



Graduate School of Development Studies

**Impact of Irrigation Dam Intervention on
Livelihoods of Farmers in the Drought Prone
Upper West Region of Ghana:
The IFAD Funded Busa and Karni Dams**

A Research Paper presented by:

Emmanuel Lignule

(Ghana)

in partial fulfillment of the requirements for obtaining the degree of
MASTERS OF ARTS IN DEVELOPMENT STUDIES

Specialization:

**Environment and Sustainable Development
(ESD)**

Members of the examining committee:

Dr Bram Buscher

Dr Bram Buscher

The Hague, The Netherlands
November, 2010

Disclaimer:

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Inquiries:

Postal address:	Institute of Social Studies P.O. Box 29776 2502 LT The Hague The Netherlands
Location:	Kortenaerkade 12 2518 AX The Hague The Netherlands
Telephone:	+31 70 426 0460
Fax:	+31 70 426 0799

Contents

<i>List of Tables</i>	<i>iv</i>
<i>List of Figures</i>	<i>iv</i>
<i>List of Acronyms</i>	<i>v</i>
<i>Abstract</i>	<i>vi</i>
Chapter 1	
Background of Research	1
1.1 Introduction	1
1.2 Conceptual Framework	3
1.3 Research Methodology	8
Chapter 2	
Contextualizing the Irrigation Dam Intervention	11
2.1 The Study Area	11
2.2 Institutional Context of the Irrigation Dam Intervention	12
Chapter 3	
Farmer-Managed Irrigation Dams in Busa and Karni	18
3.1 Operation and Maintenance of Irrigation Facilities	18
3.2 Uses of Irrigated Farm Income	23
Chapter 4	
Approach and Impacts of the Irrigation Dam Intervention on Farmers' Livelihoods	25
4.1 Approach and Outcomes of the Irrigation Dam Intervention	25
4.2 Impact of the Irrigation Dam Intervention on Farmers' Livelihoods	28
Chapter 5	
Conclusion	31
<i>References</i>	<i>33</i>
<i>Appendices</i>	<i>1</i>

List of Tables

Table 3.1 Age and Sex of Respondents (%)	18
Table 3.2 Marital Statuse of Respondents (%)	19
Table 3.3 Mode of Acquisition of Plots (%)	19
Table 3.4 Plot Sizes (%)	20
Table 3.5 Uses of Irrigated Farm Income (%)	24

List of Figures

Figure 1.1 Analytical Framework	8
Figure 2.1 The Karni Dam	16
Figure 2.2 An Irrigation Canal in Karni	16
Figure 3.1 A Broken Canal in Karni	22
Figure 3.2 An Irrigation Well in Busa	22

List of Acronyms

AEAs	Agricultural Extension Agents
CMU	Community Mobilization Unit
EPA	Environmental Protection Agency
FASDEP	Food and Agricultural Sector Development Policy
FGDs	Focus Group Discussions
GIDA	Ghana Irrigation Development Authority
IFAD	International Fund for Agricultural Development
LACOSREP	Land Conservation and Smallholder Rehabilitation Project
M&E	Monitoring and Evaluation
MoFA	Ministry of Food and Agriculture
PSU	Project Support Unit
UWADEP	Upper West Agricultural Development Project
UER	Upper East Region
UWR	Upper West Region
WUAs	Water Users Associations

Abstract

An increasing number of irrigation dam interventions are user-managed, presuming that this approach delivers better project outcomes. Using an institutional approach, this paper explores how the IFAD-funded, user-managed, irrigation dam interventions in Ghana's Upper West Region impacted on farmers' capacity to cope with drought. Water users associations were formed to address problems of malfeasance among members and ensure collective action for efficient irrigation management to empower participants and reduce poverty and vulnerability to drought. The study concludes that perverse incentives at all levels, particularly at design led to the framing of the intervention on the neo-liberal tenet of full cost recovery, and at implementation to poorly constructed irrigation canals, while lack of collective action during the operational phase contributed to lack of maintenance. As a result, the intervention contributed to a low increase in the capacity of respondents to cope with drought.

Relevance to Development Studies

Access to and management of irrigation facilities is vital for the livelihoods of poor and vulnerable farmers living in drought-stricken areas. By exploring how this donor-funded, user-managed irrigation dam intervention worked and impacted on the capacity of farmers to cope with drought, this paper makes a theoretical contribution to literature on irrigation, climate change and rural livelihoods.

Keywords

Empowerment, Institutions, Irrigation, Livelihoods, Power, Poverty, Vulnerability

Chapter 1

Background of Research

1.1 Introduction

The title of this paper denotes that irrigation dam interventions bring about changes in the capacity of farmers to make their livelihood under conditions of drought. An irrigation dam intervention denotes a project, which by definition, is a clearly defined set of activities, with measurable costs and benefits, and time-bound activities and budgets. A drought prone region is one which experiences prolonged periods of insufficient rainfall.

Many donor funded irrigation projects in developing countries are farmer-managed. The adoption of this approach is often based on claims that user-managed irrigation schemes have consistently achieved better outcomes than state-managed ones, which have been described as corruption-ridden and unable to recover the full cost of operation. Subsequently, the approach evokes the principle of full cost recovery as a market remedy (Mehta 2000:12) and formalization of users' associations to solve problems of mistrust and financial malfeasance and ensure collective action (Cleaver 1999:600) in irrigation management.

However, it is often argued that the impact of a development project does not only depend on a good or bad design but also on the inevitable power relations among different actors involved at every stage. Also, it has been pointed out that these relations are inextricably linked with the political, economic and social contexts in which they emerge.

Exposure to risk of drought is one of the challenges confronting food crop farmers in the Upper West Region (UWR) of Ghana. The people living in the region depend mostly on agriculture for their livelihoods (Ghana Statistical Service 2005) but recent droughts have resulted in increased risk of food crop failure (Assan et al 2009, EPA Ghana 2002, Owusu and Waylen 2009). Poverty is very high in the region and has been linked to exposure of farmers to risk of drought. The people living in the Upper West Region are the poorest in the country and insufficient food intake is a major cause of high morbidity and mortality among children (Ghana Statistical Service 2005). Consequently some farmers in the region engage in distress livelihood diversification by migrating seasonally to work as agricultural labourers in the wetter southern parts of the country (Van der Geest 2002). This stems from a historically produced pattern of inadequate state investment in agricultural and non agricultural sectors as well as human capital in the region (Ibid).

The importance of small scale irrigation for reducing food deficit, improving nutrition among farm households, creating on-farm and off-farm employment and increasing income has been noted in irrigation literature (Tesfaye et al. 2008). However, investment in irrigation in the Upper West Region is inadequate and most farmers lack access to irrigation facilities (SEND Ghana 2009). The region received only 3 % of national agricultural sector budgetary

allocation between 2002 and 2008 and only a small amount of this was invested in irrigation. At the same time the adjoining Upper East and Northern regions with similar proportions of agricultural population and level of poverty received 3 and 7% respectively. The Greater Accra region, which is the seat of national government, with lower agricultural population and people living in poverty received 9%. This is an indication of inequitable distribution of irrigation facilities to the disadvantage of the poorer regions and Upper West in particular. As a result, farmers in the Upper West Region are among those in drought prone areas with the least access to irrigation facilities in the country (Ibid). Also, it has been observed that the few existing irrigation facilities in the region are mostly hand-dug wells, which are inefficient in water productivity (Ibid: 43).

Enhancing the productivity of existing irrigation facilities is seen as essential for increasing food production in Ghana. The country's irrigation policy seeks to enhance the production potential of existing irrigation schemes and decentralize irrigation management from state institutions to farmers' associations (MoFA 2007). The Ministry of Food and Agriculture of Ghana argues that state managed irrigation facilities in the country are poorly maintained and inefficient in water productivity because state institutions have been unable to recover the full cost of operation (Ibid: 11). As noted above, this has been attributed to corruption and lack of accountability on the part of state institutions and claims that water users can ensure accountability and collective action for better outcomes (Cleaver 1999, Ribot and Larson 2005). As Agrawal et al. (1999, in Ribot 2002: 26) emphasize, it is presumed that local people have power to "create or modify rules, decide on how a resource will be used, implement and ensure compliance with rules, and adjudicate disputes that arise in the effort to ensure compliance". Besides, downward accountability of state institutions to local authorities in the provision of financial and other forms of support influences community resource management outcomes (Ribot and Larson 2005:6).

The International Fund for Agricultural Development (IFAD) financed the rehabilitation of some existing small dams as a component of the Upper West Agricultural Development Project (UWADEP) implemented by regional office of MoFA (UWADEP Interim Evaluation Report 2005). The rehabilitation involved the construction of canals and expansion of the existing total irrigable area of 131 ha by 220. Rehabilitation works started in 1998 and by the end of the project in 2004, only 8 dams were completed, against an appraisal target of 20. The additional irrigable area developed was 23 ha. Water Users' Associations (WUAs) were formed and trained to make and enforce rules to manage the irrigation dams. However, by the end of the project less than half (41.5%) of the total irrigable area was reported to be used for irrigation (ibid). The report indicated that the Ministry of Food and Agriculture employed incompetent project staff and did not adequately involve nongovernmental organizations (NGOs) in decision making during implementation.

From the information presented above, two important issues are implicit. First, the intervention is based on the assumption that water users' associations can make and effectively enforce compliance with formal rules of access to irrigation, payment of irrigation maintenance charges and financial accountabil-

ity mechanisms among members. Second, the attribution of project outcomes to appointment of staff with inadequate expertise and exclusion of NGOs from decision making indicate that power relations between institutions shaped intervention processes.

Focusing on the Busa and Karni small irrigation dams, this paper seeks to ascertain how the irrigation intervention has worked and impacted on farmers' livelihoods to cope with drought. By this, the paper also seeks to unearth the theories and social realities that shaped the intervention and thus contribute to literature on irrigation and rural livelihoods. Therefore, to what extent has the irrigation dam interventions impacted on the livelihoods of farmers? How has institutional setup of the intervention shaped processes and outcomes? What evidence do the irrigation interventions present in relation to the normative and prescriptive visions underlying them? What are the impacts of the intervention on farmers' capacity to make livelihood choices to cope with drought?

The paper is organized into five chapters. The rest of this chapter presents the conceptual framework and methodology of the study. Chapter 2 presents the context the irrigation dam intervention. Findings on farmer management of the irrigation dams are presented in chapter 3 and the institutional approach and impact of the intervention discussed in the next chapter. The conclusion is presented in chapter 5.

