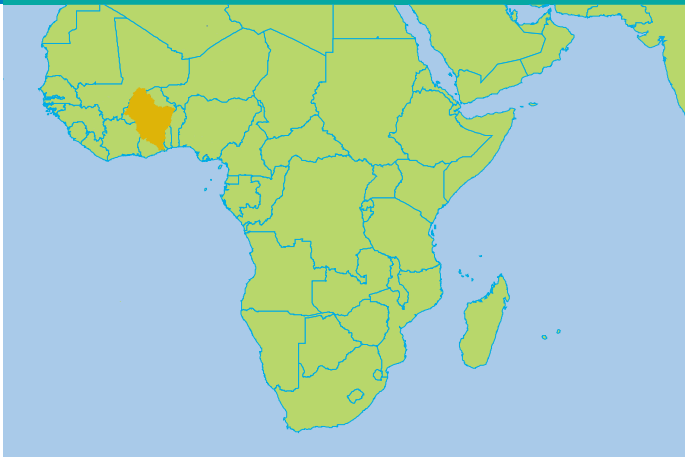




# Summary of CPWF Research in the Volta River Basin

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## About the Volta River Basin

- The Volta river's three main tributaries are the Black Volta, White Volta and Red Volta.
- The Volta river basin covers parts of the countries of Burkina Faso, Ghana, Togo, Benin, Mali, and Cote d'Ivoire, totaling an area of about 400,000 km<sup>2</sup>.
- About 20 million people live in the river basin. The countries in the river basin have some of the fastest growing populations in the world.
- Annual precipitation rates vary from 400 mm in the northern parts to 1,600 mm in the south.
- Most people live in rural areas, and more than two-thirds work in agriculture. More than 70 percent of the population in Burkina Faso and Ghana lives on less than \$US2.00 a day.

The farmers in the Volta river basin, some of the poorest in the world, generally rely on rain-fed agriculture. However, insufficient or irregular rainfall frequently puts farmers at risk of losing their crops. In addition, climate change is making already variable rainfall less reliable.

The risk of losing crops makes farmers reluctant to invest in agriculture and water management. Farmers must have access to a reliable water supply to sustain their livelihoods.

## The Volta Basin Development Challenge

The Challenge Program on Water and Food (CPWF) began its research in the Volta river basin in 2003. Between 2003 and 2008, twelve independent projects conducted research on a wide range of water and food-related issues. When designing its second round of projects, CPWF decided to limit its focus to one theme and one geographical area. Thus, between 2010 and 2013, CPWF explored the institutional and technical aspects of rainwater management as well as small reservoir development and maintenance in Burkina Faso and northern Ghana. The research has been linked with similar CPWF research projects in the Nile and Limpopo river basins.

# Summary of Key Findings

There are more than 1,700 small reservoirs scattered across Burkina Faso and northern Ghana. Initially, many reservoirs were built as watering holes for cattle, but they have come to serve multiple purposes, providing opportunities for farmers to mitigate the risks of variable rainfall.

Farmers use the reservoirs to help better manage the periods of drought and floods, trying to ensure that water is more consistently available for their crops and animals throughout the year.

However, external drivers of change such as population growth and climate change are putting pressure on the limited rainwater resources. Improved rainwater management is a necessity for smallholder farmers to intensify their production, i.e., use less water to grow more crops, rear more cattle, or both.

That's why CPWF set out to find ways to strengthen integrated management of rainwater and small reservoirs, so they can be used equitably and for multiple purposes.

To achieve this objective, CPWF has used different research disciplines, partnered with local, national, and international organizations, and operated at the household, community, watershed, and basin levels.



Photo: Mahamoudou Sawadogo

## Targeting Agricultural Water Management Interventions

*Opportunities to adopt and adapt agricultural water management interventions for improved income and livelihoods in the Volta River basin still exist. Replicating successful agricultural water management interventions in new locations requires consideration of economic, biophysical, institutional, and cultural factors.*

During the past 50 years several agricultural water management interventions have proved successful in the Volta river basin, including soil and water conservation, small-scale irrigation, and small reservoirs. Yet, according to key stakeholders, successful targeting and scaling-out of interventions remains a challenge and more support for decisions is needed. The question is, which interventions are likely to be successful where?

By developing the *Targeting Agricultural Water Management Interventions* (TAGMI) tool, CPWF intended to help decision-makers answer this question. The tool is based on both biophysical and socio-economic data. In addition to data about a district's background, i.e. key social, human, physical, financial and natural factors, the tool also relies on local knowledge and expert opinion collected through stakeholder consultations. Based on these inputs, the tool calculates the relative probability that an agricultural water management intervention would be successful in a given district.

