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Paper Summary

Increasing Access to Irrigation: Lessons Learned from Investing in Small Reservoirs in Ghana

Regina Birner, Nancy McCarthy, Ricky Robertson, Douglas Waale, and Eva Schiffer

Background

Increasing smallholders' access to irrigation is an important strategy to promote a green revolution in Africa. It is widely acknowledged that the potential for irrigation on the continent is largely underused, which is also the case for Ghana. Yet, it is an open question as to what strategy is most suitable to increase access to irrigation in a particular region. What are the advantages and disadvantage of different options such as large-scale reservoirs, small-scale reservoirs, groundwater irrigation, pumping water from rivers; and other methods? And which factors influence the comparative advantage of these different investment options in a given situation? Among these options, small-scale reservoirs have received considerable attention in recent years, because they promise to avoid the governance challenges that have affected large-scale irrigation projects in Africa in the past (Rydzewski, 1990; Biswas, 1987; Alam, 1991). These governance challenges include problems in procurement and construction that result in high costs of providing the required irrigation infrastructure. The Tono irrigation scheme is an example of this problem (Laube, 2006). There is also the hope that it is easier to maintain and manage small-scale reservoirs since these functions can be devolved from state agencies to local water user associations. However, whether investing in small reservoirs is indeed able to fulfill these promises is an empirical question. Some authors have cast doubt on the sustainability and economic profitability of small reservoirs (Aberra, 2004), but the available evidence is rather scarce.

Objectives of the study

This note summarizes the findings of a case study that was conducted in the Upper East Region of Ghana with the objective to throw light on the question whether small-scale reservoirs can avoid the governance challenges that are often associated with large-scale reservoirs, such as problems in procurement, construction, management and maintenance. The study also aimed at identifying strategies to increase the effectiveness of investing in small-scale reservoirs, considering that investing in small reservoirs plays an important role in several donor-funded strategies to promote agricultural development in Ghana. The case study was conducted as part of a project financed by the Challenge Program on Water and Food, which was implemented in the Upper East Region of Ghana.

Research methods

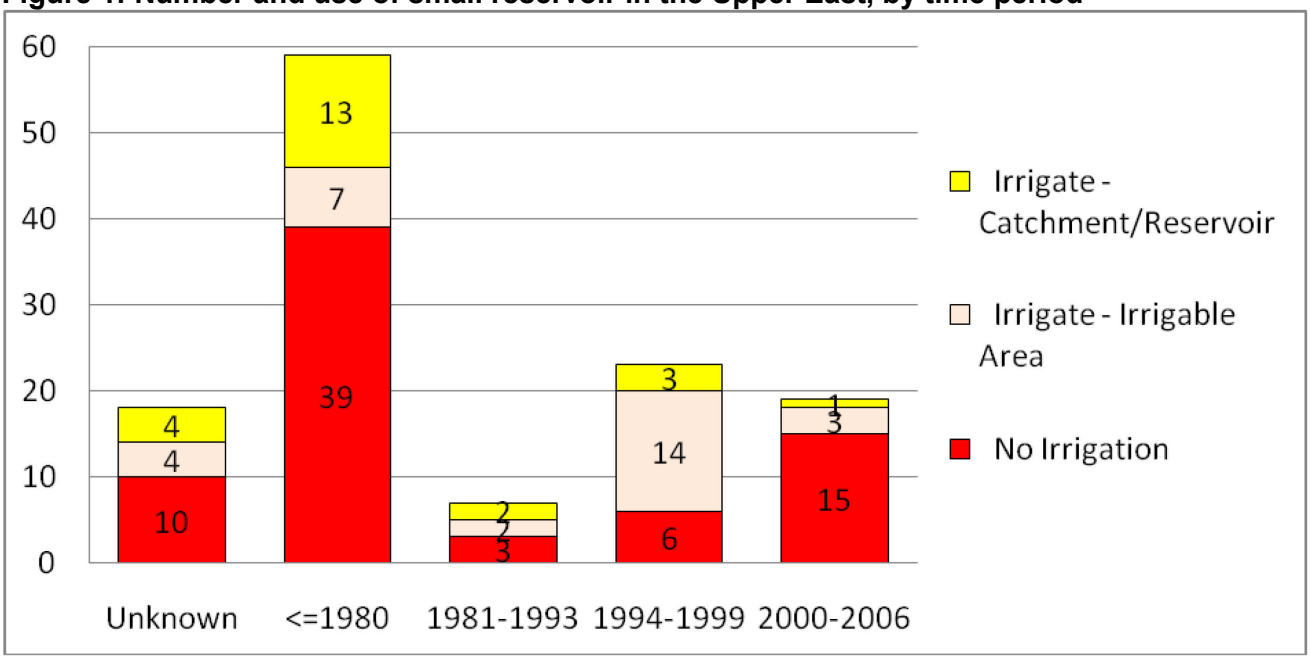
The study combined quantitative and qualitative research methods. Based on government statistics and a satellite image, 126 small reservoirs were identified in the Upper East Region. All reservoirs were visited for data collection. According to available data, they represent approximately 75% of the existing small reservoir in the Upper East. A "Quality of Infrastructure" questionnaire was used, which captured observable characteristics of the small reservoirs, such as the state of erosion of the dam walls, the existence of canals, and whether crop cultivation takes place. Additional information was collected from members of the local communities, such as year of construction. In 31 cases, a Water User Association (WUA) was in charge of managing the small reservoir. In these cases, a WUA representative was interviewed, focusing on the structure and functioning of the association in managing and using the small reservoir. Data from 31 WUAs were collected. In addition, key informant interviews were held with actors involved in the construction of small reservoirs, including contractors.

