names of people, gender, age, education level, primary occupations, secondary occupations, crops grown, and livestock. We also collected data on a number of particular activities, which were either being promoted by government services, or where attempts were made to control or ban specific activities. The latter included charcoal burning. The former included tree plantations, honey production, and grasscutter rearing.

The chairperson of the Area Council took responsibility for overseeing the survey. The original framework was to give out questionnaires to Unit Committees to fill in. The Unit Committees would announce to the whole community that they were conducting a survey with the Area Council and the Unit Committee members would go round the households filling in information. This structure had to be modified later, when it became apparent that not all Unit Committees had capable or committed members who could enter the survey or had time to go around all the households. The modified structure involved Unit Committees nominating members in their community to conduct the survey. Over thirty volunteers participated in the enumeration of the survey. The Unit Committee and the Area Council chairperson monitored their progress. The success of this organisational structure was manifest in the rapid rate of completion of the survey.

Data entry and analysis

After the data was collected it needed to be inputted into computers. Training was organised by Opoku Pabi, the Geographical Information Systems (GIS) and remote sensing specialist working on the DEAR team. The Area Council was responsible for nominating people to be trained. Again it became evident that the trainees needed to be extended beyond members of the Area Council to include community members who had the time and capacity to engage in data entry. Youth, Area Council secretaries and typists, and schoolteachers became the most committed data managers. None of the people selected for data entry had worked with computers before, although some had done secretarial courses. The DEAR team ensured that women were included among the trainees.

The training included an introduction to SPSS and Arcview, the two programmes used in creating a GIS. The focus was on hands on task-oriented training with participants learning new skills as they proceeded through the task of processing the survey. Ten people were trained to use SPSS and Arcview, including four women. A further three people went on to receive training in analysing data, and processing spatial data in Arcview. Two officers from the Agricultural Department were also involved in the training, in an attempt to build up linkages with the district administration and district based skills in managing the database. The New Longoro team was able to successfully input 7,500 records representing all the interviewed people in the Area Council and establish a fully functional database in a period of about six months.

Scaling up

Having successfully completed the survey in one Area Council, we decided to extend it to a second council. The rationale behind this was to see if the method we had established in New Longoro was replicable and confirm if it fitted into the structures and capabilities of Area Council, or if the results were fortuitous – the result of serendipity. A second objective was to establish the pathways through which the Area Council survey could be scaled up into a district process, and to define the roles that the districts could play in this process. The survey was replicated in the Babato Area Council. Two members of the District Reference Group were invited to be involved in the process, including the Planning Officer and an Agricultural Officer. The objective of this was to familiarise them with the methodology and strategy so that they would be able to take up the process within the district assembly and apply it to other Area Councils in the district.

The DEAR team limited itself to playing a supervisory and technical backstopping role. Members of the New Longoro Area Council research team were used to train those participating from Babato. The process began with a meeting with the Babato Area Council in which the objectives of the data collection process were explained. Members from the New Longoro team shared their experiences and maps, images and tables documenting the results of their survey were presented. The different tasks and responsibilities in the data collecting process were identified. The Babato Area Council was asked to identify individuals within their council area who could participate in the survey, including women.

Subsequently meetings were organised for the training of the survey team selected by the council. A plan was designed around a map of the area to ensure coverage of all communities. A member of the New Longoro survey team explained the

questionnaire design, taking the Babato members through the questionnaire used at New Longoro. He narrated the difficulties, problems, challenges and pitfalls that had emerged in conducting the questionnaire. Relevant questions were then drawn up to be included in the questionnaire. Although these were based on the survey used in New Longoro, they were modified to take account of different activities in the Area Council and the variation of crops grown. The Babato Area Council also decided to collect data on all members of households in its area, irrespective of age.

Figure 5. 1 Meeting between New Longoro and Babato Area Councils on survey design

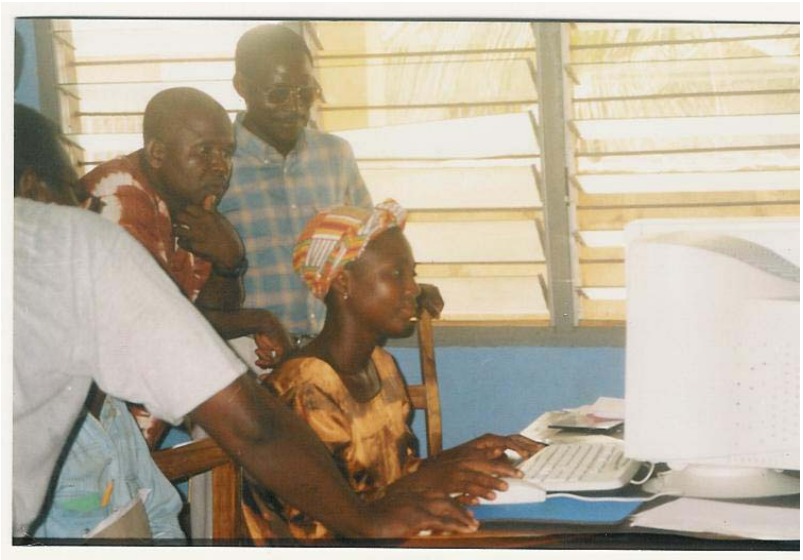


Figure 5. 2 New Longoro Area Council and community members entering data

The Babato Area Council selected eight people for data entry including four men and four women. Training was carried out largely by members of the New Longoro team

who had been involved in data entry, with the DEAR team introducing concepts in data analysis and the use of computers. This was the first time that these trainees had seen a computer. However, within a period of one week, the trainees started entering data, supervised by trainers from New Longoro. Within a period of five to six months 8,947 questionnaires were inputted into a database. Although the database is not perfect, and not all settlements are represented due to some logistic problems, the initiative confirms the capacity of the Area Council to conduct a census and collect relevant information that can be used in planning. With time, experience and support a truly comprehensive dataset can be created with radical implications for national development planning, provided there is national political support and commitment to participatory democracy.

Integrating Area Council Surveys into the District

The duration of the project did not enable us to extend the survey for the third Area Council in the Kintampo North district. However, to make the survey relevant to the district it had to be integrated into a larger database, which contained information on the district.

Although many problems have emerged in building linkages between the Area Council information systems and the district, there have also been successes. Having seen the results of the information system carried out in New Longoro and Babato, and realising its potential for district information management, the North Kintampo district has decided to extend the survey to Kadelso Area Council, using its own resources. The Agricultural Department is also interested in using the method to develop a district-based survey on livestock. It has consulted the DEAR Project about how to develop this survey.

In addition to the data on the two Area Councils, available information on the Kintampo district was assembled. This information was collected from the administration, the departments and from national and regional data sources. This was supplemented by part of our research programme concerned with remote sensing and land cover change. This included spatial information on the district and its resources, including settlements, population, watercourses, topography, soils, etc. The information contained in the GIS could be overlaid on these data sets, giving more comprehensive data than what was collected.

District Map

An accurate map of the district is essential for GIS, since it presents its data in a series of maps of the district. It is also essential for planning, for allocating services, infrastructure facilities, and for identifying settlements that lack services and need to be given priority in the allocation of funds and resources. District maps are prepared by the Town and Country Planning Office from the national Survey Department maps. The map of the Kintampo district was on a scale of 1:250,000, which was coarse for working within Area Councils. The settlements and roads plotted on this map were out of date. The map was derived from aerial photographs originating in the 1970s, which was the last national aerial photograph survey. Since then many new settlements and roads had sprung up, and some of the old settlements were deserted. Maps had not been updated to account for these changes.

One of the essential tasks in building a GIS relevant to the district was to produce an updated map of the district. Current settlements were identified through the national population census of 2000, from the lists of communities resulting from the Area Council surveys, and from discussions with Area Councils and community members. The coordinates of settlements were plotted using a Geographical Positioning System (GPS). Area Council and community members were trained to use the GPS and hired to plot the coordinates of settlements, which they travelled to by public transport, bicycle and canoe (for reaching settlements on the banks of the Volta river). The Kintampo Health Research Institute had also plotted out the location of settlements using a GPS in its Vitamin A project, and this data was used to locate many settlements. Existing Survey Department maps were digitised, including maps of settlements and road networks, watercourses, topography, etc. These maps were updated appending data from satellite imagery from 1990/1 and 2000/1 and identifying settlement and road networks using the collected GPS points. The boundaries of the district were plotted by identifying communities along the boundaries and verifying with the Unit Committees, Assembly Members and Area Councils in boundary communities the districts in which they fell and plotting their boundaries using GPS. This became particularly significant in 2005 when the Kintampo district was divided into North and South Kintampo, and the boundaries of the districts were not clearly known to the district assemblies. The DEAR project was able to produce accurate maps of the settlements and road networks in the two new districts, on which GIS sets could be built. There was a large demand for these maps in several departments within the district, including agriculture, health, education and the district administration. Large formatted district maps of the scale 1:150,000 and 1:120,000 were printed for district departments. Soil survey maps of the district were also digitised. Land cover analysis from interpretation of the satellite imagery was also recorded for the district. This was also compared to land use cover data collected under the Ghana Environment Resources Management Project (GERMPS). However, the GERMPS data was not very useful, since a large percentage of the North Kintampo district was covered with cloud.

The land use cover map was extracted from the 2000 Enhanced Landsat TM digital data. The data was extracted through a series of standard and conventional computer-based remote sensing processing and analytical techniques of geographic correction, registration, enhancement and classification. The resultant data was classified into natural vegetation cover, cultivated land, fallow land, built up areas, and water bodies.

While producing a map is clearly not a requisite for developing a district based information system, this shows that districts can update maps relatively easily, with some support from national research agency (such as supplying digitised maps). Districts can update there maps relatively easily with recent technology. A GPS system enables new settlements to be easily plotted onto existing digitised maps, which can be updated within the district rather than waiting for national initiatives which often take long to complete and are infrequently undertaken because of their costs. Relevant spatial data is often collected by sector-based projects mapping out specific facilities within districts. While they collect specialised data sets these are often grafted onto more general data (such as settlements, distribution of infrastructure facilities, etc.), which are of relevance to the district.

Synthesising information from district departments

Data was collected from the various departments within the district. However, there was a notable lack of data management within the district, with no concerted attempt to manage, store and build up data sets. For instance, valuable information on revenues collected from the various settlements and Area Councils was not collated. Yet the computation of simple statistics based on these records would have given indication of the importance of particular natural resources, crops, and livelihoods within the district. The Information Services also lacked basic data on the district. Most of the information they disseminated was based on prescriptive government policies and moral indictments. While most departments engaged in activities that involved the communication of information there was little attempt to collect and exchange information and build up profiles of the district. Even basic data on the members of the district assembly and the composition of Area Councils and unit committees was not readily available. Information collected by projects within the district is often disseminated to central agencies, but not collated within the district for future reference.

Institutionalising the use of information in planning

The collection of data form communities using sub-district structures can be achieved relatively easily. However, getting information used in planning processes is more difficult, since this is influenced by political factors and deep-seated institutional practices.

In fairness to the New Longoro Area Council and the Kintampo District Assembly several extraneous problems occurred during the life of the project, which deeply affected their functioning. The division of the Kintampo district into two at the end of 2004 adversely affected the New Longoro Area Council, which became divided between the two districts. While the New Longoro Area Council remained within Kintampo North, the richest settlements within its boundaries had been transferred to Kintampo South. Because of this division, the payment of revenues to New Longoro Area Council was thrown into confusion and became delayed. Those settlements within the south of New Longoro were also not clear of their new political identity and how they were to be incorporated into the new district. For much of 2005 there was speculation that the division of the New Longoro Area Council would not be effected, since the relevant Legislative Instrument was not published. As a consequence of these developments the New Longoro Area Council failed to meet, since it did not have funds to hold meetings, and was also confused about which settlements to invite to the meetings. These problems also tended to heighten factional disputes within the Area Council. The New Longoro Area Council became embroiled in problems related to its own identity, which clearly took precedence over information generation and policy deliberation. By the end of the project, these problems have still not being clearly resolved. Until these problems are resolved the Area Council GIS system cannot be effectively incorporated into a planning process, since this will have to be restructured and rebuilt. This also seriously affected the district assembly, which had to reconstruct its identity and its institutional configuration. The offices of the Kintampo district Assembly were taken over by Kintampo North, while new offices were created for Kintampo South in its newly created administrative capital of Jeema. Some of the district staff in Kintampo were transferred to Jeema.

Beyond these difficulties, there are certain structural features within the configuration of districts and Area Councils that result in weaknesses in planning and the use of information. Neither of the two Area Councils involved in the survey reported their involvement in the survey to the district, nor did they attempt to solicit resources and support for their activities. While there were frequent meetings and informal exchanges between Area Council members and the District Chief Executive, these did not result in a better coordination of policy. Many of these meetings seemed to take the form of requests from the DCE to collect information from particular settlements in order to respond to policy demands coming from central government. The Area Councils rarely placed demands on the Assembly to operationalise their policy roles. A lot of policymaking seemed to be reactive. The Assembly often appeared to be preoccupied with maintaining its day to day functioning and seemed to be stretched by central government demands. It did not develop a proactive approach to policy, developing its capacities to develop forward planning and to evaluate and reflect upon its activities. This became evident in the workshop held with the North Kintampo District Assembly (see annex B). The major concerns raised by the participants, mainly made up of Assembly Members and district administrative staff, were with a lack of institutionalised planning and consultation in planning. The contradictions between democratic elected representation, government appointed councillors and a government appointed DCE also result in some of these problems, in which government exerts its influence over local planning processes, and local policies are dominated by government concerns rather than local needs. Highly placed officials with government connections often attempt to monopolise the planning process rather than promote democratic consultations.

Similarly, the district assembly is also weak in representing its capacities and needs to the Regional Coordinating Council. When the Regional Coordinating Council introduced the Management Information Systems (MIS) Project to the Kintampo district, the district administration (including members of the DEAR Reference Group) did not inform the Regional Coordinating Council of the initiative it was involved in with the DEAR Project. The two initiatives were seen as essentially separate, because they involved different district departments. The main district collaborator in the MIS initiative was the Budget Officer. The MIS project was also reluctant to share experiences and data. It was largely concerned with getting the districts to comply with its overall design for the region and standardising data collection techniques, rather than building district capacities to process and communicate information.

Within the district assembly there is little capacity to manage information or institutional recognition of the importance of information in planning. Although the district has a District Planning and Coordinating Unit, with responsibilities for collecting information, this unit is not functioning. As Kwadjo Yeboah (2005:15), the Town and Country Planning Officer for Kintampo North commented in a paper presented at a Workshop organised by the DEAR Project on Decentralised Information Systems and Natural Resource Management (Annex B):

> '[The DPCU] is supposed to assist the DA in its designated planning, implementing of programmes, monitoring and evaluation, and coordinating functions. However, this does not exist on the ground. Their activities extend to the Area Councils and Area Council sub sectors. However, in most cases where the DPCU should prepare plans for the areas, this is done from their desks rather than establishing a process of consultation.

> Every DA is supposed to prepare a development plan that guides the management of the district. In Kintampo one was prepared in 2002 and it is supposed to be annualised every year to roll back the plans. Only a few people participate in the planning process. I don't know if the projects earmarked for the areas are still in the development plan because someone can sit down somewhere and cancel a lot of things and change the plans without consultation. Planning oscillates between the roles of initiating and reaction, and most of the time the actual decision-making and implementation of projects is done by the politicians and people with economic shoulder rather than as a process.'

There are no meetings within the district assembly to discuss and determine the information needs of the district and its information requirements for realising its planning roles and responsibilities. Information gathering and disseminating processes respond to political hierarchies and are determined from above. Thus, most information gathering processes are reactions to central government demands for particular information. Information dissemination is based on the requirements of particular projects organised at the national level, rather than responses to the needs of citizens.

These processes are reinforced by the control of central government over district policymaking through the DCE, which undermines the ability of districts to develop their own policies in consultation with the wishes of the citizens. The resistance of departments to decentralisation and the continued determination of district policies by central agencies results in top-down decision-making continuing to dominate district departments. Policies for the districts are largely determined by these central departments and depend upon information at the central level, rather than districts coming together to build information to use in determining their own priorities in consultation with citizens. These define national programmes and projects that are to be implemented in the districts by staff. The district heads attend nationally and regionally organised meetings on the implementation of specific programmes in the districts, and the department staff attend training workshops. Staff are usually trained within a framework of modernisation theory which dismisses the technologies of the rural people and seeks to replace them with new technology. While the departments now espouse participation, this vision involves rural people participating in externally generated programmes and adopting predefined prescriptions. These constraints are reinforced by the Regional Coordinating Council, which tends to present sets of prescriptions and demands for districts to implement, including byelaws, rather than facilitating processes of consultation and information generation to get more responsive policies in place. Information demands on the district usually are transmitted from regional departments and projects, rather than originating within a multi-sectoral framework that addresses information capacity building.

Some of the main constraints in information within the district include the following:

1) Information is not methodically collected. It tends to be generated when there is an external demand from government and external agencies.
2) Information tends to be contained within departments. It is jealously guarded, and not shared or built upon through exchanging experiences.
3) Information is not collated. There is considerable data and sources of data available to the district administration that is not processed, collated, stored for future use, or used in policy decisions.

4) The district does not define and analyse its data needs, develop strategies for building information systems, and place demands on government agencies.
5) There are few attempts to build capacity and capabilities.
6) Information is not valued and used in planning, and planning is often about muddling through and implementing policies defined higher up the policy hierarchy.

The key to building information systems within the district is to recognise their importance in planning, and establish processes of consultation in planning. Data and the perceptions and demands of citizens are central to more sensitive planning. Information is important in creating citizens who are conscious of the objectives of policies and willing to contribute to their improvement and relevance. Establishing a framework for informed policymaking that meets the needs of citizens can achieve more than the distribution of infrastructure projects and social amenities.

The centrist framework of policymaking results in a top-down desire to control information, to demand particular pieces of information without addressing information capacity building issues, and to transmit information as a set of prescriptions. However, this fails to enhance the institutional structures of information collection and communication. Information systems are most effective when they facilitate the downstream collection of information, and seek to build capacities for generating information and the communication of information. Thus, an important function of decentralisation is the building of local capacities to generate and communicate information. This can only occur when institutions higher up the hierarchy give priority to building information generating capacities down the hierarchy, and rely on this institutionalised capacity to supply them with much needed information.

The action research the DEAR project carried out in the Kintampo district reveals a potential framework for the management of information based on existing decentralised structures. In this structure the Area Councils collect information about their areas in consultation with the communities, using the structures of decentralisation that reach down into the communities, through the Unit Committees. The districts facilitate this process by providing logistic support for this exercise and conveying the needs of the Area Councils to the Regional Coordinating Councils. The data collected by the Area Councils is synthesised into a district database which would come under the responsibility of the District Planning and Coordinating Unit. The data collected by the Area Councils is disseminated to the Unit Committees. Ideally, every Unit Committee should have a record of the data collected on all the individuals within its area of jurisdiction, which they can check for accuracy. This also provides a cost effective strategy for periodically updating the information through Unit Committees. Data collected by district departments would also be collated into this database. Consultations would be held between Area Councils, who should have representation on the DPCU, the District administration, the departments and the committees and sub-committees. Districts would develop plans for enhancing information within the district. These information needs would be conveyed to the Regional Coordinating Council who would be responsible for building capacity at the districts to manage information, and providing the districts with information they require from national sources and with training to build upon their existing datasets. The Regional Coordinating Council would place demands on national information and research services to provide relevant information for the districts. They would

also collate the information generated from the districts into a regional information system. Ideally, research capacity would be built at the regional level enabling more thorough technical data on the region to be collated, including mapping technologies and specialised technical data. The data would regularly be updated by the Area Councils and districts, rather than waiting for expensive national initiatives that can only be conducted at long intervals and which take long periods to process the data and put it in the public domain (by which time it is often dated). Ultimately, this system depends upon the willing participation of communities to supply information. This support will depend upon the extent to which districts develop planning processes that meet their needs rather than antagonise them. Thus, information, planning and participation are closely interrelated.

In spite of the institutional constraints that characterise the use and communication of information within districts, the Kintampo North District Assembly has expressed interest in taking over the management of the natural resource management information system. An arrangement has been reached where the Area Council GIS are to be housed in the district assembly premises (rather than the district administration), with the district assembly guaranteeing the Area Council rights to access their data, and rights to manage and update it. This arrangement has the advantage of enabling the Area Councils to fall back on the district for support in maintaining the GIS and for the maintenance of computer equipment. While information technologies are still in a rudimentary state at the present within the district, technicians are available on some projects and certain skills that can provide support. This arrangement can facilitate collaboration between the Area Councils and the District Assembly in building information systems. However, the future of this information system will be shaped by the extent to which the district develops it to meet the needs of citizens and to build downward accountability, or to meet the demands of central government for information from the districts.

There is increasing interest at present in the district assembly in information. This is largely a result on increasing national demands for information, as information technologies begin to be established within national agencies, and pressures are created from donors and investors for more transparent and available information. However, this demand for information may not necessarily translate into more democratic planning methods based on consensus building, but may be informed by top-down processes demanding information for processing to justify national policies. They may not result in the sharing of information and the enhancing of downstream information generating capacities that empower people to exercise choice based on deliberation. They may lead to the creation of top-down bureaucratic information systems, which lay the emphasis on new technology rather than the use of technology to enhance participation in policy processes. The present period offers much potential for building new approaches to information and the communication of information, before new information technologies become institutionalised within the district. The potential exists for using new technologies to achieve institutional change that responds to the needs of citizens and enables policy planning to be better integrated with existing conditions, perspectives and aspirations.

Participatory planning and advocacy

In recent years there have been several initiatives that have attempted to promote participatory planning. In Ghana, this has included the GTZ Programme for Rural Action (PRA) and the UNICEF supported Community Based Development

Programme (CBDP). These programmes have focused on building linkages between communities and district assembly and strengthening planning capacity. They focus on a process of community mobilisation where community facilitators are trained to help the community prioritise their needs and develop plans which are submitted to the district assembly for funding. The district administration assesses and evaluates the proposals, and prioritises them for funding. The donor usually provides some funds for the district to support small scale community programmes. These projects usually work with social amenity programmes, such as schools, clinics and boreholes, and the funding of rotating credit programmes, community grinding mills, etc. In the PRA, unit committee members and assembly members were trained as community animators. The Kintampo district was one of the pilot sites for the PRA.

These programmes largely focus on the allocation of resources for the development of infrastructure. They involve the ranking of various proposals from different settlements and the allocation of funding based on prioritisation of need. They do not easily translate into programmes concerned with the environment or with complex governance issues. They assume that the major issue in district planning is transparency. They also assume that information is readily available, that communities have the information they require to articulate their needs and do not have differentiated social and group interests. They also assume that the districts have sufficient information in which to effectively plan for the district, and that planning is merely about allocating scarce resources to particular projects and particular areas. Ultimately, transparency is related to the availability of information and lack of transparency occurs when information is not used and shared.

A second approach is to promote advocacy among civil society groups. These civil society groups (often NGOs) usually focus on demanding accountability from government and local government. In the context of local government, they often focus on budgets. The standards against which accountability is measures are usually drawn from international declarations of human rights to which the government of the land support, which may include rights to notions of democracy, social welfare, freedom of expression, and information. Given the problems with planning processes within local governments and the problems of representation, it might be useful to complement this civil rights approach with notions of participation in policymaking and a capabilities approach. This would focus on participatory democracy as a right and on downward accountability. Policy processes and planning would be measured against the demands and perspectives of citizens, and the objectives of interventions would be to create more inclusive and representative policy processes in which rural people participate. In this context, policy interventions would focus less on budgets, which come at the end of the policy process, and more with the information systems and the communication of information for consultative policymaking.

Within the natural resource sector, there is a large rift between the perspectives and livelihoods of rural people and the dominant policies advocated by governments. The problems go well beyond accountability to issues of the ways in which rural people are represented. There needs to be more emphasis on consensus building and informed decision-making rather than on regulation and enforcement of regulation. While it is often asserted that environmental degradation costs nations a significant proportion of their wealth, it is also the case that policies that alienate rural people also encourage poverty, hinder wealth creation among the most marginalised elements in society, and foster rent-seeking, corruption and ineffective policies. The right

balance between these two factors can surely only be achieved by developing more informed and open policy processes that encourage dialogue and consensus.

A focus on information in planning offers a promising way of tackling some of the constraints built into current decentralisation initiatives and the control central government continues to hold over decentralised policy-making. The main elements in this would consist of promoting the following:

- informed policymaking and dialogue and consensus between different interest groups at different hierarchical levels;
- the collection and dissemination of information between all the different levels in the hierarchies of decentralisation;
- the right of rural citizens to information on policy and development options.

This approach is likely to contribute towards the development of more participatory and downwardly accountable policymaking. It is also likely to enable present inadequacies in national policy planning processes and the main obstacles to more participatory planning processes to be identified, in terms that are more tangible.

While there is likely to be resistance within the higher policymaking echelons to reforms that promote a greater role for Area Councils and communities in policy formulation, there is also the potential to open up new spaces. These spaces essentially arise from the inadequacies of existing support to policy processes at the lower levels of decentralisation; the sheer frustration felt by many people working at this level of the inadequacies of their actions and the lack of logistical support; and a recognition of the political dimensions of centrist policy processes.

However, this space can only be won by focusing on building the capabilities of lower level administrative units, emphasising civil society support for local policies, and the complementarity of local government-civil society initiatives. It is important to identify civil society with the rural poor rather than the rural elite; and to promote downward accountability as an essential part of democracy. Positive interventions need to be made at the district level, which translate better information into more effective policy processes that enhances both the quality of work carried out by people within the districts and their work-related self-esteem. While this work may appear to be intensive, demanding and cost-intensive, successes are likely to be highly replicable on a national level.

Information technology can play an important role in contributing to opening up spaces for access to information and dialogue. This is because the advantages of information technologies can only be realised when they facilitate the communication of information between a large number of actors in different locations. The benefits of information technologies cannot be realised when information is closed, guarded and communicated as prescriptions..

Conclusion

Natural resource policies at the district level are often based on prescriptions and moral imperatives that are frequently not reflected in the conditions that pertain in the rural areas. They are rarely based on the dissemination and collection of information and the building of consensus. The DEAR project attempted to build an information system for natural resource management that would fit into the institutional

framework of decentralisation within the Kintampo district. The approach focussed on building information generation into a framework of participatory democratic policymaking. The initiative began by building comprehensive data collection at the lowest level of decentralisation, where links with communities are strongest. While this level may have the lowest concentration of skilled personnel, it contains thick social networks that have much knowledge of the locality, its people and its natural resources. The youth within these settlements also have the capacity to learn new skills and can make important inputs into the development of information systems.

Dominant approaches to information in policy processes tend to define the information they require from lower down policy hierarchies and demand that this information is provided. However, they rarely build the capacity of lower administrative structures to collect and analyse information. As a result, information collecting tends to be poor, and this is ramified throughout the whole policy hierarchy to the national level. Information tends to confirm preconceived notions and received knowledge. Information is also poorly disseminated and communicated. The main information being conveyed down the policy hierarchies by district information services and departments is often a set of prescriptions, moral imperatives and byelaws. The weakness of information results in policies that do not accurately reflect situations, that alienate and antagonise rural people and criminalises their livelihoods. Policy fails to build on local capacities and capabilities, wins little support from the people, and fails to make meaningful contributions to society.

In contrast with these approaches, the DEAR Project sought to strengthen local capacities to use and communicate information. It allowed the Area Councils to decide what information was relevant to them. It enabled them to develop a census in a form that was meaningful to them and with which they were comfortable. It used the existing institutional structures within the sub-districts down to the community level in implementing the census and allowed the Area Council and communities to take the initiative. It encouraged the Area Council to use the available skills and capabilities within the communities in implementing and processing the survey. In a short period, the Area Council was able to collect a comprehensive set of data on its area. Since this process is dependent upon support from the communities, its future depends upon the Area Council communicating the results to its citizens and using the information in developing a more consultative approach to planning.

Having worked out a strategy for building information systems at the sub-district level, the project devised pathways for scaling up the project to the district level. This involved an Area Council training other Area Councils, and the district administration synthesising the database of various Area Councils into a district information system, and providing support to the Area Councils. The information system can then be used in district planning. However, the ultimate success of this will depend on institutional reform within administrative bureaucracies and departments. This requires a much clearer delimitation of roles and responsibilities. It requires a recognition of the responsibilities of higher administrative organs to build the capacities of lower administrative organisations to set their own priorities based on information and information management. It requires recognition of the rights of communities to information, and the right to participate in the process of making policy decisions that effect their lives and livelihoods. Without these basic considerations, policies cannot meet the needs of rural citizens and build upon their capabilities, needs and aspirations. The creation of better-informed rural citizens and downward accountability carries many political implications that go against the grain of

dominant policy processes, which are based on the control of information and the downward dissemination of centrally determined policy prescriptions. Nevertheless, the contemporary contradictions between over-centralised policy processes and articulation of support of popular participation, democracy, democratic accountability, human rights, and decentralisation must open up political spaces for top-down policy processes to be challenged and transformed.