TAGMI uses Bayesian network models to assess the potential success of interventions, estimating how different factors, such as access to water and climate variability, interact. TAGMI offers a map-based visualization of the Bayesian model's results, showing how likely it is that soil and water conservation, small-scale irrigation, or small reservoirs could be successfully adopted in different districts. The certainty with which the model predicts the likelihood of success would be greatly improved if more data could be collected and made available.

TAGMI was developed by the Stockholm Environment Institute in partnership with the *Institut de l'Environnement et de Recherches Agricoles*, the Civil Engineering Department of the Kwame Nkrumah University of Science and Technology in Ghana, the Council for Scientific and Industrial research of the Savanna Agricultural Research Institute, and University of Ouagadougou in Burkina Faso. The TAGMI tool is available at [www.seimapping.org/TAGMI](http://www.seimapping.org/TAGMI)

### Outcomes: Change in Knowledge

- Researchers and students have become better at conducting participatory geographic information systems research;
- Students improved fieldwork for their theses, presented and engaged in regional and international fora;
- Farmers have better understanding of participatory geographic information systems and use of Google Earth;
- Expert stakeholders have learned how to use the TAGMI tool and are finding it relevant, useful, and timely.

# Summary of Key Findings (cont.)

## Using Innovation Platforms to Strengthen Value Chains

*Innovation platforms provide space for a wide range of stakeholders to exchange knowledge, learn, and develop joint initiatives to solve agricultural development challenges. Successful innovation can only happen when stakeholders have a sustained interest in working together to acquire new knowledge and find solutions; the research community cannot bring about innovation on its own.*

Between 1970 and 2009, 195 bilateral and multilateral agricultural water management projects were implemented in Burkina Faso, an investment of US\$641 million. In Ghana, only 46 projects of this kind were implemented, for a total of US\$258 million. While these projects yielded numerous technical solutions, their actual impact on livelihoods is controversial, which raises the question of whether or how technical solutions alone can improve water availability, food security, and livelihoods.

CPWF proposes innovation platforms as a good approach to promote practices that can improve agricultural production, albeit not without challenges. Innovation platforms are a form of public-private partnership. They are also multi-actor systems set up to allow stakeholders to work together to identify shared challenges and solutions. For an innovation platform to be effective participation must be driven by people's interest, such as interest to improve a value chain for their own benefit. CPWF has found that livelihood options and indigenous experiences shape the ways farmers manage rainwater. Making water management more productive requires joint learning as well as technical, institutional, and policy support.

CPWF partner, the Netherlands Development Organization (SNV), developed four innovation platforms around crop-livestock value chains in Burkina Faso and Ghana. Based on findings from a rapid rural appraisal survey carried out by the *Institut de l'Environnement et de Recherches Agricoles* (INERA) and ensuing studies of existing value chains, SNV brought together farmers, traders, livestock keepers, input suppliers, technical agents, researchers, and non-government organizations to set up innovation platforms in four select communities.

Innovation platform meetings led to increased exchange of information and knowledge between different stakeholders, better access to support services, and access to training provided by INERA. As a result, the innovation platform members reported some improvements in access to inputs, access to markets, access to information, improved soil and water management, as well as improved skills.

### **Outcomes: Change in Knowledge and Practice**

- As a result of the trainings provided through the innovation platform, farmers have changed their practice. Newly adopted practices include: regular ridges that trap rainwater and prevent erosion; a new technique for sowing maize in lines with one seed per hole; ventilating livestock pens; building larger pens and cleaning pens more frequently; livestock vaccinations; mixing manure with inorganic fertilizer; using crop residue as fodder; composting; intercropping maize and soybeans; water pits to collect water for livestock; recording expenditures and budgeting; and improved soil and water management.
- As a result of innovation platform exchanges, farmers know more about market options, particularly which farming inputs (e.g. seeds) are available and when and where to sell agricultural products.
- The Burkinabese *Fédération Nationale des Groupements Naam* (FNGN, the national farmers' association in Burkina Faso and local implementing partner of CPWF) has decided to include innovation platforms as a development tool in their coming five-year strategic plan.



Photo: IWMI/Nana Kofi Acquah

# Summary of Key Findings (cont.)

## Options for Sustainable and Efficient Use of Small Reservoirs

*Small reservoirs promote diversification of agricultural activities at the local scale. Technical innovations may increase productivity, but limited access to market and lack of policy incentives constitute the main challenges.*

CPWF has sought to understand how small reservoirs are being managed in the Volta River basin and to discuss alternative options with the appropriate stakeholders.