The survey data were used together with other geographical data, such as population density, soil quality, travel distance to markets, to conduct an econometric analysis of the factors influencing the functioning of small reservoirs. Based on the preliminary findings from the survey, a technique called “Process Net-Map” was applied to better understand the governance issues involved in constructing small reservoirs. This method is described in more detail below.

To what extent are small reservoirs actually used for irrigation?

As shown in Figure 1, the survey of the small reservoirs indicated that the share of small reservoirs that are used for irrigation in the irrigable area differed considerably depending on the time period in which they were established. Some reservoirs are used for irrigation in the catchment or reservoir area, which is an undesirable practice.

Figure 1: Number and use of small reservoir in the Upper East, by time period



Source: IFPRI Water Challenge Project Survey, 2006/2007

The figure shows that a disturbingly high number of reservoirs that were constructed or rehabilitated in the period between 2000 and 2006 (15 out of 19) were not used for irrigation. The majority of the elder reservoirs (constructed or rehabilitated before 1980) were not used for irrigation either.

Which factors influence the functioning of small reservoirs?

To answer this question, an econometric analysis was conducted using the survey data and spatial information. This analysis showed that irrigation in the designed area is significantly higher in locations with better quality construction, with greater water availability and with better soil quality. Irrigation in the irrigable area is also more likely to occur in isolated areas. Irrigation in the catchment/reservoir area is more likely to take place in locations with higher population density.

An econometric analysis was also conducted to identify the factors associated with maintenance and protection activities for the small reservoirs. This analysis showed that dams constructed with concrete spillways—as an indicator of quality of construction—were more likely to have stable dam walls, to have trees or grasses planted in the catchment, and have more collective activities related to the maintenance of the reservoir overall. Better soil quality was also associated with more collective activities, whereas the degree of isolation

of the dam site and population pressures had no statistically significant impact on any of these variables.[1]

Box 1: Construction problems affecting the functioning of small reservoirs

The survey showed that out of 19 small reservoirs that were constructed in the period between 2000 and 2006 in the Upper East, only three were used for irrigation in the irrigable area. The visits to the reservoir sites revealed the following problems that hindered the use of the reservoirs for irrigation.

- At 6 sites, work was never completed even though it began in 2002-2004; canals in particular were often not finalized.
- At 5 sites, canals are already broken or choked with weeds.
- At 4 sites, the water level was already too low to flow through canals. According to the respondents, this was mainly due to seepage and siltation.
- At 1 site, the canal pipe was poorly placed and will never function without replacement.
- At 1 site, canals were not built.