Within the present configuration of decentralisation in Ghana the two most effective locations for innovative interventions are probably at the sub-district and regional levels. These two levels represent important interfaces - the first between local government and communities, and the second between local government and central government. The DEAR Project focused on the Area Councils - the Regional Co-ordinating Councils (RCCs) lay beyond the scope of the project. However, there are interesting parallels between these two interfaces. In the case of the RCC, there are conflicting roles between its responsibilities to ensure that government policies are translated to the districts and that district plans conform to government policies. This tends to produce a top-down approach, in which the RCCs develop policy prescriptions for the districts to implement. However, the RCCs also have a second role in building the capacities and capabilities of the district administrations to engage in policymaking, information gathering and planning. Given the nature of the instruments defining decentralisation in Ghana, this should involve the RCCs in finding innovative ways in which to actualise a participatory consultative and democratic framework for decentralised development.

In reality this does not occur, since the RCCs are under-resourced and do not have the capacity to undertake such a programme. Lack of financial support, logistics, and human resource development prevent the RCCs engaging in capacity building programmes. The main activities of the RCCs largely consist in acting as a conduit for government prescriptions and demands for information on particular areas. This role has a negative impact on the districts. It pressurises the districts to conform to government demands, which prevents them from considering their own needs, and reflecting on how to actualise effective development plans that reflect consultative institutional processes within the district. The RCCs are responsible for maintaining an information system for the region and reporting on the conditions within the various districts. However, their data sets for the districts are often scanty, lack innovative approaches and sensitivity to the perceptions of the rural people within the districts. The data they produce often seem to originate from national data sets rather than the districts.

During the 1990s there was a move of donors to work at the regional level. The DFID Brong Ahafo District Support Programme worked with strengthening the communication of information, and the transparency of the institutional management of information mainly within the Regional setting with pilot district. However, without a parallel programme working at the interface between local government and communities these issues are not translated into downward accountability, and the development of policy processes that meet the requirements of the citizens within the district. The combination of regional bodies working to enable capacity within the districts, and sub-district bodies working at the interface with communities, should produce a pressure on districts to actualise their planning processes in ways that are downwardly accountable and meet expectations of people. Although there are powerful interests continually seeking to subvert these developments for their own narrow interests, there are limits on the ways in which they can continue to subvert

institutional development, particularly when these institutional processes exhibit promising capabilities and innovative ways in which to solve problems. The challenge is to identify these promising institutional configurations and provide them with support to begin to show their potential for a process of self-reliant development that mobilises existing human and social capabilities.

6. CHARCOAL PRODUCTION, POLICIES, LIVELIHOODS AND REGENERATION

In recent years charcoal has become an important livelihood activity for farming communities within the transition zone and savanna woodlands, as urban demand increases. In environmental policy circles, the expansion of charcoal production has resulted in growing alarm, and allegations that charcoal production is destroying the environment and resulting in rapid deforestation. This has created pressures to either ban charcoal production or introduce controls. Controls consist of introducing improved technologies for more efficient burning of charcoal, and encouraging production from woodlot. In reality, there is little monitoring of charcoal resources in policy circles. Little research has been carried out into the nature of regeneration in the environments in which charcoal is produced. The evidence against charcoal production is largely based on assumptions rather than on research.

This chapter examines the importance of charcoal in the economy of the transition zone. It argues that charcoal production has become highly politicised. Many of the debates and environmental discourses about charcoal form part of a political struggle between different interest groups to gain control of the lucrative resources, revenues and profits from the production of charcoal. These interest groups use narratives of environmental destruction to further their interests and justify their control over the resource. The chapter examines the nature of regeneration within charcoal production areas and examines the impact of charcoal production on the environment. Research was based on a detailed study of the nature of regeneration on a select number of farms and fallow areas in which charcoal was been cut, and the distribution of the main species used for charcoal production. This is complemented by remote sensing analysis, which examines wider patterns of land cover changes in the landscape of the charcoal burning settlement where we worked.

Charcoal in Ghana is mainly produced in the transition zone and in savanna woodlands. Its production in high forest is insignificant. The major zone of production lies in the Brong Ahafo region and northern Ashanti, extending from the Kintampo district to Ejura and Mampong. During the late 1980s about 50 percent of charcoal for the Accra Market was estimated to originate from Brong Ahafo, 25 percent from the Afram Plains and 10 percent from the Volta Regions. During the same period 90 percent of the supply of charcoal for the Kumasi market originated from Mampong, Nkoranza, and Kintampo areas, and 10 percent from the waste of sawmills within the city (Nketiah et. al. 1988). In recent years, charcoal production has rapidly grown as the urban areas expand. Charcoal is the major source of cooking fuel in urban areas. About 70 percent of urban households rely on charcoal, followed by 17 percent on fuelwood, 6 percent on kerosene, 4 percent on gas and 3 percent on electricity (Nketiah et. al. 1988).

Policy approaches to charcoal management

Since the late 1980s, charcoal production has become an important environmental policy issue. Policy recommendations oscillate between banning charcoal production and introducing controls and modern technologies to make it more "efficient" and less "environmentally destructive". Bans on charcoal are usually implemented at the district level through byelaws. They claim to respond to concerns that charcoal production is rapidly producing deforestation within the district; and that, without interventions to control deforestation, the demands of the urban market will destroy the rural environment. The alternative approach argues that it is unrealistic to ban charcoal since the vast majority of the urban population rely on it for their cooking fuel, and there are no immediate realistic and viable alternatives. Therefore, interventions need to be made to ensure charcoal production is less destructive. This can be achieved by introducing new modern efficient technologies resulting in more efficient carbonisation, and tree planting projects to mitigate the destructive effects of tree cutting. This approach has been advocated by the UNDP, FAO and the Ghana Energy Commission. However, there is little evidence of dissemination of new technologies and tree planting programmes for small-scale charcoal production, and there is no significant uptake of new technologies among the producers. The urban areas continue to be mainly supplied by charcoal produced in the established manner from naturally regenerating species. Since there are no technology packages which districts can distribute to charcoal burners, for districts, anxious to protect their environment or to be seen to have environmental policies in place, the banning of charcoal appears as the only practicable, and certainly the easiest, policy interventions that can be made.

In the late 1980s the Brong Ahafo districts of Kintampo, Nkoranza and Atebubu came together to formulate a ban on charcoal to protect the environment. While they were not able to implement this ban, from this date onwards several districts have attempted to introduce bans on charcoal, including districts in the Afram Plains, where there is currently a ban. Recently, districts within the Northern Region have also declared a ban on charcoal. In some areas, the district administration has not implemented bans but encourages or allows chiefs to introduce bans on charcoal. This enables effective bans to be introduced without the district administration having to take responsibility for any problems emerging from the ban, or having to go though the process of attempting to ratify the byelaw with the Regional Coordinating Council and the Ministry of Local Government and Rural Development.

The national media portray charcoal production in an unfavourable light. For instance an article in *The Advocate* of June 1st 2004, titled "Wulugu and Charcoal Trade: A matter of Survival", depicts:

> 'a barren and desolate environment indicative of the havoc caused by the activities of people engaged in the firewood and charcoal trade. Over the years, the lucrative trade in wood and charcoal has encouraged harvesting beyond sustainable levels, which has had serious ecological consequences on the area….economic trees like the Shea and Dawadawa [locust bean, *Parkia biglobosa*] are among the best used wood fuels for charcoal production. Since the wood trade is not regulated, the rate of environmental degradation is on the increase' (p.5)

Among the charges against charcoal burners are that they cut trees indiscriminately without any concern about the regeneration of the environment, and cut economic trees, particularly the Shea (*Vitellaria paradoxa*) and Dawadawa (*Parkia biglobosa*). Charcoal burners are often depicted as irresponsible youth who prefer to make money the easy way through charcoal burning rather than farming. It is also alleged that charcoal burning is also leading to agricultural decline, as youth desert farming and helping their parents on their farms in favour of charcoal. These prejudices are widely found among the urban middle classes, NGOs and government agencies concerned with the environment, as revealed in the study conducted on perceptions of policy makers (See Annex G).

Although there are calls for policies to control or ban charcoal production, there is a surprisingly little research on the impact of charcoal on the environment. The district administrations (which gain significant revenues from charcoal and are at the forefront of banning its production) keep few records on the level of charcoal production within their districts and play little role in monitoring its production (Nketiah et. al., 1988).

The most substantial research on charcoal production in Ghana is the UNDP sponsored baseline study by Nketiah *et al* (1988). In contrast, with many of the policy assumptions, this study establishes that charcoal burners do not fell trees indiscriminately but are selective. It identifies a few of the species used in the production of charcoal. However, it does not conduct any research on regeneration after cutting, or cite literature on this. It assumes charcoal production is leading to deforestation, that most of the species are slow growing and on the way to extinction:
'Standing trees of the preferred wood species are cut whilst residues of the so called unsuitable species are not utilized. Most of the preferred species are slow growing and may soon be extinct. There is the need to control the rate of their exploitation, e.g. by setting girth limits for trees that can be felled for charcoal.' (Nketiah et. al., 1988: 42)

The second body of research on charcoal has been carried out by the Traditional Energy Unit of the Savannah Resource Management Centre of the Forestry Commission, with support from DANIDA. The overall research findings of this project and there formulation into a policy strategy document can be found in *Sustainable Production and Marketing of Woodfuels: Strategy for sustainable natural resource management in the northern Savannah* (Traditional Energy Unit, 2002). This document advocates:

> 'A fundamentally new approach to woodfuel production and marketing needs to be initiated in the savannah region, not only to balance production with the environment but also to promote development within the traditional energy sector itself.
>
> There exists a need to establish new institutional and legal arrangements that promote direct public and private sector investment in a more efficient production and consumption techniques. Thus, the sub-sector will have to shift towards an economy of conservation with incentives to integrate environmental values into business practices and promoting long-term investment and capital gains, rather than short-term profit maximisation. This requires a new approach to woodland management, harvesting techniques, taxation and a new corporate vision.' (Traditional Energy Unit, 2002:5).

The basis of this new strategy involves the Forestry Commission exerting greater controls over the management and regulation of charcoal, and the introduction of new taxation levels to pay for the cost of management. The interventions also encourage a fundamental restructuring of the charcoal trade in favour of large scale commercial producers. This is to be achieved by:

- Promotion of investments in more efficient energy consumption for large-scale users
- Exploring alternative income generating sources for non-wood products (Traditional Energy Unit 2002:6).

At the community level, this requires the displacement of existing small-scale charcoal producers, who will be provided with alternative livelihood support, based on:

'Introducing farmers especially women's groups and the unemployed youth to alternative income generating activities like small ruminant rearing, dry season gardening, bee keeping, improved Shea butter processing, and breeding of wildlife in captivity'. (Traditional Energy Unit 2002:10)

A radical restructuring of the charcoal industry is proposed on the basis that charcoal burning is unsustainable. However, the report provides little evidence of this. Indeed, in its effort to solicit support from government and donors for new forestry sector interventions, the report stresses how little is known on woodfuel production:
'Ghana does not have an accurate and consistent data on woodfuels to guide policy and planning for sustainable production, marketing and consumption of woodfuels. There are no comprehensive and consistent data sets on stocks of woodfuel available in the country in each ecological zone, neither are there any data on woodfuel consumption by the various sectors of the national economy. At the macro level, aggregate data are inferred from very weak database, which does not provide any meaningful base for planning.' (Traditional Energy Unit 2002:6)

A visit to the Savanna Management Resources Centre in 2004 confirmed that they did not have any data on the natures of savanna regeneration and detailed studies of the impact of cutting on regeneration. The Forestry Commission only carried out inventory data on timber species. Thus, the framework for sustainable woodfuel production is largely supported by preconceived notions that dismiss the livelihood strategies of peasant farmers and rural producers and presume an environmental crisis. The concept of sustainable cultivation is largely used to introduce a political agenda with disturbing implications for small-scale producers.

Charcoal production and rural livelihoods in Kintampo

Charcoal production is one of the most important economic activities within the Kintampo district. It is the most important source of revenues collected in the rural areas by the Area Councils. Collating returns for revenues from charcoal from 2000-2004, charcoal consistently produces in the range of about 50-80 percent of total revenues for the Area Councils in Kintampo North District and 68 percent of total revenues for the three area councils for the period 2000-2004.

Table 6.1 Area Council Revenues in Kintampo North (in Ghana cedis)

BABATO AREA COUNCIL						
Year	**Charcoal**	**farm produce**	**Market**	**Others**	**Total**	**% of charcoal**
2000	36,268,800	5,813,500	6,896,500	2,120,000	51,099,800	**70.98**
2001	30,863,000	11,365,000	8,162,000	1,563,000	51,953,500	**59.41**
2002	50,192,000	28,724,000	11,494,000	679,500	91,089,500	**60.78**
2003	51,020,000	27,448,000	7,998,000	878,000	87,344,000	**58.41**
2004	57,824,000	49,349,000	8,533,000	2,186,000	117,892,000	**49.10**
TOTAL	**226,167,800**	**122,699,500**	**43,083,500**	**7,426,500**	**399,378,80**	**59.73**

KADELSO AREA COUNCIL						
Year	**Charcoal**	**farm produce**	**Cattle**	**Others**	**Total**	**% of charcoal**
2000	12,966,000	6,940,620	4,127,000	3,532,100	27,565,720	**47.04**
2001	13,567,000	4,249,500	4,361,000	150,000	22,327,500	**60.76**
2002	25,862,000	5,984,000			31,846,000	**81.21**
2003	50,041,000	8,049,000	2,457,000		60,547,000	**82.65**
2004	79,493,000	17,942,000	5,000,000	40,000	102,475,000	**77.57**
TOTAL	**181,929,000**	**43,165,120**	**15,945,000**	**3,722,100**	**244,761,220**	**69.86**

NEW LONGORO AREA COUNCIL					
Year	**Charcoal**	**farm produce**	**Others**	**Total**	**% of charcoal**
2000	25,921,000	8,319,000	2,183,900	36,424,610	**71.17**
2001	18,718,000	8,243,000	2,366,000	29,327,000	**63.83**
2002	28,742,000	6,358,000		35,100,000	**81.89**
2003	63,621,000	8,188,000	2,448,000	74,257,000	**85.66**
2004	75,493,000	18,677,000	5,040,000	99,210,000	**76.09**
TOTAL	**212,495,710**	**49,785,000**	**12,037,900**	**274,318,610**	**75.89**

Table 6.2 Total bags of charcoal on which revenues collected

Year	No of bags of charcoal on which revenues collected		
	Babato	**Kadelso**	**New Longoro**
2000	72,536	25,932	51,542
2001	61,726	27,134	37,436
2002	50,192	25,862	28,742
2003	51,020	50,041	63,621
2004	57,824	79,493	75,493
Total	293,298	208,462	256,834

Charcoal is a major supplementary livelihood for a large number of people within Brong Ahafo and the Kintampo district. The Area Council survey for New Longoro reveals that about 15 percent of the population of the area over the age of 18 engage in charcoal production. This includes 20 percent of men and 7 percent of women (see table 4.3). This includes several settlements in which charcoal has been banned by chiefs, including Yaara, Busuama, Sora, Bonyonga, Mansra, Ntraban and Nyame Asem, where virtually no charcoal production took place. In some of the individual settlements, such as Larampe and Wala line, over 45 percent of the settlement engaged in charcoal production, while in others such as Ayorya, Nwkanta, Chara and Asantekwa between a quarter to a half of the population engaged in charcoal burning. However, these are likely to be conservative estimates. Many people may be reluctant

to declare their participation in charcoal burning since the survey was carried out by the Area Council, which is a collector of revenue on charcoal, and also associated with district assembly policies that are often hostile to small-scale charcoal burning. In another more detailed survey we undertook of 539 people over the age of 13 (since youth of that age begin to participate in charcoal burning) in Asantekwa revealed that 38 percent of respondents admitted burning charcoal, including 49 percent of men and 26 percent of women (table 6.4).

While charcoal burning is often associated with youth, the survey at Asantekwa reveals that it is an important activity for the mature age groups. The dominant age groups in charcoal production for men are 26-35, 36-45 and 45-60. For women charcoal burning is most important among the 36-45 year old group (see table 6.4).

Table 6.3 Charcoal burning in settlements in the New Longoro Area Council

Settlement	Percentage of population over 18 burning charcoal		Total population over 18
Bonyonga	0	ban on charcoal	27
Kandige	15.5		168
Old Longoro	1.4		74
Mansie	16.1		404
Babu Kurom	12.7		142
Nkwanta	23.7		173
Chara	22.0		159
Mansra	3.3	Ban on charcoal	214
New Longoro	8.9		507
Asantekwa	18.5		486
Busuama	0	Ban on charcoal	365
Yaara	0	Ban on charcoal	233
Ntaraban	5.0	Ban on charcoal	159
Dwere	28.4		197
Gomboi	22.5		89
Ahenakrom	20.8		125
Sogliboi	.7	Ban on charcoal	136
Techira 1	26.3		217
Baniantwe	9.1		220
Ayorya	31.9		357
Taiano	8.1		37
Weila	8.3		471
Tofoboi	.7	Ban on charcoal	137
Chigba	19.2		276
Kalann	10.9		64
Popo	0		36
Dakore-Babu	0		21
Wala Line	48.8		201
Sora	0		101
Nyame Asem	0		192
Issakofi Akuraa	6.0		168
Konkorma	0		45
Kwabena Kurom	0		30
Bewele	2.4		83
Kwi	22.5		80
Basabasa	2.5		120
Red Akuraa	100.0		17
Kewa Akuraa	0		37
Agege	23.6		72
Larampe	47.4		209
Sabule	19.4		279
Yabraso	8.2		98
Aworata	37		73
Techira 2	21.1		133
Tandegne	0		35
Total	14.8		7502

Source: New Longoro Area Council Survey 2005, New Longoro Area Council and DEAR Project

Table 6.4 Age groups of men and women burning charcoal at Asantekwa

Age	Percentage of males burning charcoal	Percentage of females burning charcoal	Percentage of men and women burning charcoal
Up to 20	41	4	24
21-25	50	16	30
26-35	63	38	50
36-45	55	55	55
46-60	52	36	45
Over 60	36	6	27
No of respondents	273	266	539

Charcoal burning is largely undertaken in conjunction with farming. In the Asantekwa survey 73 percent of all charcoal burners also farmed; an additional 20 percent (mainly youth) helped their parents on the farm, and 3 percent farmed with their spouse. Only 2 percent of charcoal burners did not do any farming. The majority of charcoal is produced from farm wood supplies. Sixty nine percent of farmers produced charcoal from wood on their own farms, 29 percent from bush, and 2 percent from both farm and bush. The concept of bush is slightly vague, since it was used by many farmers to denote their own fallow land, rather than the intended meaning of unclaimed common land that was not being managed by anyone.

We also conducted two in depth questionnaire surveys of charcoal burners in the New Longoro area at the settlements of Asantekwa, Nwanta and Mansie, and in the Babato area at Dawadawa and Atta Akura, aiming to find out about the conditions of charcoal production and differences between areas. This included in-depth interviews with 93 farmers (including 52 men and 42 women) in the New Longoro settlements and 98 farmers (including 55 men and 43 women) in the Babato settlements.

In the survey of charcoal burners in New Longoro settlements 81 percent of charcoal burners combined charcoal with farming, including 70 percent of men and 90 percent of women. Nineteen percent of men concentrated on charcoal burning without farming as compared to 2 percent of women. The majority of charcoal burners sourced their wood from their farms: 76 percent of charcoal burners produced charcoal from their farm plots, 12 percent from bush and another 12 percent from a combination of farm and bush. The majority of charcoal burners felt that farming was their most important occupation: 59 percent of the respondents indicated farming was their most important occupation, including 68 percent of men and 50 percent of women. However, the majority of respondents identified charcoal as the activity that brought them the most money. Sixty three percent of the respondents felt that charcoal provided them with more income than farming, including 80 percent of women and 47 percent of men. Only 19 percent of the charcoal burners felt that farming provided them with more income, and only 8 percent of women as compared to 16 percent of men. The remaining 20 percent of respondent depicted a situation in which charcoal and farming complemented each other. Farming provided all year round food for the family and charcoal provided access to relatively "quick" capital that could be raised to meet hospital expenses, school fees, to defray other social obligations and also provide capital to invest in farming. In the New Longoro area farming is deeply integrated into the farm economy, providing incomes from the by products of farm

clearance, and capital to invest in farming and to meet social obligations to family and children.

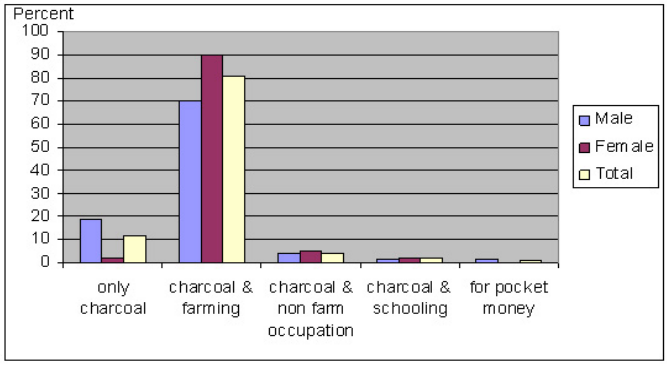


Figure 6. 1 Occupation of charcoal burners in New Longoro settlements

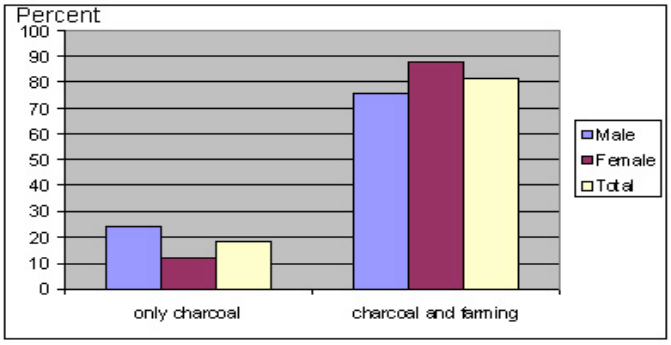


Figure 6. 2 Occupation of charcoal burners in Babato settlements

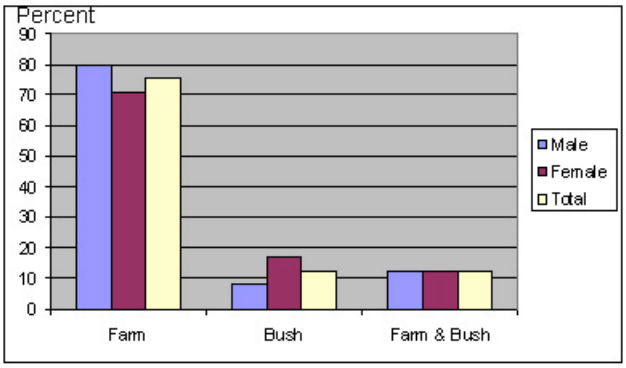


Figure 6. 3 Source of wood for charcoal production in New Longoro settlements

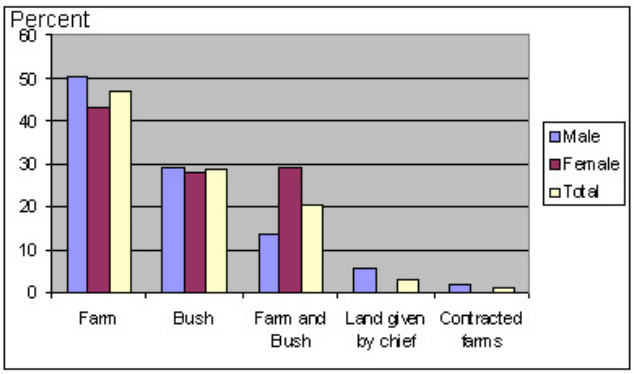


Figure 6. 4 Source of wood for charcoal production in Babato settlements

In the two surveyed settlements in the Babato 72 percent of respondents combined charcoal with farming, including 74 percent of women and 68 percent of men. However, 24 percent of men and 11 percent of women produced charcoal without farming – significantly higher than in the New Longoro area. The majority of farmers sourced their wood for charcoal from their own farms, but more farmers exploited charcoal in the bush than in New Longoro. In the Babato settlements 47 percent of farmers gained their charcoal from farmland, 21 percent from a combination of bush and farm and 29 percent from bush. Three percent of farmers gained access to charcoal on other people's land from the chiefs and 1 percent contracted it from other farmers. A significantly higher percentage of farmers soured charcoal from bush than in the New Longoro area. In the Babato settlements 84 percent of respondents identified farming as more important than charcoal including 91 percent of women and 77 percent of men. However, in contrast with New Longoro 64 percent of respondents felt that farming provided them with more income than charcoal burning, including 67 percent of women and 62 percent of men. Thus, farming appears to be relatively more important for income generation than charcoal burning in the Babato area, although charcoal burning is a very important supplementary livelihood in both areas.

Social differentiation in charcoal production

Charcoal is an important livelihood supplement for a large number of farmers. However, charcoal is not only a supplementary livelihood, it is also a commercial activity and the charcoal producing industry is socially differentiated. Charcoal burning is a labour intensive process and large scale production can involve outlays of considerable capital. This often results in a vertical integration within the industry with traders and large scale operators financing small scale operators and controlling their operations, and hiring labour.

At New Longoro 35 percent of respondents felt that charcoal burning was socially differentiated between large scale and small scale burners, 21 percent felt there were no significant class differentiation within charcoal production, and 13 percent did not know. Criteria for large scale burners included those who hired Lorries to transport their charcoal to the large urban areas, those who hired labour and had their own sacks in which to pack charcoal. Forty six percent of farmers sold some of their charcoal at the settlement, 21 percent at Kintampo and 50 percent hired Lorries to transport some of their own charcoal to urban areas. Thirty seven percent of respondents sold their charcoal to traders at the settlement, Charcoal burners often club together to hire a lorry to send their charcoal to the urban markets. Farmers at Asantekwa mainly marketed their charcoal at Kintampo, because of its close proximity. More farmers at Mansie transport their charcoal to the urban centres, since it is far from the main roads and fewer traders visit the settlement. Forty nine percent of charcoal burners owned their own sacks, 12 percent hired them - frequently from drivers of charcoal trucks - and the rest borrowed them. Many charcoal burners depend on traders to supply them with sacks to fill with charcoal. Ownership of sacks or the ability to hire is a basic capital outlay for those wishing to transport charcoal to the urban centres. Those transporting charcoal to the urban centres need to either buy their own sacks or hire them.

Fourteen percent of the respondents were involved in contractual relations in which they either pre-financed the burning of charcoal by other people or in which they burned charcoal for other people who had pre-financed the activity. Sixty one percent of respondents confirmed that traders often pre-financed charcoal burning, entering into contracts in which in return for loans they were guaranteed a certain output of charcoal at a price below the going market rate. The main capital requirements in charcoal burning were identified as the hiring of labour by 80 percent, chainsaws by 68 percent of respondents, bags by 8 percent and transport by 2 percent. The main labour requirements are in "packing", that is moving felled logs to the burning sites and arranging them.

In the Asantekwa fifty two percent of charcoal burners hired labour, 43 percent chainsaws, and 67 percent did not own their own sacks. Seventy percent of charcoal burners sold their charcoal at Kintampo, since Asantekwa is in close proximity to this major market town. Twenty percent of charcoal burners in Asantekwa hired Lorries to transport their charcoal to the large urban centres. Production of charcoal in the last year varied from 10 bags per year to 2040 bags. The mean was 128 bags. Production was largely small scale with 75 percent of respondents producing fewer than 120 sacks of charcoal in the last year. Women produce smaller quantities of charcoal than men. However, the largest production was by a woman, the wife of the biggest yam farmer in Asantekwa, and the charcoal was largely produced from his farm. This highlights the importance of farm production of charcoal in the New Longoro area. Table 6.5 and 6.6 show production by gender and age. While women and youth produce significantly less, since they have less capital to invest in production, small scale production is dominant.

Table 6.5 No of sacks of charcoal produced in the last year at Asantekwa

Production	Male (%)	Female (%)	Total (%)
up to 50 sacks	34	49	39
51-100 sacks	34	33	34
101-200 sacks	17	13	15
201-500 sacks	10	3	7
501-1000 sacks	5	1	4
over 1000 sacks	1	1	1
No of respondents	133	69	202

Table 6.6 No of sacks of charcoal produced in the last year by different age groups at Asantekwa

Production	Age groups (%)						Total
	up to 20	21-25	26-35	36-45	46-60	over 60	
up to 50 sacks	74	44	31	30	27	31	39
51-100 sacks	26	17	33	34	41	54	34
101-200 sacks		17	18	20	23	8	15
201-500 sacks		17	5	12	9	0	7
501-1000 sacks		6	10	2		8	4
over 1000 sacks			3	2			1
	38	18	39	50	44	13	202

In the Babato settlements a significantly higher proportion of the sample identified social differentiation between charcoal burners. Thirty-seven percent of respondents defined the main differences in terms of professional burners and small scale burners who combined burning with farming, 27 percent differentiated between large and small burners, and 20 percent between commercial and non commercial burners. Five percent felt that the most significant differentiation was between men and women, with women producing on a small scale, and eight percent professed not to know of any significant social differentiation. In the Babato settlements 74 percent of the respondents marketed their charcoal in the settlement and 26 percent hired transport to send it to the large urban centres. Since these settlements are on the major road to Tamale, and are well known as charcoal producing areas, many traders come there in search of charcoal, unlike in the more remote areas, like Mansie, where charcoal producers may have to transport their charcoal to markets. Thirty one percent of farmers owned charcoal sacks and over 40 percent relied on traders to supply them. Thirty percent of the charcoal burners were pre-financed with loans by traders for the production of charcoal, and 20 percent purchased charcoal from other producers. Sixty six percent of charcoal burners hired chainsaws and 46 percent hired labour. However, 61 percent of burners engaged in reciprocal labour exchange (*nnoboa*) where they would help each other in packing their charcoal. No attempt is made to analyse estimates of production figures in the Babato area, since charcoal producers were extremely reticent to reveal this, given a politically volatile situation in which chiefs were threatening a ban and increasing the revenues they derived from charcoal. However, charcoal production is more differentiated within the Babato area than in New Longoro. The bulk of the charcoal burners are small farmers who supplement farming with small production of charcoal. Women often burn is small quantities on the farm, returning from farm with a headpan of charcoal.