1.2 Conceptual Framework

This section discusses the conceptual framework of the study. The study uses the concept of institutions to explore how the intervention worked and the extent to which it contributed to empowerment, and reduced poverty and vulnerability among farmers.

This subsection defines and discusses the concept of institutions and relates it to empowerment, poverty and vulnerability. The centrality of institutions in the conceptual framework is also highlighted. Institutions are

The set of rules actually used (the working rules or rules-in-use) by a set of individuals to organize repetitive activities that produce outcomes affecting those individuals and potentially affecting others (Ostrom 1992:19). Working rules are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what procedures must be followed, and what cost and payoffs will be assigned to individuals as a result of their actions (Ostrom 1986, in Ostrom 1992:19).

Rules contain prescriptions that forbid, permit, or require some action or outcome and are monitored and enforced when individuals make collective choices in the use of resources (Ibid: 19). In a later publication, Ostrom (2006) emphasized that institutions help to achieve collective action among appropriators (users) to sustain common pool resources such as irrigation dams, for higher net benefits. Some of the principles she outlined as the essential elements of successful common pool resource institutions include clearly defined boundaries of those individuals who have the right to withdraw resource units, graduated sanctions against those who violate rules, and conflict resolution mechanisms (Ibid. 90).

The above description denotes formal institutions of collective action because they are deliberately set up by a group of people to achieve cooperation and collective effort for maximum joint benefits from the management of resources such as irrigation facilities. However, it is important to note that there are significant differences between formal institutions. An important distinction is that some formal institutions are non-state ones because they are not backed by legislation. State institutions are defined as organizations that are “able to define and enforce collective binding decisions on members of society” (Lund 2006: 676). They derive their authority from national laws and observance of their decisions by other groups or people (Ibid). Lund observes that state institutions are centers of power, norms, development procedures and codes proper to themselves and constitute arenas where different agents negotiate for distribution of resources (Lund 2006:676). Another important distinction between state (organizations) and non state institutions is that the former can impose their decisions on non members while the latter may not. Beyond this, there are also international (financial) institutions (organizations) that are established by international law and able to define and enforce decisions on states and their citizens.

Also, some institutions (rules) are informal (i.e. cultural norms). Ostrom (2006:35) defines norms (informal rules) as expectations of “behaviour that reflects the valuations that individuals place on actions or strategies in and of themselves, not as they are connected to immediate consequences” (Ibid: 35). According to Ostrom:

When an individual strongly internalizes a norm of keeping to promises he suffers shame when a personal promise is broken. If the norm is shared by others the individual is subject to considerable social censorship for taking actions considered to be wrong (35). Norms of behaviour affect the way alternatives are perceived and weighed. Shared norms help to reduce opportunistic behaviour among appropriators (paraphrased). In a setting in which few individuals share norms about the impropriety of breaking promises, refusing to do ones share, shirking, or taking other opportunistic actions, each appropriator must expect all other appropriators to act opportunistically whenever they have the chance. In such situations it is difficult to develop stable long term commitments (Ibid: 36).

She notes that adoption of norms cannot totally control opportunistic behaviour because in some situations the benefits are so high that some individuals will also break them.

Like rules, cultural norms also influence collective action among water users but are not binding. Thus norms differ from formal rules in that, while the former are based on shared social expectations of behaviour the latter are deliberately created.

Institutions shape human behaviour through their impact on incentives Ostrom (1992) and thus influence collective action. “Incentives are the positive and negative changes in outcomes that individuals perceive as likely to result from particular actions taken within a set of working rules, combined with the relevant individual, physical and social variables that also impinge on out-

comes” (Ibid: 24). Examples include material inducements such as money or goods and conformity to habitual practices and attitudes (Ibid: 24).

However, it has been argued that community based management approaches are based on simplistic notions of the ‘community’ and community management. Institutions are embedded in social and power relations with distinction between formal and informal ones often blurred (Mehta 2000). Cleaver notes that water management institutions are socially embedded, dynamic and do not necessarily conform to project imperatives (Cleaver 1999, Mehta 2000). Access to water often depends on both formal and informal rules and conflict resolution mechanisms, and management sometimes occurs in informal institutions and other well established structures that operate outside project specific institutions (Cleaver 1999: 602).

From the forgoing discussion, institutions, which in this case are water users’ associations, consist of both formal and informal groups that participate in the management of irrigation dam interventions. These groups include both project-focused ones and those set up for other purposes. The mechanism by which these associations function is complex and linked to local cultural norms. Hence, both the rules and regulations of the water users association and cultural norms of the society (i.e. the village) may influence access to irrigation facilities, compliance with rules and resolution of conflicts among irrigation farmers. A narrow project focus on water users’ associations alone for management of the dams has the tendency to overlook the cultural norms that may influence the enforcement of the rules of the associations and other groups that may participate in irrigation management. This may influence the collective effort of irrigation farmers in complex ways. The institutional set up of the irrigation intervention aims at ensuring participation, which is a process of empowerment.

Empowerment is defined as “the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them” (Kabeer 1999:437). Strategic life choices, also termed first-order choices by Kabeer, refer to those choices such as choice of livelihood that are critical for people to live the lives they want. First-order choices then help to frame second-order choices, which are less consequential, may be important for the quality of one's life but do not constitute its determining parameters. The ability to exercise choice is expressed in terms of three inter-related dimensions, namely resources (pre-conditions), agency (process) and achievements (outcomes) (ibid).

She notes that resources include materials and a range of human and social resources which enhance the ability to exercise choice. These resources are acquired through multiple social relationships within the family, market and community. Access to such resources is then a reflection of the rules and norms governing distribution and exchange in deferent institutional arenas.

These rules and norms confer on certain actors, authority over others in determining the principles of distribution and exchange so that the distribution of ‘allocative’ resources (material resources that can be distributed) tends to be embedded within the distribution of ‘authoritative resources’ (Giddens 1979, in Kabber 1999). Authoritative resources refer to ‘the ability to define priorities and enforce claims’ (ibid: 437). Those who wield this decision-making authori-

ty include heads of households, chiefs and elites within a community by virtue of their positioning within these institutions.

Agency (i.e. 'power to', in the positive sense) refers to people's capacity to determine their own life-choices and to pursue their own goals, even in the face of opposition from others (ibid). Agency can be exercised in such forms as bargaining and negotiation by individuals or groups. Resources and agency together constitute capabilities, defined as the potential that people have for living the lives they want, achieving valued ways of 'being and doing' (Sen 1985b, in Kabeer 1999). Capabilities, in Sen's terminology consist of 'functionings', which refer to all possible ways of 'being and doing' which are valued by people in a given context. Achievements or 'functioning achievements' are the particular ways of being and doing which are realized by different individuals.

In this paper the IFAD funded irrigation dam intervention is an attempt to expand the capacity of farmers to withstand the risk of drought, which they were previously deprived of. The irrigation dam, and water users' associations together constitute the resources which offer them opportunity to make a strategic life choice. The distribution of these resources is embedded in the authoritative resources (i.e. MoFA/IFAD) which define, prioritize, enforce and can also make claims of project resources. Access to irrigation and related facilities gives farmers the 'power to' determine their life choices and goals through such processes as engaging in dry season irrigation farming, maintaining the irrigation facilities and investing returns from irrigation in other income generating activities. Endowed with irrigation facilities and power, farmers are capable of realising their functioning achievements such as increasing food production, increasing the number of meals eaten per day, reducing malnutrition and child mortality, increasing income and assets and improving shelter. As empowerment presupposes that those people been empowered are in a condition of deprivation, it is important to clarify these conditions.

Poverty is a "complex set of deprivations"; a human condition such as hunger, illness and powerlessness that reflects failures in many dimensions of human life (UNDP 2006:7). Powerlessness is the inability to impose ones will onto others or resist such imposition by others (Weber). These conditions are indicative of deprivation by the state (in this context) of adequate access to irrigation facilities to produce sufficient food under conditions of drought. Insufficient food for household consumption renders children (for example) susceptible to illnesses and early deaths. These conditions do not only result from denial of access to resources to fulfil social demands (ibid: 6) but also from deliberate exclusion of some people by others of access to resources, based on property relations and configurations of power, which occur in both local and extra local arenas (de Haan and Zoomers 2005). Implicitly farmers in the UWR are poor not only because they are deprived of access to irrigation facilities but also because they cannot (individually or collectively) influence dam allocation decisions. Therefore, poverty among these farmers is a result of powerless and deprivation.

These render farmers vulnerable to drought. Vulnerability is defined as "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard" (Blaikie et al. 2003). Exposure to risk of drought results from the

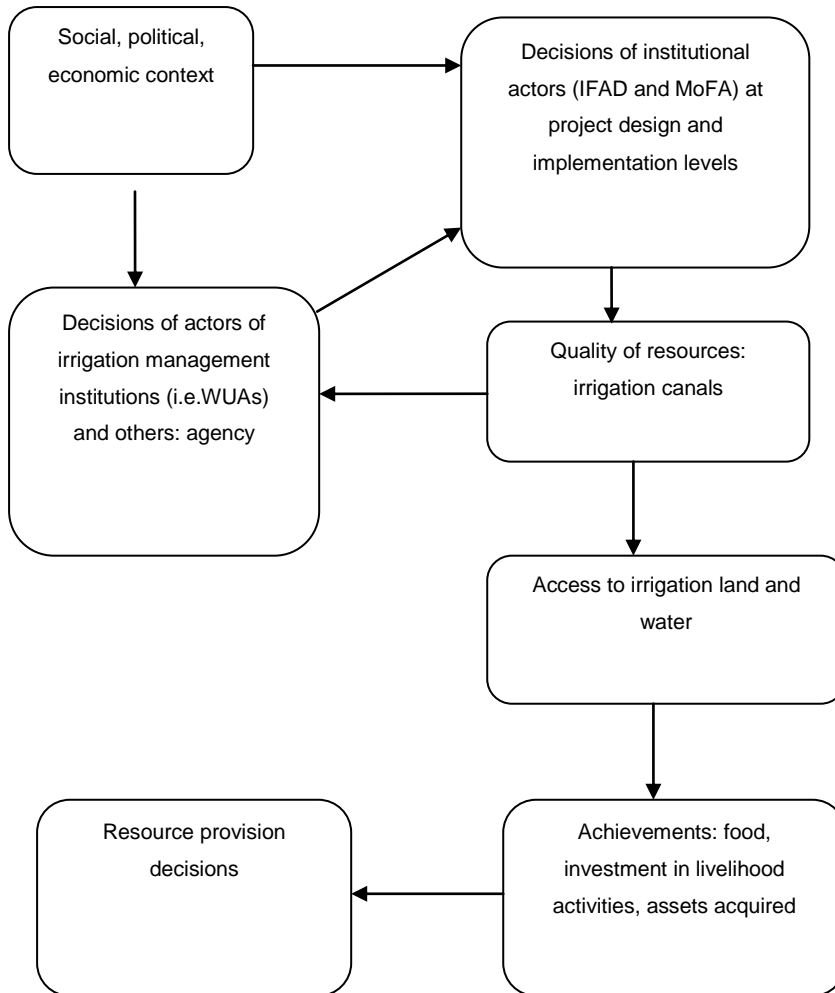
generation of vulnerability and physical exposure (Ibid). In their view vulnerability is the result of structural constraints. In this context, vulnerability is the characteristic which renders farmers susceptible to drought and results only from deprivation by the state, of access to irrigation facilities, as noted above. However, as de Haan and Zoomers (2005) note (above), access to resources also depends on membership of a group, often based on characteristics such as family, gender, age and ethnicity. Therefore, the vulnerability of farmers to drought is a result both of their powerlessness and deprivation (by the state) of access to irrigation facilities. Differences in access to resources imply that some farmers who are physically exposed to drought may not be vulnerable to it because they may have other sources of livelihood. Therefore, reducing vulnerability to drought requires providing irrigation facilities to enhance the capacity of vulnerable farmers to cope with drought.