In additional 2 sites, the respondents noted that no irrigation took place, but it remained unclear why not. These findings indicate that construction problems are a major challenge, even though maintenance issues (lack of cleaning of canals; prevention of silting) also play a role.

The survey data also revealed major construction problems for the reservoirs constructed between 2000 and 2006 (Box 1). In particular, canals were often not built or not finalized years after the construction had started, or reservoirs did not fill to a level that would allow for irrigation. In view of these problems, further research was conducted to better understand the governance challenges of the construction process.

What are the governance challenges in constructing small reservoirs?

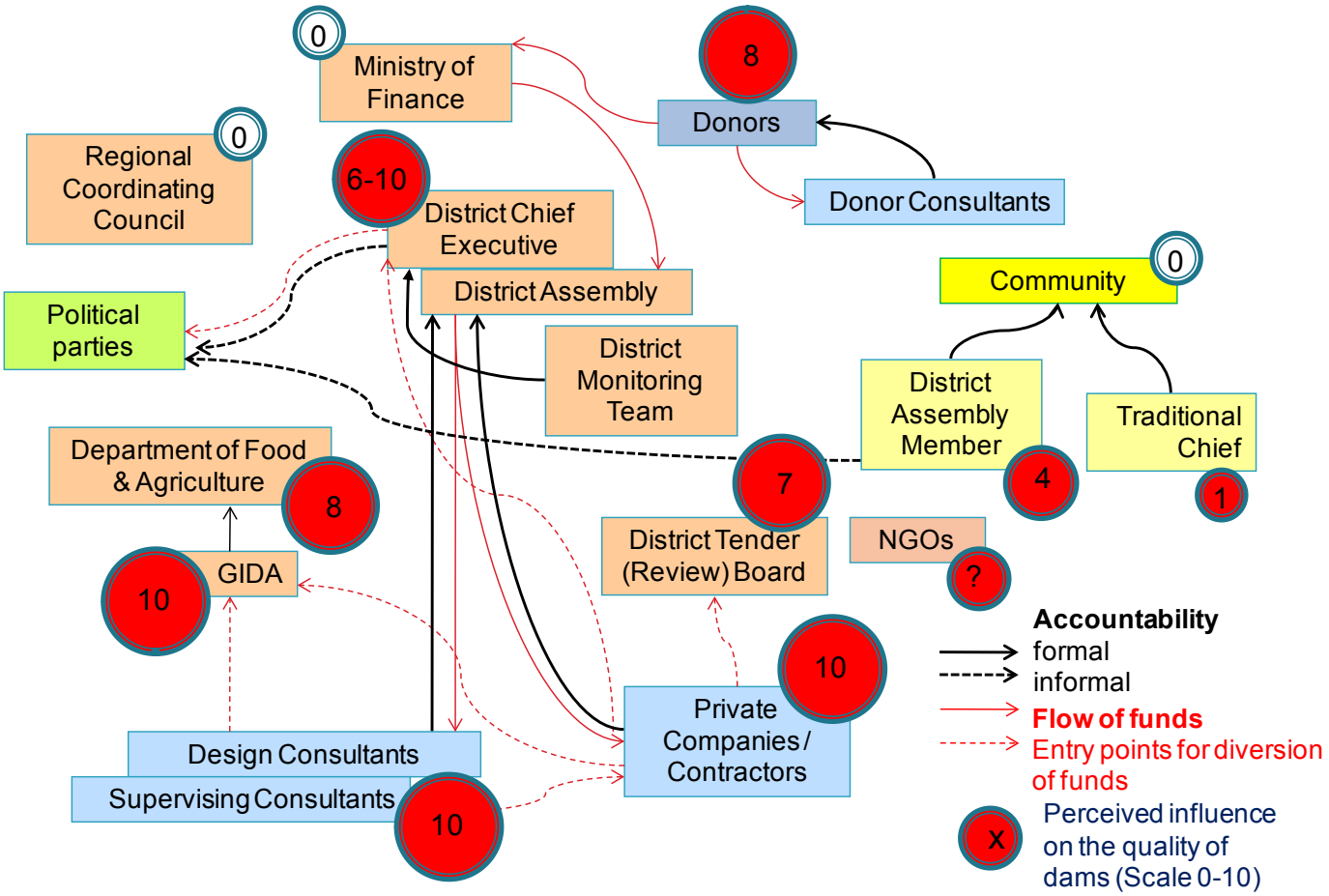
The survey indicated that problems in the construction of small reservoirs are a major challenge (Box 1), especially for reservoirs that were constructed more recently. To better understand the governance challenges leading to construction problems, the Process Net-Map method was applied.[2] The method was first used with a stakeholder focus group that included members of the different government agencies involved, academics, and NGO and farmer representatives. The method was carried out in the following manner: Group members first identified the different steps in the construction of a small reservoir, starting from the planning phase. All actors involved in the process were noted on a large sheet of paper. The different interactions between the actors, such as flows of funds, supervision, etc., were indicated by arrows between the actors, using different colors. Subsequently, the focus group members identified how much influence on a scale from 1 to 10 the different actors have on the ultimate outcome, i.e., the quality and functioning of the small reservoirs. These "influence numbers" were also noted on the paper. Using this map as a basis, the focus group then discussed where the major problems in the process occur, and what strategies could be applied to deal with this problem. For triangulation, a similar mapping was also conducted individually with two key informants.