In contrast with the New Longoro area, there are specialised large-scale professional charcoal burners in the Babato settlements. They gain large "concession" areas from the chiefs. This often gives them rights to burn on farmers' fields. Relations between the professional burners and the farmer-burners are uneasy. The farmer-charcoal

burners perceive the professional burners as monopolising the industry, expropriating their farm resources, and felling excessive trees. Many of the small-scale farmer-burners would like to see controls brought against what they regard as excessive felling by the large-scale operators. The large-scale charcoal burners see the small operators as a threat. They claim that they do not know how to burn charcoal properly and that they are spoiling the industry. Frequently these conflicts acquire ethnic undertones, as competition between Sissala and Konkomba charcoal burners. Under these conditions it is difficult for charcoal burners to present a common front. The large professional charcoal burners are often allied with the chiefs, who protect and appropriate resources for them to the detriment of the farmers who gain a supplementary income from charcoal.

The politics of resource control

The differences in charcoal production in the New Longoro and Babato area are influenced by the access and control of natural resources. The most fundamental difference between the surveyed settlements in the New Longoro and Babato area, results from the status of the population. The New Longoro settlements of Mansie, Nwkanta and Asantekwa largely consist of indigenous Mo people with rights as citizens. The Babato settlements of Atta Akura and Dawadawa largely consist of migrants. At Atta Akura and Dawadawa 93 percent of the population consisted of migrants. Sixty percent of these migrants originated from the Northern Region, of which the dominant ethnic groups were Konkomba, followed by Dagomba, Bimoda, Kabre, Grumah, and Gonja. Thirty percent of the migrants came from the Upper West region, consisting largely of Dagaaba and Sissala. While 29 percent of the migrants have come to these settlements in the last five years, 35 percent have been there for over 15 years, and 17 percent were born there. These are long established settlements of migrants. In contrast with this, 94 percent of the population of the three New Longoro towns are local citizens.

As local citizens, the inhabitants of the New Longoro settlements claim the right to establish rights in land through clearance of bush or the right to inherit the family farms. There acquisition of land is not dependent upon them gaining permission from chiefs or paying any fee. In contrast, as migrants, the inhabitants of Dawadawa and Atta Akura have to seek permission from the paramount chiefs, or their caretakers, or from indigenous landowners before they can get access to land. When they get land from the chiefs, they usually have to present “drink money” and have to make annual payments to the chiefs or the Administrator of Stool Lands for the use of the land.

Migrant farmers are not the only people requesting land from the chiefs, migrant professional burners have also been requesting land for charcoal burning over the last 40-50 years. These professional burners have usually come from the Sissala area in northwestern Ghana. They usually move between settlements, identifying areas which are particularly rich in suitable trees for charcoal, and approach the chiefs for permission to exploit charcoal. They usually gain permits or concession areas from the chiefs for a specific period for charcoal burning. Like the migrant farmers they provide “drink money” and pay a certain fee for the right to cut wood for charcoal. The areas they are demarcated by the chiefs may include the fallow lands and farms of cultivators.

This allocation of fallow land to migrant charcoal burners by chiefs has resulted in conflicts between migrant charcoal burners and farmers, particularly yam farmers. Migrant charcoal cut down trees that yam farmers are preserving as stakes for their yams. Yam farmers frequently engage in management practices that promote the regeneration of many trees and tree regeneration in yam farming areas is often more dense than in other areas. The yam varieties cultivated in the Kintampo district and their associated cultural practices require good soils that are associated with woody environments. This high density of savanna type trees that have good properties for charcoal production attract charcoal burners to these areas, and the chiefs have often given them access to lands on which farmers are working. This problem has become more pronounced with the expansion of farming areas, the growth of population and migration into the area. The movement of charcoal burners into farming areas has resulted in three developments. Firstly, farmers began to realise the value of charcoal as they saw migrant Sissala charcoal burners prosper. As the Chairman of the Kintampo Charcoal Burners Association, Mathew Kiwa, stated in a presentation at a district based workshop on charcoal:

'We began to realize that whenever these Sissala charcoal burners returned from Kumasi after the sale of their charcoal they brought big cassette recorders, jeans, big boots and other personal belongings. Some even stated flirting with our wives. We the indigenes were wallowing in poverty because our yams were being bought at low prices. At Asantekwa, another guy and I were the first people to associate ourselves with the Sissala people and enter the charcoal business. Although we saw the business to be very tedious work we were bent on doing it, because we are strong men. I started charcoal burning as far back as 1975' (Kewa, 2005:28)

Secondly, charcoal burners began to learn how to burn charcoal by observing the Sissala and working with them. They began to burn charcoal on their farmlands, and competed with Sissala for charcoal resources. Thirdly, increasing conflicts developed between the Sissala burners and the farmers, as Sissala began to cut charcoal on their recuperating yam fallows. By the late 1980s and early 1990s these conflicts escalated, and taking advantage of the growing discourse on the environment the farmers began to accuse charcoal burners of destroying their environment - the environment of regenerating yam fallow – by cutting green wood within the fallow. Thus farmers began to make demands that Sissala charcoal burners should not be allowed to cut green wood since they were destroying the environment. These demands occurred at the same period when district assemblies in Brong Ahafo, including Kintampo were contemplating banning charcoal. In the Mo heartland areas were indigenous farming populations predominated, the Sissala eventually moved away into new areas leaving the indigenous farming population to take over charcoal production.

In the areas in which migrant farmers predominate, the farmers could not insist on their rights to fallow resources, since the chiefs insisted that they had only given them permission to farm, and that the natural resources belonged to them. Thus, farmers wishing to burn charcoal needed to get permission from the chiefs and pay for access to charcoal resources. The chiefs also claimed the right to sell the charcoal resources on their farm and fallow land to third parties. Farmers who attempted to exert their rights to farm resources of attempted to prevent professional charcoal burners extracting charcoal from their land could be ejected by the chiefs. Thus, in contrast with the predominantly indigenous farming settlements, in the settlements with predominantly migrant farming populations, professional charcoal burners continue to gain access to the woodfuel resources of farms through chiefs. Farmers wishing to extract charcoal from their land need to negotiate with charcoal burners who have purchased these rights from chiefs. They also have to pay fees to the chiefs for the

charcoal they produce. This accounts for the larger reliance on charcoal resources from the bush, since their farm woodfuel resources have often been transacted by chiefs to professional burners. Since the rights of farmers to the woodfuel resources on their land is not recognised these can be exploited by anyone who gets permission from chiefs and is willing to pay for them. As one farmer/charcoal burner at Dawadawa stated:

Farmers don't want charcoal burners to burn on their land. But when it is reported to the chief, the burner is given the go ahead because chiefs say the farmers do not own the land.

Within the indigenous farming communities, chiefs have lost valuable sources of revenue as the migrant charcoal burners have retreated from these settlements. They cannot impose fees on the indigenous farmers for charcoal burning since as indigenes their rights to free land and the woodfuel resources of those farms are recognised. The chiefs have turned to using environmental rhetoric in their bid to control charcoal burning. They claim that charcoal production is destroying the environment and leading to the abandonment of farming by irresponsible youth in search of quick money. They promulgate local byelaws banning charcoal. This disrupts charcoal burning for some time. Anxious to be able to continue burning charcoal in a peaceful environment, the charcoal burners collect monies to appease the chiefs. The ban or the threatened ban is rescinded and charcoals burning usually returns to normal, until the chiefs once more feel the need to gain revenues from their subjects.

In the migrant farming communities the chiefs use the threat of a ban on charcoal to gain more revenues from small-scale charcoal burners. In the Dawadawa area, the chiefs were collecting two bags of charcoal each month from men burning charcoal and one bag from women (since they burned in smaller quantities) two years ago. This was replaced by a new decree that all male burners should contribute ¢100,000 per tractor load of charcoal they harvested and two bags of charcoal per month if they burned near the settlement. Women were to continue paying one bag per month. When the charcoal burners complained the rate was excessive, the chief introduced a ban on charcoal until they agreed to the new terms.

The chiefs have found that environmental rhetoric empowers them to gain control over natural resources. Since the rhetoric fits into the environmental objectives of the government and its sustainable development goals, the rights of chiefs to ban charcoal are not questioned by local government or central government. However, the environmental rhetoric of the state is equally rooted in political motives, a justification for the displacement of small-scale producers by large producers and the introduction of new taxes, in the name of efficiency and sustainability. In both instances the environmental rhetoric is not based on direct evidence. It maligns small-scale producers to justify their displacement and the imposition of new controls that make the future of their livelihood uncertain and insecure. By ignoring the excesses of the chiefs, the state undermines the security of access of small-scale producers to natural resources, creating the conditions for their displacement by large-scale operators.

However, the interventions of chiefs hardly promote transparency or sound environmental policies. In areas under the jurisdiction of the same paramount chief different rules governing charcoal production in different settlements can be found. In some settlements, charcoal is banned to protect the environment, while in other settlements it is permitted and chiefs transact large concessions with large-scale

commercial burners. The tolerance by districts and the state of this situation undermines environmental policies, and creates the impression among the majority of rural people that policies are unjust and against their interests.

Charcoal production and the environment

The technologies used by charcoal burners are frequently dismissed in national policy circles. For instance, the Traditional Energy Unit of the Savanna Resource Management Programme of the Forestry Service reports:
'Harvesting of wood is done savagely, without any regulation or regard to environmentally sensitive areas. In most of the pilot areas, watershed, bush fallow and riverine forests have been degraded through the careless practices and unregulated harvesting. There are no attempts to optimise production potential of the savannah resource on a sustainable basis. No attention whatsoever has been given to the overall effect of wood harvesting on the remaining tree stand, mortality and recovery in relation to harvesting damage'. (Traditional Energy Unit, 2002:6)

In discussions with forestry officials at the national and district level and at the Savanna Resource Management Centre, it became evident that the strategies of charcoal burners were being dismissed without any attempt to understand their relation with the ecology of the area, and their adaptations to ecological processes within the ecosystem and the agro-ecosystem. The ability of transitional forest environments to rapidly regenerate from the effects of cutting by coppicing was dismissed, and the main focus was on planting trees to replace those that are cut by farmers and charcoal burners.

Although it is well known among practical foresters that trees can rapidly regenerate from coppice, little research has been carried out on coppicing. Cut and coppice strategies are dismissed by foresters without carefully looking at the evidence. While they conceded that trees could regenerate from coppicing they felt that the abilities of trees to coppice was limited, and continuous cutting of farmers in fallow land would rapidly lead to reduced ability of root stocks to continue to coppice. This perspective ignores the large numbers of anthropogenic forests in the world that are essentially the product of cut and coppice policies, and which have withstood these management practices for many centuries (Botkin, 1990). It was also evident that these views were not backed by evidence, and were motivated by political interests in bringing about a particular type of change into the rural landscape. We initiated a research programme to examine farmers' management of trees and the capacity of trees to withstand cutting. To determine the extent to which charcoal production can be carried sustainably within a system of smallholder management of fallow land, we needed to establish the extent to which trees used in charcoal production could regenerate within present cycles of cutting and fallowing. This requires an understanding of the present technologies use to produce charcoal, the types of trees that are used for charcoal, and the capacity of trees to regenerate within present management systems.

Charcoal is produced in earth mound kilns. A platform is constructed to raise the kiln above the ground and enable air to penetrate. Cut logs are laid across the platform and then covered with soil and grass. The logs are left to burn for a period of up to two weeks and then allowed to cool for a few days before the charcoal is ready. The girth of the logs vary from a minimum of about 30 cm. in the lower levels up to a minimum of 20 cm at the top of the heap for hard species with rough fire resistant barks. For softer trees larger girths need to be used. The charcoal producers do not use smaller

logs since they are likely to burn to ash and will also produce inferior charcoal. Table 6.7 shows the girth sizes of logs that were randomly measured from packed trees in earth mound kilns at Asantekwa.

Figure 6. 5 A charcoal kiln

Figure 6. 6 Building a kiln

Charcoal burners are selective about the wood they use for charcoal. They concentrate on a narrow range of species. Charcoal production is labour intensive. The cost in labour or in hired labour or hiring of a chainsaw results in charcoal burners being particular about the species they exploit and the girth sizes they use. The main species utilised in the Kintampo district include *Anogeissus leiocarpus*, *Terminalia macroptera*, *Pterocarpus erinaceus*, *Burkea africana*, dead *Vitellaria paradoxa*, *Erythrophleum africanum*, *Detarium microcarpum, Isoberlinia doka, Crossopteryx febrifuga*, *Afzelia africana*, *Daniellia oliveri,* and *Prosopis africana. Anogeissus* is overwhelmingly the preferred species followed by *Terminalia* (in New Longoro), *Pterocarpus* and *Prosopis* (in Babato, see table 6.8 and 6.11). These species are considered to be the best species for charcoal production (table 6.9 and 6.12). They are also considered to be fast growing (see table 6.10 and 6.13). Most of these species are numerous in fallow land. They are, certainly, very far from becoming extinct.

Table 6.7 Girth sizes of packed logs in charcoal burning sites.

Species	No	Girth sizes (cm)	Range of girth sizes (cm)
Anogeissus leiocarpus (Kane/ Koola)	31	36,39,45,43,37,38,35,33,30,32,39,35,29,70, 38,46,45,42,49,40,39,30,33,34,38,40,47,60,50, 40,41	29-70
Crossopteryx febrifuga (Ayifroanto)	9	33,35,36,38,39,40,41,43,47.	33-47
Terminalia macroptera (Sasu)	11	33,34,34,36,36,38,39,40,40,41,41,	33-41
Pterocarpus erinaceus (Krahyire Tweema)	8	34,34,35,36,38,40,41.	34-41
Combretum fragrans (Pamparo)	4	29,30,36,38.	29-38
*Detarium microcarpum (*nam)	8	23,29,30,34,35,35,38,39.	23-39
Ficus ingens (Dumbiepru)	3	70,88,118.	70-118
Margaritaria discoidea (Yereyere)	2	29,35.	29-35
Total	76		

Table 6.8 Main tree species used by charcoal burners in the New Longoro settlements

Species	Akan - Mo names	% of charcoal burners
Anogeissus leiocarpus	kane – koola	88
Terminalia macroptera	ngoo – sasu	60
Pterocarpus erinaceus	krahyire – tweema	53
Burkea africana	pinimu – heela	45
Vitellaria paradoxa	nkudua –sul - dead shea	9
Erythrophleum africanum	Potrodum – vomkpo	12
Detarium microcarpum	- nam	12
Isoberlinia doka	-tawu	11
Crossopteryx febrifuga	Ayifroanto – kalenjargo	11
Afzelia Africana	Papao -	9
Lophira lanceolata	Krebente	8
Daniellia oliveri	Senya – cham	7
Carapa procera	Boto	6
Pseudocedrela kotschyi	Bogo	6
Khaya senegalensis	Kruba- mahogany	5
Margaritaria discoidea	Pepewa – yereyere	4
Erythrophleum suaveolens	- hol	4
Pericopsis laxiflora	- holonga	4
Hymenocardia acida	-dahweema	3
Parkia biglobosa	Srono, dawadawa	3
No of respondents		94

Table 6.9 Best charcoal species used in the New Longoro settlements

TREE SPECIES	AKAN – MO NAME	% OF CHARCOAL BURNERS
Anogeissus leiocarpus	kane – koola	81
Terminalia macroptera	ngoo – sasu	26
Burkea Africana	pinimu – heela	19
Pterocarpus erinaceus	krahyire – tweema	15
Detarium microcarpum	- nam	6
Crossopteryx febrifuga	- ayifroanto –kalenjargo	6
Isoberlinia doka	- tawu	3
Erythrophleum africanum	Potrodum – vomkpo	9
No of respondents		94

Table 6.10 Fastest growing charcoal species identified in the New Longoro settlements

Species	Akan – Mo names	% of charcoal burners
Anogeissus leiocarpus	Kane – koola	52
Pterocarpus erinaceus	tweema krahyire	30
Terminalia macroptera	ngoo sasu	19
Burkea Africana	Heela	16
Isoberlinia doka	Tawu	9
Crossopteryx febrifuga	Ayifroanto	5
Syzygium guineense	Boto	4
Detarium microcarpum	Nam	4
No of respondents		94

Table 6.11 Main charcoal species identified in the Babato settlements

TREE SPECIES	AKAN – MO NAME	% OF CHARCOAL BURNERS
Anogeissus leiocarpus	Kane – koola	76
Prosopis Africana	Prekese – kreketse	68
Pterocarpus erinaceus	Mogyadua, krahyire –tweema	62
Terminalia macroptera	Ngoo – sasu	19
Lophira lanceolata	Krebente	18
Erythrophleum africanum	Potrodum – vomkpo	11
Afzelia Africana	- Papao	8
Vitellaria paradoxa	Nkudua –sul - dead shea	3
Khaya senegalensis	Kruba- mahogany	2
Detarium microcarpum	- nam	2
Daniellia oliveri	senya – cham	2
No of respondents		98

Table 6.12 Best trees for charcoal identified in the Babato settlements

TREE	AKAN – MO NAME	% OF CHARCOAL BURNERS
Anogeissus leiocarpus	Kane	73.4
Prosopis Africana	Prekese	42.8
Pterocarpus erinaceus	Mogyadua/Krahyire/tweema	28
Erythrophleum africanum	Potrodum	4.1
Lophira lanceolata	Krebente	4.1
Terminalia macroptera	ngoo – sasu	4
No of respondents		98

Table 6.13 Fastest regenerating species identified in Babato settlements

TREE SPECIES	AKAN - MO NAME	% OF CHARCOAL BURNERS
Anogeissus leiocarpus	kane – koola	53
Terminalia macroptera	ngoo – sasu	7
Lophira lanceolata	Krebente	2
Pterocarpus erinaceus	mogyadua, krahyire – tweema	19
Prosopis Africana	Prekese	10
No of respondents		98

Coppice regeneration

Most of the species used for charcoal burning regenerate from coppice. Three different types of coppice growth can be found. Basal coppices regenerate from the stole of a tree. Stem coppices regenerate from buds on the main cut stem. Root coppices regenerate along the roots of trees. Some trees combine all three different

types of coppices or two different types, such as stem and root coppices, or basal and root coppices

Figure 6. 7 Root coppice

Figure 6. 8 Stem coppice

Figure 6. 9 Mature stem coppice

Figure 6. 10 Basal coppice

To examine the propensity of the species used for charcoal burning to regenerate from coppice a study was conducted on regeneration on farms after cutting. Cut stoles and stumps were examined and the number of coppices was counted, and their length and girth size measured using a tape measure and a 200 centimetre graduated stick. The girth sizes of the coppices were measured at the height of 2 centimetres from the base. The girth of regenerating stumps was measured at a height of 20 centimetres from the ground. Geographical Positioning System (GPS) coordinates of the trees and farms were taken so that we could return to observe the same trees later.

Farm plots were chosen to measure regeneration, since much charcoal originates from this location. Farms are also subject to an intensive regime of cutting during farm preparation or in the case of yam after staking and harvesting. The study focused on old yam farms, where most of the trees have been cut, burned, used for charcoal and then abandoned to fallow and regenerate. A number of plots were also sampled in which there was extended cultivation after yam farming. For instance, Deborah's farms consist of old yam farms in which cultivation has been extended with groundnuts, maize, cassava and vegetables for 4-5 years. After harvesting the yams, most the trees are cut for charcoal and then groundnuts are planted. The farms are more open than the usual with very few trees on them. However, many of the stumps are alive and coppicing. Next to the groundnut farms, are densely wooded fallow in which she will makes her new yam farms. She is adamant that the groundnut farms will regenerate into similar vegetation to the yam farms in about 8-12 years.

In contrast, the farm of Guri is a thickly wooded old yam farm. Most of the trees are standing but burned. At the time of the survey, they were being cut for charcoal. New coppice growth is developing throughout the farm. The numbers of coppice on Guri's and Sayen's farm are unusually high with, respectively, 1,293 and 1,802 coppices. Sayen's farm has been constantly cultivated for ten years, which suggests the high coppice rate is associated with his management techniques. Sayen is a Dagau migrant. He only has a small piece of land. He was given a plot by one of his compatriots when he came down south about ten years ago, which is the only land he has to farm. Guri suggests that the rate of coppicing is influenced by management strategies. He argues that the use of the hoe encourages profuse coppicing when it scrapes against roots and the bowls of stumps. Trees coppice in three different ways: they produce stem coppices, basal coppices (sprouting from the base of the tree) and root coppices. Basal coppices are dominant in these fields and account for over 70 percent of all coppices. Table 4.15 shows the distribution of coppices of the most important charcoal producing species in these fields. Many of the important charcoal species are profuse coppicers that are common in farmers' fields. There are also considerable variations in the way that different species coppice on different fields, indicating that management practices and other factors may also influence coppicing.

Figure 6. 11 High densities of trees on an old yam farm

Table 6.14 Coppice regrowth on old farms

Farm	Crop history	Size of farm (acres)	No of basal stoles	No of basal coppice	No of stem boles	No of stem coppice	No of root stocks	No of root coppice	Total no of stoles	Total no of coppice
Deborah	Groundnut farm cultivated for 5 years after yam. Previously fallowed for 40 years	1.0	127	907	5	54	16	96	146	1048
Boyekumah	Groundnut farm cultivated constantly for nine years after 17 year fallow	1.0	35	201	3	12	3	3	54	216
Guri1	Bambara beans following yam after about 13 years fallow	0.5	129	1065	9	81	8	45	148	1293
Guri2	Groundnut and bambara beans following yam 1 acre after about 13 years fallow	1.0	86	677	8	116	1	2	102	795
Guri3	Old yam farm after about 13 years fallow	1.0	39	422	0	0	14	51	50	475
Sayen	Maize farm 10 years constant farming	1.5	185	1523	51	266	4	12	224	1802
Asumah	Old yam farm cultivated 5 years after 25 year fallow	1.0	28	471	23	199	0	0	50	714
Patrick	Rice and yam farm cultivated for two years after six years fallow	1.0	87	832	22	114	10	35	123	982
Anthony	Old yam farm cultivated 1 year following 3 years fallow	1.5	70	331	12	58	3	6	97	395
Twinefor	Old yam farm fallowed 7 years before cultivation	0.5	62	562	7	51	6	29	74	642
Total coppices			848	6991	140	951	65	279	1068	9677

Table 6.15 The coppicing ability of important charcoal species on farm plots

Species	Farm plot	No of basal stoles	No of basal coppice	No of stem boles	No of stem coppices	No of root stocks	No of root coppice	Total no of stoles	Total no of coppices
Anogeissus leiocarpus	Sayen	3	5	2	8	0	0	5	13
Anogeissus leiocarpus	Patrick	2	27	2	9	0	0	4	36
Burkea Africana	Twenefor	1	1	0	0	0	0	1	1
Burkea Africana	Anthony	1	2	0	0	0	0	1	2
Burkea Africana	Guri1	1	26	0	0	0	0	1	26
Burkea Africana	Guri3	39	422	0	0	1	51	50	475
Burkea Africana	Asumah	3	14	3	22	0	0	51	714
Crossopteryx febrifuga	Guri1	1	4	0	0	0	0	1	4
Crossopteryx febrifuga	Asumah	0	0	1	10	0	0	1	10
Daniellia oliveri	Boyekuma	0	0	0	0	3	3	3	3
Daniellia oliveri	Guri2	1	4	0	0	0	0	1	4
Daniellia oliveri	Sayen	2	4	1	4	2	6	4	14
Daniellia oliveri	Anthony	19	37	0	0	0	0	19	37
Daniellia oliveri	Debora1	13	45	0	0	2	5	15	50
Daniellia oliveri	Twenefor	10	138	1	6	6	29	74	642
Detarium microcarpum	Anthony	1	2	0	0	0	0	1	2
Detarium microcarpum	Asumah	1	7	0	0	0	0	1	7
Detarium microcarpum	Guri2	5	19	0	0	0	0	5	19
Erythrophleum suaveolens	Boyekuma	1	2	0	0	0	0	1	2
Erythrophleum suaveolens	Twenefor	1	3	1	1	0	0	2	4
Hymenocardia acida	Anthony	3	7	0	0	0	0	3	7
Hymenocardia acida	Guri1	3	38	0	0	1	51	4	89
Hymenocardia acida	Asumah	3	108	0	0	0	0	3	108
Lophira lanceolata	Guri2	4	17	3	16	0	0	7	33
Lophira lanceolata	Asumah	9	73	7	63	0	0	6	63

Species	Farm plot	No of basal stoles	No of basal coppice	No of stem boles	No of stem coppices	No of root stocks	No of root coppice	Total no of stoles	Total no of coppices
Lophira lanceolata	Guri1	41	26	6	23	0	0	47	284
Margaritaria discoidea	Sayen	0	0	1	3	0	0	1	3
Margaritaria discoidea	Anthony	1	3	0	0	0	0	1	3
Margaritaria discoidea	Guri2	1	4	0	0	0	0	1	4
Margaritaria discoidea	Boyekuma	1	14	0	0	0	0	1	14
Pericopsis laxiflora	Guri1	0	0	0	0	1	25	1	25
Margaritaria discoidea	Debora 1	17	55	3	8	0	0	20	63
Margaritaria discoidea	Asumah	3	14	3	22	0	0	50	714
Margaritaria discoidea	Patrick	87	832	22	114	10	35	123	982
Pericopsis laxiflora	Sayen	0	0	0	0	1	3	1	3
Pericopsis laxiflora	Twenefor	4	37	0	0	1	6	5	43
Pericopsis laxiflora	Asumah	1	51	0	0	0	0	1	51
Pseudocedrela kotschyi	Guri2	1	2	1	1	0	0	2	3
Pseudocedrela kotschyi	Twenefor	2	5	1	2	0	0	3	7
Pterocarpus erinaceus	Debora1	6	32	0	0	1	1	7	33
Pterocarpus erinaceus	Twenefor	2	38	0	0	0	0	2	38
Pterocarpus erinaceus	Sayen	9	19	8	26	0	6	16	46
Pterocarpus erinaceus	Patrick	4	55	1	3	0	0	6	58
Terminalia macroptera	Twenefor	1	1	0	0	0	0	1	1
Terminalia macroptera	Anthony	1	1	1	3	0	0	2	4
Terminalia macroptera	Patrick	1	6	0	0	0	0	1	6
Terminalia macroptera	Sayen	9	29	4	10	0	0	12	39
Terminalia macroptera	Asumah	4	49	3	17	0	0	7	66
Terminalia macroptera	Guri1	12	74	0	0	0	0	12	74

Management practices

To gain further insight into the nature of coppice regrowth and coppice response to cutting an experiment was set up to observe coppice regrowth under different cutting regimes. A total of twelve different tree species were selected based on popularly used charcoal production species. Seventy one trees were selected from these species at two sites on common land close to Asantekwa town. The trees were cut at different heights from 5 cm to 190cm. At least four trees of each species were cut at heights of 5cm, 30cm, and 93cm and190cm. These heights were chosen on the basis of observing the heights of cut stumps in fallow land, either cut by farmers or charcoal burning. The number of coppices that emerged was measured weekly in the first month and then at monthly intervals.

Figure 6. 12 Measuring coppice regrowth

The earliest species to coppice was *Pterocarpus erinaceus*, which began to put out coppices after a week. They were followed by Anogeissus leiocarpus, *Terminalia macroptera,* and *Burkea africana*. While *Pterocarpus*, *Terminalia* and *Burkea* rapidly grew in length, they were slow to gain in girth. *Detarium microcarpum* initially put out coppices slowly, but these then regenerated faster than most of the early species. Trees with rough barks tend to regenerate better than smooth ones. The rough bark protects the buds under them. Thus, *Anogeissus* has varieties with both a smooth and a rough bark. The rough bark variety has more buds that from into coppices than the smooth variety. Some species, such as *Terminalia*, have few buds on the lower part of the stems.

The heights at which the stumps are cut influence the nature of regeneration. Contrary to expectations, when the stumps are cut lower down they regenerate better. Most stumps cut below 50 cm develop into small trees, while those cut above develop into branches. Stumps cut very low may put out several basal and root coppices that can form into different trees. Charcoal burners frequently cut down low to encourage the regeneration of sturdy trees. However some yam farmers cut high up the stem at above 90 cm to encourage the rapid regeneration of branches and tall spindly trees that will serve as good stakes for yams without creating a large canopy. Yam farmers often wish to create an environment consisting of a large density of tall spindly trees among which their yam vines can wind up.

Cutting low down has the danger of limiting regeneration to fewer buds. If these get damaged in the cutting process this may result in coppicing failure. However, we found that wood cutters and chainsaw burners were acutely aware of these factors and had devised appropriate cutting solutions. Rather than cut the stump flat they cut it in a V (or M) section. Starting on one side they slant the cut to the middle. They then begin cutting from the other side slanting into the middle. Any ruptures of splinter of the cut occur in the middle of the stump, rather than along the bark. This assures that the bark is not torn and the buds destroyed.