From the foregoing discussion, the following framework will be used to analyze the data. In this framework institutions are complex, dynamic and related to local and extra-local social realities. Multiple institutions participate in irrigation management and conflictual and cooperative forms of access to resources, based on social relations such as family, age, and gender, influence farmer access to irrigation facilities (i.e. land and water). Decision making by institutions means that institutional agents wield power and have interest in the irrigation project. Institutional agents therefore take decisions in their own interest and understanding of what is in the common interest of farmers. Therefore, decisions on who should participate in project implementation, how the irrigation facilities should be constructed and particular forms of farmer participation in irrigation management are linked with the interests and views of the decision makers. Decisions on particular forms of farmer participation are based on theoretical precepts of cooperation for the use of irrigation dams which are shared resources. These precepts cannot capture the complex and dynamic realities of individual farmer and institutional behavior. These decisions tend to create opportunity for some decision makers to maximize their interests in the irrigation project and influence farmer cooperation (participation) in the maintenance of the facilities. Maximization of actor interests and farmer cooperation or conflict then influence access to irrigation facilities and affect the capacity of farmers to exercise livelihood choices to cope with drought.

The irrigation dam intervention consists of resources that are provided to expand the capacity of farmers to make strategic life choices (the choice of livelihood) to cope with drought. The expansion in farmers' capacity is influenced by institutions, which make decisions and shape the processes and outcomes of irrigation intervention at multiple levels, including project design, implementation (provision of dams), operation and maintenance of irrigation facilities. As poverty and vulnerable to drought are related to physically exposed to drought and lack adequate access to irrigation facilities to produce sufficient food, empowerment is expected to minimize these conditions. Since these access problem results from the inability of farmers to influence dam allocation decisions and deprivation by state institutions that make such decisions, impacts will be measured in terms of the capacity to make livelihood

choices to cope with drought. A conceptual framework synthesized from the reviewed literature is presented in figure 1.1.

Figure 1.1 Analytical Framework



Source: Synthesized from conceptual framework

1.3 Research Methodology

This section discusses the methods, sources and techniques of data collection employed in the research. The research used primary data gathered within six weeks, from mid-July to mid-August 2010, and reports and academic literature. The IFAD funded, Busa and Karni small irrigation dam interventions were purposively selected for the study. Busa dam was selected because it is one of the oldest in the Upper West Region and the only site where the area under

irrigation was reported to have exceeded the command area (irrigable area of 10ha by 2) of the canals after rehabilitation (Interim Evaluation Report of the Upper West Agricultural Development Project 2005). While a substantial part of the irrigable area (3.3 of 10ha) in Karni was reported uncultivated after rehabilitation, inclusion of blind people in access to irrigation was said to be a success story.

For purposes of triangulation, several techniques were used to collect data for this research. First hand information was obtained through observation of the dams, size of individual plots and irrigable areas being cultivated, crops grown, state of maintenance of irrigation canals and use of wells. This method was very useful, as O'Leary (2009) observed, for obtaining a sense of reality and validating information gathered from other sources.

Two separate focus group discussions (FGDs) were organized with water users associations (WUAs) in each of the two villages. In Busa, these discussions were held with two six-member groups, one consisting of men and the other of women. This was in conformity with the usual practice of organizing meetings in this predominantly Muslim community. In Karni, each of the two six-member focus group discussions consisted of both women and men. In Busa this technique was useful for avoiding the influence of male dominance on women's contribution in discussions involving both sexes and gathering information from women about financial malfeasance on the part of the male dominated executives of the Water Users Association.

The challenge encountered in using this method was that Agricultural Extension Agents (AEAs) working in the two villages were used as interpreters in the FGDs, because I do not understand Dagaare, the language spoken in the study area. Two main challenges possibly compromised the richness of data gathered through this method. First, as the Agricultural Extension Agents work with these farmers, their use as interpreters could influence their responses. Second, some of the information might have been lost in translation. However, as this method is relevant for the study, use of interpreters was inevitable. The use of these Agricultural Extension Agents, who are known to the farmers, helped to implore them to avoid withholding information from the researcher, who otherwise might have been seen as a stranger. Also, the possibility of misinterpretation was minimal because the Agricultural Extension Agents have working knowledge of irrigation and are native speakers of Dagaare with good understanding of English. The discussions were recorded and transcribed.

Using snowball sampling, five key informant interviews were conducted (in English Language). The informants were selected based on their knowledge of the intervention. They include two Agricultural Extension Agents, the Regional Engineer of Ghana Irrigation Development Authority (GIDA), Regional Monitoring and Evaluation (M&E) officer and Regional Agricultural Development Officer in charge of crops. A major challenge of this technique was that lack of anonymity (O'Leary 2009) and involvement of some of these respondents in project implementation contributed to their decline to provide honest responses to some questions. To minimize this challenge, informed consent of respondents was sought and confidentiality of information assured. In spite of these challenges, key informants provided information which could

not be obtained from other sources, as Woodhouse (1998, in Chataway and Wuyts 1998) observed. Also, this technique was useful for gathering information from few respondents, since some of the staff involved in the implementation of the intervention had been transferred to offices elsewhere in the country.

An open-ended questionnaire was also used to gather data. Using snow ball sampling, a sample size of 68, representing 10% of a total population of 677 irrigation farmers obtained from the water users' associations, was drawn for the survey. The total population consisted of a 457 member water users' association in Busa and 220 in Karni. The questionnaire was administered to a sample of 46 irrigation farmers in the former and 22 in the latter. This sample was chosen because it is large enough to capture the information required for the study. In each of the two villages, two research assistants administered the questionnaires while the researcher monitored the process. These research assistants are all native speakers of Dagaare, with good understanding of English language and were given orientation prior to the commencement of questionnaire administration, which was in English Language. Their proficiency level in both languages helped to minimize possible misinterpretation and ensured that data was accurately documented. The response rate was 100% because the process continued until the sample size was covered. The advantage of this technique is that it was used to collect some statistical information, which the other techniques described above could not appropriately capture. Also, the technique was used to collect some relevant information which the researcher did not originally envisage.

Secondary sources constitute an essential part of this study. These include reports, policy and strategic documents, articles and books. Secondary sources are particularly relevant because substantial information about the irrigation project exists in the form of reports. The challenge in using project reports as the main source of data is that these are subject to censorship due to power relations between researchers and organizations which commission studies into the production of such documents (O'Laughlin 1998). The use of academic literature and primary sources helped to minimize this challenge. The data was analyzed qualitatively, using the conceptual framework outlined in this chapter.

This chapter has presented the background of the study. It has shown that vulnerability to drought in the Upper West Region of Ghana is a result of deprivation of access to irrigation facilities, powerlessness on the part of farmers to influence access, and physical exposure to drought. The chapter has also outlined the conceptual framework, consisting mainly of institutions within which the empowering and poverty reduction effects of the intervention will be explored. The sources, methods and techniques of data collection used for the study have also been specified.

Chapter 2

Contextualizing the Irrigation Dam Intervention

This chapter gives a brief background of the study area and describes the irrigation dam intervention while highlighting the institutional context in which it was implemented. The underlying concepts of the intervention and implicit assumptions are outlined and the power relations between institutional actors pointed out. By so doing, the chapter is both descriptive and analytical.

2.1 The Study Area

Busa and Karni are rural communities in the Upper West Region of Ghana. The Region is bordered to the north by Burkina Faso, south by Northern Region, east by Upper East Region and west by Cote D'Ivoire. Busa is located in the Wa municipality and Karni in the Lambussie-Karni District of the region. A significant number of people in Karni are blind, due to infestation of the area with the black fly in the recent past. Agriculture is the main source of livelihood of the people living in the two villages. Though data on these villages is not available, their agricultural population might be higher than the averages of 66.6% and 80% in the Wa municipality and Lambussie-Karni district respectively, since these averages cover both urban and rural populations. The farmers grow crops such as millet, sorghum, maize, groundnuts and beans. Other sources of livelihood in the study villages include *pito* (local beer) brewing, shea butter processing, charcoal production and petty trading, which are predominantly female activities.

Farmers in the two villages are poor and vulnerable to drought due to inadequate access to irrigation facilities and therefore, lack the capacity to provide adequate access to the latter without external support. 9 out of every 10 persons in the region, including the two villages, are classified as poor (Ghana Statistical Service 2005) and 70% of households eat only 2 meals a day (MoFA and WHO 2009). Also, 14% of children are malnourished, 10 % anemic (Ghana Statistical Service 2008) and 208 out of every 1000 children die before their fifth birthday, due partly to insufficient food intake (Ghana Demographic and Health Survey 2004). This situation is related to the exposure of farmers to risk of drought. The wet season in the area is marked by untimely onset of rainfall, abrupt dry spells and drought, which has resulted in increased risk of food crop failure (EPA Ghana 2002). The area experienced the major country-wide droughts of 1968-73, 1982-85 and 1990-92, which caused extensive food crop failure (Ibid). Consequently, some farmers in the region (including Busa and Karni) engage in distress livelihood diversification, due partly to deprivation by the state, as noted in chapter one.