To understand current management practices, CPWF studied reservoirs in two pilot sites: Boura in southern Burkina Faso and Binaba in upper eastern Ghana. Through stakeholder surveys CPWF identified challenges related to management of the reservoirs, i.e., proliferation of macrophytes (a type of aquatic weed) in Boura and siltation in Binaba. The identified challenges helped to direct CPWF's ensuing research on management options. Regular engagement with local stakeholders has strengthened their confidence and increased interest in CPWF's scientific results.

CPWF's studies indicate that management strategies for small reservoirs are constrained by the amount of water that is available. Rain-fed agriculture seems to determine the economic status of local households, while irrigated agriculture remains a secondary activity around the reservoirs. However, reservoirs have greater value when they are used for multiple purposes, such as both irrigation and watering livestock, and water users are able to diversify their sources of income.

In Boura, CPWF studied the trade-off between agricultural intensification and the aquatic health status of the reservoir and made comparisons with two reference sites, one pristine and one impacted. CPWF studied macroinvertebrate communities in the reservoirs and found that they echo the macrophyte contamination.

Trade-offs between agricultural intensification and the health status of aquatic ecosystems have to be thoroughly considered to ensure the sustainability of these socio-agro-ecosystems.

### **Outcomes: Change in Knowledge and Skills**

- Local communities, researchers, and students have increased their understanding of (1) the main processes that control the productivity of small reservoirs and (2) the complexity of their interactions.
- Researchers and students have increased their flexibility and become better at using multi-disciplinary approaches.
- Recurrent feedback and interactions between researchers and local stakeholders have enhanced stakeholders' confidence and interest in scientific activities. Hence, scientific results and recommendations will be considered for the preparation of the next *Plan Communal de Développement* in Boura.



# Summary of Key Findings (cont.)

## Understanding Water Management Options in West Africa

*Successful integrated water resources management requires interactions between more actors from more levels of decision making than previously considered. The companion modeling approach is a good framework to highlight interactions between actors and allows a collective decision-making process to unfold.*

CPWF has sought to understand the processes that govern integrated water resources management policy-making, practices, and research in Ghana and Burkina Faso. CPWF sought to identify which governance options could bring about improved management of rainwater and small reservoirs at the watershed level.

By developing multi-level engagement and negotiation methodologies, CPWF enabled stakeholders to identify their different understandings of what integrated water resources management is, in addition to the structures responsible for its implementation.

Multi-stakeholder platform meetings brought together stakeholders spanning from the community level (the users of natural resources) to the national level (decision-makers). During these meetings, CPWF used a participatory modeling approach, called companion modeling, that allows stakeholders to map land cover and use as well as relevant natural resource issues and regulations. Such user-friendly participatory tools allow people to express their views on water management, to better understand the points of view of others, and identify how they are impacted by each other's activities.

In Ghana, multi-stakeholder platform meetings complemented the Ghanaian government's ongoing institutional reforms that were intended to implement integrated water resources management policies. The meetings allowed decision-makers from multiple levels of government to create a shared understanding of water issues and concerns in the watershed. CPWF has developed a role-playing game called Bawkudo to be used during multi-stakeholder platform meetings. Bawkudo sounds like "beaucoup d'eau" in French, meaning "a lot of water". Bawkudo is a participatory tool that allows for modeling of erosion, sedimentation, and flooding dynamics through

discussions. It enabled stakeholders to identify potential options for shared water governance solutions that would satisfy everyone.

In Burkina Faso, multi-stakeholder platform meetings helped to operationalize a local water committee (*Comité Local de l'Eau* or CLE). The meetings highlighted necessary interactions between the committee and other levels of decision-making, including communes, regions, and state. During multi-stakeholder meetings, participants had the opportunity to discuss the mandate of the local water committee and its role in implementing integrated water resources management. As a result of these discussions, a consensus on the role of committee is emerging. A working group has been established to draft an action plan and help the local water committee in Bougouriba to become operational. While the process is underway, and actors at many different levels are committed and involved, the successful operationalization of the water committee still depends on the implementation of an action plan.

Collaboration with existing integrated water resources management institutions, such as local water committees, ensures that research can inform national and basin-level knowledge and thinking and encourages sharing of experiences between institutions, development practitioners, researchers, and local stakeholders.