Figure 6. 13 The V cut on an old Erythrophleum africanum (vomkpo) stump with basal coppice behind

In a discussion with charcoal burners and chainsaw operators at Dawadawa on June 12 2005, the wood cutters were convinced that stumps produced better coppice when they were cut low down. John Frimpong also explained the technique of cutting:

"You watch where the tree will fall and then you cut a piece out in a V-shape from that direction. Then you come to the opposite side and cut a slant and the whole stump will look like a capital M-shape. The stump will start coppicing from where you first cut the v-shape."

However, not all cutters followed this technique, as Sampson elaborated: "Some chainsaw operators don't want to bend down low so they cut high up. Others cut the tree flat or at a high level in order to avoid sand getting into the chain of the machine. But in general we cut low". Woodcutters, who use the axe, practice the same technique of cutting a slanted v-notch at a low level. When closely observing stumps in fallow land it becomes apparent that many of them are cut in this fashion.

The charcoal burners and chainsaw operators explained that although they did not use elaborate methods of managing coppice regrowth they knew how to protect stumps. Stumps were hardy. Bush fires and browsing animals could not destroy them. They rather encouraged the trees to coppice more and made their coppices hardier. Stump mortality was usually associated with disease, and pest attack. These weakened the stumps, and when cut the added stress could result in mortality. Cutting stumps at the height of the dry season, when there was insufficient water available for the roots, could also kill stumps.

At the experimental site in Asantekwa, during the rainy season of 2003, several of the coppices were attacked by pests and disease and began to wither and blacken. Coppices were also destroyed by livestock. In the dry season bush fires spread through one of the research sites destroying a large percentage of the coppices. However, the stumps rapidly put out new coppice and the coppice grew more vigorously than those stumps that had not been burned. Within a period of between six months to one year many of these post-fire coppices had outgrown those that had not been burned. Fire tends to have a positive role on coppicing and regeneration of many of these species, which have adapted to fire.

Rates of regeneration

It is often assumed that the off-take of charcoal must be higher than the rate of regeneration. However, this is rarely backed up by evidence based on research, and little research has been carried into the regeneration of savanna woodlands. Within the confines of the duration of the project, it was impossible to measure regeneration by taking temporal measurements of changes in vegetation. In a bid to gain some indication of the rates of regeneration of trees used in charcoal burning, we found farmers who could clearly remember the last time they had cleared a particular area, who could identify the time when they had cleared particular stumps and fields. We took an inventory of the stumps and the coppice regrowth cleared at different dates, building up a record of the gains in girth of coppice cut in different estimated years for different species. Measurements of 306 coppice girths were collected. The results are represented in figure 6.9 and figure 6.10. Figure 1 shows that within a period of

between 8 to 10 years the rate of regrowth of charcoal species reaches the 30 cm girth requirement for quality charcoal. Within 12 years these requirements are easily exceeded. Figure 2 shows the regeneration for various charcoal species. This shows there is considerable variability within the regeneration of single species and that other factors are also at play, which may include the history of cutting, the size of the original stump, management practices, incidences of bush fire (which may both retard and intensify coppice regeneration), pest attacks, rainfall patterns, etc. The charts also reveal the rapid regenerative ability of *Anogeissu*s, the preferred charcoal species. The high initial regeneration figures after four years and the rapid gains after 12 years reflect the high incidences of *Anogeissus* in the samples of these two years. *Detarium microcarpum* and *Pterocarpus erinaceus* also reveals a propensity to regenerate rapidly. The regeneration of *Erythrophleum suaveolens* also looks promising, although it had very limited representation in the sample.

A regeneration period of 8-12 years translates into much shorter periods of off-take, since there are numerous coppices and charcoal burners are selective and leave small coppices. With sound ecological management and good practices, it is possible that harvesting regimes of four to six years could sustain production.

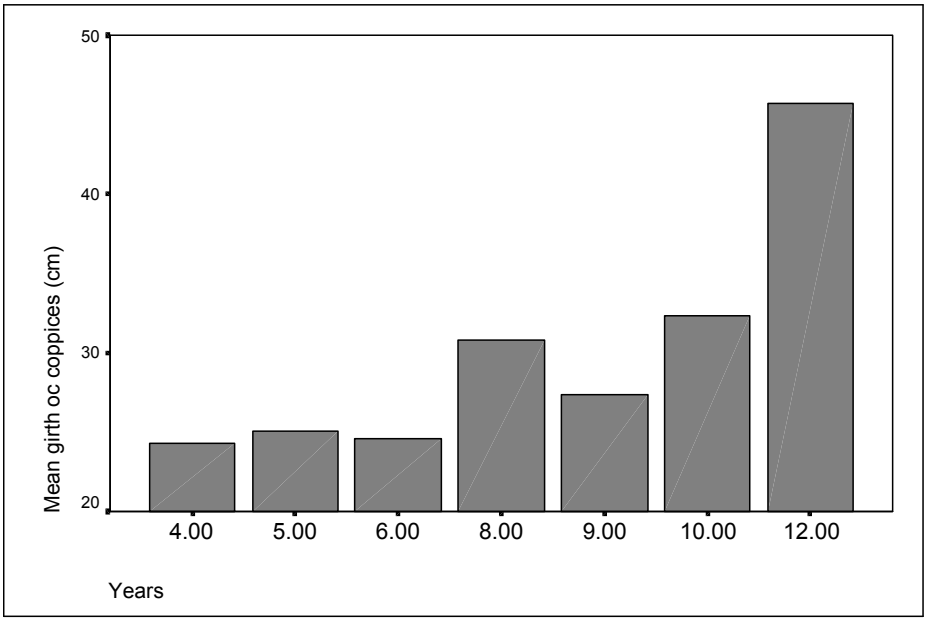


Figure 6. 14 Average girth size of coppice regeneration over a number of years

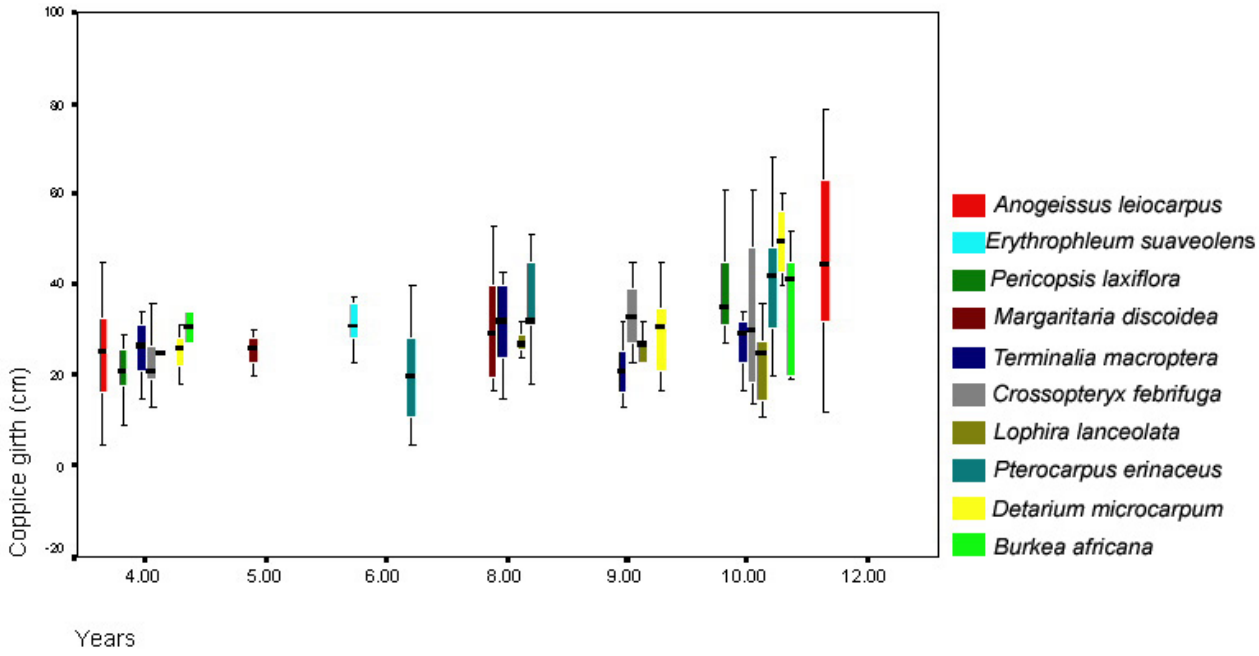


Figure 6. 15 Coppice regeneration of different species over a number of years

Community controls

In contrast with the free-for-all often portrayed as characterising natural resource usage in rural communities, the communities in the New Longoro and Babato area have rules and regulations about the use of trees and natural resources. These regulate the use of economic trees for charcoal production, particularly *Vitellaria paradoxa* and *Parkia biglobosa*. The use of these species for charcoal production is often cited in the media and policy circles as reflecting the limited horizons of rural people and the need to introduce national policy regulations. However, economic species are locally defined. The shea and locust bean tree occur in high densities in rural areas in the transitional and savanna zones precisely because they are valued and preserved by humans. They do not occur in such high densities in wilderness areas or in regions of the transition zone and savanna in which foods are not culturally highly valued, such as the Accra Plains and parts of the Volta region. Local regulations also exist on felling streams on the banks of watercourses and in particular areas which are preserved as community forests. At Mansie, a community forest of mature *Anogeissus* exists on the outskirts of the settlement, in the old village site. Charcoal burners pass through this woodland every day on there way to fell charcoal, but no one fells charcoal in this area. These regulations and codes of conduct often emerge in response to conflicts between farmers and charcoal burners, although they my be complicated by political interests and political power, such as where charcoal burners have been given rights by chiefs to burn on the regenerating fallow lands of farmers. Charcoal burners within a settlement often have a loosely organised association with a head who is responsible for negotiating disputes and formulating moral codes. The chiefs and elders are often responsible for enforcing these rules and people who violate regulations are often taken to the chiefs and elders for judgement and punishment.

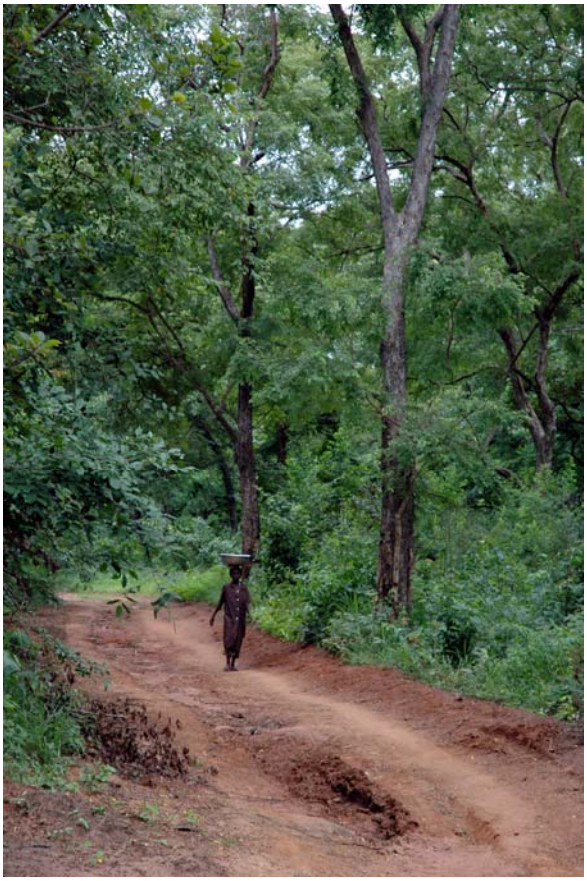


Figure 6. 16 Mansie Community Forest

In recent years, there have been attempts by central government and chiefs to use chiefs to enforce natural resource byelaws being promoted by government. Chiefs are also empowered to control natural resources and ensure the availability of resources for outside entrepreneurs and investors. This creates a conflict of interest for chiefs who can gain significant economic benefits from transacting local natural resources but are responsible for managing the use of the resources. This frequently leads to a lack of transparency in which chiefs frequently manipulate their control over resources for narrow financial gain. This frequently undermines the attempts of the community to enforce rules and regulations concerning the management of natural resources and undermines the building of consensus.

Conclusion

Charcoal burners are frequently dismissed in policy circles as destroyers of the environment with impoverished cultural horizons. The main policy interventions consist of attempts to ban charcoal or to displace existing small-scale burners with large-scale investors and new technology. Plantations with exotic species are advocated as the way forward, although there are no detailed studies on the viability of producing plantation charcoal for the existing markets. The allegations that charcoal from natural fallow woods is unsustainable is based on assumptions and political motives rather than on detailed research with directly corroborated evidence of the impact of increasing charcoal production on woodland and fallow regeneration. These narratives lack a fundamental understanding of ecological processes within

savanna woodland and the transition zone, and the adaptations of peasant farmers to this ecology. The technologies they wish to introduce are not adapted to ecological processes within the savanna. It is not clear why replacing the naturally regenerating trees in fallows, which need to be cut for farming, with monocultural exotic plantations will enhance the environment. Such an intervention would only make sense in the light of a catastrophic deterioration in the environment, in which trees failed to regenerate as a result of excessive cutting and were replaced by grassland. This is clearly not the case in the Kintampo district, where the dominant yam farming systems depend upon the regeneration of trees to create the agroecological environment in which they have been adapted to grow, and in which dominant fallow is characterised by many small trees and not grassland.

In contrast with the assertions of crisis narratives, charcoal burners and farmers have developed management techniques and strategies which are rooted in the ecological processes of the transition zone. Charcoal burning within fallow land and cycles of fallowing within farming systems has the potential to be sustainable. There are potentials of creating new systems of management based on the existing practices and knowledge of farmers and charcoal burners allied to ecological research into the characteristics of the savanna environment. The research carried out by DEAR suggests that charcoal burning has the potential to be sustainable and that the stump and coppice ecology of the forest-agricultural interface has the potential to support rapid rates of regeneration and off-take provided it is managed with an understanding of ecological processes and the properties of the trees. A better understanding of the ecosystem in the context of livelihoods and the relation between people and natural resources offers great potential in furthering our understanding of ecology and changing environments, and building on local capabilities. In dismissing the livelihood activities of the rural poor, the modernising discourse substitutes a narrow political agenda for the generation of new knowledge, information, and creativity.

7. Land cover change and regeneration: Evidence from remote sensing

The land cover within the transition zone consists of a complex of different patch mosaics, with varying combinations of grass, shrub and tree species (Markham and Babbedge, 1979). These mosaics have often been interpreted as evidence of land degradation, in a tradition going back to colonial forestry (Basset and Crummey, 2003; Fairhead and Leach, 1998). The woodland thickets are interpreted to be the original environment and the more open vegetation to result from deforestation. Recent research has challenged this conception and as historical analysis develops of long term change in African environments, it becomes evident that their have been dramatic changes in the land cover of the transition zone and the forest throughout history, including periods in which savanna extended to the coast and forest penetrated further inland. These changes challenge notions of equilibrium

environments, and suggest that the variety of vegetation formations are not the product of anthropogenic disturbances, but rooted in complex factors including the interactions of climate, soil, and incidences of fire. Anthropogenic disturbances can also lead to the enhancement of vegetation.

Recent research into long term climatic and ecological change suggest that the present period is marked by an underlying expansion of forest within transition zones, although this underlying trend of expansion is marked by wetter and drier phases in which forests contracts and expands (Maley, 1996; 2002). It has now becoming increasingly evident that environmental change is multidirectional. While human activities can result in a depletion of land cover, they can also lead to gains. For instance, old settlement sites can have rich soils resulting from the decomposition of human refuse which results in the growth of woodlands that is richer than the surrounding vegetation (Fairhead and Leach, 1998; 1996). In our case studies, such an example lies in the community forest in Mansie, which has regenerated on the old settlement sites and supports a rich grove of *Anogeissus leiocarpus*, with much higher densities of large trees than found in the uncultivated landscape. Other studies have also shown that grazing cattle often create rich fertile soils that promote the regeneration of woodland and forest plants (Basset and Zuéli, 2000).

The picture of expanding forests within the transition zone is complicated by economic activities, which can significantly transform the vegetation. The development of mechanised agriculture within the transition zone has frequently led to uprooting of trees and destruction of the soil root-mat to make way for mechanised ploughing of the land. Timber felling by concessionaire can also remove significant numbers of large trees within the transition zone, particularly since only a few timber species are found, most species being too small for timber production. The aim of this chapter is to examine the impact of farming practice and charcoal burning on land cover change. If charcoal burning is leading to the rapid depletion of trees in the environment, this should be reflected in patterns of land cover change, particularly within the farming areas in which charcoal burning is concentrated.

Two studies have been carried out by the research team, using remote sensing methods. These are presented in Annex N and F. The study in Annex O compares and contrasts land cover change in the mechanised agricultural belt around the Branam state farms and the surrounding yam faming belt, extending to around Mansie and Weila and the maize farming belt around Badu in the Wenchi District (referred to as study O). The study in Annex F compares regeneration in eight localities in the Kintampo district, using satellite imagery from December to January 1990 and 2001 (referred to as study F). This chapter provides a brief synopsis of this research, presenting case study materials from the localities in the Kintampo district in which we were working in the present study, namely Mansie and Asantekwa in the New Longoro area, and Dawadawa and Ataa Akura in the Babato area.

Methodology

To assess the directions of change in land cover, the two studies used two remote sensing images captured from different dates and compared the changes in vegetation. In study O satellite images captured from December 1984 and early January 2001

were used. In study F the images were captured in December 1990 and January 2001. Landsat TM data was used in both studies, since it has a relatively high spectral resolution.

The main problem in selecting images for study is that data captured in the rainy season tend to be covered with thick cloud, which prevents analysis of the data. While dry season data has much less cloud cover, it suffers from burnt vegetation scars and smoke from burning sites resulting from bush fires in fire prone environments. The use of dry season data is, thus, the result of a less than ideal trade-off, in which important land cover information that would be present during the cropping season is missing. Some vegetation types, such as grassland, are likely to be under-represented, since these are the types of vegetation most likely to be burnt. The use of dry season data also results in an under-representation of deciduous woody vegetation as would have been registered during the rain season. Thus, the use of remote sensing imagery is distorted by two problems – securing data with little cloud and without extensive burnt vegetation scars.

Intensive ground truthing of spectral data was carried out and geo-referenced using a GPS. Aerial photographs were used where possible to improve the information available. The later scenes were registered and served as base-year images to correct the earlier image by image-to-image registration. The images were classified analysed using the Iterative Self-Organizing Data Analysis (ISODATA) Technique (Tou and Gonzalez, 1974). The output was classified using a flexible functional/structural classification scheme that could discriminate between identifiable land use/cover change types and generate detailed information on the patterns of change between different land cover types between the two periods. Principal component analysis (PCA) was carried out to identify the most relevant bands and components with specific information values. The enhanced image was finally classified by a Maximum Likelihood classifier algorithm.

In study O, no attempt was made to differentiate between farmland, naturally occurring grassland and short fallows. It is difficult to differentiate between currently farmed areas and other types of vegetation, since the vegetation had dried up during the dry season or was burnt. Tree and shrub formations were classified as closed or open woodland. To ensure that a comparison of vegetation change could be carried out vegetation classifications were reduced to four types:

1. Closed or dense woodlands, with trees that form a closed or nearly closed canopy, above a lower storey of shrubs and grass. In many areas of the more northerly transition zone, this type of formation is rare, and the main occurrences are on teak plantations and forest reserves, and (anthropogenic) forest groves that are managed by communities;

2. Open woodland tree or shrub formations with moderate to widely open canopies with grass and bushes and annual crop farms. The woodier yam farms may also have similar spectral characteristics to this floristic formation. Much of this formation consists of mature woody fallow land;

3. Fallows/annual crops -dominantly herbaceous fallows of forbs and grass and annual crops with or without isolated trees and/shrubs;

4. Bare lands/settlements - built-up areas, recently cleared farmlands or farms harvested of crops and left in bare or burnt state.

However, this generalisation may mask certain process of local regeneration, since it does not account for intermediary stages.

In study F, an attempt was made to introduce more land cover categories. A functional-structural classification scheme was developed which was flexible and more sensitive at discriminating between land cover types. The classification scheme focused on generating information on the processes of change between various land use types through conversion and transformation. The tree and shrub dominated landscape was classified into three different classes. Farms were classified into two different categories. Spectral characteristics related to the density of woody vegetation, and the density of the undergrowth, including characteristics related to herbaceous undergrowth, grass, and bare soil as characterises farms, were used to classify these land types. The land-use classification system consisted of the following:

1. Dense woodland (DWL): recently uncultivated woodland with fully or partially closed canopy cover (more than 50% cover);

2. Open woodland (OWL): moderately opened recently uncultivated woodland with patches of bushes and grasses in gaps of canopies (between 35 percent to 50 percent cover). This would include abandoned yam fields where many trees were left intact but now has substantial bushy undergrowths in canopy gaps;

3. Long fallow (LFA): dominantly young trees and shrubs with isolated matured trees and dense bush. These are found on old fallow lands. Some of the woodier yam farms may have similar spectral characteristics;

4. Short fallow (SFA): young or short herbivorous growth with tree coppices on abandoned farmlands or other areas with isolated or no trees. This category may also contain dominant grasslands which have not been cultivated for a long time, but in which the regeneration of woody trees has been arrested by the recurrence of farm. The type of regeneration on this land is not generally suitable for the cultivation of yams (LNTC), although it may be used for more open type farms (INTC), such as maize, groundnuts, and vegetables;

5. Intensive cultivation (INTC) - current annual cropping system in which practically all trees on the farms are removed;

6. Less intensive cultivation (LINTC) - annual cropping lands with moderate to sparse tree and shrub cover. Comparatively, farms are larger than the intensive cultivated farmed lands;

7. Gallery vegetation (GAV) - a mixture of tree, shrubs and herbaceous vegetation along water bodies;

8. Build-up/exposed areas (BUP) - constructed areas;

9. Cloud cover (CLCOV);

10. Water body (Black Volta) (BV).

Training areas were selected for the various land-use/cover classes. These were digitized on-screen as polygon shapes. A Jeffries-Matustiu separability matrix was generated for the training areas, to determine the degree of separation or similarity between them. Histogram and scatter plots also facilitated the classification process by progressively indicating the degree of between-class separation prior to the final classification of entire image samples. A field verification survey carried out after the unsupervised classification yielded important information that improved the subsequent supervised classification. A Maximum Likelihood classifier algorithm was used to classify the image. The pixels used to train the Maximum Likelihood algorithm were not used as test samples. This was to ensure that the reference information was as independent or unbiased as possible. The test samples were converted into a point shape, rasterised and used for a pixel-by-pixel comparison with the classified image, and accuracy computed using Kappa statistical technique in IDRISI software.

The Mansie yam belt

Mansie lies about twenty kilometres from the Branam state farms. It lies just beyond the extent of the area in which mechanised farm services and synthetic inputs were distributed to farmers by agricultural services from the 1960s to the early 1980s. In the Mansie area farmers did not plough their lands with tractors or apply fertilisers. The dominant cultivation within Mansie is of yam within a rotational bush cycle. Mansie is also a major charcoal burning centre. Thus, by comparing land cover change between the Mansie and Branam-Subinso areas the impact of yam farming and charcoal, and mechanised agriculture on the environment can be examined.

The mechanised farming zone around Branam-Subinso is characterised by a distinct contraction in wooded areas. In 1984, 50 percent of the area analysed was under closed and open woodland. However, by 2001, less than 2 percent of the same area was under wooded land. From analysis of the change in land cover, it is evident that 30 percent of all transformations of vegetation represented a conversion from open woodland to herbaceous fallow/annual cropland (See Table 7.1). This represented about 45 percent of the total fallow/annual cropland that existed in 2001.

In contrast, in the yam belt around Mansie, about 70 percent of the area was under open woodland in 1984. In 2001, 50 percent of the area was still under open woodland. Of the total open woodland that occurred in the area, 73 percent was retained from 1984. However, 20 percent of the open woodland in 2001 consisted of land that was grassland fallow in 1984, which had regenerated into woody vegetation (Table 7.2 and Figures 7.1 and 7.2). Conversion of land is multidirectional, some areas of woody fallow are transformed into grassland and other areas of grassland regenerate into woody environments. In contrast with the Branam-Subinso mechanised farming zone, there is no evidence of a downward spiralling of regeneration and a permanent or long-term replacement of woody fallow by grassland and shrub land.

Clearly, the practice of preserving the root and soil mat and stumps in the yam belt encourages the regeneration of trees, allowing for gains in woody vegetation. This contrasts with the mechanised ploughing belt, where despite the abandonment of the state farms in the early 1980s and the decline of mechanised cultivation and high inputs agriculture in the same period, regeneration of woody vegetation is slow.

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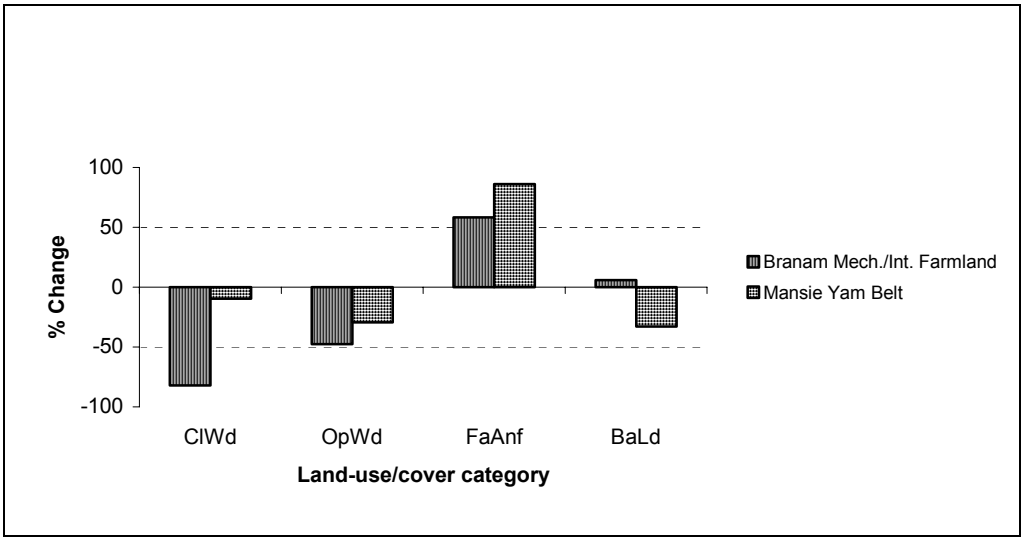
Table 7. 1 Land cover change in the Branam-Subinso mechanised farm zone, 1984-2001

	2001					
1984	Land-use/cover **(percent)**	Closed woodland	Open woodland	Fallow/ annual farm	Bare land	Total
	Close woodland	0.06	0.97	3.64	0.31	4.97
	Open woodland	0.68	13.74	29.96	1.05	45.42
	Fallow/ annual farm	0.14	8.55	32.33	3.10	44.12
	Bare land	0.00	00.55	03.69	0.99	5.23
	Total	0.87	23.82	69.77	5.53	100.00

Table 7. 2 Proportional land cover changes in Mansie Yam Belt, 1984-2001

	2001					
1984	Land-use/cover **(percent)**	Closed woodland	Open Woodland	Fallow/ annual farm	Bare land	*Total*
	Close woodland	0.12	1.53	0.73	0.00	2.38
	Open woodland	1.82	36.48	31.30	0.18	69.78
	Fallow/ annual farm	0.22	10.61	14.20	0.38	25.41
	Bare land	0.00	0.35	0.92	0.77	2.04
	Total |	2.17	49.24	47.25	1.34	100.00

Figure 7. 1 Percentage change in land cover in Branam and Mansie, 1984-2001



Clwd = Close woodland OpWD = Open woodland FaAnf = Fallow or annual farm
BaLd= Bare land

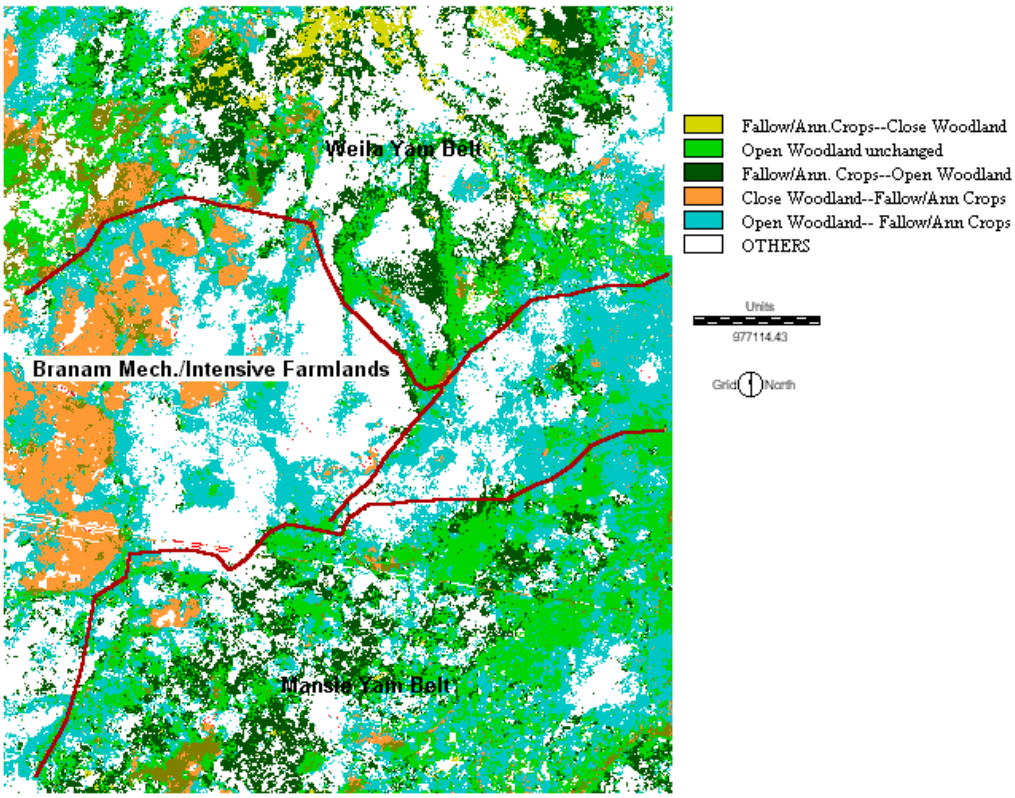


Figure 7. 2 Land cover change in the Branam and Subinso area, 1984-2001

The decline in vegetation within the mechanised areas is clearly more pronounced than within the yam farming and charcoal burning areas. Natural resource policies within Ghana usually promote permanent cultivation. It is argued in policy circles that

permanent cultivation preserves the land by limiting the areas under cultivation, and allowing large areas to be retained as woodland. This is not borne out by the analysis of satellite imagery. This shows that the extension of mechanised cultivation has resulted in the transformation of the overall characteristics of a significant belt of land. There is no evidence of small areas being cultivated, surrounded by large areas of woodland left intact. We can conclude from the evidence, that mechanised cultivation has had a more pronounced effect on the decline of forest cover than yam cultivation and charcoal burning.