Prior to the intervention, the existing small dams in these villages could not supply sufficient water for irrigation. The Busa dam was built by the government of Ghana in 1971 and that of Karni in 1989 for domestic use and watering of animals. According to the farmers interviewed, a minister of state from Busa was instrumental in the provision of the dam in that village. As

these dams were not originally meant for irrigation, canals were not constructed. Some farmers in the two villages resorted to drilling wells in the downstream areas of dams for dry season irrigation to reduce their food deficits. However, these wells could not yield sufficient water for irrigation because they often dried out. Inadequate access to irrigation facilities to cope with drought in the two villages was what necessitated the irrigation dam interventions funded by the International Fund for Agricultural Development.

2.2 Institutional Context of the Irrigation Dam Intervention

The small scale irrigation dam intervention in Busa and Karni was a component of the eight-year Upper West Agricultural Development Project (UWADEP) funded by the International Fund for Agricultural Development (UWADEP Interim Evaluation Report 2005). It was implemented by the Upper West Regional office of the Ministry of Food and Agriculture (MoFA) of the Government of Ghana, from March 1996 to December 2004 (ibid). The irrigation component of the project consisted of rehabilitation of irrigation dams through construction of canals, formation of water users associations to manage the dams, and rehabilitation of rural roads.

Before dealing with the project components in detail, it is important to give a brief description of the donor and implementing institutions (organizations) and point out the approach they employed. IFAD is a specialized agency of the United Nations and the only international financial institution mandated to contribute exclusively to reducing poverty and food insecurity in the rural areas of developing countries (IFAD 2007). The goal of IFAD is to “empower rural women and men in developing countries to achieve higher incomes, improved food security at the household level, and thus contribute to the eradication of extreme poverty” (Ibid: 2007:18). As outlined in its strategic framework for 2007-2010, IFAD ensures that interventions are consistent with policies of recipient (often developing) countries and works with national governments to enhance their capacity to enable the extremely poor, mostly agricultural-dependent rural people to overcome poverty (Ibid). It focuses on financing the delivery of social service projects such as local water supplies, only in response to the needs of local communities where such facilities are limited and critical for poverty reduction, and other financing sources are lacking. IFAD also works with, and helps strengthen the capacity of organizations (formal or informal) of poor rural people to, among other things, enable them better manage their assets. The implementing organization is a state institution responsible for formulating and co-ordinating the implementation of agricultural policies and facilitating agricultural development programmes in Ghana (MoFA 2002:5).

The Ministry of Food and Agriculture modeled the project on the existing IFAD-financed Upper East Region (UER) Land Conservation and Smallholder Rehabilitation Project (LACOSREP I) (UWADEP Interim Evaluation Report 2005), which was implemented between 1991 and 1997. Unlike the traditional management of irrigation schemes by state institutions, those under the LACOSREP were managed by Water Users Associations. These user associations made moderate achievements in the collection of fees for maintenance of

irrigation facilities and thus contributed to improvement in the livelihoods of beneficiary farmers in the Upper East Region (World Bank et al. 2009:247). IFADs stated rationale for financing the intervention was the need to reduce poverty and vulnerability to drought, in line with Ghana's policy prescriptions. These were stated by an IFAD project appraisal team in 1995 as a strong existing demand for dam rehabilitation, the potential for Water Users Associations to be sustained to ensure food security and inadequate government financing of development projects in the Upper West Region. Another justification was conformity of the intervention with Ghana's agricultural policy and poverty reduction strategy objectives of reducing rural poverty and increasing food security among farmers exposed to drought, especially in the three northern regions of Ghana (Ibid). These are the Upper West, Upper East and Northern regions.

By modeling the irrigation intervention this way, it is taken for granted that user management necessarily leads to the achievement of expected outcomes and impacts. However, as modeling involves subjectivity, often based on particular theoretical stance, the implications for outcomes and impacts of the intervention will be explored. Also, it is a decision making process which is inextricably bound up with power relations and interests of the institutional actors involved. In this process, the power of the International Fund for Agricultural Development to accept the modeled project is derived from its mandate as a funding institution. The power of Ministry of Food and Agriculture to model the project is derived from its mandate as a policy formulation and implementing institution. The interests these institutions in the intervention and how their decisions shaped intervention outcomes and impacts will be explored in the rest of this and subsequent chapters.

The overall implementation of the Upper West Agricultural Development Project as well as the irrigation component was the responsibility of the Project Support Unit (PSU) (Interim Evaluation Report of the Upper West Agricultural Development Project 2005). The Project Support Unit consisted mainly of staff of the Ministry of Food and Agriculture, regardless of competence. Nongovernmental organizations and other state institutions working in the region were largely excluded from the project support unit (Ibid). It was the community mobilization unit, responsible for the formation and training of Water Users Associations, which had visible presence of staff of other state institutions such as Department of Women and National Council for Civic Education (Ibid). The ministry's exclusion of some institutions from implementation of the irrigation intervention implies that there is an underlying motive, which will be explored in this paper.

Under the institutional capacity building component of the intervention, three training centres were established, in Wa, Tumu and Nadowli. To ensure that farmers take up the responsibility of managing the irrigation dams, Water Users' Associations were formed in Busa and Karni. A series of training workshops were organized from 1996 to 2001, for selected WUA members on issues such as leadership skills, communication skills, group dynamics, conflict resolution and financial management (Report on Impact Assessment of the Upper West Agricultural Development Project 2003). Equipped with requisite skills, these WUAs were expected to elect executives; make their own rules and

regulations, including stipulated conflict resolution mechanisms, to ensure farmer cooperation and collective effort especially in making financial and labour contributions for maintenance of irrigation facilities. Some of the rules of the associations are presented in box 1.

Box 2.1 Rules of Water Users' Associations

- All members of the association shall contribute money and labor for maintenance of irrigation facilities. The elected executives shall collect money and organize labor for such maintenance works as and when the need arises.
- The amount to be contributed per farmer shall be determined by the association, taking into consideration, the estimated total cost of maintenance works required.
- Refusal of any member to contribute money or labor for maintenance shall result in cease of his or her plot by the association.
- The executives shall be answerable to members of the association for the use of their financial contributions.
- Failure of executives to account for all or part of members' contributions shall result in dismissal from office.
- Under such circumstances the association shall compel the culprits to pay back the total amount of money that could not be accounted for.

Source: Field data

Such an emphasis on institutional capacity building, based on technical rationalities such as acquisition of skills and formalization of rules is based on assumptions that once farmers acquire requisite skills they will act in expected ways and formal rules can control individual behavior and promote cooperative effort. It is taken for granted that reliance on project focused formal institutions alone can ensure effective management of irrigation facilities. The study will explore these assumptions and point out what the empirical evidence of the irrigation intervention suggests.

The Busa and Karni small irrigation dams were rehabilitated to increase access to irrigation facilities and improve the capacity of farmers to cope with drought. Rehabilitation involved the award of contracts for construction of canals and supervising consultancy services. The canals were to channel water from dams to the irrigable areas. In 1997, the Project Support Unit awarded the former to local construction companies and the later to Ghana Irrigation Development Authority staff within the Project Support Unit (Interim Evaluation Report of the Upper West Agricultural Development Project 2005). Rehabilitation works were carried out during the following year. The rehabilitation works increased the irrigable area from 8 to 10 ha in Busa and 6.7 to 10 in Karni. However, at the inception of rehabilitation works, owners of the existing well-based irrigated plots in Busa resisted the clearing of portions of their fields to pave way for construction works. My discussion with water users revealed that, this action was informed by farmers' fear of losing their plots to others in the top-down approach of the intervention. This stalled the rehabilitation works for a couple of months until a leader in the village persuaded the resisting farmers to yield to such demands. This resistance suggests that the intervention was based on normative prescriptions of the empowering effects of dam rehabilitation, which treat farmers as objects of development.

By the completion of rehabilitation works on the Busa dam in 1998, sufficient water could not flow to the entire 10 ha field because concrete slabs of the canal were poorly laid, the canal leaked and laterals fewer than required. In Karni the valve leaked and water was wasted, the canal was lower than the laterals, which were not enough to distribute water to all parts of the field. The canal was deteriorating due to the build up of hydrostatic pressure behind canal walls as a result of the high water table, weak concrete mix and absence of weep holes to relief the pressure. However, this canal could not be repaired because the cost was found to be too high to be carried on as part of on-farm works (minor repairs).

Evidence suggests that these poorly constructed canals resulted from the strategy employed by the Project Support Unit to use some project funds for personal benefits. The latter awarded contracts to low grade contractors who inflexibly used the dam rehabilitation designs provided in the appraisal (Interim Evaluation Report of the Upper West Agricultural Development Project 2005: xiii) and supervising consultancy service to one of its members (Ghana Irrigation Development Authority) (Ibid). My discussion with irrigation farmers revealed that the consultant did not monitor rehabilitation works regularly, leading to delays and use of insufficient cement by contractors. Further, contractors defaulted and the Project Support Unit re-packaged and re-awarded contracts to different contractors, without applying prescribed sanctions to the defaulters. Also, laboratory investigations for quality assessment of the works were not conducted (Ibid: 8). These suggest that lack of regular monitoring, decline of the Project Support Unit to sanction defaulting contractors and conduct quality assessment of construction works, were negotiated terms between the former and latter for sharing of part of the contract sum. The attribution of weak involvement of nongovernmental organizations in project implementation to the desire of staff of the Ministry of Food Agriculture to use some project resources for personal benefits (Ibid: x) lend credence to this motive. Also, the observation in the Interim Evaluation Report of the Upper West Agricultural Development Project (2005:26) of the Project Support Unit's exaggerated claims that rehabilitation of 19 dams was completed before the end of the project further supports this point. Further the observation in the report that such claims were not verified by the International Fund for Agricultural Development is indicative of the interest of the latter and will be explored in this paper.

Such claims indicate that project funds meant for the completion of some of the rehabilitation works were diverted for personal benefits of the PSU members. Therefore, faulty irrigation facilities such as lower elevation of canals relative laterals, which are attributable to contractor incompetence, are part of the generally poor quality of irrigation facilities in the two villages linked to the range of strategies employed by the Project Support Unit to make personal benefits from dam rehabilitation.