Figure 2 indicates the fund flows and the relations of accountability. The funds flow from the donor agency to the Ministry of Finance, and from there to the District Assembly. The Regional Coordinating Council is informed about the process, but not involved in the handling of the funds. The funds are disbursed from the district administration in tranches. The release is conditional on the report of the supervising consultant that the work was carried out correctly. The district administration also has a monitoring team, which includes the District Engineer and the head of the District Office of the Ministry of Food and Agriculture (MoFA). The District Chief Executive relies on the monitoring team for the supervision of the work. If consultants are hired for design and supervision, they are also contracted by the district administration. If the Ghana Irrigation Development Authority (GIDA) is hired for that purpose, funding is provided to GIDA.

[1] The econometric analysis was led by Nancy McCarthy. Ricky Robertson contributed to the analysis, in particular to the spatial dimension.

[2] Process Net-Map is a version of the Net-Map method developed by Eva Schiffer (http://netmap.ifpriblog.org/).

Figure 2: Accountability relations, and fund flows, and perceived influence of different actors in the construction of small reservoirs



According to the interview information, hiring of consultants is typically the preferred option. The original idea of introducing this option may have been to create competition with GIDA. In practice, however, it appears that the consultancies "informally" hire GIDA staff to carry out the respective design and supervision activities, since they do not have their own personnel with the respective expertise. In some cases, NGOs are involved in the process, and have financed the construction or rehabilitation of a few small reservoirs. In other cases, they have played a role in sensitizing the community, or in providing information on problems related to reservoirs.

Figure 2 also displays the level of influence on the ultimate quality of the reservoir, as perceived by the focus group. The figure provides important clues regarding the problems in the construction of the small reservoirs. Even though there is a strong rhetoric about community involvement, the focus group agreed that in practice, communities cannot really influence the quality of the reservoir construction at all (indicated by the zero influence level in the diagram).

The two actors that have the strongest influence on the quality of the reservoir are the contractors, the consultants in charge of design and supervision, and GIDA. Among those who have influence, only the elected District Assembly members and the local chiefs are directly accountable to the local communities. These actors have, however, also a relatively low level of influence, since they are not formally involved in the supervision of the work and are not required to sign off when the contractor hands over the reservoir.

Similar to other studies, the study findings indicate that, since the District Chief Executive is appointed, he or she is accountable to the political party in power at the national level. Even though the local government system is non-partisan, elected District Assembly members are also to some extent accountable to the political parties that support them. The political parties have to satisfy the voters, but this accountability link is rather generalized and does not seem to contribute much to an improved quality of small reservoir infrastructure.

The process Net-Map was also used to discuss potential entry points for the “leakage” or “diversion of funding”, which may contribute to the low quality in infrastructure construction. It is important to emphasize that the study aimed at identifying potential problems that generally exist in the current system. The study did not intend to investigate any particular case. According to key informant interviews, the District Chief Executive is typically expected to contribute to political party financing, and funds from public infrastructure projects may become a source for this purpose, which constitutes one potential entry point for leakages.

