AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

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This briefing note is a summary of the situation analysis conducted in Ghana in 2009-2010. The analysis reviewed existing agricultural water management practices and the conditions within which they took place.

# GHANA SITUATION ANALYSIS

## Introduction

This situation analysis covers all regions of Ghana and is based on secondary data, field observations, household interviews in selected locations and interviews with key informants.

The results of the situation analysis are summarized here concentrating on existing environmental, social and political conditions across Ghana as well as on the agricultural water management (AWM) solutions currently in use and those that have potential to improve agricultural production and farmers' livelihoods. The AWM solutions described were shared at the National Consultation Workshop and priority solutions were selected by participants. For more on this workshop, please see the National Consultation Workshop Brief which is also available on the website.

## The Context

Agriculture contributes about 37% of GDP in Ghana and employs 56% of the economically active population. Approximately 2.74 million households are involved in farming, and smallholder farms account for about 80% of the total agricultural output. Only about 38% of agricultural land in Ghana is cultivated and productivity is generally low.

Ghana is endowed with sufficient water resources, and estimates of Ghana's irrigation potential range from 0.36 to 2.9 million ha depending on the degree of water control. However, the country faces significant variability in water resources, both spatially and temporally, such as periodic floods and droughts, and uneven distribution of annual precipitation that, on average, is 283.2 billion $m^3$/year. The dependence on rainfed agriculture, particularly in the north, means that even though production of the major staple food crops is adequate in most years, seasonal food insecurity is widespread.

Ghana is drained by the Volta, Southwestern and Coastal River systems, with a mean annual runoff of 39.4 billion $m^3$ that, if adequately managed, is enough to support most domestic and irrigation uses. In 2000, about 652 million $m^3$ of water was used for irrigation, approximately 66% of total withdrawals. Ghana also has over 56,000 groundwater abstraction systems (Kortatsi et al. 1995) but its use is still less than 5% of the average annual groundwater recharge in most of the basin.

## AWM Solutions

The irrigation system typologies observed in Ghana may broadly be classified into two groups based on their current level of formalization. These are:

- Emerging irrigation systems, which are initiated and developed by private entrepreneurs and farmers, either autonomously or with limited support from government or NGOs. These systems are expanding due to access to pumping technologies and export markets; and
- Conventional systems, which are mainly surface irrigation schemes initiated and developed by the government or NGOs.

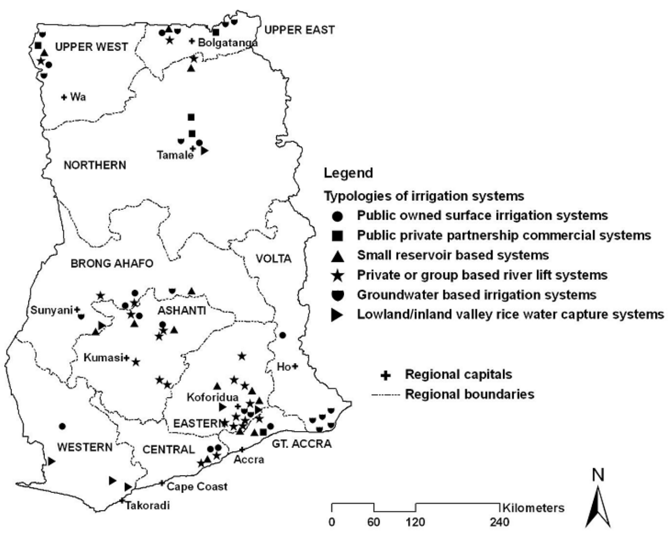
## Emerging Irrigation Systems

Emerging systems are diverse but mainly rely on the use of small pumps. The systems are usually privately owned but may be communally managed or part of partnerships with the private sector.

### Shallow Groundwater Irrigation

Shallow groundwater is tapped for irrigation, using hand-dug wells, wherever it is available. Groundwater is

## Figure 1. Locations of farms visited and the typologies of irrigation system encountered.




mainly used to grow vegetables in the dry season, which provides considerable income even on small land areas. Different versions or sub-typologies of shallow groundwater irrigation systems were observed during the field surveys.