Land cover change in the Kintampo district

In study F land cover change was sampled in 8 different localities in the Kintampo district, including, Asantekwa, Dawadawa, Atta Akura, Kunsu, Apesika, Sabrama, Nyame Bekyere, and the Punpun basis.

In 1990, woody vegetation, consisting of closed woodland (DWL), open woodland (OWL) and long fallow (LFA), made up 59 percent of the vegetation and in 2001 54 percent of the vegetation.

All the land-use/cover classes experienced changes by different amounts within the period investigated. The LINTC changed by the greatest amount, gaining by 7307.29 ha or by 62.4 percent, and the DWL experienced the highest negative change declining by -50.3 percent. However, this change did not have a great impact on the landscape, since the DWL constituted a relatively small part of the area of land. The LFA experienced a marginal percentage decline of -4.2 percent, with the intensive cultivated areas experiencing a marginal change of - 6.5 percent. The DWL experienced the highest negative change, whereas the LINTC underwent the highest positive change. The DWL changed by -50.27 percent. However, this should not be seen as a very significant change, since the area under closed woodland comprised a small proportion of the total land, declining from 8.27 percent of land in 1990 to 3.93 percent in 2001. The area under open woodland gained by 8.57 percent which represented an increase of 1260 ha, The LFA experienced a marginal decline of -4.17% (see Table 7.1 and Figure 7.2). The land under intensive farming and short fallows also declined. The most significant gains were in the LNTC and in open woodland.

Table 7. 3 Land cover for all sites in Kintampo district, 1990 and 2001

Land cover	1990 (Ha)	1990 (%)	2001 (Ha)	2001 (%)	Percent change 1900-2000
DWL	**5524.296**	**8.27**	**2747.126**	**3.93**	**-50.27**
OWL	**14705.860**	**22.01**	**15966.220**	**22.87**	**8.57**
LFA	**19485.950**	**29.17**	**18673.560**	**26.75**	**-4.17**
SFA	**5637.407**	**8.44**	**4294.285**	**6.15**	**-23.83**
INTC	**9736.233**	**14.57**	**9107.224**	**13.05**	**-6.46**
LINTC	**11719.450**	**17.54**	**19026.730**	**27.25**	**62.35**
Total	**66809.200**	**100**	**69815.150**	**100**	

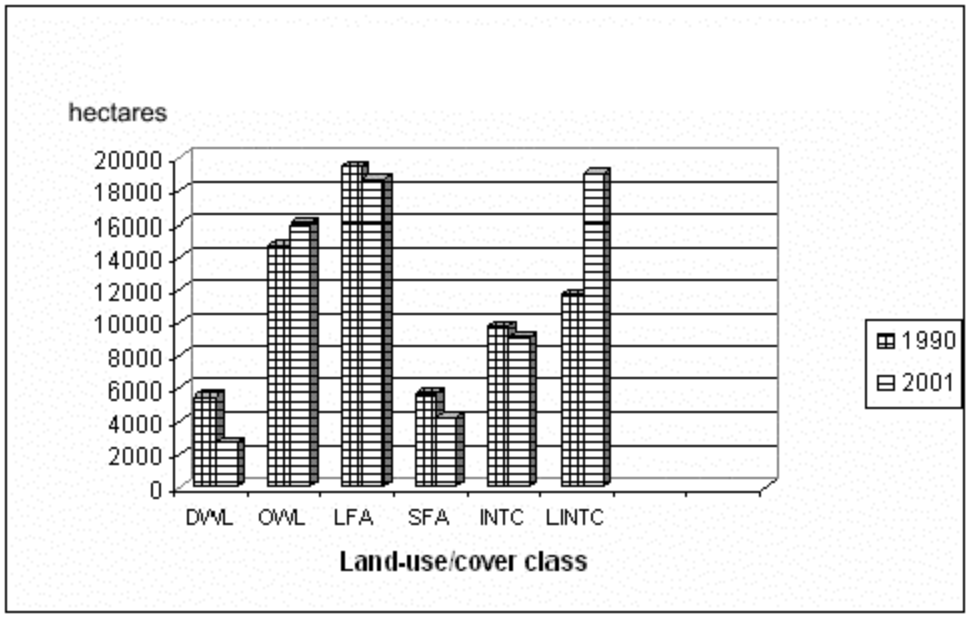


Figure 7. 3 Land cover categories for all sites in 1990 and 2001

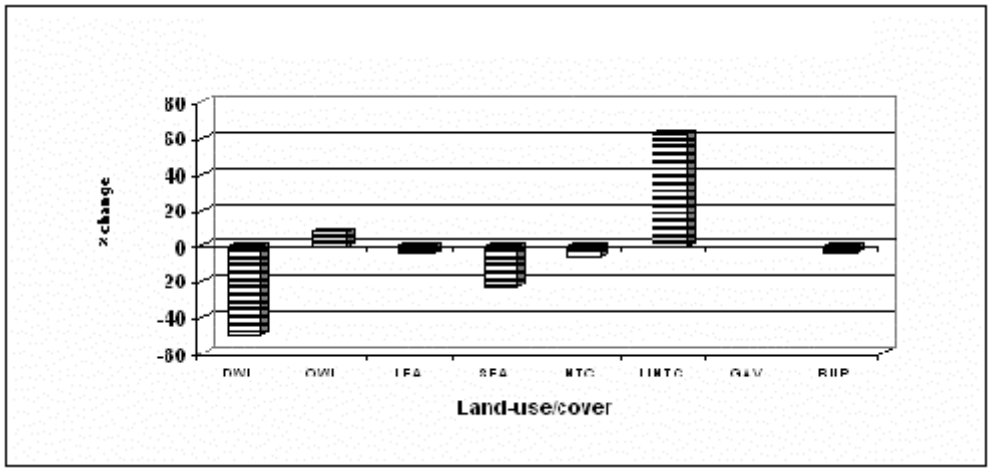


Figure 7. 4 Percentage of land cover change for all sites

Asantekwa

In 1990, the dense woodland and open woodland formed only 8 percent of the area analysed in Asantekwa (see Table 7.4 and Figure 7.6). The dominant unfarmed vegetation consisted of well-regenerated fallow. The largest proportion of land was under LINTC, which made up nearly 37 percent of the landscape. INTC comprised of 22 percent of the land. Short fallow, consisting of small trees, shrubs and grassland, only made up 0.75 percent of the area, comprising 41.3 hectares.

Table 7. 4 Land cover at Asantekwa in 1990 and 2001

Land cover	1990 (hectares)	1990 (percent)	2001 (Hectares)	2001 (percent)	Percent change 1990-2001
DWL	245.62	4.46	124.46	2.26	-49.33
OWL	190.55	3.46	1468.74	26.68	670.79
LFA	1272.70	23.14	2037.37	37.00	60.08
SFA	41.30	0.75	824.41	14.97	1896.15
INTC	1215.41	22.09	179.53	3.26	-85.23
LINTC	2029.91	36.90	795.78	14.45	-60.80
GAV	14.32	0.26	67.19	1.22	369.20
BUP	256.08	4.66	8.26	0.15	-96.77
Total	5501.1	100.00	5505.74	100.00	

In 2001, the most significant gains in the landscape was an expansion of the LFA, which now occupied 37% of the area and the OWL which had expanded to 26 percent of the area (see Table 7.4 and Figure 7.7). The area under LINTC had reduced by more than half (14.5%) of what existed in 1990. The size of the intensive cultivated area had also experienced a dramatic decrease to form only 3.3% of the area. The SFA expanded from an insignificant area in 1900 to occupy about 15 percent of the area. Most of this expansion occurred in a particular areas in the upper half of the landscape (see Figure 7.8). However, the dominant changes in the area were of recuperation and regeneration of land into OWL and LFA, and the resting of farmland. Farmers were presumably moving into adjacent areas to open up for cultivation. While it is possible that there is some blurring between the categories of INTC, SFA, LINTC and LFA, this does not detract from the general gain in vegetation in the more woody categories of OWL and LFA.

When the process of transformation of vegetation is examined between the two periods (see Figure 7.8 and Table 7.5), high proportions of the LINTC of 1990 were converted into OWL and LFA in 2001. Twenty-six percent pf the LINTC in 1990 (536.3ha) was converted into OWL and 37 percent (753.9 ha) was converted into LFA. Forty three percent of the DWL in 2001 was transformed from OWL and LFA. A high proportion (26.30 percent) of the LFA that existed in 1900 was transformed into OWL. Twenty-six percent of the LINTC of 1990 was converted into OWL, and 37 percent of the LINTC was converted into LFA. The gains in woodland from cultivated land were higher in the LINTC areas than in the SFA or INTC areas that existed in 1990. Thirty-seven percent of the LFA in 2001 had been transformed from LINTC, while 17 percent was transformed from INTC. Less than one percent of the SFA was transformed into LFA in 2001. The cultivated lands in 2001 were mainly converted from LFA, which made up 54 percent of the LINTC and INTC. These processes of transformation, again, suggest processes of regeneration at play, in which farmland is being transformed into woody fallows and open woodland, and farmers convert regenerated woodland into farms. There is no evidence of any crisis, in which excessive cutting of wood for charcoal and farming pressures are resulting in significant declines in woody vegetation and declining fallow qualities. While closed woodland occupies only a small proportion of the land, this is a characteristic feature

of the transition zone, with its dominantly open vegetation and mosaics of different types of vegetation. Within the Asantekwa area, land cover change is multidirectional. Nevertheless, processes of regeneration and recuperation of woody vegetation are highly evident and dominant within the landscape.

Figure 7. 5 Table Land cover transformations in the Asantekwa area

		2001								
	Land-use/ cover	**DWL**	**OWL**	**LFA**	**SFA**	**INTC**	**LINTC**	**GAV**	**BUP**	**Total**
1990	**DWL** Ha	15.97	63.88	101.88	25.33	4.41	30.84	2.75	0.00	245.62
	Percent	*0.29*	*1.16*	*1.85*	*0.46*	*0.08*	*0.56*	*0.05*	*0.00*	*4.45*
	OWL Ha	16.52	68.29	55.07	4.96	2.20	19.83	23.13	0.00	190.55
	Percent	*0.30*	*1.24*	*1.00*	*0.09*	*0.04*	*0.36*	*0.42*	*0.00*	*3.45*
	LFA Ha	36.35	334.83	591.46	122.81	25.33	152	10.46	0.00	1272.69
	Percent	*0.66*	*6.08*	*10.74*	*2.23*	*0.46*	*2.76*	*0.19*	*0.00*	*23.12*
	SFA Ha	3.30	11.01	4.41	3.85	0.00	0.55	17.62	0.00	41.3
	Percent	*0.06*	*0.20*	*0.08*	*0.07*	*0.00*	*0.01*	*0.32*	*0.00*	*0.74*
	INTC Ha	11.01	323.27	353.01	244.52	72.14	205.41	3.3	2.75	1215.42
	Percent	*0.20*	*5.87*	*6.41*	*4.44*	*1.31*	*3.73*	*0.06*	*0.05*	*22.07*
	LINTC Ha	24.78	536.39	753.92	348.05	49.01	315.01	2.2	0.55	2029.92
	Percent	*0.45*	*9.74*	*13.69*	*6.32*	*0.89*	*5.72*	*0.04*	*0.01*	*36.86*
	GAV Ha	0.55	3.85	3.30	0.55	0.00	0.55	5.51	0.00	14.32
	Percent	*0.01*	*0.07*	*0.06*	*0.01*	*0.00*	*0.01*	*0.10*	*0.00*	*0.26*
	BUP Ha	4.41	65.53	77.65	46.26	17.62	39.1	1.1	4.41	256.08
	Percent	*0.08*	*1.19*	*1.41*	*0.84*	*0.32*	*0.71*	*0.02*	*0.08*	*4.65*
	CCOV Ha	12.12	61.68	97.48	28.64	8.26	31.94	1.65	0.00	241.76
	Percent	*0.22*	*1.12*	*1.77*	*0.52*	*0.15*	*0.58*	*0.03*	*0.00*	*4.39*
	Total Ha	124.46	1468.74	2037.63	824.41	179.53	795.78	67.19	8.26	5506.55
	Percent	*2.26*	*26.67*	*37.00*	*14.97*	*3.26*	*14.45*	*1.22*	*0.15*	*100*

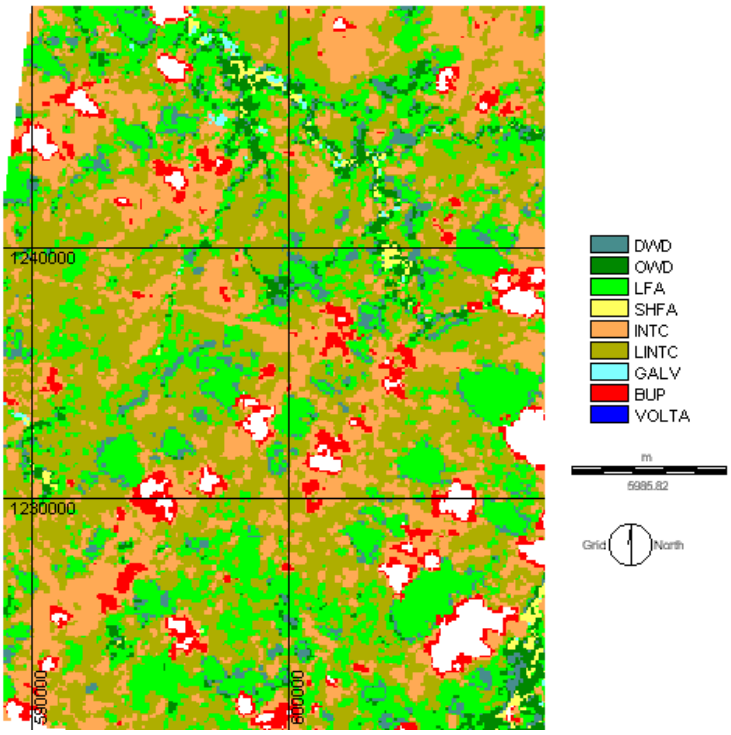


Figure 7. 6 Land cover at Asantekwa in 1990

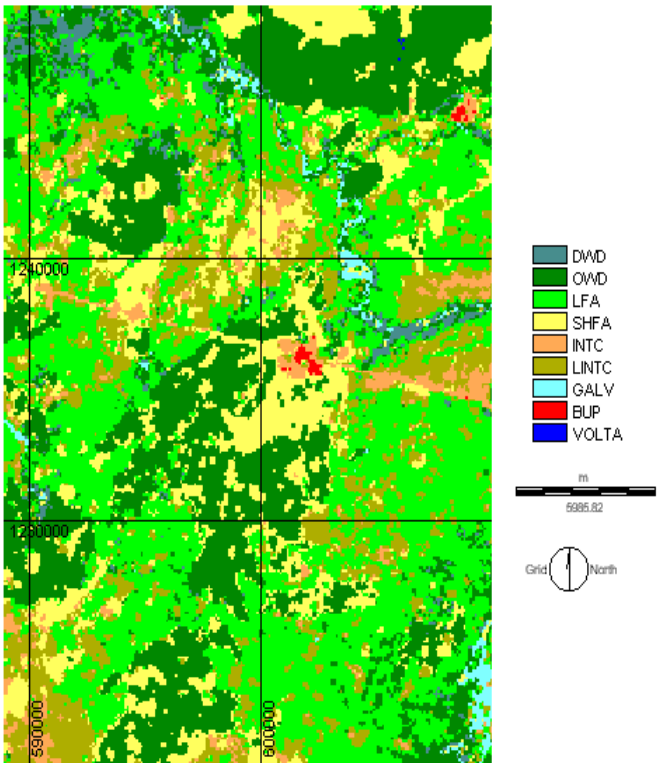


Figure 7. 7 Land cover at Asantekwa in 2001

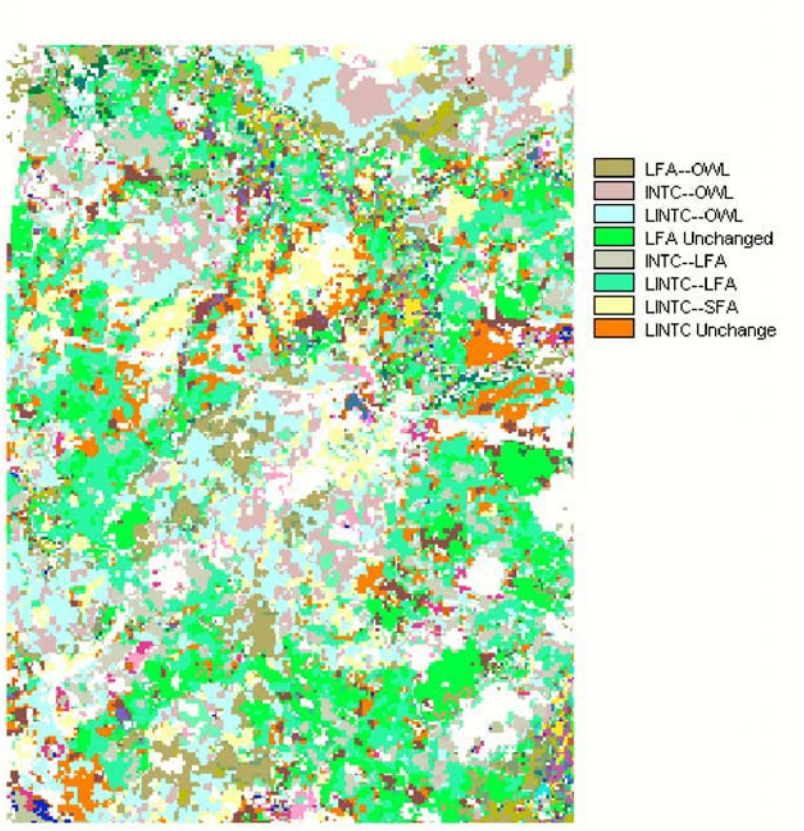


Figure 7. 8 Land cover change in Asantekwa, 1990- 2001

Dawadawa

In 1990, cultivated lands dominated the Dawadawa landscape (Table 7.5 and Figure 7.9). The farmlands occupied about 80 percent of the area. Dense woodland formed 5.4 percent of the area, OWL formed only 0.84 percent, and LFA 11.5 percent of the landscape.

Cultivated lands had significantly reduced by 2001 (Table 7.5 and Figure 7.9). The area under LINTC reduced from 53.1 percent to just 12.1 percent and the INTC from 26.8 percent to 7.05 percent of the area. The area under OWL and the LFA increased significantly, with the OWL expanding from 11 percent in 1990 to more than 31 % of the total area in 2001. This was more than 3500% increase over the 1990 area. The DWL maintained almost the same area that was occupied in 1990.

Table 7. 5 Land cover in the Dawadawa area, 1990 and 2001

Land-use/cover	1990 (hectares)	1990 (percent)	2001 (hectares)	2001 (percent)	Percent change 1900-2001
DWL	508.08	5.42	425.28	4.52	-16.10
OWL	79.04	0.84	2920.54	31.04	3595.24
LFA	1073.56	11.45	2918.66	31.02	171.87
SFA	2.823	0.03	1182.71	12.57	41795.50
INTC	2508.43	26.76	663.33	7.05	-73.56
LINTC	4977.34	53.11	1142.25	12.14	-77.05
GAV	3.77	0.04	99.73	1.06	2549.71
BUP	219.23	2.34	56.45	0.60	-74.25
Total	9372.27	100	9408.97	100	

Table 7. 6 Land cover transformations in the Dawadawa area

		2001								
	Land-use/ cover	**DWL**	**OWL**	**LFA**	**SFA**	**INTC**	**LINTC**	**GAV**	**BUP**	**Total**
1990	**DWL** Ha	21.64	127.96	131.73	87.50	40.46	87.50	10.35	1.88	508.08
	Percent	*0.23*	*1.36*	*1.40*	*0.93*	*0.43*	*0.93*	*0.11*	*0.02*	*5.40*
	OWL Ha	3.76	16.94	18.82	5.65	6.59	8.47	18.82	0.00	79.04
	Percent	*0.04*	*0.18*	*0.20*	*0.06*	*0.07*	*0.09*	*0.20*	*0.00*	*0.84*
	LFA Ha	57.39	320.85	352.84	132.67	66.80	94.09	44.22	4.70	1073.56
	Percent	*0.61*	*3.41*	*3.75*	*1.41*	*0.71*	*1.00*	*0.47*	*0.05*	*11.41*
	SFA Ha	0.00	0.00	0.94	0.00	0.00	0.00	1.88	0.00	2.82
	Percent	*0.00*	*0.00*	*0.01*	*0.00*	*0.00*	*0.00*	*0.02*	*0.00*	*0.03*
	INTC Ha	70.57	853.39	660.51	382.00	203.23	306.73	8.47	22.58	2508.43
	Percent	*0.75*	*9.07*	*7.02*	*4.06*	*2.16*	*3.26*	*0.09*	*0.24*	*26.66*
	LINTC Ha	266.27	1501.67	1694.55	535.37	322.73	620.05	13.17	23.52	4977.34
	Percent	*2.83*	*15.96*	*18.01*	*5.69*	*3.43*	*6.59*	*0.14*	*0.25*	*52.90*
	GAV Ha	0.00	0.00	1.88	0.00	0.00	0.00	1.88	0.00	3.76
	Percent	*0.00*	*0.00*	*0.02*	*0.00*	*0.00*	*0.00*	*0.02*	*0.00*	*0.04*
	BUP Ha	4.70	85.62	50.81	31.99	21.64	20.70	0.00	4.70	219.23
	Percent	*0.05*	*0.91*	*0.54*	*0.34*	*0.23*	*0.22*	*0.00*	*0.05*	*2.33*
	CCOV Ha	0.94	14.11	7.53	7.53	1.88	4.70	0.00	0.00	36.69
	Percent	*0.01*	*0.15*	*0.08*	*0.08*	*0.02*	*0.05*	*0.00*	*0.00*	*0.39*

	Total Ha	425.29	2920.54	2918.66	1182.71	663.33	1142.25	99.73	56.45	9408.95
	Percent	*4.52*	*31.04*	*31.02*	*12.57*	*7.05*	*12.14*	*1.06*	*0.60*	*100.00*

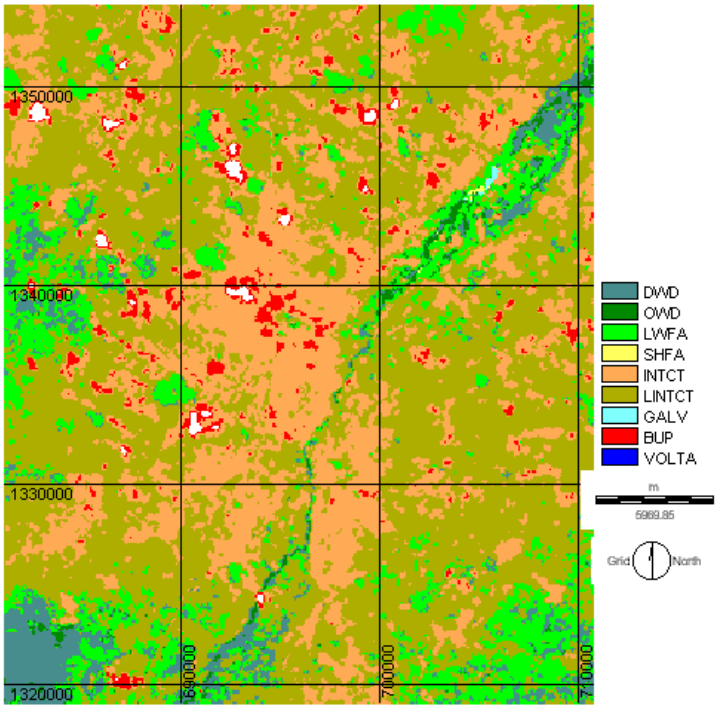


Figure 7. 9 Land cover at Dawadawa in 1990

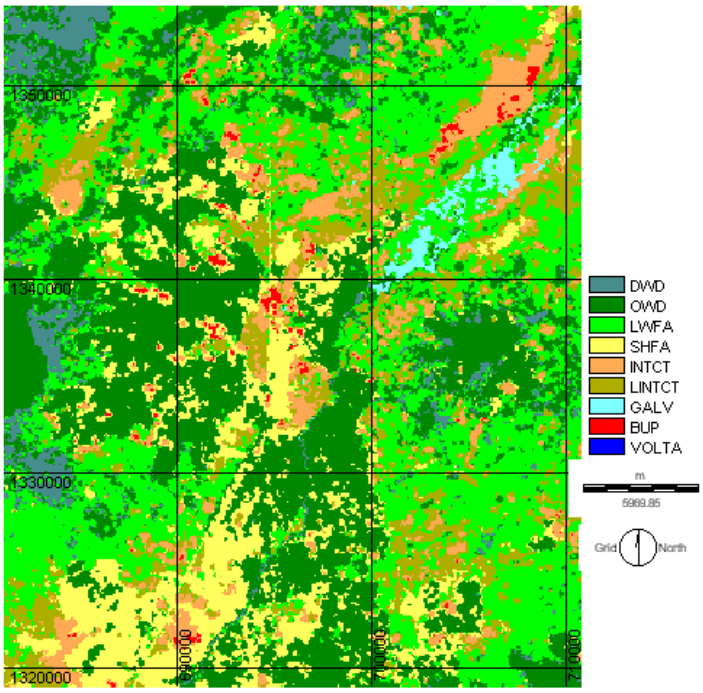


Figure 7. 10 Land cover at Dawadawa in 2001

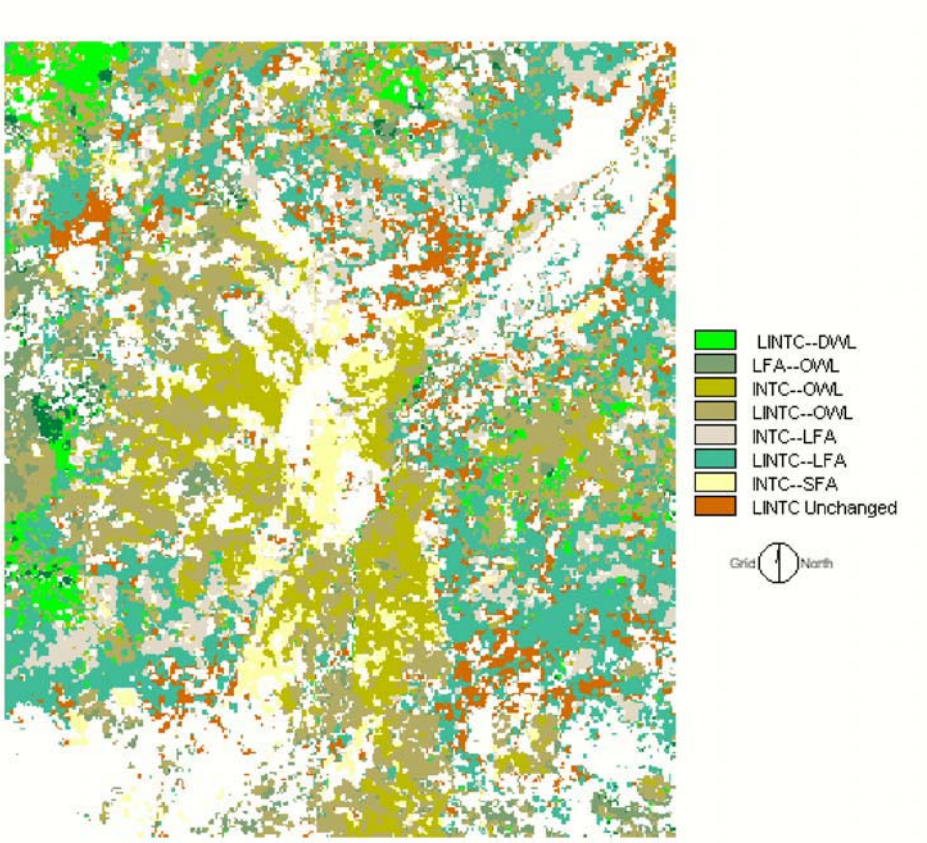


Figure 7. 11 Land cover change in the Dawadawa area, 1990-2001

Transformations into a woodier environment were significant (see Table 7.7 and Figure 7.11). In 2001, 79.2 percent of the DWL that was recorded was converted from less intensive farmlands that existed in 1990. Fifty-one percent of the OWL that existed in 2001 was converted from LINTC. This indicates that a substantial regeneration on cultivated lands was occurring, particularly on mixed tree and crop farms (LINTC) in the eastern and western sections of the image, and towards the centre of the area (see Figure 7.11). The transformation from dense to less dense woody forms of land cover types was uncommon. It was more common for less woody cover types to be transformed to more-woody land cover forms. Again, processes of regeneration and recuperation of land are well established in the landscape.