This necessitated regular maintenance of the irrigation canals. Three year after rehabilitation several maintenance and additional constructional works were carried out. Poorly laid slabs on a 150 meter main canal in Busa were replaced, fourteen (14) additional laterals built and pipes fixed on laterals in 2001, with funding from Food and Agriculture Budget Support and using commu-

nity labour (Monitoring and Evaluation Unit, Upper West Agricultural Development Project 2001). In Karni, six additional laterals were constructed by Ghana Irrigation Development Authority during the same year, using hired community labour (Ibid). The Water Users' Association of Busa also carried out some repair works on the canals during the following year (Monitoring and Evaluation Unit, Upper West Agricultural Development Project 2002). Figures 2.1 and 2.2 show the Karni dam and canal respectively.

Figure 2.1 The Karni Dam



Figure 2.2 An Irrigation Canal in Karni



Rural roads linking Busa and Karni to market centres were rehabilitated. This was geared towards reducing physical access to market. The Report on Impact Assessment of the Upper West Agricultural Development Project (2003) only provides district-wide data on rehabilitated rural roads. It indicates that all the 14.8km of roads earmarked for re-gravelling and 16.8km for spot-improvement in the Wa Municipality were completed by 2002, while works had not yet begun on roads in the Lambussie/Karni District. My interviews with key informants showed that the Busa-Wa and Karni-Jirapa roads were improved under the UWADP. At the period of my field work in the two villages from mid-July to mid-August 2010, these roads were in good condition, and 5km of the Wa-Busa road was tarred, with government funds. Implicitly, it is taken for granted that, inaccessibility to market is the most important marketing challenge facing farmers in the area. The implications for project outcomes and impacts will be explored.

This chapter has shown that the intervention was funded because Ghana's agricultural policy is in conformity with the funding requirements of the International Fund for Agricultural Development. It has pointed out that the intervention was modelled on user management of irrigation facilities and that this is a decision making process which is linked with power relations and interest of the institutions involved. The chapter has also indicated that the interests of institutional actors involved as well as the concepts on which the intervention is modelled have significant implications on the processes and outcomes of the intervention, which will be explored in subsequent chapters. Particularly it has shown that decision making at the Upper West Regional office of the Ministry of Food and Agriculture during the implementation of the intervention resulted in poorly constructed irrigation canals and made maintenance an essential part of irrigation management in the two villages.

Chapter 3

Farmer-Managed Irrigation Dams in Busa and Karni

Using primary data, this chapter describes the operation of irrigation dams in the villages of Busa and Karni. It focuses on how respondents gain access to irrigation facilities and maintain the canals. The crops cultivated are also described and the uses of irrigated farm income highlighted.

3.1 Operation and Maintenance of Irrigation Facilities

Irrigation facilities in Busa and Karni are used and managed by the farmers. Respondents of the sampled population of irrigation farmers in the two villages consists of 60.8% males and 39.2% are females in Busa , with ages ranging between 15 to over 60. In Karni, 27.2% are males and 72.8% females, between the ages of 21 to over 60. This is represented in table 3.1.

Table 3.1 Age and Sex of Respondents (%)

Busa					
Sex	Age				Total
	15-20	21-40	41-60	61+	
Male	10.9	39.0	8.7	2.2	60.8
Female	0	24	13.0	2.2	39.2
Total	10.9	63	21.7	4.4	100
Karni					
Sex	Age				Total
	15-20	21-40	41-60	61+	
Male	-	18.2	4.5	4.5	27.2
Female	-	36.4	27.3	9.1	72.8
Total	-	72.2	31.8	13.6	100

Source: Field data

As illustrated in table 3.2 below, most of these respondents are married and a few of them widowed. As will be shown later, marital status influences access to irrigation facilities among female respondents in both villages.

Table 3.2 Marital Statuse of Respondents (%)

Busa			
Marital status	Single	Married	Widowed
Male	10.9	47.7	2.2
Female	0	36.9	2.2
Total	10.9	84.6	4.4
Karni			
Marital status	Single	Married	Widowed
Male	0	22.7	4.5
Female	0	63.7	9.1
Total	0	86.4	13.6

Field data

Primary data gathered from irrigation farmers in the study villages suggest that access to these facilities is mediated by both the formal rules of the associations as well as informal forms of access to resources in these villages.

In Busa, most respondents acquired plots through transfer of use rights from their family members. These is because farmers who were in possession of plots on the 8 ha field used for well-based irrigation before dam rehabilitation retained and later transferred these plots to their sons and wives. Plots acquired through sharing are those on the additional 2 ha field, on the first come, first serve rule of the WUAs. The modes of access to irrigation facilities in the study villages are shown in table 3.3.

Table 3.3 Mode of Acquisition of Plots (%)

		Busa				
Sex	Mode of acquisition	Transfer from father	Transfer from husband	Sharing	Self-allocated	Influence of chief/custodian of land
	Male		41.1	-	8.0	11
Female		-	29.1	4.0	3	3.8
Total		41.1	29.1	12.0	14	3.8
		Karni				
Sex	Mode of acquisition	Transfer from father	Transfer from husband	Sharing	Self-allocated	Influence of chief/custodian of land
	Male		-	-	25.0	-
Female		-	11.8	54.1	-	6.9
Total		-	11.8	79.1	-	9.1

Field data

Under this rule, late comers are those that resorted to the existing practice of self-allocation of plots outside the irrigable field, where they rely on hand-dug wells. In Karni, most people acquired plots through sharing on the basis of first come first serve rule, because much of the existing 6.7 ha, well-based field was not irrigated due to lack of sufficient water.

It is significant to note that 3.8 % of female respondents in Busa and 9.1% in Karni (consisting of 2.2% blind males and 6.9% blind females) acquired plots through a chief and influential person respectively. The blind respondents in Karni said they were assisted by a Belgian social rehabilitation specialist, who also trained them in farming. Also, an important observation in Busa was that the main occupation of 6.1% of the respondents was non agricultural activities (i.e. civil service).

The plot per farmer is very small in both villages. As shown in table 3.4, the sizes of individual plots range from very small to 1½ acre. This is due to the large number of people sharing small irrigable fields. About 457 farmers share 12 ha in Busa and 220 shares 10 in Karni. The largest individual plots were mostly acquired through influential persons and transfer of use rights from family members. Therefore, the differences in plot size are associated with differences in access to land for irrigation in the two villages.

Table 3.4 Plot Sizes (%)

Plot size (acre)	Busa	Karni
Very small	11.0	-
¼	50.4	80.0
½	30.8	10.0
1 ½	7.8	10.0
Total	100.0	100.0

Field data

Information gathered from key informant interviews, focus group discussions and questionnaire show that farmers acquire water for irrigation through regular opening of canals by the executives of their associations. Water flows by gravity from reservoirs into the lateral canals, from which farmers collect water with buckets and water their crops using watering cans and perforated buckets. Other respondents depend on wells. Respondents are required by the rules of their associations, to pay irrigation facility maintenance fees and contribute labor for maintaining the canals. The executives are responsible for collecting fees and organizing labor. In Karni, respondents said each irrigation farmer pays an annual fee of Gh0.5 Cedi and in Busa the fee varies according to the total amount of money required for maintenance at any point in time. Users of hand dug wells maintain these, using own labour for desilting and further deepening to yield more water.

Information gathered from questionnaire and discussions with some members of the WUA of Busa indicate that uncooperative behavior of some members contributed to lack of maintenance of the canal. According to the respondents, and as noted in chapter 2, they made both financial and labour contributions and mended several cracks on the canal in 2001, which was the third year after the dam was rehabilitated. However, at the time of field work, it was observed that some broken portions of the canal were not repaired. This poor state of irrigation facilities is partly attributable to the link between the formal conflict resolution mechanism of the association and informal conflict resolution mechanisms in the society. According to some respondents (72%),

WUA executives could not account for the financial contributions meant for repairing the canal. They indicated that the WUA members declined to retrieve the money and remove the executives from office because such prescribed sanctions were in contravention of the norm of society to avoid causing embarrassment to community members. These executives were changed through an election out at the end of their tenure of office in 2005 but the new executives had not collected any fees for repairs at the time of field work for this study. Discussions with some WUA members and responses from a questionnaire survey indicated that refusal to pay maintenance fees resulted from the decline to sanction the executives who embezzled funds. As labour contribution is contingent upon financial contribution, refusal to pay maintenance fees led to the refusal to contribute labour in Busa.

However, in Karni where there was no case of financial malfeasance, it was observed that a broken part of the canal was not repaired. Discussions with water users revealed that financial contributions were too small, members were not willing to contribute more and no organization or individual provided financial assistance. As a result, water is not well distributed and often causes flooding of some plots.

The poor quality of irrigation facilities in the two villages has influenced access to irrigation. In Karni, all the irrigation farmers use the canal system. However, farmers said until five years after dam rehabilitation, the additional 3.3ha field was not irrigated because sufficient water could not flow to that part of the field. At the time of field work, it was observed that all the 10 ha field was irrigated. An indicator of inadequate water supply on some of the plots in Karni is the drilling of wells to collect water on flooded plots for irrigation. Consequently, 34.0 % of respondents in Karni said they have resorted to reducing flooding on their plots and storing water in this way for watering their crops.

In Busa, 77.7% of the respondents use the canal system for watering their crops while 22.3% use wells because their fields lie outside the irrigable field. 13.3% of those who use the canal system said they also use wells because water supply from the canal is insufficient. 72.7% of the users of wells said their wells sometimes dry up and when this happens they share wells with neighboring farmers and also use pumping machines to draw water from the reservoir for watering their crops. According to the respondents these machines are 8 in all, 2 of which they acquired from a deputy minister of state and parliamentary candidate in the 2008 elections and 6 from the Upper West Regional office of the Ministry of Food and Agriculture. Combined use of canals and wells illustrated in figure 3.1, indicate that access to water through the canal system is inadequate as figure 3.1 shows.

Figure 3.1 A Broken Canal in Karni



Figure 3.2 An Irrigation Well in Busa



In addition to these moderate increase in access to water, the increase in number farmers with access to irrigation is marginal in Busa and massive in Karni. At the time of field work, information obtained from the water users' associations indicated that their membership rose from 440 in 1997 to 457 in 2010 in Busa and 95 to 220 in Karni during the same period. The former represents a marginal increase in of 4% of farmers with access to irrigation due to an increase of the irrigable field by (25%). In the latter, the number of farmers increased by 131% after an increase in size of the irrigable field by 49 %.

However, it is important to note that, in Busa farmers whose plots lie outside the canal irrigated fields are not members of the WUA.

In the two villages farmers practice dry season irrigated crop growing between October and May. The commonly grown crops are vegetables such as tomatoes, pepper, okro, garden eggs, cabbage and beans. Other vegetables include lettuce, pumpkin, cucumber and water melon. Onion is grown only in Karni. Maize and rice are the commonly irrigated cereal crops in the two villages. Irrigated farm produce from Busa are mainly sold in Wa market and that of Karni are mainly sold within the village to market women who often come from Jirapa. According to the respondents in the two villages, prices are dictated by buyers (market women/queens) and often very low.