Another potential entry point stems from the fact that private companies often contribute to election campaigns, and are afterwards “compensated” afterward with preferential access to contracts. According to the information collected from key informants, the contracting process is also often subject to an informal “10 percent rule”, according to which different actors involved in the process receive 10 percent of the funding. According to the interviewed contractors, the funds that are available in the end are hardly sufficient to construct the reservoir according to required standards. Figure 2 indicates some other potential entry points for leakages. Contractors may have incentives to make side-payments to the consultants who are supposed to supervise their work. In case of small reservoirs, supervisors need to be on-site daily during construction; otherwise it is very difficult to assess construction quality.

Collusion between the supervisors and the contractors seems to be more difficult for consultants that the donor agencies themselves hire to put additional checks on the system. Because of this reason, donors that hire their own consultants are perceived to have a rather high influence on the quality of the reservoir (influence level 8 of 10).

The focus group members had different perceptions regarding the actual influence that the District Chief Executive has on the quality of infrastructure provision, ranking it between 6 and 10. The DCE has to rely on his monitoring team to be able to influence the quality of the construction work, and the effectiveness of this team seems to vary across districts. Unlike the supervising consultants, however, members of the monitoring team are not able to make daily visits to the construction site.

One key informant also indicated that a major problem leading to low construction quality is the lack of liability. There is a six-month period during which a share of the contract sum is withheld in case of quality problems. However, for problems that become apparent after this period, there are no legal consequences for the contractor, or anyone else involved, if a reservoir cannot be used for irrigation.

Possibilities for local communities to monitor the construction process are confronted with several problems. Their signature is not usually required when the reservoir is handed over by the contractor, except in cases where donors make this a requirement. Moreover, there are limitations regarding the technical knowledge that is required for monitoring. Collective action problems and uncertainty also reduce incentives for community-based monitoring, since individual community members may not be sure whether or not they will ultimately benefit from the reservoir.

Policy Implications

Placement of Small Reservoirs

The econometric analysis has some important implications for the placement of small reservoirs, which deserve further considerations. Favorable agro-ecological conditions are associated with more irrigation in the irrigable area, and with more management activities. This may be linked to the

higher returns to labor in such areas. If this association is valid, policy makers would need to carefully consider the strategy of irrigating lower quality land as it may not be a sustainable options. The study also found that small reservoirs that are more isolated (larger distance to towns) are more likely to be used for irrigation in the irrigable areas, which may be linked to lower opportunity costs for labor—which matters both for cultivation, and for the undertaking of the collective action activities required to maintain and mange the reservoirs. These geographic factors certainly require further consideration in the construction of future small reservoirs.

Approaches to address governance challenges

Strengthen Water User Associations: Using a community-based approach, by supporting Water User Associations (WUAs) has been the predominant strategy for the management of the small reservoirs. The findings indicate some challenges of making this approach sustainable, as only 31 functioning WUAs could be identified for the 126 surveyed small reservoirs. Apart from their role for the management and maintenance of small reservoirs, WUAs could also play a stronger role in overcoming the governance challenges in the construction process. Involving the communities from the design stage onward more actively in the process may be useful, because they are the ones who have the strongest stake in the functioning of reservoirs. When handing over the reservoir, it would be useful to formally require the signature of the WUA leadership. Increasing the capacity of community members to monitor the construction is another strategy. This may require training WUA members for that purpose. New technologies, such as using pictures of the construction process taken with cell phones might also be applied.

A more far-reaching approach, which follows the "community-driven development" paradigm, would transfer the authority to handle the funding for the small reservoirs to the WUAs, and use a *community-contracting* procedure. However, one needs to be careful not to pass the entire management and supervision burden on the local community, expecting their voluntary contributions, without making stronger efforts to resolve the problems that exist on part of the experts who are officially responsible and paid for this purpose.

Strengthen the role of elected District Assembly Members. The elected District Assembly members could play a more formalized role in the monitoring process, since their stakes in the outcome in terms of the quality of small reservoirs are more closely aligned with those of the community members than is the case for other actors involved. District Assembly members could also play a mediating role between community members and contractors by communicating concerns and problems to contractors with more authority than community members are able to. However, since they have many obligations and their time is not paid, it does not seem to be a good strategy to overburden them with the demanding task of monitoring small reservoir construction. Still, to create additional checks and balances, it would also be useful to also require the signature of the District Assembly member, as the elected representative of the communities, before handing over a small reservoir.