Atta Akura

In 1990, the Atta Akura area was dominated by woody vegetation. Forty-nine percent of the area consisted of woodland (DWL and OWL), and another 30 percent of LFA. The cultivated area consisted of 28.7 percent of the land. LNTC was more dominant than intensive crops and accounted for 19.7 percent of the area. By 2001 the DWL and OWL had contracted to 33.5 percent of the area and the LFA had declined to 4.6 percent of the area. The LNTC declined from 19.7 percent to 6.2 percent, while the INTC slightly expanded to occupy 9.4 percent of the area. The most significant gain

in vegetation was of the SFA, which expanded from 0.6 percent of the area in 1900 to 44 percent in 2001.

Table 7. 7 Land cover in the Atta Akuraa, 1990 and 2001

Land-use/cover	1990 (hectares)	1990 (percent)	2001 (hectares)	2001 (percent)	Percent change 1990-2001
DWL	508.08	5.42	425.28	4.52	-16.10
OWL	79.04	0.84	2920.54	31.04	3595.24
LFA	1073.56	11.45	2918.66	31.02	171.87
SFA	2.823	0.03	1182.71	12.57	41795.50
INTC	2508.43	26.76	663.33	7.05	-73.56
LINTC	4977.34	53.11	1142.25	12.14	-77.05
GAV	3.77	0.04	99.73	1.06	2549.71
BUP	219.23	2.34	56.45	0.60	-74.25
Total	9372.27	100	9408.97	100	

In 2001 the SFA consisted of 561.9 ha of which 21.6 percent originated from conversion of dense woodland (DWL), 27 percent from LFA and 24 percent from LINTC. While the dominant overall pattern was one of an overall decline in land cover, processes of regeneration were also evident. In 2001, the OWL had expanded from 165.5 to 396.3 ha. This included significant portions of land that had regenerated from LFA and LINTC. About 27 percent of the OWL in 2001 had consisted of LFA in 1990 and 18 percent was under LINTC.

About 21 percent of LINTC farms in 2001 were made on land that was DWL in 1990, 24 percent were made on land that was OWL, 33 percent on land that was LFA and under one percent on SFA lands. It is evident that as the area of SFA land expands, LINTC farms decline. Presumably, farmers will leave this area to regenerate and open up new LNTC farms in other areas. This is likely to result in the scenario which was evident at Dawadawa - processes of regeneration of fallow land and declining conversion of woodlands and fallow into farms. This scenario was confirmed by field research. The majority of farmers residing at Dawadawa and Atta Akuraa were farming some distance from the settlement along the banks of the Kunso area. The pattern of farming followed a distinct direction away from Atta Akura and Dawadawa, and the old fallow areas in the new areas in which they have been farming over the last fifteen to twenty years were regenerating into distinct woody environments with tall trees.

Table 7. 8 Land transformations in the Atta Akura area

					2001				
Land-use/cover	DWL	OWL	LFA	SFA	INTC	LINTC	GAV	BUP	**Total**

1990	**DWL**									
	Ha	10.59	137.30	18.50	121.22	17.10	16.33	1.40	3.19	325.76
	Percent	*0.83*	*10.76*	*1.45*	*9.50*	*1.34*	*1.28*	*0.11*	*0.25*	*25.53*
	OWL									
	Ha	5.10	50.02	15.69	58.31	14.93	18.76	1.66	1.02	165.50
	Percent	*0.40*	*3.92*	*1.23*	*4.57*	*1.17*	*1.47*	*0.13*	*0.08*	*12.97*
	LFA									
	Ha	10.97	103.87	19.14	175.71	42.75	26.29	2.17	6.51	387.52
	Percent	*0.86*	*8.14*	*1.50*	*13.77*	*3.35*	*2.06*	*0.17*	*0.51*	*30.37*
	SFA									
	Ha	2.68	2.93	0.77	0.51	0.00	0.51	0.51	0.00	7.78
	Percent	*0.21*	*0.23*	*0.06*	*0.04*	*0.00*	*0.04*	*0.04*	*0.00*	*0.61*
	INTC									
	Ha	0.26	25.52	1.40	61.12	14.80	4.47	0.13	5.74	113.56
	Percent	*0.02*	*2.00*	*0.11*	*4.79*	*1.16*	*0.35*	*0.01*	*0.45*	*8.90*
	LINTC									
	Ha	0.77	71.58	3.45	134.36	24.63	11.36	0.00	4.98	251.12
	Percent	*0.06*	*5.61*	*0.27*	*10.53*	*1.93*	*0.89*	*0.00*	*0.39*	*19.68*
	GAV									
	Ha	0.00	0.13	0.00	0.51	0.00	0.00	0.13	0.00	0.77
	Percent	*0.00*	*0.01*	*0.00*	*0.04*	*0.00*	*0.00*	*0.01*	*0.00*	*0.06*
	BUP									
	Ha	0.00	3.32	0.00	8.04	4.34	1.15	0.13	2.93	20.03
	Percent	*0.00*	*0.26*	*0.00*	*0.63*	*0.34*	*0.09*	*0.01*	*0.23*	*1.57*
	Total									
	Ha	30.50	396.33	58.82	561.82	118.67	79.11	6.00	24.63	1276
	Percent	*2.39*	*31.06*	*4.61*	*44.03*	*9.30*	*6.20*	*0.47*	*1.93*	*100.00*

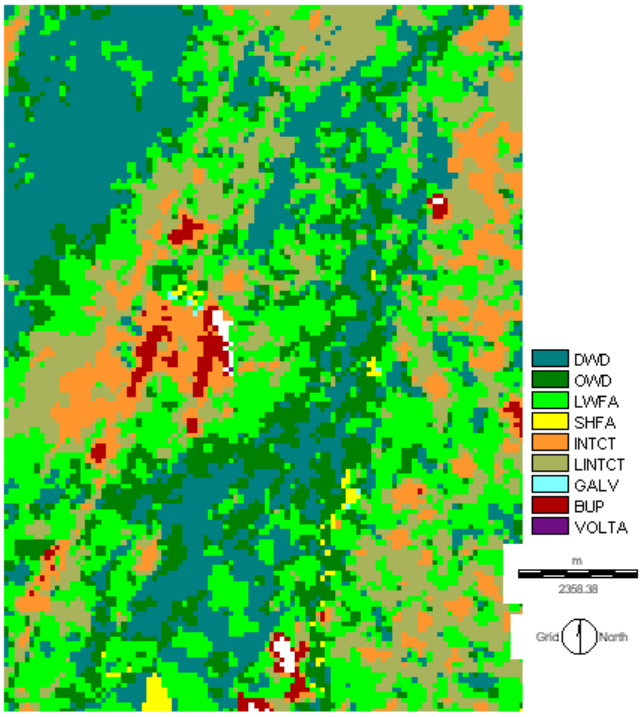


Figure 7. 12 Land cover in Atta Akuraa, 1990

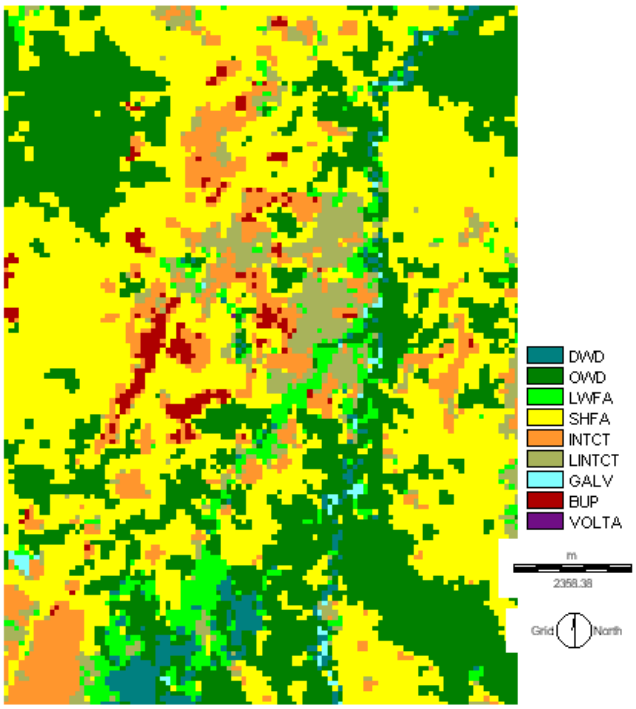


Figure 7. 13 Land cover in Atta Akuraa, 2001

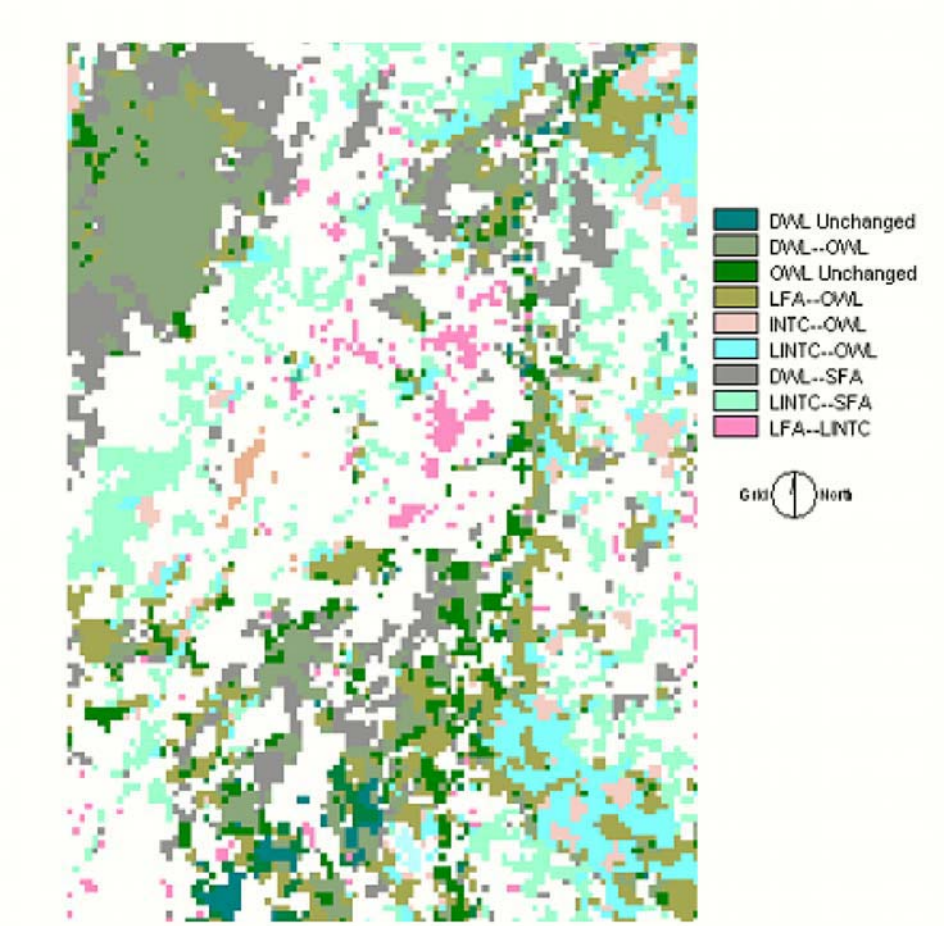


Figure 7. 14 Land cover change at Atta Akura, 1990-2001

Conclusion

The remote sensing evidence, from these four localities in the Kintampo districts, suggests that patterns of regeneration are well established within the various landscapes. There is evidence of the significant regeneration of the landscape into open woodland and mature woody fallows in many localities. This occurs alongside other processes of conversion of woodlands into farmlands and environments characterised by grassland, shrubs and small tree species.

The dominant cropping system within the Kintampo district is yam, and this is usually cultivated in woody environments characterised by the existence of large numbers of small trees. Where these woody environments tend to decline and grass, shrubs and more sparsely distributed trees predominate, farming areas contract, and farmers move into other areas allowing these areas to regenerate. This suggests that large areas of woody environments exist into which farmers can move, and that regenerative processes are well established and replenishing the stocks of woody environments into which farmers move. At Atta Akura, between 1990 and 2001 there was both a significant expansion of grassy fallow land over a large area but also significant areas of regeneration of open woodland and woody fallow. The expansion

of grassy fallows was associated with a decline in farming, resulting in recuperation of land. At Dawadawa a similar process could be seen, with a contraction of farmed land between 1990 and 2001. However, the decline of cultivation was associated with a marked regeneration of fallow, land and conversion of farming areas into woody fallows and open woodland. Similarly, in Asantekwa, significant areas of formerly farmed land were fallowed and converted into woody fallow and open woodland. In none of these farming areas could similar transformations be seen as characterised the mechanised belt around Branam-Subinso in which woodlands become converted into grasslands, which have show little sign of regenerating back into woody fallows over the last twenty years. Clearly, there is no evidence from this data of a rapid escalation in the cutting of woody matter for farm clearance or charcoal, adversely affecting patterns of regeneration.

The comparison of data from two different periods enables changes in vegetation cover to be viewed over a period without making assumptions about what the original vegetation cover should have been. However, without sampling from other periods, it does not enable us to establish the cycles of conversion and regeneration, the periods of cultivation, and the duration of fallowing cycles. For instance, it is not clear how the environments characterised as short fallow come into being and the nature of their regeneration. The impact of fire is also not clear. Where grassy and shrubby species prevail, it is likely that these environments will become more prone to fire outbreaks and that yearly outbreaks of fire may prevent the regeneration of these environments into woody fallows. This may result in their abandonment by farmers, who may move into more fertile and woody environments in which yams will thrive better. However, will this abandonment lead to recuperation and transformation? Will fires continue to prevent the environment regenerating? Will regeneration also be affected by climatic conditions, in which a wetter period may create the conditions for regeneration in fire prone areas? In addition to studying cyclical patterns of change, it is important to examine the directions in which farmers move and the impact of directional farming movement on the patterns of landscape regeneration.

It should be possible to begin to develop models of changing environments with the collection of more data on patterns of land cover change within farming systems and the wider landscape; and detailed information from farming communities on their fallowing strategies and the history of land clearance and abandonment. It should be possible to develop a deeper understanding of how land cover types contract, expand and change in relation to the different management strategies of natural resource users, weather conditions, and other factors. However, these models can only be built with an intimate understanding and feel for processes of regeneration within both farming systems and the wider ecology. A detailed understanding of these processes within specific landscapes should eventually contribute towards the development of modelling techniques that can be applied to wider areas and used to both interpret and predict the patterns of change.

8. YAM FARMING AND NATURAL RESOURCE MANAGEMENT

Yam farming provides interesting paradoxes for natural resource management. On the one hand, yam farming is associated with shifting agriculture. Researchers who regard shifting agriculture as promoting environmental destruction view yam cropping systems as promoting deforestation. On the other hand yams are genetically highly diverse and their cultivation is largely concentrated in West Africa. Therefore, the displacement of yams by other crops and by the spread of agricultural modernisation results in genetic erosion and in the decline of agrobiodiversity. There are two discourses on sustainable development that can be applied in this context. The first, concerned with the impact of shifting agriculture on the environment, and the second with the displacement of agrobiodiversity by standardisation resulting in the cultivation of an increasing narrow range of high yielding genetic material

Yam (*Dioscorea* sp.) genetic resources do not easily respond to agricultural modernisation with its associated cultural practices of permanent culture and use of external inputs. Yams are not easy crops to cultivate; they are demanding of good soils, staking material and large labour expenditure on soil preparation (mounding) and harvesting. Furthermore, yams do not respond well to fertiliser use and develop poor taste, texture and storage qualities (Van der Zang *et al.* 1980). Yam is a crop that depends upon careful management of the environment. Therefore, problems of land degradation and unsustainable practices should reflect in crisis in production. This has somewhat been inverted in agricultural modernisation approaches which begin from the premise that since yam is based on shifting cultivation it is an outmoded form of cultivation that is harmful to the environment and needs to be replaced.

Yam is essentially a regional crop. While it is produced in many different parts of the world, ninety percent of global production occurs in the West African nation states of Nigeria, Benin, Togo, Ghana and Côte d'Ivoire. As a result, there is a much weaker research base for yam than for some of the more globally cultivated crops, in which there are large programmes in international research centres. In international research yam is a relatively minor crop, with a small mandate in the International Institute for Tropical Research (IITA).

In the literature on agrobiodiversity, there is an increasing recognition that farmers play an important role in creating and maintaining genetic variety (Amanor et. al., 1993; Brush, 1991; Altieri and Merrick, 1987; Olfield and Alcorn; 1987). Bush (1991) has argued that the preservation of landraces cannot be achieved through creating isolated biosphere reserves and gene banks, since they are dependent upon agroecosystems. Their continued vitality requires that farmers are encouraged to cultivate landraces in their fields. Altieri and Merrick (1987) argue that plant genetic conservation activities should be linked to rural development policies and placed within the context of the overall development of the farming system. Conservation should embrace both the farming environment and the farmers' own varieties, creating a dynamic system in which agriculture is modernised on the basis of the utilisation of the environment and its genetic materials. This implies a radical different approach to conservation of genetic resources in which farmers are encouraged to

maintain genetic materials and to continue experimenting on their further development and adaptation to environments, which may also be change in time.

This chapter examines how research and development cope with a difficult regional crop that does not easily adapt to the notions and assumptions behind agricultural modernisation. It also examines how farmers manage the complex relationship between selection of genetic variability, adaptation to and maintenance of the environment, and production for markets.

Yam in the research system

The demise of yam cultivation has been predicted for many years (Pursglove, 1978). Yam is considered to be a pre-modern crop that poorly fits into modern agriculture. However, yam continues to be tenacious and production in Ghana has expanded from 700,000 mt in the 1970s to over 800,000 mt in the late 1990s. There is a large urban demand for yam and much of the yams in rural areas are produced for the urban market, in spite of the fact that it is an extremely bulky crop. Yam contributes about 16 percent of Agricultural Gross Domestic Product (AgGDP) in Ghana, and is second only to cassava, which contributes 19 percent of AgGDP. Cocoa, the main export crop, only produces about 13 percent of AgGDP. Yet 45 percent of research funds are allocated to cocoa. The root and tuber crops (cassava, yam, plantain, and cocoyam) produced around 60 percent of AgGDP, but receive only about 5 percent of research time allocated to agricultural research (Plan Consult 1993). Although funding for cassava has increased recently, with the development of a Special Presidential Initiative for cassava (for starch processing), yam continues to be an orphan crop, with few researchers working on its development. The fact that no modern variety of yam has yet been released reflects the limited research on yam. There is clearly a disparity between research support and economic importance.

In the Kintampo North District, yam is the most important crop and generates the second most important revenues for the Area Councils after charcoal. However, yam receives very little priority in agricultural extension Food crop extension largely focuses on maize, cowpea and groundnut. In Kintampo North, cashew, mango and teak have been identified as the most promising crops in which the district has a comparative advantage by the Minsitry of Food and Agriculture. Tree planting is also promoted by NGOs, including ADRA.. In the New Longoro Area Council census, 9 percent of constituents within the area cultivated cashew and 4 percent cultivated teak, as compared to 49 percent who cultivated yam. In a survey of 128 farmers in Mansie, Nkwanta and Asantekwa in the New Longoro area 26 percent cultivated cashew and 13 percent teak on a small scale, This compared with 71 percent of farmers who cultivated yam. In a survey of 56 farmers in Babatokuma, Ataakura and Dawadawa in the Babato Area Council, 7 percent cultivated cashew, 5 percent teak and 70 percent yams. Thus, the uptake of tree plantations among farmers does not reflect the extent of their promotion by development services. However, tree crops require significant investment capital, which excludes many farmers who do not have sufficient capital to invest in their development.

Since yam cultivation is confined to a specific region, it received low priority in international research. Given the structures of international agricultural research, in which basic and applied research is carried out in the North and in international

agricultural research centres, it is difficult for national agricultural research in Africa to develop autonomous research capacities on crops that do not feature in international agricultural research. The main role of national centres has been to fine tune technologies and crop varieties developed in international centres and develop appropriate cultural recommendation through adaptive trials (Ravnborg, 1992).

Little systematic research exists on yam genetic resources and the agroecosystems with which they are associated. Pioneering work carried out by Burkill (1951, 1960), Coursey (1966, 1967, 1976) and Ayensu and Coursey (1972) in classifying yam landraces has not been consolidated. The Plant Genetic Centre and Crop Research Institute (CRI) have made some collection of local germplasm. Tetteh and Saakwa (1991) have identified 26 varieties of *Dioscorea rotundata* (white yam) and 13 varieties of *D. alata* (wateryam) in Ghana, but this is by no means exhaustive. IITA has conducted research on tissue propagation and miniset production (Acheampong, 1985; Okoli, 1985; Tetteh *et al.,* 1987), and has created some new varieties of yam. Little has been written on the criteria and strategies used by farmers in selecting and maintaining yams. Coursey (1967) has noted that many varieties of yams are selected by farmers on the basis of water requirements, drought tolerance, and length of maturity. Those requiring long maturation periods are grown in the wetter areas with the shortest dry seasons. In drier areas, farmers may grow several varieties with different maturation to achieve a greater spread of crops through the year. Little is known of the processes through which yams are selected, maintained, and adapted; and how new varieties come into being as conditions of production change.

Recently, researchers at the Crop Research Institute in Kumasi have begun breeding new varieties of yam, with support from IITA. They have collected varieties from farmers in many localities in Ghana, the neighbouring countries and as far as from Cost Rica. They have experimented in crossing these varieties. The criteria that they are using in varietal trials include size, colour, taste, and texture. The researchers have met with farmers to identify the characteristics they preferred in different localities. From the genetic materials they collected, they bred thirty-six varieties which were considered promising. These were distributed to farmers in three locations in different ecological zone of the country to experiment with. The thirty-six varieties were eventually narrowed down to three, which were thought to be commercially promising, based on considerations of morphological characteristics, pest and diseases vulnerability, yield, and culinary characteristics (taste, texture and aroma). The programme is also trying to develop yams that do not need staking and which are robust and can be planted in the same locality from year to year, and will respond to fertilisers (Otoo, 2005, in Annex E). The objectives of this programme are to achieve an intensification of yam cultivation that will enable yam to be cultivated on permanent plots. Staking is seen as an inherent constraint in yam production. It is identified as a major source of degradation. It is also seen as laborious. However, existing varieties of yam produce much lower yields when they are not staked. It has been estimated that staking results in increases in yields from between 30-100 percent (Otoo, 2005). A major concern of this programme is to produce yams that meet all the aesthetic and taste requirements of farmers and consumers; that will provide high yields without staking; and which will be sufficiently robust to resist pests and nematodes when planted in the same plot from year to year (Otoo, 2005).

While the research is committed to enhancing yam genetic resources, the underlying philosophical framework is based on replacing and displacing the genetic resources of farmers - although these are the same genetic resources that researchers depend upon for their breeding programme. Altieri and Merrick (1987) argue that crop conservation activities should embrace both the farming environment and the farmers genetic resources. In contrast with this, the CRI yam breeding programme rejects the existing farm environments. This is seen as a potentially degraded environment, or an environment that encourages degradation since it is based on rotational bush fallowing. It seeks to breed yams that are adapted to permanent cultivation. Permanent agriculture is seen as promoting sustainable agriculture since it reduces the area of woodlands farmers need to cultivate, and reduces the need to cut new areas of woodland once the farm has been initially established. However, the form of permanent agriculture that is being promoted also attempts to free farmers from cultivating yams within woodland environments and from a dependence on trees for live staking of yams. It attempts to develop yams which no longer need to be grown on woody stakes. It overlooks the fact that the integration of yams with trees in many cropping systems forces farmers to preserve woody environments and makes sure that their fallows regenerate into woodlands. Existing farming strategies in many instances have to conform to the needs of conserving and regenerating woodlands. This promotes the cultivation of yam in open areas. Ultimately, the new varieties and their recommended cultural practices will pose a threat to the existing local yam genetic resources in the transition zone, should they prove to be successful and are taken up by the majority of farmers and begin to displace and replace farmers own varieties.

Although the CRI breeding programme has been very careful in involving farmers in the selection of agronomic characteristics of yams, it has not attempted to adapt the new yams to existing farmer practice and conditions. It has not developed its breeding strategies to fit into existing farming systems and the different agroeocological conditions of yam production in different areas. It attempts to create standardised packages that replace the existing diversity of agroecological environments.

Yam production in Ghana

Yam is produced in the forest, transition and savanna zones of Ghana. In the various ecological zones distinct varieties have been adapted to different agroecological conditions. Some of the forest yams are partially tolerant of shade, and can be planted under cocoa trees. In the transition zone, yams are usually cultivated in mounds under small trees. The small trees are usually burnt before cultivation, to arrest their growth and ensure that they do not compete with the yams. They shed their leaves after burning and put out new coppice regrowth. The burnt trunks are used as live stakes for the yam tendrils to wind around. After the yams are harvested, the land is abandoned and the trees regenerate. Many varieties of yam require rich soils and long fallow intervals. Yam farmers in the transition zone look for land with many small trees on which to plant their trees. Although they need to cut the trees for cultivation, they also ensure that they regenerate. In savanna areas, yams are often cultivated in open grassland in which there are not many trees. Since they are not dependent upon trees the yam mounds are often more dense than in the transition zone. Farmers have

evolved practices of staking the yams with cut sticks, or coiling the vines around the mounds in which the yams are planted.

Figure 8. 1 Yam cropping system in transition zone with trees as live stakes

Yam farmers usually plant different varieties of yam to meet different food requirements and to provide all year round food. Some varieties are good for pounding into fufu, and others are eaten as boiled of fried slices. Different yams have different maturity period and different storing qualities. Some varieties of white yam mature in six to seven months, while wateryams can take one year to mature. White yams, however, only store for a few months, while water yam can keep throughout the year. Urban consumers are particular about the varieties of yam they purchase. Most of the urban population prefer white yams and are reluctant to consume wateryams. The main commercial producing areas are situated in the transition and savanna woodland zones where white yams thrive.

In some yam growing areas there have been high densities of population for a long time and farmers have evolved intensive modes of cultivating yams with short fallows, such as in the Kete Krachi and Atebubu area. In other areas, yams are planted in well wooded environments that have been fallowed for more than 10 years. A better understanding of yam production systems requires much needed research into the different adaptations in yam farming systems in different areas.

Yam production in the Kintampo area

In the Kintampo area, the DEAR Project established networks of yam farmers in the New Longoro and Babato areas. There was a notable concern among the farmers in the New Longoro that there were negative changes in their yam cropping system. They felt that the conditions on their farms were no longer supporting white yams and that they were increasingly forced to cultivate wateryams, which had a poor market price. In contrast, farmers in the Babato area were not having as much difficulty cultivating white yam. Yet there were no indications that conditions on their farms were any better than at New Longoro. Initially, we intended to establish exchange visits between the farmers in the two groups to learn from each other and reflect on their farming practices. These did not materialise because the farmers in the Babato area farm distances of about 15 miles from their settlements, beyond swampy land. During the rainy season, the farming areas become cut off from the mains settlements, as the road and terrain becomes waterlogged, and the farmers resided in small hamlets on their farm until the rains subside. However, we were able to use our research in the two areas to develop an analysis of the main constraints facing yam farmers.

In the New Longoro area, 80 percent of yam farmers interviewed felt that their yam yields were declining. Only 11 percent of farmers thought that their yields were increasing. Fifty-five percent of farmers believed that the yam varieties that they were planting had changed and that white yams were not performing as they did in the past. However, most farmers were adamant that the fertility of their soils were good: sixty percent classifieds their soils as fertile, 21 percent as very fertile, and 17 percent as less fertile. Although farmers at Babato expressed similar concerns about changes in farming and declining yields, they did not have the perception that white yams were becoming difficult to cultivate because of changing environmental conditions. About 70 percent of farmers felt that yields were decreasing, but 20 percent reported increasing yields. Forty nine percent of farmers classified their soils as fertile, 32 percent as very fertile, and 19 percent as less fertile.