3.2 Uses of Irrigated Farm Income

Respondents in the two villages use their irrigated farm income for several purposes. The income of respondents range from Ghana Cedi 90.0 to 400 and the uses are presented in table 3.5. Respondents use their irrigated farm income to purchase food for consumption, invest in livelihood activities and provide other socio-economic needs. All the respondents said they consume part of their produce and close to 30% of them in each of the study villages use their irrigated farm income to purchase food for household consumption. In addition, about 4% of respondents in Busa and 23.5% in Karni invest part of their irrigated farm income in rain-fed farms through ploughing and acquisition of fertilizers. A further 13% in Busa and 9% in Karni said they invest their irrigated farm income in livestock rearing, which is relatively less sensitive to drought. More than 36% of the respondents said they invest in the education of their children and a similarly high percentage use part of their income for providing clothing. A few respondents also use their income to pay health insurance premiums, pay their personal debts, building houses and purchase motorbikes.

This expenditure pattern shows that food deficits have been reduced and income levels of respondents increased and some assets which were previously lacking are acquired.

Table 3.5 Uses of Irrigated Farm Income (%)

Use of income	Location	
	Busa	Karni
Invest income in rain-fed farming (plowing and fertilizer purchase)	3.8	23.5
Buy food for household consumption	27.8	29.6
Increase in household vegetable consumption	100	100
Building of houses	5.0	2.6
Acquisition of motorbikes	2.2	
Invest in rearing of small ruminants	13.0	9.0
Paying educational expenses of children	36.1	38.5
Paying health insurance premium	7.7	14.3
Paying debts	-	14.3
Buying clothes	30.0	25.9

Source Field data

The chapter has demonstrated that formal rules of the water users associations and informal forms of access such as membership of a family and relationship with influential persons mediated access to irrigation facilities in the two villages. An important revelation is that the application of formal rules of the water users associations did not result in the expected level of collective action among water users for maintenance of irrigation canals. In Busa, shared cultural norms among water users about the impropriety of putting a community member into shame resulted in a decline to apply prescribed sanctions of the water users associations on culprits of financial malfeasance and contributed to refusal of some respondents to pay irrigation facility maintenance fees. In spite of this opportunistic behavior, respondents in Busa acted collectively to acquire water pumping machines to improve access to water. In Karni, where respondents were not found to have broken their cultural norms, they did not comply with the formal rules of the water users association either. They did not contribute money and labor to repair the canal, but acted independently of each other to drill and use wells on flooded plots. From the data presented above it is evident that lack of collective effort among respondents is associated with both formal and informal institutions and the requirement of paying the full cost of repairing the poorly constructed and fast deteriorating canals. As a result there is a marginal increase in access to water. Respondents use their irrigated farm income to buy food, clothing, invest in rain fed farming, livestock rearing, health, education of children, and build houses.

Chapter 4

Approach and Impacts of the Irrigation Dam Intervention on Farmers' Livelihoods

According to Ostrom et al (1993):

A set of perverse incentives confront multiple actors involved in the design, finance, construction, operation, maintenance and use of rural infrastructure in developing countries. Where capital is invested in physical facilities the cause of failure could occur at any or all of the stages of the development process, there is no solitary easily identifiable cause. When rural infrastructure facilities are deteriorating rapidly soon after construction, some actors involved might have confronted a set of incentives that rewarded them or did not sanction them for actions that yielded an unsustainable investment (Ibid: 8). The rate of deterioration and perceptibility of a decline in the effectiveness of a facility are likely to affect the willingness of users to undertake maintenance activities (Ibid: 104)

Focusing on the decision making processes and underlying precepts, this chapter explores how the relations between institutional actors at multiple levels of the intervention shaped processes and outcomes and the extent to which poverty is reduced and respondents empowered to make livelihood choices to cope with drought. It also outlines what the study suggests in relation to the normative prescriptions underlying the intervention.

4.1 Approach and Outcomes of the Irrigation Dam Intervention

Decision making by institutional actors at multiple levels of the irrigation dam intervention has influenced processes and outcomes. One important decision made by IFAD, the donor agency, and to some extent, MoFA, the implementing agency, at the design stage of the intervention was to place responsibility for management of the irrigation dams exclusively on the shoulders of water users associations. These are based on assumptions that water users associations can make and enforce formal rules to ensure mutual cooperation in sharing of plots and distribution of water, contributing labor and money for maintaining irrigation canals. It is presumed that water users associations can apply sanctions on their members who may prove uncooperative and thus solve problems of malfeasance in irrigation management. As indicated in chapter 1, these assumptions are based on theories of new institutionalism, which see institutions as clever solutions to problems of malfeasance in economic life. These associations are then expected to replace state irrigation management institutions, which are perceived as corrupt and inefficient (Mehta 2000, Shivakoti and Ostrom 2002). For this reason, it is a form of decentralization.

An essential part of the responsibility of the associations is to bear the full cost of maintenance of the irrigation facilities. Apparently, full cost recovery is evoked as a market solution to irrigation water scarcity because inadequate wa-

ter pricing is considered as largely responsible for the latter (Mehta 2000: 9). In theory, full cost recovery is a tenet of liberalization, which is an aspect of the neo-liberal agenda. Amenga-Etego and Grusky (2005: 278, in McDonald and Ruiters 2005) observe that in Ghana, full cost recovery of maintenance of water facilities is being implemented to reduce central government budget deficit in conformity with the free market policies being pursued by donor institutions. It is therefore, evident that, pursuance of the full cost recovery agenda has been conflated in decentralization of irrigation management to water users. As Ribot and Larson observe, decentralization of resource management is often implemented with the “primary instrumental goals of intervening agencies or meeting donor demands” (Ibid: 2005:8). Also Moore and Schmitz’s observation of the motive of donor organizations lends credence to this argument.

The development community depends overwhelmingly for its funding on the major OECD countries, most of whose governments have become fully committed to global neo-liberalism. On the other hand it depends morally on the acute needs and deepening despair – or cynicism – of millions of ordinary people in underdeveloped countries. The development community has been caught in the middle; and one of the ways in which it has responded to its predicament has been to wrap its activities in thicker and thicker layers of rhetoric, in which participation figure (s) prominently (Ibid: 1995: iv).

Also, donor agency ulterior motive for project intervention is demonstrated by Ostrom’s observation that they are inclined towards favoring major capital goods expenditure projects in order to finish spending a particular year’s money to justify the need for continuous inflow of funds (in Shivakoti et al 2002: 21).

This incentive structure also influenced the quality of irrigation canals constructed in the study area. As Ostrom observes, the interaction of incentives has increased the level of corruption, due in part to the requirement that many donors must work with national governments so that grants and loans are sought out by national politicians, to achieve their “objective functions” which may vary from the objective functions of the official beneficiaries (Ibid: 21). This suggests that the decline of the International Fund for Agricultural Development to verify exaggerated claims by Ghana’s Ministry of Food and Agriculture of completed dam rehabilitation works as noted in chapter 2, was part of the desire of the former to disburse funds and justify continuous receipt of funding from donor governments. As available information about project implementation presented in chapter 2 suggest, the project support unit (consisting of MoFA staff) excluded NGOs from project implementation, negotiated with contractors to divert some project funds for personal benefits. This resulted in poorly constructed irrigation facilities in the two villages as highlighted above.

The incentive structure within the intervention shaped the extent of poverty reduction and empowerment of respondents. As the reviewed information above suggests the interaction of incentives between the International Fund for Agricultural Development and Ghana’s Ministry of Food and Agriculture resulted in the construction of the respondents as subjects of the empowerment process. The decisions to decentralize irrigation management to

the respondents in line with the principle of full cost recovery and institutions of collective action were made prior to 'consultation' with the respondents. Respondents' indication that they were only informed during the appraisal stage of the planned rehabilitation of dams denotes that the appraisal team of the International Fund for Agricultural Development, noted in chapter 2, did not adequately involve them in the project planning process. This in line with Amenga-Etego and Grusky's (2005: 280, in McDonald and Ruiters 2005) observation that donors have funded foreign consultants to produce studies favorable to water privatization in Ghana. Farmer resistance to rehabilitation works in Busa, as indicated in chapter 2, lends further credence to this argument.

Apart from weak participation of respondents in the planning process, the Ministry of Food and Agriculture was not accountable to the farmers for the irrigation facilities which constituted the resource on which empowerment pursued. Exclusionary decision making during implementation of the irrigation dam intervention for the purpose of diversion of some funds led to the construction of poor irrigation canals which placed a huge responsibility on respondents for maintenance. As Ribot and Larson 2005: 6) observe, downward accountability of central government (i.e. MoFA in this case) to local authorities (water users associations) is necessary for effective decentralization of resource management and mechanisms are required for local authorities to hold higher level bureaucrats accountable to them.

A complex web of factors; including farmer responsibility for paying the full cost of maintaining the poorly constructed and fast deteriorating canals, and the mediation of collective action through formal and informal institutions for the latter influenced the extent to which the intervention increased the capacity of respondents to cope with drought. First, water users' associations could not ensure the cooperation of the respondents for effective collective action for irrigation management because access to irrigation facilities was mediated by the formal rules of the latter as well as informal forms of access to resources. Apart from those who acquired plots through the first come first serve rule of the water users associations, those acquired through transfer of land use rights to family members, based on informal land tenure arrangements, without recourse to the associations, were uncooperative. Another uncooperative form of access was the use of influential persons as indicated in chapter 3. The use of these persons implies that access is also mediated by property relations and configurations of power, as De Haan and Zoomers (2005) observe. The women in Busa who acquired plots through their links with the chief (a traditional ruler) and *tendaana* (custodian of communal lands) did so because such persons wield enormous power in the village and were able to influence the enforcement of the rules of the association. The blind in Karni also acquired plots because they had links with a powerful person. These indicate that which individuals can be empowered depends on who gets access to irrigation but not necessarily who is poor or vulnerable to drought. As found in Busa, the main sources of livelihood of a few respondents are not vulnerable to drought because their main sources of livelihood are civil service activities.