Involve traditional authorities: Since the traditional chiefs are typically respected in rural Ghanaian society, they could also exercise more influence, for example, by making public statements on their expectations regarding the quality of small reservoir construction. It may also be a useful strategy to require the signature of the chief when handing over a reservoir.

Involve NGOs: In villages where NGOs and development workers are active, they could play an important role by sensitizing the community before the project starts, and by alerting the community about potential problems. They could also engage in advocacy for selecting good contractors and play a "watch dog" function for contractors and supervising consultants.

Strengthen the role of the District administration: In principle, the district administration could blacklist and publicize non-performing contractors. The challenge of this approach is to overcome the political obstacles to this measure, since non-performing contractors may play an important role in political campaign

financing. It may also be useful to improve the technical capacity of District Assembly monitoring team, since its members are not usually specialized in irrigation infrastructure.

***Create stronger incentives for GIDA and consultants*:** The staff of GIDA plays a particularly important role with regard to the quality of the reservoirs. If GIDA is in charge of supervision, they directly supervise the contractors. If consultancies are contracted for that task, they often informally act on behalf of the consultancies. According to the interviewees, they face disincentives because there is a substantial difference in the salary they receive and the remuneration for the contactor. Yet, since they are government staff, it is not possible to change their salary levels. If they work informally for the consultancies, they receive a higher remuneration, but the difference remains substantial, thus creating scope for leakages. A possible entry point in the short run is to create incentives for the consultancies that informally hire GIDA staff as supervisors. If these consultancies are blacklisted in case of low quality infrastructure, their incentives to ensure better supervision may increase. Using more supervisors hired by the donors may also be an option, even though making the system more dependent on donors does not seem to be a desirable long-term solution.

***Strengthen the technical knowledge of contractors and creating competition*:** While it may be difficult to change the incentives of contractors in the short run—given their role in political campaign financing—improving their technical knowledge regarding small reservoir construction may help to achieve better quality even within the given constraints. Creating more competition among contractors by inviting contractors from other regions or even other countries may also help. In other regions of Ghana, it was reportedly beneficial that Chinese contractors were invited to bid. Ghana's procurement law has already been reformed and complies, in principle, with international standards. Hence, it is rather the implementation of the procurement process that needs consideration.

***Involve central-level ministries and agencies to create local incentives*:** Even though the decentralization process in Ghana envisions that district-level officers of MoFA will become accountable to District Assemblies, at present, they remain mainly accountable to the regional and central units of their own ministry. Likewise, local units of GIDA remain accountable to the head office. Making use of this situation, central-level ministries and agencies could try to influence the quality of the reservoirs by a stronger supervision and inspection than is normally exercised from the central level. The central-level ministries could also use the instruments they have in terms of human resource management (performance contracts, annual performance reviews, promotion rules) to promote better quality of small reservoirs. Since they are less involved in local politics, central-level supervisors or inspectors may be more effective than local ones. The challenge, however, may be to create incentives for the central-level agencies to use such instruments.

***Involve the media*:** Last, but not least, the media could play a more important role, for example, by publicizing low performance in small reservoir construction. Recent years have seen an increase in local radio stations, which may be well suited to publicize problems related to the quality of small reservoirs.

***Long-term policy options*:** As the analysis shows, the low quality of small reservoir construction is influenced by structural problems of the political, administrative and legal system, which are not specific to small-scale irrigation. These problems include the incomplete decentralization process, the lack of alternative political party finance mechanisms and the absence of liability rules for public infrastructure that can be enforced. Challenges faced by the civil service, such as dysfunctional pay scales also contribute to low infrastructure quality, as well. Hence, general governance reforms that address these problems will also benefit investments in small-scale irrigation.