### Outcomes: Change in Knowledge, Attitude, and Practice

- In early July 2012, after completion of one of several multi-stakeholder platform meetings in Burkina Faso, CPWF noted an interesting development. Members of the executive body of the CLE in Bougouriba convened on their own initiative and met on two occasions, specifically focusing on the development of a road map to achieve a CLE management plan. The committee requested a CPWF research team to help them in drafting a management plan. The two meetings of the committee, and its request for help to move the initiative forward, is a big leap in a positive direction; a change in mindset of a previously dysfunctional water committee. The dialogue and fruitful exchange during the multi-stakeholder sessions spurred the local water committee to take initiative. Continuous interest and involvement, notably from the centralized services of the *Secrétariat Permanent/Plan d'Action pour la Gestion Intégrée des Ressources en Eau* and the *Direction Générale des Ressources en Eau* is needed to sustain momentum.
- In Ghana, as a result of board members participating in the Bawkudo games, the White Volta Basin Board realized it needed to reconstitute and begin its activities, having been inactive since it was established. In addition, the exchange at the multi-stakeholder platform meetings informed the ongoing discussion about whether or not to create mini-basin boards to tackle issues at the very local level.



Photo: Philippe Cecchi

# Lessons Learned

*Research for development takes time, and resources and must be supported for long enough that innovation can emerge and be evaluated.*

As a research for development program, CPWF seeks to provide knowledge and tools that can help solve agricultural development challenges and improve peoples' livelihoods.

If researchers are to influence agricultural practices, they must continuously engage with a wide range of stakeholders, including farmers, policy-makers, and development practitioners. Through iterative dialogue researchers can learn from stakeholders, ensuring that their work is relevant, can be used, and responds to real-life challenges.

For exchanges between stakeholders and researchers to be truly informative, everyone must have a shared understanding of the issues discussed. Participatory approaches, such as companion modeling and participatory geographic information systems, allow

participants to increase their knowledge and make informed contributions.

Finally, it is reasonable to expect that stakeholders will only adopt improved agricultural practices if a new practice is to their own benefit. For example, stakeholders will only participate in innovation platform meetings when they see the value of doing so. Consequently, it is key for any research program looking to promote improved practices to identify the appropriate lever of change, whether it is financial, social, or cultural.

In the Volta river basin CPWF has continuously interacted with stakeholders, from the community to the basin level. These exchanges have directed and informed the research. While CPWF has thus sought to respond to the challenges identified by local stakeholders, achieving uptake of new practices takes time. To date, CPWF has primarily succeeded in contributing to change in stakeholders' knowledge, attitude, and skills, which is a step on the way toward development outcomes.

## Partners

Agricultural Research Centre for International Development (CIRAD) / G-eau Research Unit **Animal Research Institute (CSIR-ARI), Ghana** Civil Engineering Dept. of the Kwame Nkrumah University of Science and Technology (KNUST) **Council for Scientific and Industrial research / Savanna Agricultural Research Institute (CSIR/SARI)** Delft University of Technology, the Netherlands **Département de Géographie de l'Université de Ouagadougou** Global Water Partnership (GWP) **Institut International d'Ingénierie de l'Eau et de l'Environnement, 2iE Foundation** **Institut National de l'Environnement et de Recherches Agricoles (INERA)** **International Livestock Research Institute (ILRI)** International Water Management Institute (IWMI) **Secrétariat Permanent/Plan d'Action pour la Gestion Intégrée des Ressources en Eau (SP-PAGIRE)** SNV Burkina Faso (Netherlands Development Organization) **Stockholm Environmental Institute (SEI)** The Savanna Agricultural Research Institute (SARI) **Universités de Ouagadougou, de Bobo Dioulasso, de Kumasí** University of Development Studies-Faculty of Integrated Development Studies (UDS-FIDS) **Volta Basin Authority (VBA)** Wageningen University, Plant Production Systems (WUR-PPS), Wageningen, the Netherlands **Water Resources Commission-White Volta Basin Board (WRC-WVBB)** Water Research Institute (WRI-CSIR)

## About CPWF

The CGIAR Challenge Program on Water and Food was launched in 2002. CPWF aims to increase the resilience of social and ecological systems through better water management for food production (crops, fisheries and livestock). We do this through an innovative research and development approach that brings together a broad range of scientists, development specialists, policy makers and communities, in six river basins, to address the challenges of food security, poverty and water scarcity.

The CPWF is part of the CGIAR Research Program on Water, Land and Ecosystems. WLE combines the resources of 11 CGIAR centers and numerous international, regional and national partners to provide an integrated approach to natural resource management research. The program goal is to reduce poverty and improve food security through the development of agriculture within nature. This program is led by the International Water Management Institute (IWMI).

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