Land pressures have not resulted in the break down of fallowing systems. At New Longoro about 48 percent of yam farmers did not know the length the land had lain fallow before cultivation – which is possibly indicative of long fallows since short fallow systems are relatively easy to track. Of the remaining farmers, 12 percent fallowed up to 5 years, 18 percent between 6-10 years and 21 percent over ten years. Most yam farms in the New Longoro landscape seemed to be made on well-regenerated land with many trees. The soils are soft and friable and rich in organic matter. In the Babato area, 46 percent of farmers planted their yams on land that had fallowed for five years, 16 percent on land that had fallow for between 6-10 years and 27 percent on land that was fallowed for over 10 years.

The low population densities in the Kintampo district have not created land pressures resulting in short fallows. In both areas land is readily available for cultivation. Citizens have rights to cultivate land anywhere that is not being farmed by other people or used as fallow. Migrants, gain permission from the chiefs and the landlords and make small annual payments for the land to the chiefs, the Administrator of Stool lands or to local landowners. Once having gained land the farmers begin to clear in one direction until they meet farmers clearing towards them. They then reorient their

clearing or move backwards to where they started clearing from if the land is sufficiently regenerated. Access to labour and capital to hire labour is, however, a major constraint on the areas of land farmers can cultivate. Those without sufficient capital or family labour to clear large areas, prolong cultivation on existing plots to minimise the cost of clearing new areas.

Yam is usually the first crop cultivated. Traditionally it is followed by groundnuts. In the past men focused on yam and women on groundnuts. Men usually opened up the land, cleared the new plots and planted yam. Women followed the men, planting groundnuts in old plots the following year after the yam was harvested. The land was fallowed following cultivation of groundnuts. With good market prices for many food crops in recent years, men have diversified into other crops. They now follow yams with maize, cassava, groundnuts and rice. As a result, they increasingly extend cultivation following yam with other crops. This includes cassava, maize and groundnut. Instead of giving their old farms to their wives to plant, they now share the old plot between themselves and their wives. Because of this practice, many women are no longer guaranteed sufficient land by their husbands to meet their farming requirements. Women have also expanded the range of crops they cultivate in response to market prices. To meet their land requirements they are either forced to hire labour to clear their own farmland or extend the duration they cultivate old farmers and append new areas every year, rather than recycling land into fallow. Since leguminous crops, such as groundnuts, do not make heavy demands on the soil there cultivation can be extended. Rotations can be introduced to minimise the build up of pests. However, extending cultivation gradually results in increased weeding. Many women with access to capital have also taken up yam cultivation, which they follow with groundnuts, cassava, maize and vegetables. They supplement the meagre share of land they receive each year from their husbands with maintaining less demanding crops in old fields, which they may continue cultivating for five years. Many farmers now extend the years of cultivation of the farm to reap benefits from their investment in labour in farm clearance and mound preparation. At New Longoro, 35 percent of farmers follow yam cultivation with cassava, 3 percent with cassava and maize, and 17 percent with groundnut. At Babato, in contrast, 24 percent of farmers fallowed their land immediately after cultivating yam, 14 percent followed yam with groundnuts, 14 percent with rice and 8 percent with cassava.

Farmers have also introduced systems of intercropping yams with cassava and maize. This as a way of intensifying cultivation and maximising yield from a plot of land, or from the expenditure on labour input in clearing and weeding (since land is available at a low cost and labour is relatively more costly than land). In the New Longoro area, the yam and cassava intercrop is now more popular than sole yam cultivation - 51 percent of yam cultivators intercrop yam with cassava and compared to 37 percent who plant sole yam. In contrast, in the Babato area 41 percent of farmers plant yam monocrops while 24 percent intercrop yam and cassava, 16 percent yam and maize and 11 percent yam and rice.

Yam farmers also plant different varieties of yam together. In the Babato area, farmers named a total of 19 different varieties of yam they planted. In the New Longoro area, they named 12 different varieties. Since the New Longoro sample of yam farmers is three times larger than the Babato sample, this difference is likely to be more significant - a larger sample may have revealed more species at Babato.

Farmers combine a wide variety of yams to meet several objectives. Different yams have different maturing seasons, so farmers combine different yams to widen the availability of yams throughout the year and to spread labour requirements on the farm. Yams also have different storing durations. Wateryams can be stored much longer than white yams. Therefore, farmers cultivate different varieties to maximise the year round availability of yams. Yams have different taste, texture and culinary characteristics – a variety of yams are planted to diversify the types of food that can be eaten. Certain yams have a good price and a high demand on the market and are cultivated for commercial reasons. Other yams are robust, withstand drought and poor soil conditions, and are cultivated for food security in bad years. Typical varietal combinations mix wateryams and white yam, such as:

Seidubile, Lopre, Tila, Mononyo
Lopre, Pona, Mononyo, Lile, Akaba, Seidubile
Pona, Seidubile, Asobayere.

Table 8.1 Varieties of yam planted by farmers in New Longoro

Yam variety	Wateryam Varieties	New Longoro	Babato
Seidubile /Matches	*	80	78
Mononyo/ Mutwumodo/ Afebetua		39	60
Lile		13	32
Pona		24	68
Larebeko			5
Afebetua			38
Dentepruka		3	24
Asobayere		2	5
Dahobo			3
Lopre		54	5
Akaba	*	9	14
Nananto		3	3
Nimo		2	8
Dress			8
Zongo			8
Sogla			3
Kowandzo			3
Afasie nantwe	*		3
Dworase			3
Tila		22	
Dowireless	*	3	
No of yam cultivators		91	38

Yams are planted from sets that are cut from whole yams. White yams are also planted from "seed" yams that are grown by a process of "pricking" .This involves cutting the tubers off near the top and leaving the crown on the stem in July or August. The stem is then replanted in the mound. It reproduces another small tuber,

which is harvested and used as seed yam in the following rainy season. Wateryams are planted from much smaller sets.

Yam planting materials are relatively expensive in comparison to other crops. They involve the purchase of yam tubers from which a limited number of sets can be produced. Wateryams are cheaper to purchase than white yam and more sets can be produced from them. Wateryams also store better than yams. The available planting material is an important constraint on the varieties planted by farmers and this was cited by 68 percent of respondents in the New Longoro area and 42 percent in the Babato settlements.

A "new" production technique originating from IITA has been developed, which is being promoted by extensions services, known as miniset production. This involves creating small sets which are dipped in fungicide. The smaller sets are planted out to produce small seed yams in the first year, which are then used as planting material in the second year. Unfortunately, while the technology performs well on wateryams it is difficult to apply miniset production to Pona, the prime commercial yam. Minisets are essentially a variant of the technology that farmers use in planting wateryams. Unfortunately, miniset production cannot be used to solve one of the major constraints that farmers face, insufficient planting material of Pona, the main commercial yam. Because of its commercial value it is expensive for farmers to purchase Pona as seed yam.

Table 8.2 Factors affecting choice of varieties of yam planted

	% of New Longoro farmers	% of Babato farmers
Available planting material	68	43
Good yield – performance on type of land available	15	5
Market price/demand	6	5
Long storage	4	8
Early maturing	4	5
Cost of planting material (Pona is too expensive)	1	7
Achieve diversity	.	8
No of farmers	91	38

Farmers have to be careful in maintaining their planting materials, since replacing them can be prohibitively expensive. With erratic weather conditions and crop failures farmers can lose their planting materials. Over time, the overall proportion of planting materials of the more robust species tends to increase and those of the more fragile species decline. This is evident from the reasons farmers give for selecting the varieties they plant (see table 8.2), where the major factor cited is the constraint of the planting material they have. Others, whose planting materials had obviously spiralled down to the cheaper wateryams, stated "I can't afford Pona" or "white yams are too expensive".

Old varieties go out as conditions of production change and their yield declines. Yield decline and yield failure result in a decrease in the planting materials of specific

varieties available to farmers. New varieties adapted to farm conditions replace older varieties in the genetic collections of farmers. The high cost of planting materials tends to results in genetic erosion of yam varieties, but also in a dynamic process of matching genetic resources with the farm environment.

One of the major changes in yam production in Brong Ahafo occurred in the late 1980s and early 1990s when a new variety of wateryam emerged, which originated from Côte D'Ivoire. This variety is known as Seidubile or Matches. This wateryam is extremely robust, high yielding, and can be reproduced from small sets. The name Matches originates from the observation that the sets could be cut to the size of a box. However, it was later found out that increasing the size of the sets resulted in larger yams, so most farmers use larger sets now. This wateryam can also be pounded into fufu, unlike many wateryams that have a too soft texture. The cultivation of Seidubile spread rapidly throughout the transition zone and it has emerged as the dominant yam. However, market demand for Seidubile is limited to the rural town markets: it is unpopular on the urban markets where consumers want Pona or other white yams, and dislike wateryams, which they often do not know how to cook.

Seidubile is often intercropped with cassava, and both tubers are pounded together as fufu in domestic consumption. Seidubile has proved to be highly popular with farmers. However, this popularity may be undermining other varieties of yam. Seidubile is rapidly displacing other yams. It is now the dominant yam. Around 80 percent of respondents in the farm surveys are now planting Seidubile. In the New Longoro area the cultivation of white yams has declined. The most popular white yam cultivated was Lopre, and this is only produced by 54 percent of farmers. But Lopre is not the favoured white yam on the market. The major commercial yam, Pona, is only produced by 24 percent of farmers. This contrasts with the Babato area where 68 percent of farmers are still producing Pona. This in effect means that farmers in New Longoro are essentially producing yams for subsistence purposes, and Seidubile effectively meets all year round domestic consumption of yam. However, they are producing large surpluses of Seidubile, which is resulting in an overproduction for which there is little market outlet. Stories abound of farmers who transported tractor loads of Seidubile for sale at Kintampo market and were offered prices that were lower than the cost of transportation. Indignantly, the farmers refused to sell, but were unable to get a better price. They ended up abandoning their yams in Kintampo rather than pay the high costs to transport them home. Market traders who buy Seidubile often claim that they have problems selling them in the urban markets. As one market trader pithily stated: "If you buy Seidubile you have bought trouble for yourself".

The introduction of Seidubile has probably resulted in higher yields of yam in the New Longoro district. It has resulted in improved food security for domestic consumption. However, it has probably undermined white yam cultivation and the market production of yam. The impact of the introduction of Seidubile on the cultivation of white yams needs more research. It is possible that Seidubile has enabled more intensive techniques of farming or shorter cycles to be introduced that have transformed the farm environment to the detriment of white yams. The ease with which sets of Seidubile can be produced has promoted rapid expansion of its cultivation. However, this has probably resulted in the decline of areas planted under white yams, ultimately resulting in the decline of yields and of available planting materials.

Farmers in the New Longoro area are faced with the choice of shifting production to other crops for the market and retaining yam for domestic production or finding ways of upgrading their yam varieties into commercially viable varieties. The same pressures exist within the Babato area, although to a lesser degree. Farmers here have managed to retain their white yam varieties

White yam producers are also susceptible to the pressures of the market and the high cost of production. Yam market are highly cartelised with tightly organised traders controlling wholesale production and prices (Clark, 1994). Since white yams do not store well, most farmers offload these varieties quickly, before they become bruised, attacked by rodents, or susceptible to rot. White yam farmers also need capital immediately following harvest to hire labour to clear their farms and prepare yam mounds. The harvest season is marked by a glut and low wholesale prices which do not reflect the high costs of production. Thus, white yam farmers also find their standards of living are being eroded, and do not have comfortable margins of profit in which they can protect their genetic resources. These pressures lead to a downward spiralling of production in which robust varieties of wateryams replace white yams.

Implications for natural resource management

The story of the rise of Seidubile has many important implications for agricultural research and development. Firstly, yam cultivation involves the management of a stock of diverse genetic materials and environments to which they have been adapted. No one single yam variety can meet all the requirements of a farming family. The success of yam farming is related to the ability to manage this stock of genetic material in various combinations to meet a variety of needs; including all year round domestic food security, and market sales. This has to be achieved in accordance with the constraints of each variety and their ability to perform in particular farm environments, in combination with other varieties and with other crops. This involves agronomic information on taste for domestic foods and urban preferences; the maturity of different varieties; the storage capacity of different varieties; and information on their performance in different environments. To manage yams successfully, farmers need considerable information on the characteristic of the various varieties, on the nature of the environment and environmental change, and on the nature of yam markets and production outlets. Information is, thus, critical for yam production. To be able to introduce new varieties they also need to inform the urban consumers of these varieties, their culinary potentials and methods of preparation.

The creation of a few miracle varieties adapted to specific ecological zones is unlikely to be a successful long term strategy, since yam production is a dynamic system characterised by change and adaptation. The introduction of miracle varieties may result in a variation on the story of Seidubile, the domination of one type of robust yam that displaces other varieties and their ecological niches. Apparent short-term gains in one variety may result in long-term problems.

The introduction of breeding programmes working on new varieties is a welcome addition to the stock of genetic materials farmers have at their disposal. The clientele for new varieties of yam are existing yam farmers. Thus, research on yams must

focus on the ways that yam farmers produce yams and must study the dynamics of the ways in which environments and genetic materials are made to fit and adapted to each other. It should facilitate this process of adaptation and help farmers to maintain high quality planting materials. Unfortunately, the present initiatives in breeding yam genetic resources are dismissing the contemporary environments in which yam genetic resources are maintained and nurtured as environments of degradation and shifting agriculture. They are creating imaginary model environments, which are characterised by static permanent cultivation, no trees and no regenerative processes. Thus, processes of genetic resource conservation and development are being influenced by crisis narratives of the destruction of the environment by shifting cultivation, which are not based on studies of change within farming systems but on received wisdom and dogmatic prescriptions. This is resulting in programmes to breed yams that do not result in adaptation of technology to existing agroecological conditions, but the desire to introduce forms of permanent cultivation. If these programmes are successful in getting farmers to uptake new varieties and adopt new cultural methods of cultivation, this may in the long term displace varieties of yams that have been adapted to specific environments. It may replace regenerative processes based on fallowing and conservation of many tree species with high input agriculture, which transform and standardise natural environments.

Within the transition area of Ghana, support for the conservation and development of yam genetic resources should be given high priority in conservation initiatives. The transition zone in Ghana is one of the centres of domestication of this crop with an extremely high diversity of species. Since the majority of yam production in the world takes place in West Africa, the conservation of these resources is critical for the maintenance of global genetic diversity. Conservation involves ensuring farmers are able to maintain a diversity of varieties, have access to a diversity of planting materials, and continue to experiment in matching planting materials to changing environments and a diversity of agroecological environments. It also involves informing consumers about various yam varieties, their qualities and in some cases their cultural and historical importance. These resources are under threat from the expansion of agricultural modernisation, and attempts to replace genetic diversity with a narrow range of crops that conform to standardised modern varieties and uniform cultural recommendations (van der Ploeg, 1990). This involves adapting the environment in which the crop thrives by replacing local agroecosystems with modified environments that support the application of external inputs, and uniform practices. A major threat to yam genetic resources and their environments are also likely to originate from tree planting initiatives. These seek to replace fallow land with exotic plantations of teak, exotic fuelwood woodlots, and cashew and mango plantations.

9. NETWORKS, PLATFORMS AND INFORMATION

One of the underlying aims of this research has been to contribute towards improving the quality of information available to in the policy process, by supporting information flows upwards from localities to district administrations. The precondition for this is the creation of networks where rural producers can come together to reflect on their situation, develop a common programme, and articulate this to policymakers at the district level. The project was also concerned with developing information systems within district administrative systems, which would encourage policymakers to develop more consultative planning processes, and orientate them towards soliciting the views and perspectives of communities, interest groups and citizens, as part of the information gathering process. This two-way flow of information would generate the conditions for creating platforms in which local demands and perspectives would be integrated into the policy process. The platforms would enable local communities to become more aware of policy objectives and ways of influencing policy. The project implicitly understood that natural resource policies and the narratives they generate are influenced by political interests. The misfit between policy contexts and policy recommendations results from both misunderstandings and political interests. Thus, the project was interested in examining the institutional contexts and processes through which policies are politically constructed.

Networks and platforms

One of the fundamental problems in building networks of farmers is representation. Who do those in the network represent? How were they selected? How far are they able to represent their own interests within these networks and negotiate common positions? How far are they able to analyse their situation? How far do they know what they want?

Much of the literature on popular participation and agricultural populism assumes that the farmers know what they want. The only problem is for those in the policy process to listen to them. However, in reality knowing what you want is a complex process, which involves having access to information, having time to discuss problem areas with others, and finding the time to reflect and articulate these reflections. Our first attempts at listening to farmers were disappointing. One group of charcoal burners we worked with first told us that they wanted a tomato project, because they had heard of one starting in some neighbouring villages. They had also heard that the tomato-canning factory in Wenchi was going to be reopened. When we were not enthusiastic about this, they wanted a teak plantation project to grow fuelwood for charcoal production. Later we found out that charcoal burners regard teak to make poor charcoal. We encountered people making charcoal in teak plantations. It was not the teak they were using for charcoal, but other trees that had regenerated from coppice in the teak plantation. An organised group of yam farmers told us that they already cultivated yams so they were not interested in yams, they wanted a cashew project. Later this turned into a ginger project. We organised an exchange visit to a group of ginger farmers to learn about ginger farming and they learned how to cultivate ginger. Then they wanted to learn about pepper. The project was in danger of

becoming an on-farm extension programme. The central problem was that if we were trying to promote farmer perspectives and demands in policy processes the demands should come from the farmers and not us. However, if we acceded to poorly thought out demands that did not reflect on the policy process, the platforms created would be weak and would not pose a challenge to the policy process. If the interventions were going to carry any significance, they had to pose a challenge to the policy process itself.

These realisations led to a fundamental reorganisation of the project. Action research needed to focus on the existing livelihoods of farmers and the policy impacts on the livelihoods. Action research needed to promote a process of learning among rural producers in which they would become more conscious about policies, the impacts of policies, and ways in which they could influence and place their demands on the policy process. This required research into a series of livelihood issues and the resource conflicts and policy conflicts around them. Thus, the aims of the researcher must be to conduct research that throws light on the situations of the rural producers, and reports these research findings back to the producers so that they can use this knowledge in developing their own demands.

A second problem is related to the representation of the networks. In searching for interest groups, we naturally looked for well-articulated agendas and groups with agendas, since we did not want to force our own agendas on them. However, the fact that groups had well articulated agendas was probably a reflection of their status. Groups with highly articulated agendas were most likely to be politically connected, and to be influenced by elite agendas and dominant policy lines. They were more likely to be the better off middle strata farmers with more knowledge of the outside world and development policies, although they may not be particularly wealthy. These well-articulated agendas may not necessarily turn into promising community projects. Thus, the existence of a well-articulated agenda or the inexistence of an agenda should not be the major criteria for determining partners within the community. In many instances, rural development interventions are geared towards an echelon of middle-strata farmers, who are represented as the rural poor. This became evident when we started working among youth who were charcoal burners. Members of our farmers group began to question us about why we were working with destroyers of the environment. This became a familiar theme throughout the research period, with several groups complaining about the destruction of the environment by other groups, whose activities they felt should be controlled. In some settlements charcoal burners complained about Fulani cattle herders who set fire to the bush, which was blamed for the shortage of grass during the dry season to cover earth mound charcoal kilns. In situations in which many different groups, including many different migrant groups, are competing over resources and using the same resources in different ways, conflicts frequently arise and accusation of destroying the environment constitutes a powerful weapon with which to blame adversaries. It was necessary to avoid inflaming conflicts. We needed to focus on natural resource situations in which the user groups had problems with the policy world rather than with each other, and focus on the livelihood situations in which they felt marginalised and alienated by policies. We needed to focus on the least powerful and influential. This resulted in a focus on youth and women. Many of the farmer and charcoal burner groups we worked with were organised around dynamic youth rather than community leaders. We also made sure that women were represented in our networks. Thus, the composition of the

group and their livelihood concerns are more important than the articulated agendas of groups.

Within the rural areas there are long histories of organising farmers groups. The conception that African societies are characterised by a weak civil society, is not historically correct, as attested by the anti-colonial movement. The history of rural organisations is frequently of ephemeral organisations that fail to represent the interests of the membership. Government frequently has close ties with the leadership of these organisations, who are compromised. The leadership often develop patron-client ties with government agencies, in which in exchange for supporting government policies the organisations are promised resources to disburse to their supporters. Several of the participants at our network meetings came with preconceived notions of popular organisation. This revolved around immediately electing an executive membership with a chairman, secretary and treasurer, and collecting membership dues. Some of the village farmer groups also adopted this structure, which tended to close debate within the group. In one instance, the membership of one group we had created refused to speak with us because the elected chairman had travelled. In other instances, there were political factions within the networks. At one charcoal burners meeting a bitter exchange ensued between two faction from one settlement. The two factions represented supporters of the main rival national political parties. Notions of an independent civil society that represent the rights of citizens are somewhat simplistic. There are great pressures on these groups to compromise their interests and to make deals in which they become collaborators and appendages to government policy.

Organising network meetings across the district also became a major time consuming task. Rural transport is not well developed and is relatively expensive. Transport is often unpredictable and difficult outside of market days. Consequently, there are huge delays in organising meetings because of the time it takes many participants to get transport. Some of the participants in the outlying settlements in the Kintampo North district were unable to participate in meetings, because of transport difficulties – one participant arrived a day late to a meeting because transport took him two days! While the project helped participants with the cost of transportation to meetings, the cost of transport will become a major constraint for the networks in their bid to continue organising.

In spite of all these difficulties, the network meetings contributed to an understanding of policy issues. The two different networks functioned in different ways, which reflected the issues with which they were concerned. In the case of charcoal burning, the issues were very clear. Charcoal burners wanted a change in policies on charcoal. They felt they were unjustly maligned for destroying the environment and their strategies misunderstood. They felt that government empowered chiefs to introduce bans on charcoal, and this was used by the chiefs to unjustly extract revenues from them. Meetings began with groups asserting the importance of charcoal as a livelihood and the problems they faced. One of the early initiatives involved the design of a poster which affirmed the rights of charcoal burners to a livelihood. This raised the issue that charcoal burners did not destroy the environment any more significantly than other natural resource users, but were maligned. The DEAR project provided evidence from research it was carrying out and explained government policies to the charcoal burners. A forestry officer was brought in to one meeting to

explain policies on chainsaw and illegal felling of timber. The project began to carry out research with some of the farmers into the regeneration of trees on land.

Figure 9. 1 Charcoal burners' network meeting at the DEAR Centre

Figure 9. 2 Charcoal Burners' discussion group

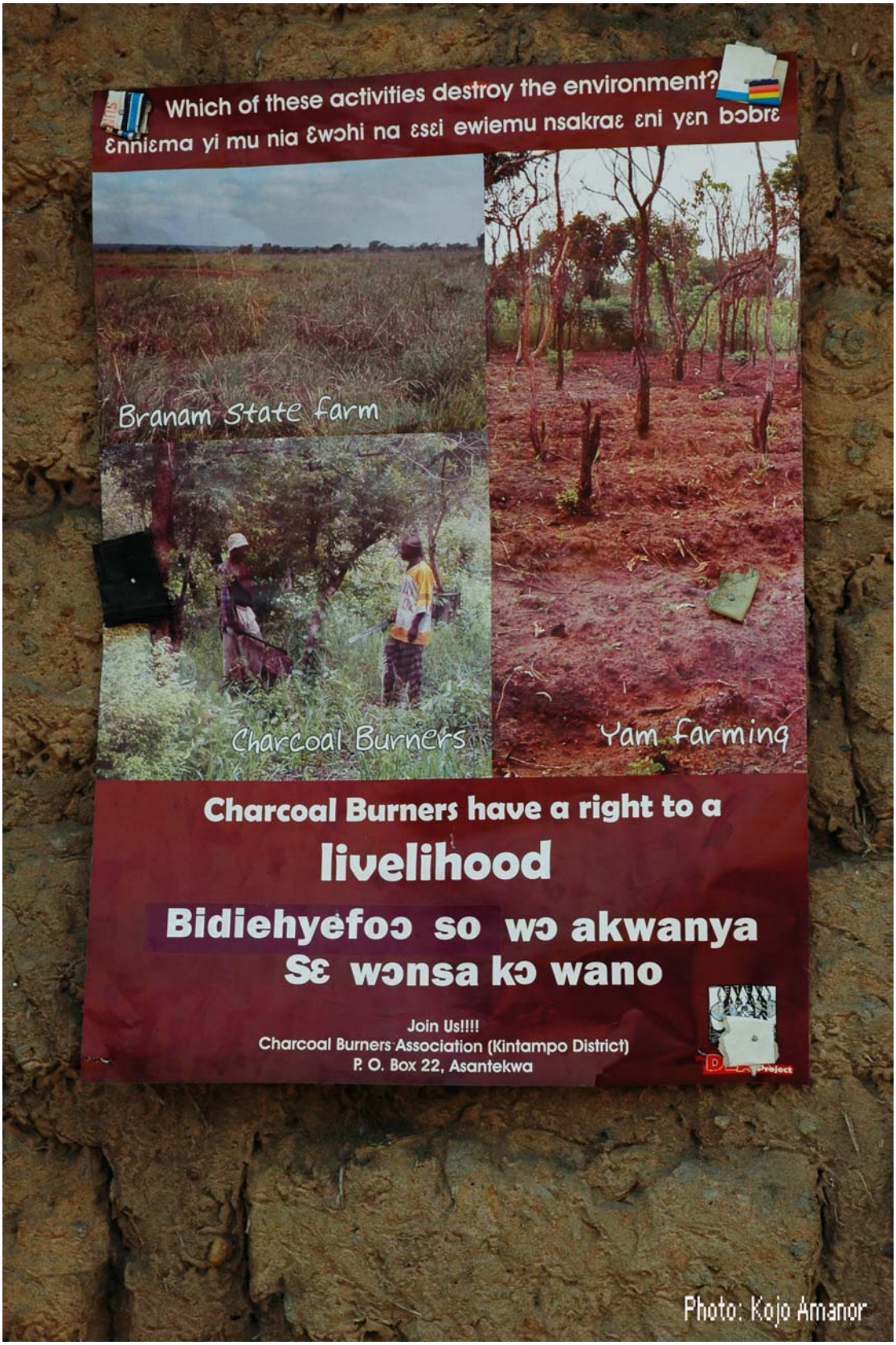


Figure 9. 3 Charcoal burners' poster on a house wall

Box 9.1. Recommendations of the Charcoal Burners Association (Kintampo) presented to the Kintampo North District Assembly

1) Charcoal Burners have a right to a livelihood. This right should not be tampered with, unless there is tangible evidence that charcoal burning destroys the land. The necessary scientific research to merit the idea that charcoal should be banned has not been established.

2) Most charcoal burners are farmers and most charcoal originates from farms and farm clearance. It is impossible to separate the effects of both activities and pinpoint charcoal as the main cause of environmental destruction.

3) Most of the tree species used for charcoal burning are plentiful on farms and fallows. They regenerate rapidly when cut. They are not scarce.

4) Making plantations for charcoal burning is not a good practice for charcoal burners in the Kintampo districts because the indigenous species are numerous and would be cleared to make way for plantations of single species. Many of the indigenous species are fast growing, coppice quickly, good for charcoal and have other important uses. They usually regenerate quicker than plantations grow.

5) Current byelaws banning charcoals are not consistent, transparent or democratic. Chiefs frequently introduce bans against charcoal so that they can collect revenues from charcoal burners. In settlements in which they get large revenues from charcoal they allow burning, while in other areas they introduce bans until charcoal burners raise monies for them. The same chief can have different policies in different settlements in which in some areas charcoal is permitted while in others it is banned. There should be a consistent policy for all settlements. There should be a meeting between charcoal burners, traditional authorities and the district assembly to create more transparent and fair regulations for charcoal.

6) Before policies are made on charcoal the opinions of charcoal burners and farming communities should be sought. Policy makers should be informed about charcoal burning rather than making policies on assumptions and distorted views about charcoal destroying the environment. There should be educational programmes to defuse the idea that charcoal burning destroys the environment

7) Charcoal burners and farmers should come together to develop local conventions and best practices for charcoal management in their localities, rather than other authorities imposing regulations upon them.

8) There should be more research on regeneration to help charcoal burners to develop best practices for the management and cutting of trees.

At subsequent meetings, the membership expanded to new settlements and a broader picture began to develop of how policies impacted on the life of charcoal burners within different areas. The meetings expanded to around 80 participants, but became unwieldy. A new structure was created in which settlements formed their own groups and nominated representatives to attend meetings. From the minutes of the meetings, the project began to develop an analysis of the main policy issues around charcoal. This was written up into a two-page summary and distributed among the various groups to discuss in their settlements. A meeting was held to discuss the document and it was synthesised into a one-page document of demands (see box 9.1).

A platform meeting was then organised with representatives from the district administration, the assembly and the area councils and the demands of the charcoal burners were presented alongside an analysis of charcoal policy issues by the project and charcoal burners. The policymakers were then divided into working groups to deliberate on the main issues and make responses. While the policymakers did not accept the points and evidence made by the charcoal burners and the DEAR project, a channel of dialogue has been opened. The policymakers may attempt to co-opt the association in the future, but a process has begun. Ordinary farmers from rural villages developed a programme and coherently argued their case to policymakers.