Box 2 Strategies to address governance challenges in the construction of small reservoirs

One can distinguish two types of strategies to address the governance challenges that lead to low quality in the provision of irrigation infrastructure. One type of strategies aims at empowering communities to demand better quality reservoirs, and hold the agencies involved in their construction accountable. Public sector reform strategies aim at enhancing the capacity of the agencies involved to respond to the demand for improved governance. A combination of both types of approaches will be most promising to address the governance challenges in providing irrigation infrastructure.

Community empowerment strategies

(1) Support and empower community-based organizations
- Support the establishment of community-based water user associations
- Create mechanisms to involve community organizations directly in construction supervision to create checks and balances for elected local leaders
  - For example, make signature of water user association leaders a formal requirement when handing over irrigation infrastructure
- Strengthen the capacity of community organizations to monitor, e.g., by increasing their technical knowledge on irrigation infrastructure

(2) Create an enabling environment and financial support for NGOs
- Strengthen the capacity of NGOs to support community-based organizations
- Strengthen the role of NGOs as "watch-dogs"

(3) Involve traditional authorities as a countervailing power
- In situations where traditional authorities enjoy legitimacy, make consultation with local authorities a requirement, e.g., before handing over irrigation infrastructure

(4) Increase transparency
- Strengthen citizen's right to information, e.g., on contracts regarding the construction of irrigation infrastructure

(5) Use local media
- Encourage local radio stations to publicize problems related to natural resource management, such as low quality irrigation infrastructure, or logging without permit

Public sector reform strategies

(1) Increase accountability of the public administration
- Strengthen accountability of local public administration to locally elected governments, e.g., by requiring the signature of local assembly members on irrigation infrastructure contracts
- Combine local with central supervision and inspection mechanisms

(2) Reform political campaign financing
- Create checks on the role of contractors in financing political campaigns
- Develop alternative mechanisms for political party financing

Note:

This brief is based on the following source: Governance and Modeling Author Team (2009): Integrating Knowledge from Computational Modeling with Multi-stakeholder Governance: Towards More Secure Livelihoods through Improved Tools for Integrated River Basin Management. Challenge Program on Water and Food (CPWF) Project Number 40. Final Report. International Food Policy Research Institute and Partners. Washington, DC.

References

Aberra, Y. (2004). Problems of the Solution: Intervention into Small-scale Irrigation for Drought Proofing in the Mekele Plateau of Northern Ethiopia. *The Geographical Journal, 170,* 226-237.

Alam, M. (1991). Problems and Potential of Irrigated Agriculture in Sub-Saharan Africa. *Journal of Irrigation and Drainage Engineering, 117,* 155-172.

Biswas, A. K. (1987). Water for Food Production in Sub-Saharan Africa. *GeoJournal, 15,* 233-242.

McCarthy, N., Robertson, R., Birner, R., Hillesland, M., Schiffer, E., & Waale, D. (2008). *Factors Influencing the Functionality of Small Reservoirs in the Upper East of Ghana*. Washington, DC: Unpublished Manuscript, International Food Policy Research Institute.

Meinzen-Dick, R. & Knox, A. (2001). Collective Action, Property Rights, and Devolution of Natural Resource Management: A Conceptual Framework. In R.Meinzen-Dick, A. Knox, & M. Di Gregorio (Eds.), *Collective Action, Property Rights and Devolution of Natural Resource Management - Exchange of Knowledge and Implications for Policy* (pp. 41-73). Eurasburg: CAPRi, ICLARM, ZEL/DSE.

Laube, W. (2006). Changing Natural Resource Management Regimes in Northern Ghana. Lit Verlag.

NCG & DEGE Consult (2007). *Joint Government of Ghana and Development Partner Decentralization Policy Review* Accra: Nordic Consulting Group; DEGE Consult.

Rydzewski, R. J. (1990). Irrigation: A Viable Development Strategy? *The Geographical Journal, 156,* 175-180.

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For further information:
Shashi Kolavalli, Senior Research Fellow and Program Coordinator
GSSP – IFPRI
Postal Address: c/o IWMI, PMB CT 112, Cantonments, Accra, Ghana
Local Address: Martin Odei Block, CSIR Campus, Airport Residential Area
Tel: +233-(0)-21-780716 • Fax: +233-(0)-21-784752
http://www.ifpri.org/themes/gssp/gssp.htm