Second broken canals are not repaired partly because the water users associations were unable to ensure effective collective action among members. As indicated in chapter 3, though contribution of irrigation fees in Busa depended on the estimated cost of maintenance, shared cultural norms among water users about the impropriety of putting a community member into shame resulted in a decline to sanction the executives of the water users association who indulged in financial malfeasance. On the grounds of this opportunistic behavior most of the respondents also acted opportunistically by refusing to pay irrigation facility maintenance fees. This situation contributed to the lack of maintenance of the irrigation canal in Busa. In spite of this, respondents in Busa acted collectively to acquire 8 water pumping machines to improve access to water. The use of these pumping machines has contributed to improved access to irrigation, especially among respondents who depend on wells, as indicated in chapter 3. However, in Karni, where each respondent paid a low annual irrigation maintenance fees irrespective of the cost of maintenance, problems of financial malfeasance did not arise, the amount was not enough to repair the broken canals, respondents were not unable to get external financial support. They acted independently of each other to drill and use wells on flooded plots.

The data presented in chapters 2 and 3 suggest that the poor quality of irrigation facilities and the responsibility of poor farmers for paying the full cost of maintenance are more important than lack of cooperation, in explaining lack of maintenance. As the situation denotes, lack of cooperation among respondents arose out of the need for collective action to repair the canals, which started deteriorating soon after completion of rehabilitation works. Lack of cooperation among respondents only contributed to deterioration of the canals but did not determine it. This is consistent with Smith's (1998: 199) observation that full cost recovery discourages utilization of services by the poor if such costs are high, services of poor quality and financial accountability lacking. Also Amenga-Eyego and Grusky (2005 281, in McDonald and Ruiters 2005) observe that majority of Ghana's population cannot afford to pay the market price of water because they earn less than US\$1 a day while high inflation leads to high cost of maintenance.

4.2 Impact of the Irrigation Dam Intervention on Farmers' Livelihoods

From the above, it is evident that incentives facing institutional actors at various stages of the intervention influenced access of respondents to irrigation facilities, exercise of agency and achievements in terms of changes in their capacity to cope with drought. Access to allocative resources (irrigation plots and water) in the two villages is associated with the distribution of authoritative resources. These are the International Fund for Agricultural Development and Ghana's Ministry of Food and Agriculture in that framed the irrigation intervention in line with principles of full cost recovery of irrigation maintenance and formal institutions of collective action. Authoritative resources also influenced the provision of poorly constructed irrigation canals.

The above factors interacted with cultural norms and institutions in complex ways to mediate access to and maintenance of irrigation facilities. These

forms of access imply that differences in level of poverty and vulnerability of respondents were not taken into account in the distribution of plots. Hence, in the case of Karni, where the blind, who gained access to irrigation facilities through an influential person, are a vulnerable group, some respondents in Busa are not, as indicated above. The increase in access to irrigation facilities among respondents is moderate. The increase in size of the irrigable field after dam rehabilitation led to a marginal percentage increase in the number of farmers in Busa and a massive increase in Karni as highlighted in chapter 3. Another indicator is the continuous use of wells within the irrigable area by a large number of respondents, as illustrated in chapter 3. However, it is important to note that the use of wells, particularly on flooded plots in Karni, can be partly attributed to the intervention. The flow of water from the broken canal is what necessitated such efforts. In spite of this, the benefits from such efforts are likely to be moderate because it is often argued that the output of a group (i.e. benefit of collective effort) is greater than the sum of the output of individual members. Because some of the respondents in Karni made efforts independent of each other to improve their individual access to water for irrigation, the total net benefits will be less than could have been achieved if they had contributed to repair the canals and improve access by the entire group. Such efforts have not succeeded in totally controlling flooding of irrigated fields since 34.0% of respondents said their plots often get flooded, as indicated in chapter 3. In Busa, shared cultural norms among respondents contributed to lack of maintenance of canals, as indicated above, while at the same time respondents acted collectively to acquire pumping machines and thus contributing to improved access to water among users of wells.

In spite of the low outcomes in collective agency, the intervention has significantly increased the capacity of farmers to make livelihood choices to cope with drought. The indicators of impact include the consumption of vegetables by all respondents, low percentage of respondents that used their irrigated farm income to provide food for household consumption, invest in rain fed farming and livestock rearing, as indicated in chapter 3. These are the first order choices and denote increased availability of food and diversification of the livelihood portfolios of respondents to increase output on rain-fed farms through ploughing and fertilizer application as indicated in chapter 3. Respondents also invested in livestock rearing, to reduce their vulnerability to drought since the livestock sector is less sensitive to the latter. Most of the respondents invested their irrigated farm income in the education of their children and acquisition of clothing. A low but significant number also used this income to pay health insurance premiums, build houses, purchase motor bikes and pay their debts. Since these second order choices are consequential upon the first order choices, the capacities of a large number of respondents have been increased to cope with drought. However, it is important to note that some of the respondents are less vulnerable to drought as their main sources of livelihood are non agricultural activities.

From this, it is evident that the level of empowerment is low. The requirement to recover the full cost of maintaining the poorly constructed irrigation facilities, which resulted from power relations within institutional arenas highlighted above deprived respondents of adequate access to irrigation facili-

ties. On their part the respondents were not able to ensure effective collective action to gain adequate access to irrigation facilities. Therefore, powerlessness on the part of the respondents and deprivation of adequate access to irrigation facilities by the International Fund for Agricultural Development and Ghana's Ministry of Food and Agriculture have resulted in low empowerment of respondents, who are physically exposed to low risk of drought. Hence the level of vulnerability of respondents to drought is now low.

Also, increased access to irrigation contributed to poverty reduction. As respondents are now able to provide more food, diversify their livelihood portfolios, invest in health, education and housing, acquire more clothing and motorbikes; their poverty level has been reduced. However, respondents are still poor because they are deprived of adequate access to irrigation and are powerless to increase access on their own.

This chapter has shown that perverse incentives have shaped the processes and outcomes of the intervention and influenced the extent of empowerment and poverty reduction among respondents. First the International Fund for Agricultural Development influenced the framing of the intervention on the principle of full cost recovery of irrigation maintenance in order to satisfy the conditionalities of its funding governments. Ghana's Ministry of Food and Agriculture framed the intervention on this approach in order to satisfy the funding conditionalities of the former. Also, available information suggests that the ministry diverted some project resources, resulting in poorly constructed canals. Consequently, respondents were not able to repair the canals because the cost is high and shared cultural norms and institutions were unable to ensure the payment of irrigation maintenance fees. In Busa, shared cultural norms about the impropriety of exposing a community member into shame contributed to financial malfeasance and refusal to pay irrigation maintenance fees. At the same time, respondents acted collectively to acquire water pumping machines. In Karni, where there was no such opportunistic behavior, there was no collective action either. Also, the formal and informal rules of access to irrigation were not able to consider differences in poverty and vulnerability to drought. The intervention made a low impact on the capacity of respondents to cope with drought. While access to food has increased, livelihoods diversified and some income invested in health, education, housing and clothing, respondents have been deprived of adequate access to irrigation and cannot improve it on their own. Hence the level of empowerment, reduction of poverty and vulnerability are low. The chapter has shown that the intervention was based on tenets of neo-liberalism and institutions of collective action. It has also demonstrated that the outcomes of the approach are related more to the power relations in which the intervention was framed and less to the complex relations between cultural norms and institutions in the study villages. This chapter has shown that global political and economic relations between Ghana and the International Fund for Agricultural Development, and unavoidably, the countries that fund the latter, and rent seeking as well as the inability of water users to ensure collective action were the factors that contributed to the low increase in the capacity of respondents to cope with drought.

Chapter 5

Conclusion

The intervention made a low impact on the capacity of farmers to make livelihood choices to cope with drought. The capacity of individual respondents has been increased and they all consume some of the vegetables they produce. They also use part of their irrigated farm income to purchase food and thus reduce food deficits. Respondents invest part of their income in rain fed farming to increase food production and in livestock rearing to reduce risk of drought. Individual respondents also use their irrigated farm income to pay the educational expenses of children and buy clothes. Some also invest in health insurance to improve their health, building houses, buying motorbikes and servicing their debts.

In spite of these achievements, there is a low increase in the capacity of respondents to make livelihood choices to cope with drought. Respondents in the two villages are deprived of adequate access to irrigation facilities by the International Fund for Agricultural Development, which funded the intervention, and Ghana's Ministry of Food and Agriculture, which took part in the design and implementation, and are powerless to act collectively to ensure increased access. This is a result of perverse incentives facing institutions at all stages of the intervention. First the International Fund for Agricultural Development influenced the framing of the intervention on the neo-liberal tenet of full cost recovery, in order to satisfy the conditionalities of its funding governments while at the same time tailoring it towards empowerment of the respondents, who are poor and vulnerable to drought. In order to receive funding, Ghana's Ministry of Food and Agriculture framed the intervention in line with this tenet. Theories of institutions of collective action were then used in an attempt to ensure that water users' associations manage the irrigation facilities in accordance with this market principle by applying formal rules to ensure the cooperation of members in payment of collect fees and contribution of labor for maintaining the irrigation facilities. Available information suggest that the Upper West Regional office of the Ministry of Food and Agriculture diverted part of project funds meant for rehabilitation of the dams, resulting in poorly constructed and rapidly deteriorating canals.

While this deprived the respondents of adequate access to irrigation facilities, complex interactions between the project-specific formal institutions (i.e. water users' associations), and informal institutions in the study area in relation to full cost recovery resulted in lack of maintenance of irrigation canals. Complex interaction between the water users' association and local cultural norms in Busa produced two contradictory irrigation management outcomes. Though the determination of irrigation maintenance fees in this village was appropriate, based on the estimated cost, financial malfeasance contributed to lack of maintenance. The shared cultural norm of avoiding putting a community member into shame resulted in the decline to sanction the executives of the water users' association who indulged in financial malfeasance. This contributed to lack of maintenance of irrigation facilities as many respondents subsequently refused

to pay irrigation facility maintenance fees. However, unlike Ostrom's claim that opportunistic behavior makes it difficult to achieve collective action, the respondents in Busa acted collectively, in spite of this challenge, to acquire water pumping machines to improve access to irrigation. In Karni, the water users' association failed to charge irrigation maintenance fees at market price and respondents were unable to act collectively in any other way to repair the canal. Irrigation maintenance fees were a fixed amount, irrespective of the cost of maintenance, were not enough to repair the canals. Here, financial malfeasance did not arise but there was no collective action either. Respondents acted individually to drill and use wells, with the output of each of these respondents, lower than it could possibly be if they were able to act collectively to repair the canals.