**Seasonal shallow wells** range in depth from 1 to 5 m depending on the water table and the water lifting technology used. A well can be dug by one person in approximately 4 hours at a cost of around GH¢55/year. It can serve plots within a 50 m radius. Water is collected from the wells using motorized pumps, hand pumps, treadle pumps, or ropes and buckets. Wells are usually used by farmers in low-lying areas with high water tables, often along river banks, on riverbeds and in swampy areas. They may also be used close to poorly functioning formal irrigation schemes, where seepage water can be tapped. Examples of this are Busa in the Upper West (UW) Region, and Bugri, Kugri and Telania in the Upper East (UE) Region. At Telania, farmers pay fees to the water user association (WUA) for the privilege.

**Permanent shallow wells** are used throughout the year for vegetables, domestic purposes and livestock. Farmers prefer cement-lined wells but some do not have the financial means to acquire the materials. The depth of the wells ranges from 1 to 14 m. In Northern Ghana, the construction cost of a typical unlined permanent shallow well is GH¢52. As with seasonal wells, diverse water lifting technologies are used.

**Shallow tube wells** are commonly found in the Volta Region. They may be individually or communally owned and are used for irrigation and domestic purposes. The capital cost was around GH¢350 in 2007, and the cost of electricity is GH¢50 per month. The irrigated area is 0.2-0.8 ha while the depth is 6-9 m, and the water application to the fields is via sprinklers or hoses.

**Pilot communal borehole irrigation systems** were developed in UE, UW, and Northern regions in 2000 under the Village Infrastructure Project of the Ministry of Food and Agriculture (MOFA). Some windmill pumps were constructed but not used.

**Constraints** to realization of the full economic potential of groundwater irrigation include:

- Land tenure insecurity, which discourages farmers from digging wells.
- Frequent failure and restrictive irrigation schedules in communal systems.
- Inadequate storage facilities and markets.
- Pests and diseases.
- Limited access to inputs, including water lifting technologies and affordable well-drilling.
- Inadequate technical knowledge for proper operation and maintenance (O&M).
- The cost of fuel and electricity to run pumps.
- High labor demands.
- Lack of credit facilities.
- Poor AWM extension services.

### River and Stream Lifting Systems

River and stream lifting with small motorized pumps is the most common irrigation system among individual smallholders in Ashanti, Brong Ahafo, Eastern and Western regions. There are also some communal smallholder systems, mostly initiated by NGOs or MOFA in Greater Accra, Ashanti, Eastern, Volta, Western, Northern, UE, and UW regions. In communal systems farmers are organized into groups with a written constitution or set of bylaws. MOFA may facilitate credit and provide advice on crop choice.

Pumps are usually small petrol or diesel pumps of 3.5-10 horsepower, which cost GH¢170-300 depending on the supplier and model. Some farmers hire them for GH¢8.00-10.00 per day (GH¢50 per season). They can be moved from one water source to another and can irrigate within 300 m from the abstraction point.

**Large-scale commercial systems** are similar but pump capacities are higher and farms are larger. They are usually producing for export but irrigation practices are the same. They are common in Greater Accra, Volta and Eastern regions.

**Outgrower schemes** are a form of management in which a nuclear farmer, usually a large-scale export-oriented farmer, enters into contracts with groups of farmers. The nuclear farmer provides inputs, water and marketing. The farmers provide land and labor.

The **constraints** observed are common to all forms of pump-based irrigation. The most significant are inadequate extension support, poorly functioning marketing systems, biophysical constraints and limited access to inputs, equipment and financing.

**Private small reservoirs and dugout systems**
The use of small reservoirs is common among large-scale plantation farmers, especially in Eastern and Ashanti regions. Reservoir surface areas are in the range of 400-20,000 $m^2$ and irrigate 2.8-120 ha. They are used for irrigating vegetable plots, and, to a lesser extent, as supplemental wet-season irrigation of cereals.

The **constraints** include: limited bank loans, lack of processing facilities, siltation, insufficient labor, and damage to infrastructure caused by livestock.

**Lowland/inland valley water capture systems**
The inland valleys are low-lying areas in forest zones that receive runoff from hills and mountains. The water capture systems are structures such as bunds for water retention and canals for gravity delivery. Bunds and spillways on the fields improve infiltration and allow drainage when required. The systems are designed to provide supplemental irrigation to rainfed rice production in the wet season but may also be used to irrigate vegetable plots in the dry season.