In contrast, with the yam networks no clear set of issues and demands surfaced. The farmers felt marginalised and they felt that they needed help, but they were not sure of the problems they faced and the solutions to their problems. They were also unfamiliar about how to go about getting help from available services, and the roles that different organisations played in agricultural development. However, research, extension and NGOS had no solutions for yam farmers and no analysis of the problem. The aim of the platform meeting was to enable farmers to gain a better understanding of the institutional structures of agricultural research and extension, and to get research, extension and NGOs to address problems identified by farmers and to deliberate on them. The focus of network meetings was to collect as much information on yam farming in the different areas, and begin to make an analysis. This analysis was presented at the platform meetings for government services and NGOs (CARE International and Abrono Organic Farmers Project) to deliberate upon and to begin to address the design of a programme that would support yam farmers. This involved inviting Crop Research Institute (CRI) scientists to explain to farmers what they were doing, and for farmers to explain to them the way they were farming. The NGOs and extension services then considered what role they could play in this programme and the types of linkages that can be created. In the platform meeting (see annex D), the different perspectives of farmers and researchers became apparent. However, research services ultimately need farmers to test and adopt or reject the new varieties they are developing. The creation of a large network of farmers with interest in the development of their crops is ultimately appealing to crop development researchers who frequently work with small numbers of farmers and rely on extension services to disseminate crops. Feedback from large groups of farmers involved in dialogue can ultimately help researchers in developing crops. By working with researchers in the development of crop resources, large networks can begin to influence the research agenda and create pressures for the types of development they are interested in, by providing researchers with new information. Ultimately, farmers can create pressures for yam genetic varieties that fit into their adaptive strategies for managing environments, while at the same time offering researchers a large audience of experimenting farmers, willing to further the process of crop development. However, farmers must be able to articulate their own perspectives, otherwise they are likely to be co-opted into dominant trends of agricultural research, which attempt to create standardised cultural practices which modify the environment according to the sensibilities of agricultural modernisation. Ultimately, the development of improved services for yam farmers will depend upon the development of new research strategies based on a better understanding of how farmers manage yam genetic resources and their environments.

Conclusion

This project has dealt with three different types of information situations:

1. The collection of information by agencies that are not well resourced to manage and collect information that is necessary for planning processes. This was reflected in the Area Council survey.

2. Enabling communities that have little access to information in relation to their livelihood activities and support structures to place their demands, problems, and perspectives to research and development agencies and solicit help. This approach was developed in the yam farmer networks.

3. Empowering rural people who feel maligned and marginalised by existing policies. This involved helping them to articulate their perspectives and demands for policy change, and to correct misinformation about their livelihood activities. This approach was developed in relation to charcoal burners.

In these three areas, different approaches had to be developed which reflected different aspects of the policy process and the role of information in policy. Nevertheless, there were many common threads which ran through all these programmes, which reflect the relationship between knowledge and power, and the ways in which power determines the ways in which knowledge and evidence are constructed and communicated. In these three different areas, information and knowledge are being used for different purposes and needs. The intention of this conclusion is to reflect on the relationship between knowledge and power and its implications for action research.

District information systems

The Area Councils regarded information management as a way of enabling them to carry out their mandate to implement policies within the sub-districts. It may also have been seen as a way of enhancing their image. The operational mandate given to the Area Councils by government includes collecting revenues. The justification for information collection was initially articulated in terms of carrying out an inventory of natural resources on which revenues could be raised. In the survey, this concern with revenues was manifest in the discovery of settlements within the Area Council boundaries of whose existence the Area Council was unaware. The New Longoro Area Council took measures to establish revenue-collecting points on the routes used by these settlements in transporting their produce.

As the survey progressed, the Area Council had to increasingly rely on members within the communities to implement the survey rather than control it themselves. The intensive nature of collecting data and entering it onto computers meant that many of the senior members of the Area Council were not able to monopolise the survey. This became a joint activity between members of the Area Council and youth within the communities who had the energy, time and aptitude to rise to the challenges of entering questionnaires and learning data entry techniques. Thus, the real successes of the Area Council survey lay in the ways in which the structures of the Unit Committees, community networks, and the existing capabilities within the

communicates were mobilised to realise the survey. The contributions of the DEAR Project to this process lay in working out ways of training people without higher educational backgrounds to carry out fairly complex research tasks. The involvement of people with minimal secondary education and of youth meant that the information generating process was not being controlled by a narrow district elite. This involvement of community members and youth was very important, since individuals from these groups were also involved in other networks, including the farmer and charcoal burner networks. This resulted in the Area Council being intimately aware of developments on the farmer and charcoal burner network meetings. Members of the Area Council, including its chairman, regularly attended the farmer and charcoal burner network meetings. Although they invariably had completely different perspectives from the user groups, they were aware of the main issues that arose in these networks.

A second important achievement in the Area Council surveys lay in the transfer of techniques and methodologies for infomration gathering and management from one Area Council to another. The experience suggests that there are important human resources and capabilities at the sub-district level, which are not being mobilised for development and administrative initiatives. The Area Councils are frequently dismissed by higher-level policy organs as poorly endowed with human resources and not being able to operate efficiently. There are few examples of attempts to build their capacities to engage dynamically with policy issues.

Building creative dynamics for information collection and management has tremendous potential at the sub-district level. However, communicating this information vertically and horizontally and using it to inform the policy process and planning is characterised by many constraints. In fairness to the Area Councils, it should be recognised that the duration of the project was far too short to realise the transformation of the results from the information systems into policy deliberations. The data systems were only beginning to get up and running by the time the project was in its completion phase and the major emphasis had been on the extension of method to Babato Area Council, rather than in using the data in planning in New Longoro.

The New Longoro Area Council was also beset by a number of unforeseen problems which were external to the project. The division of the Kintampo district into two at the end of 2004 adversely affected the New Longoro Area Council, since it became divided between the two districts. While the New Longoro Area Council remained within Kintampo North, the richest settlements within the sub-district had been transferred to Kintampo South. As a result of this division , the payment of revenues to New Longoro Area Council was thrown into confusion and became delayed. Those settlements within the New Longoro Area Council that were transferred to South Kintampo District were not clear of their new political identity, and how they were to be incorporated into the new district. For much of 2005 there was speculation that the division of the New Longoro Area Council would not be effected, since the relevant Legislative Instrument was not published. Because of these developments, the New Longoro Area Council failed to meet, since it did not have funds to hold meetings and was confused about which were the relevant representatives of settlements under its new jurisdiction to invite to the meetings. At the few meetings which occurred during this period, such as a meeting to elect a new Area Council

Chairperson, disputes erupted about who had the right to participate and vote within these meetings. Thus, the New Longoro Area Council became embroiled in problems related to its own identity, which clearly took precedence over information generation and policy deliberation. By the end of the project, these problems had still not been resolved. Until these problems are resolved, the Area Council GIS system cannot be effectively incorporated into a planning process, since it will have to be restructured and rebuilt.

Apart from these problems, other noticeable weaknesses within the Area Council include a reluctance to place demands on the district and to engage in effective dialogue with the district administration in realising its functions. The Area Councils failed to take the initiative in informing the district of the survey they were conducting and in making demands for resources for this. In the end, the DEAR project had to take on the role of informing the district assembly and negotiating support for the surveys.

The districts rarely play a proactive role in supporting the Area Councils. The relationship between the two is often characterised by tension with the districts frequently holding on to the revenues of the Area Council and using them for district functions rather than releasing them. The districts collect information from the Area Councils when pressurised by the RCC and central government, but do not really consider the policy needs of the Area Councils and the roles they can play in strengthening these.

While vertical information exchange between the Area Councils and District were weak, the horizontal exchange between Area Councils was more effective. The New Longoro Area Council survey team were effectively able to convey to the Babato team the significance of the survey and a methodology for operationalising it successfully and quickly. Perhaps, if all the Area Councils in Kintampo North had been involved in the survey from the beginning, and meetings organised between the Area Councils and district administration, facilitated by the project, the Area Councils may have been more effective in communicating their needs. However, there was a need to work out a detailed methodology on a pilot basis before extending it to other Area Councils, since we were entering a new field of research in which we could not draw on experience.

The critical contributions to the Workshop on Information (see Annex B), which members of the District Administration, Assembly Members and Area Councils made, suggest that communication of information is a general problem within the Assembly, which not only characterises the relationship between Area Councils and District Assemblies, but also between the district administration, sector departments and Assembly Members. Information and policy decisions tend to be controlled by a few dominant actors within the district. This results in the failure to develop district planning on the basis of institutionalised information gathering and consensus building. Planning processes are frequently distorted by political interests, which are often not sensitive to the actual conditions within the district – the example was given in the workshop of funds allocated to the building of a school in a settlement which was located *outside* of the district. District annual plans fail to be regularly developed. When they have been created, few members of the district assembly have participated in deliberations or provided feedback. They are not widely disseminated

within the district, but merely communicated up the hierarchy of central government to the RCC and the Ministry of Local Government and Rural Development. The Assembly did not meet regularly enough to play a dynamic role in planning and making the planning process accountable to the interests of their constituencies. Assembly members do not report on district decisions to their constituencies or hold consultative meetings to identify and prioritise local interests and demands before they attended Assembly meetings. Assembly members and Area Councillors are expected to carry out their roles voluntarily. No provisions are made for them to gain financial support for expenditures on transport to meet their constituencies. As a result, meetings with the community rarely occur. In contrast, the DCE and other members of the District Administration regularly meet with the RCC and central government agencies, and comparatively generous provisions are made for these meetings. District departmental staff regularly attend national, regional and district workshops for which they receive allowances. The DCE is appointed by government to ensure that district planning complies with government policies and priorities. Thus, the structure of decentralisations tends to erode downward accountability and planning according to the needs of citizens. It ensures that the priorities of government and its main power brokers are met. This is further reinforced by the separation of parliamentary elections from local government elections, and the "non-partisan" nature of local government elections. While a parliamentary candidate can belong to an opposition party, s/he has no power to influence the local development agenda, which is controlled by the Assembly under its DCE. Through the ability to appoint one third of the members of the Assembly, the government will also tend to have strong influence in all the assemblies. Thus, there are strong political currents within the structure of decentralisation that undermine popular democracy and encourage the enforcement of centrally defined agendas and top-down approaches to development. This ensures central government control over decentralisation. However, it also undermines the state, by resulting in weak policies that do not meet the needs of the citizens in the rural areas. This results in a weak support base for policies; and regulations and byelaws that are regularly flouted by the rural population who consider them unworkable and unjust. These issues undermine democratic accountability and they can result in a political crisis. If taken up by an opposition political party in a call for reform, there could be a transformation in political space resulting in scope for policy reforms. Thus, these issues must be of concern to central government and have the potential to open up spaces for policy negotiation and change.

Yam farming networks

Yam is a low priority crop in agricultural research. The agricultural services have not yet developed improved yam varieties for dissemination and the extension services do not have recommendations for yam cultivation. Thus, yam farmers gain little support from agricultural services. Given the lack of support for yam in development circles, some farmers perceive that if they are to develop their farming they must move from yam into other crops, which are given a high profile by government, such as cashew, exotic mango and tree plantations. Some yam farmers wanted us to help them to learn about other crops rather than focus on yam, which they felt they already knew about. It was difficult to determine if the search for alternative crops reflected elite concerns of participating in the new cash crops that are promoted by government, and if this detracted from concerns with enhancing the existing food production of local

agriculture. Many farmers did not have the capital to cultivate these new crops, and extending knowledge and ability to farmers would involve providing them with capital or finding an agency prepared to make loans to farmers. However, these types of activities were already being developed by government agricultural services, which had programmes providing loans for tree crop farmers and groups. NGOs, such as ADRA, were also providing support to tree farmers. Since yam was the dominant staple crop of most farmers, it made sense to highlight the needs of these farmers. Taking up the crops advocated by government services would merely reduplicate the initiatives already being carried out by the extension services. It would merely extend existing programmes to farmers we were working with, and would only allow those fortunate to work with us to gain access to limited extension support. Such an intervention would be an act of extending patronage rather than challenging existing policies. Apart from duplicating existing mainstream initiatives, this approach also evaded a central problem in agriculture within the district. Yam was the most important crop in the Kintampo districts but it was marginal in the government agricultural services. This was largely because it was difficult for research and extension services to work out successful recommendations that conformed with the sensibilities of agricultural modernisation, such as permanent cultivation, line planting, use of inputs, and use of improved varieties bred by agricultural services. The little research that was being conducted on yam in national agricultural research was also attempting to make yam conform to these agricultural modernisation criteria, of replacing rotational bush fallow with permanent cultivation. However, the low population densities in the district did not warrant such a transformation of farming techniques. Thus, in the yam farming networks, the central problem that was formulated was for yam farmers to articulate their needs to development agencies, and to get development agencies to focus on what *they were doing* rather than on perceptions of what *they should be doing*.

In contrast with the Area Council information system, the approach developed in the yam farming networks involved the project conducting research to gain a better understanding of yam farming. The project also searched for appropriate organisations with the potential to help yam farmers. This involved bringing the Crop Research Institute (based in Kumasi), NGOs from outside the district (since there were none within the district working within an appropriate field) and district agricultural services together, to discuss possible innovatory approaches which could help the yam farmers.

The existing national agricultural research on yams is based on certain assumptions that do not seem to be applicable to the Kintampo district. These assumptions include the desirability of promoting permanent cultivation of yam to counteract deforestation, and the need to develop new varieties of yam that respond to permanent cultivation and non-staking. Given the low density of population in Kintampo and the availability of land, these factors are not of prime concern for farmers. Farmers often shift from one plot to another to minimise pest attacks, weed infestations, and labour expended in weeding, as well as to recycle soil nutrients and maintain tree regenerative processes. As Mathew Kofi Kewa stated in the yam workshop (See Annex D)

[A]gricultural research has shown that we should do permanent farming but what we have learnt from our forefathers is that if you cultivate the same piece of land

continuously you will spend more time weeding. If for instance, last year you weeded your land twice before harvesting, this year you are going to weed it 3 or 4 times before harvesting. If you do not do that you will not get a good yield… That is why we rotate the land…(p.27)

Researchers seem to be making processes of crop development more difficult for themselves by responding to imaginary constraints, and identifying constraints that are not pressing within the locality at present. Behind these research activities are powerful narratives emanating from international development agencies about sustainable agriculture and agricultural modernisation, which are concerned with restructuring small-scale agricultural production. They also shape the agendas in research institutions. Although these institutions have developed forms of participatory research for fine tuning new varieties, many assumptions shape these programmes that result in vastly different perspectives from farmers. Thus, the new varieties of yams are not been adapted to the existing conditions of farmers' land, and the existing strategies of farmers, but to notions of how yam cultivators should farm, despite a well established participatory methodology which takes culinary, taste and agronomic factors into consideration.

While researchers need support of farmers in taking up their new varieties; they seek to impose a set of factors on farmers, which reproduce the very factors that alienate farmers from research. Yam researchers seek to mainstream yam by making it conform to all the objections raised against it by agricultural modernisation. The new varieties being developed and associated recommendation will require a drastic transformation in farming practices Thus, participation in technology development is not enough to ensure that popular needs are carried into research and mainstreamed. What is of significance is the areas in which we choose to extend participation and the areas in which participation is not negotiated because they are subject to underlying assumptions and technocentric prescriptions about the directions of change. These prescriptions are developed at very high levels of policy, frequently in the international domains. They are difficult to negotiate within particular programmes, since the prescriptions work at the level of determining wider institutional practices. They are not argued out within the parameters of a particular programme, where they appear as self-evident assumptions. It is difficult for them to be questioned within the context of the programme, since that would risk undermining the very foundations of the programme. Ultimately, by redefining the conditions of production and creating a new environment which replicates the environment of the experimental station, the researchers are empowered to create standard conditions and control farming recommendations and technologies (van der Ploeg, 1990). However, the researchers need farmers to uptake their technology and the farmers are free to reject the technology, although this may confirm their marginalisation.

The NGOs who participated in the programme were concerned with creating innovatory linkages within communities, which would support some farmers to acquire new skills and act as intermediaries between the community and extension services. The emphasis in this approach is on building up community organisation to network with government services and to fill in the weaknesses of extension services. The weakness of this approach is that it tends to focus on enhancing the dissemination of dominant technologies, without questioning the appropriateness of the technologies

or the narratives of agricultural modernisation. These interventions are constructed within a framework of service delivery that extends the downward diffusion of existing government agency promoted technologies. However, what is required within this situation is an NGO that can make demands for agricultural research to be carried out in different ways based on the needs of farmers. This requires the ability to conduct research on farmers' existing practices and their knowledge, and to question the dominant narratives of agricultural modernisation. This requires a move from a framework of agricultural service delivery to one of advocacy, based on increasing participation of farmers in agricultural policy decision-making.

The comparative strength of the yam farmers platform created by the DEAR Project was that it assembled large numbers of farmers together from different settlements, who were linked to other networks of farmers within the settlements from which they came. The farmers were encouraged to voice their own perspectives and their perceptions of yams cultivation and the attempts to develop new varieties. If the project had extended further, these networks could have gone on to experiment with the new varieties being developed by crop researchers, and devise their own experiments, and develop a constructive critique of yam genetic resource development, which would have formed the focus for subsequent platform meetings[4]. Since the platform has the potential to reach to large networks of farmers, it is likely that it would be taken seriously by crop researchers. Certainly, the potential of these networks was not lost on the crop researchers who attended the yam farmers' workshop. They were interested in developing ties with the farmers' groups and providing them with new varieties to plant and experiment with, in spite of the critical comments of many farmers and the DEAR Project of their approaches.

However, without the support of the DEAR Project in critiquing policies on yam farming it is unlikely that this would have occurred. While the role that the DEAR Project played could be taken on by an NGO, this would have to be in another framework other than service delivery, such as a concern with preserving farmers varieties on-farm, and conserving agroecosystems diversity. Farmer platforms are likely to develop complex political dynamics, in which small groups of farmers with the patronage of the agricultural services may attempt to win the platform over to dominant agricultural discourses and policies and use the platforms as instruments for the dissemination of existing agricultural technologies in a top-down fashion.

Charcoal burners platform

In the charcoal burners platform, the central concern was to get charcoal burners to articulated their concerns with how policy maligned them and created insecurity for their livelihoods. Research on regeneration of charcoal burning species formed an important part of the activities of the DEAR Project, and progress on this was regularly reported back to charcoal burners at the network meetings. From discussions of DEAR project research findings at the charcoal burner networks a common programme gradually evolved, which was able to develop a focused set of

[4] These objectives could not be taken up in a two and a half year programme, in which yam farming was but one component.

demands to place before policymakers. This programme was presented to the District Administration at a lively platform meeting (transcripts can be found in Annex C).

The network meetings and workshops were important in enabling a detailed analysis of the political dynamics of charcoal burning in different areas to be made, based on reflections on experiences in different localities. These probably would have not been so clearly revealed through research based on a questionnaire survey. The dynamics of chiefs banning charcoal as a form of rent-seeking became evident at the network meetings through groups from different settlements narrating their experiences in their various settlements to each other.

Many of the Area Council members and district administration were familiar with many of the arguments raised at the platform meeting through discussions with the project, the distribution of leaflets, and through their attendance of some of the charcoal network meetings. However, it was not easy to get them to concede any ground at the platform meeting. Most of the evidence presented in the research findings of the DEAR Project, on regeneration of charcoal species and the rent seeking interests of chiefs in establishing bans, was flatly rejected by the administration. The members of the Area Councils and District Administration presented well-rehearsed routines on deforestation, the role of the peasantry in deforestation, and the need for tree plantation, but with little empirical evidence. Most of their local "evidence" was based on anecdotes and hearsay. These reflected official "story-lines" which have been reiterated in the many workshops that they have attended. The abilities of the charcoal burners to argue their case irritated some district assembly and the Area Council members (who were supposed to be their representatives). Both of these groups were determined to maintain the official narratives, and to keep charcoal burners in their place. Narratives about deforestation, created insecurity for charcoal burners about the future of their livelihood and the threat of bans. Empowering chiefs to create bans against charcoal production enables their activities to be controlled through rent-seeking behaviour and threats. Empowering chiefs to introduce bans against charcoal enables the District Administration to exert control over charcoal burning, without taking the responsibility for these policies. The District Administration can claim there was no ban on charcoal within the district, that there was no policy to ban charcoal. At the same time, it empowers the District Administration to negotiate with the chiefs on behalf of the charcoal burners in return for certain concessions, thus extending the power of the district assembly over charcoal burners. Thus, the existing policy relations place charcoal burners in a state of vulnerability in relation to policymakers. Relinquishing narratives about the destructiveness of charcoal on the environment would remove the power that policymakers have over charcoal burners. In their final deliberations in a workshop session, the policymakers and Area Council members rejected the evidence that charcoal burning destroyed the environment, called for tree planting programmes to be established, and affirmed the customary rights of chiefs to extract revenues from charcoal burners. In their report of their deliberations in their discussion group, the Area Council members argued that the chiefs needed to collect revenues from charcoal burning "for pouring libation so that misfortune does not befall the charcoal burners as they go about their duties" .(Annex C: 41).

The fact that the District Assembly was losing much revenue from the banning of charcoal in many settlements was not a major concern of the District Assembly. This may be related to two factors:

1. While charcoal is the most important locally generated revenue, internally generated revenues are insignificant in comparison to direct central government funding for the districts. Thus, local revenue sources are underrated and not given their due concern. However, this conception promotes inefficient local planning;

2. Potential revenues from a reorganisation of the economy, and greater resource control by external investors and entrepreneurs are considered to be of more import than the existing low levels of revenues, particularly where the districts are comparatively poor and do not generate large revenues. Thus, policies focus on encouraging external investment rather than enhancing internal wealth generation. Consolidating the rights of rural farmers to natural resources may be construed as a threat to the potential of opening up natural resources within the district to external investment, particularly if locals were to begin to challenge allocation of land and resources to investors.

Where centrist policies and the top-down dissemination of policies dominate over the building of local participation in the policy process, local administrations are more likely to be hostile to the demands of citizens and citizen groups, particularly when these go against dominant policy frameworks. In this context, decentralised government agency officials are likely to receive considerable training in mastering existing national policies in numerous regional and national sector workshops, which they will be able to cite by rote. They will receive much less training in learning by listening, and in building consensus, although they will be made aware of the importance of building participation and focus groups for the dissemination of government policies and new government-supported technologies.

In the case of charcoal burning, the policies introduced within the Kintampo district are not unique to the district, but form part of a broader movement of bans, partial bans, and bans by chiefs, which are forming a regular pattern throughout all the districts within the transition zone and savanna woodlands. In holding to crisis narratives about charcoal and deforestation, the district administration are probably upholding national directives that have not been clearly formulated in a published policy document. If this is the case, any attempt by the district assembly to reform district policy on charcoal would go against an evolving national policy framework, and question its very basis. This is unlikely to happen in a situation where decentralisation is controlled by central government and expected to conform to government policy priorities.

In this context what can the charcoal burners do? One possibility would be to network outside the district, establish a wider national basis, establish linkages with other civil society groups and forums, including trade unions, and make their representations at a higher level, directly to the national Forestry Commission, the Energy Commission, parliamentarians, the national media, etc. In the past, chainsaw operators effectively mobilised a national association, affiliated to the Informal sector of the Woodworkers Union, and were able to negotiate access to legal timber. However, this ended in 1994 with the banning of chainsaw lumber, which

criminalised their activities. Other possible lines of activities would be to support candidates for local Assembly elections who were willing to take up the issue of reforming existing natural resource policies within the district and policies on charcoal burning. This approach would focus on exploiting the contradictions within the institutional and legal framework for democratic decentralisation between downward representation and central control as a way of challenging dominant policies.

Action research

This study was constructed within a framework of action research. Action research sought to facilitate a number of interventions within information systems at the interface between community groups and local government, which would result in a better representation of the interests of rural people and the rural poor, and more informed policymaking. Research did not attempt to be "neutral", in the sense of facilitating a dialogue within the community between different interest groups to negotiate a consensus of community solutions or to create community priorities. It attempted to identify marginalised groups and help them to develop their own agendas, and build a platform through which they could place their demands within the policy process. It worked with the Area Councils, the lowest level of local government, whose capabilities are often dismissed in national policy frameworks, to develop an information system that could form the basis for a local level planning process. It worked with yam farmers who were dismissed as shifting cultivators who destroy the environment. It worked with charcoal burners, who were dismissed as irresponsible youth who were destroying the environment for quick money.

Targeting marginalised groups as research partners solves the problem of working with some notion of an abstract community and community interests, which may be symbols for elite interests. However, the marginalised are by no means uniform and within any interest or livelihood group can be found gradations of actors with different resource endowments, different connections to social and political networks, and different aspirations. For instance, yam farmers often cultivate a variety of other crops including maize, cassava, and groundnuts. Within the constellation of the varieties of crops available to them are "orphan" crops, such as yam, which have low research priority, and highly desirable crops which are presented as the solution to rural poverty. Conversion to these crops frequently require large outputs of capital, which many farmers cannot afford. Middle income and well-to-do farmers who cultivate relatively large amounts of yam may aspire to convert their profits and savings into these new crops. Small farmers are concerned with managing their existing yam resources within difficult economic and production constraints. The wealthier yam farmers will articulate the need to diversify into more glamorous or productive export crops, which would be in line with government policy. The small farmers would present a series of problems they face, which might no be easily articulated into a clearly defined agenda. In this context, the easy thing to follow would be the agenda of the elite farmers, particularly as it immediately suggests a programme of action coming from within the community. This would immediately gain support from the agricultural services, which have similar programmes. Attempts to develop a programme around an "orphan" crop would not receive this support, and would require considerable deliberation and research to find a course of action that would address these ill-defined needs. A focus on yam, however, can result

in a new analysis of the situation and the institutional constraints that result in yam being an "orphaned" crop and hamper its development.

Similarly, in the case of charcoal burners, when discussing interventions in which they were interested many of them cited teak plantations for charcoal burners, because they could not think of any other alternative, or out of deference to the official line, which they probably presumed was what researchers would approve. It was only when we accompanied them to view charcoal burning sites that we realised that many charcoal burners did not view regeneration as a problem. The species they cut for charcoal were robust and regenerated fast from coppice. Had we proceeded by calling a focus group discussion to prioritise interventions for a programme for charcoal burners, it is likely that this would have resulted in a programme of teak development. Meanwhile, charcoal burners do not exploit teak for charcoal and consider teak a poor charcoal species. The discovery of the perceptions of charcoal burners that the main trees they used for charcoal were robust and regenerated quickly caused controversy within the research team, between those who found the duration that charcoal burners were postulating implausible and those who felt it may be true. It then became evident that we needed to carry out detailed research on the regeneration of trees, and this became a major focus of the charcoal burners' network.

Action research should not be a short-cut solution, which short circuits the need to do research and goes directly into networking and project interventions through networking. The programmes and actions need to be informed by research, which places subjective perceptions within their contexts, and locates different individuals within specific socio-economic groups and institutions.

The first stage of building an action research programme requires detailed research to be able to understand the relationship of different groups to society and to policies. This enables suitable research partners and agendas to be identified. This requires painstaking research and much patience, since it takes time for interest groups and individuals to trust researchers and reveal their innermost concerns. Having defined suitable agendas and partners other relevant groups need to be defined who interact in the creation of policies that affect the partners. These groups also need to be involved in the research in their policy capacity, as target institutions in which change and reform are sought.

Once a programme is defined, the main roles of the researchers are in documenting the activities and perceptions of the actions by the research partners and target institutions, and disseminating research findings to them in suitable forms. The project needs to stand firmly by the types of interventions it is introducing, and not modify them along the line of least resistance to gain support and effective collaboration. The most important aspect of the research in relation to policy must be to understand how institutions respond to change, how institutional practices are shaped by wider structural practices, and the scope of individual actors to take the initiative in introducing change or conforming to existing practices. Action research is suitable for investigating policy interface situations, since it enables researchers to observe how groups build consensus; the interactions between individuals, groups, institutions and political structures and power. It enables the potential for institutional innovations that build upon existing capabilities to be investigated, and policy constraints identified. It is useful for revealing institutional processes, and the perceptions of actors within the

policy process of these institutions, change and the need for reform. Action research is by nature time consuming. It requires sufficiently long periods to be able to follow through on changing perceptions of target groups. It takes time for target groups to assimilate and accommodate new thinking, to work out institutional responses, and build trust in partners. Change often follows long periods of deliberation and programmes develop in fits and starts following lulls. It is useful to combine action research with more intensive research programmes, which collect data on economic processes, ecological conditions and institutional processes. It is useful to provide the partners with information from this research, and use the feedback to confirm the results and throw light on the various processes. The findings of research are a useful source of information for networks to discuss and reflect upon, and can help them to develop their own agenda. The feedback also throws light on the research findings and helps to develop an understanding of the context and to build the research agenda further. It is important to develop strategies for information collection and dissemination between network events; and to continually adjust research activities to address the perceptions which emerge in the meetings of the networks of producers, and within local government and development agencies circles. Although action research is slow and intensive, successes can be rapidly disseminated, since they take into consideration institutional forms, networks and perceptions. This became most evident in the rapid expansion of the charcoal burners' network, and in the short time in which the Areas Council surveys were completed.

Considerable political and institutional constraints exist in the way decentralisation presently functions in Ghana. However, the potential exists to open up spaces for change. The platforms created by the DEAR Project revealed the incipient emergence of public debate around local government issues and their implications for rural people and their livelihoods among citizens. There were also growing concerns and uneasiness in local government circles on the constraints of its policymaking functioning and performance. Democratic decentralisation opens up spaces for the participation of the rural poor in local political debates, but this space has to be fought for, negotiated, and won. Action research is useful in revealing where these spaces lie and the subjective perceptions of different groups in development processes, in ways which would be difficult to pick up in more conventional research. It has the potential to reveal the "grain" in which change can be worked.

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