The inability of water users associations in Busa and Karni to act collectively to repair the irrigation canals and increase access to irrigation indicates that outcomes of the approach of institutions of collective action for full cost recovery are related more to the power relations in which the intervention was framed than to the complex relations between cultural norms and institutions in these villages. The narrow focus on water users' associations as irrigation management institutions led to the failure to take into consideration the complex interrelations between the former and cultural norms, which contributed to lack of maintenance of canals in Busa. Contrary to normative prescriptions the water users' associations in both villages were not able to charge irrigation maintenance at market prices to repair the canals.

Also, it is not just user management of irrigation facilities that led to lack of maintenance and inadequate access but the power relations within which the intervention was framed. Therefore, lack of maintenance of irrigation canals by the water users associations is more related to the power relations and narrow concept of institutions of collective action as well as the principle of full cost recovery. These led to deprivation of respondents of adequate access to irrigation facilities under conditions in which they were not able to effectively act collectively to improve access. This has resulted in low empowerment, evidenced by the low improvement in access to irrigation as a livelihood choice among respondents to cope with drought. Though poverty is reduced respondents are still poor because they are deprived of adequate access to irrigation, by virtue of which they are still vulnerable to drought. The low impact of the intervention on the capacity of respondents to cope with drought is more a result of deprivation by the institutions involved in the design and implementation, which shaped the functioning of the institutions of collective action and underlying principle of full cost recovery on which it is modeled. Low collective action in irrigation management was to a large extent more dependent on deprivation and less to inability of institutions to control individual behavior.

This low impact of the intervention is therefore linked to global political and economic factors, rent seeking and the inability of water users to ensure collective action. Thus the normative focus on water users' associations as efficient irrigation management institutions is a result of the failure to address the power relations that shaped the outcomes and impacts of the intervention.

References

- Amenga- Etego, R. N. and S. Grusky (2005), *The New Face of Conditionalities: The World Bank and Water Privatization in Ghana*, in McDonald, D. A. and G. Ruiters (eds) *The Age of Commodity: Water Privatization in Southern Africa*.
- Assan K. J., C. Caminade and F. Obeng (2009), *Environmental Variability and Vulnerable Livelihoods: Minimising Risk and Maximising Opportunities for Poverty Alleviation*. 21, 403-418 Department of Agricultural Economics University of Liverpool UK
- De Haan, L. and A. Zoomers (2005), *Exploring the Frontier of Livelihood Research*. *Development and Change*, 36(1), 27-47
- De Sardan, J. O. (1988), *Peasant Logics and Development Project Logics* Centre National de la Recherche Scientifique, Montpellier, France
- Cleaver, F. (1999), *Paradoxes of Participation: Questioning Participatory Approaches to Development*. *Journal of International Development* 11, 597-612
- Ghana Statistical Service (2005), *2000 Population and Housing Census, Upper West Region: Analysis of District Data and Implications for Planning*
- Ghana Statistical Service (2007), *Pattern and Trends of Poverty in Ghana: 1991-2006*
- Ghana Statistical Service (2004), *Ghana Demographic and Health Survey, Accra*
- Ghana Statistical Service & Ghana Health Service (2008), *Ghana Demographic and Health Survey: Preliminary Report, Accra*
- IFAD (2007), *IFAD Strategic Framework 2007-2010*, Rome
- Impact Assessment of the Upper West Agricultural Development Project (2003), Wa
- Kabeer, N. (1999), *Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment*. *Development and Change* 30, 435-464
- Laws, S., C. Harper, and R. Marcus (2003), *Research for Development, a Practical Guide*. London, Sage and Save the Children
- Lund, C. (2006), *Twilight Institutions: An Introduction*. *Development and Change*, 37(4), 673-284, Oxford UK
- Mehta, L. (2000), *Water for the Twenty- First Century: Challenges and Misconceptions*. IDS Working Paper 111. Institute of Development Studies
- MoFA (2002), *Food and Agricultural Sector Development Policy, Accra*
- MoFA (2002), *2002 Annual Report of the Upper West Agricultural Development Project*
- MoFA (2001), *2001 Annual Report of the Upper West Agricultural Development Project*
- MoFA (2007), *Food and Agricultural Sector Development Policy II, Accra*
- MoFA and WFO (2009), *Northern Ghana Food Security and Nutrition Monitoring System, Bulletin*
- Moore, D. B. and G. J. Schmitz (1995), *Debating Development Discourse: Institutional and Popular Perspectives*. Macmillan Press Ltd London
- O'Laughlin, B. (1998), *Interpreting Institutional Discourses*. In: Thomas, A. C. Joanna, and M. Wuyts (eds), *Finding Out Fast: Investigative Skills for Policy and Development*, London
- O'Leary, Z. (2009), *Researching Real World Problems: A Guide to Methods of Inquiry*, London

- Owusu, K and P. Waylen (2009), Trends in Spatio-temporal Variability in Rainfall in Ghana (1951-2000), Royal Meteorological Society, 64 (5)
- Ostrom, E. (1992), *Crafting Institutions for Self-Governing Irrigation Systems*, San Francisco California
- Ostrom, E. (2006), *Governing the Commons: The Evolution of Institutions for Collective Action*, New York
- Ostrom, E. (2002), *The Challenge of Underperformance*, in Shivakoti, G. P. and E. Ostrom (eds) *Improving Irrigation Governance and Management in Nepal*, Oakland California
- Ostrom, E., L. Schroeder, and S. Wynne, (1993), *Institutional Incentives and Sustainable Development: Infrastructure Policies in Perspective*, San Francisco
- Republic of Ghana (2005), *Interim Evaluation Report of the Upper West Agricultural Development Project*
- Ribot, J. C. (2002), *African Decentralization: Local Actors, Powers and Accountability*, United Nations Research Institute for Social Development
- Ribot, J. C., and A. M. Larson (2005), *Democratic Decentralization through a Natural Resource Lense: An introduction* in Ribot, J. C., and A. M. Larson(eds) *Democratic Decentralization through a Natural Resource Lense*, London
- SEND Ghana (2009), *Investing in Smallholder Agriculture for Optimal Results: The Ultimate Policy Choice for Ghana*
- Smith, B.C. (1998), *Participation without Power: Subterfuge or Development?* *Community Development Journal*, 33 (3), 197-204, Oxford
- Tesfaye, A., A. Bolgale, R. E. Namara and D. Bacha (2008), *The Impact of Small-scale Irrigation on Household Food Security: The Case of Filtino and Godino Irrigation Schemes in Ethiopia*. *Irrigation and Drainage Systems* 22, 145-158
- UNDP (2006), *‘What is Poverty? Concepts and Measures’* International Poverty Centre, *Poverty In Focus* 9, 1-19
- WB, FAO and IFAD (2009), *Upper East Region Land Conservation and Smallholder Rehabilitation Project, Ghana: Gender in Agriculture Source Book*, International Bank for Reconstruction and Development/World Bank, Washington DC
- Van der Geest, K. (2002), *“We are Managing” Vulnerability and Response to Climate Variability and Change Among Rural Households in Northwest Ghana* (M.A Thesis) University of Amsterdam Faculty
- Wisner, P., P. Blaikie, C. Terry, and D. Ian (2003), *At Risk: Natural Hazards, People’s Vulnerability and Disasters*. Second Edition
- Woodhouse, P. (1998), *‘Thinking with People and Organizations’*, In Chataway, T. A. J. and M. Wuyts (eds) *Finding Out Fast: Investigative Skills for Policy and Development*, London

Appendices

Key Informants Interview Guide: Staff of Ministry of Food and Agriculture (MOFA)

1. What is the objective of (the irrigation component) UWADEP?
2. Is this linked to any development policy objective?
3. What specific is this ?
4. Was a needs assessment conducted before commencement of UWADEP?
5. What facilities does the irrigation dam consist of?
6. What are the other components of UWADEP?
7. What are the linkages between these and the irrigation component?
8. Who managed the project?
9. How was this constituted?
10. What are the functions of this management body?
11. Are there water users' associations in the communities?
12. Who formed these associations?
13. How were these formed?
14. What are the roles of WUAs in the management of the irrigation project?
15. Are there some formal and informal rules and regulations for distribution of irrigation water and land to farmers?
16. What are these rules& regulations?
17. Do all willing farmers have access to water and land for irrigation?
18. Why?
19. Where do irrigation farmers sell their produce?
20. Are there any special arrangements for selling these produce?
21. Who made these arrangements?
22. Do farmers face any challenges in marketing their produce?
23. Has irrigation farming lead to changes in income level of farmers? What are these changes, if any?
24. Do farmers engage in other income generating activities other than farming? Why?
25. Is all the irrigable area been cultivated? If not, what is the size of the (un)cultivated area? Why?

Open Questionnaire: Irrigation Farmers

This questionnaire is part of a data collection process for researching the impact of the IFAD funded irrigation dam intervention on the livelihoods of farmers in the drought prone Upper West Region of Ghana. The research is in partial fulfillment of requirements for the award of a Master of Arts Degree in Development Studies, Environment and Sustainable Development Specialization at the Institute of Social Studies. The information you provide is important and confidential

1. Personal Data
 - Age
 - Gender: Male Female
 - Marital status: Married Single Divorced.....
Others (specify).....
 - Level of education attained
 - Religion
.....
2. Do you practice irrigation farming? : Yes
No.....
3. How did you acquire land for irrigation farming?
.....
4. What is the size of your irrigated farm?
.....
5. How do you gain access to irrigation water?
.....
6. What crops do you cultivate?
7. What are the cultivation practices?
8. Do you have access to sufficient water for watering your crops?
Yes..... No.....
Why.....
.....
9. Do you belong to a water users' association?
10. Has your association helped you to gain access to irrigation water and land?
If yes, in what ways?
If no, why
11. Do you pay for irrigation water?
 - If yes:
How much?
.....
How often?
.....
.....

- If no, why?
12. Who maintains the irrigation facilities?
.....
 13. How do they maintain the facilities?
.....
.....
.....
 14. Are the facilities well maintained?
.....
 15. Why
.....
.....
 16. Where do you sell your produce?
 17. Are there some special arrangements for marketing your produce?
 18. Who made these arrangements?
 19. What challenges do you face in marketing your produce?
.....
 20. What do you use your irrigated farm income for?
.....
.....
- 21 Has irrigation farming lead to changes in your income level? Yes (specify)..... No
- Why.....
.....
- Do you engage in other income generating activities other than farming? If yes, name these activities.....
 - How often do you engage in these activities? All the time..... During the dry season..... when such opportunities are available.....
22. Why do (n't) you engage in these nonfarm activities?
 23. Are there other issues of irrigation farming in this community that you would like to tell me?