Inland valley rice cultivation is commonly practiced in Western, Central, Northern, Brong Ahafo and Eastern regions. It was promoted by MOFA and the French Development Agency (AFD) through the Lowland Rice Project (1999-2002) because there is an extensive area of suitable land which can be used rather than areas that require full irrigation systems.

As with other systems, **constraints** include lack of access to credit, inadequate extension support and uncertain land tenure.

## Conventional irrigation systems

Public surface irrigation systems and communal small reservoirs constitute the major component of conventional systems. Several of these schemes were reviewed by the AgWater Solutions project team, and a summary of the findings is given in the table below.

| Example scheme | Size and use |
|---|---|
| **Run-of-river diversion based gravity-fed irrigation** | |
| Libga irrigation scheme, Northern Region | This is a 15 ha scheme, used by 60 farmers to cultivate rice and leafy vegetables. An agreement was reached between Ghana Irrigation Development Authority (GIDA) and ITFC, an export-oriented mango company - ITFC repaired the spillway in return for use of the water in its outgrower scheme. |
| The Annum Valley scheme (Section B) | Constructed in 1990 for rice farming on 200 ha of the valley bottom. Only 10 ha are in use because the main water canal is not functioning and there are serious leaks in the weir's sluice gates. Fee collection was GH¢ 60 per farmer but collection stopped in 2005. |
| The Sata scheme, Sekyere West District, Ashanti Region | Constructed in 1992 for dry season vegetables, the scheme receives water from the Sata River. Of the potential command area of 53 ha, 34 ha are developed but only 4 ha are in use. Immediate development of complications with the irrigation delivery system, field leveling and drainage. Siltation due to poor design and seepage from the sluice gates and laterals. |
| **River pumping-based gravity-fed irrigation systems** | |
| Section A, Annum Valley scheme | Designed to pump water from the river to the fields. Of the 40 ha developed, 38 ha are in use. |
| The Okyereko irrigation scheme | Constructed in 1973 and rehabilitated in 1982. Although the potential command area is 111 ha, only 45 ha are used by 105 farmers cultivating 0.2-0.8 ha each. Diesel pumps replaced with electric pumps because the former were too expensive to run. Electric pumps are operated by a farmers' cooperative and GIDA under the Joint Irrigation System Management (JISM). O&M costs are GH¢8,000 per year, paid from the Irrigation Service Charge (ISC). |
| Asankran Moseaso scheme, West District | Constructed in 2007 under the Small Farms Irrigation Project and financed by the Arab Bank for International Development (BADEA). The potential command area is 48 ha of which 40 ha are cultivated by 96 farmers. Water is pumped from the Tano River to a hydrant, released to a head ditch and distributed through a furrow system. |
| **Reservoir-based gravity-fed irrigation systems** | |
| Tono irrigation scheme, Upper East Region | Completed in 1985. Gross command area is 3,860 ha but developed irrigable area is 2,490 ha. Farmers cultivate rice and vegetables. A WUA exists, which determines the ISC every season and solves water conflicts. ISC recovery rate varies from 57 to 94%. |
| Golinga irrigation scheme, Northern Region | The area is 36 ha, used by 156 farmers producing rice and vegetables in alternate seasons. The canals are in an extremely poor state and the strict rotational schedule does not suit the variety of crops grown. Drip irrigation was introduced but has been abandoned. |
| The Dawhenya irrigation scheme | Developed by the State Farms Corporation in 1959. The total irrigable area is 450 ha but only 200 ha have been developed. It has been out of operation since 2006 due to indebtedness to the Electricity Company. Farmers use part of the scheme for rice production and lease part to a flower grower. |

| Surface water pumping and sprinkler irrigation | |
|---|---|
| Kpando Torkor, Volta Region | Commenced operation in 1978 and rehabilitation began in 2006 at an estimated cost of GH¢687,303. Altogether 106 farmers are cultivating okra on an average of 0.125 acre. The scheme operates under the JISM model and O&M are covered by the ISC at GH¢1,430/ha. |
| Tanoso irrigation scheme, south of Techiman | Construction was completed in 1984. Of the potential irrigable area of 640 ha only 64 ha were developed. Water was raised in the Tano River by constructing a concrete weir. The scheme was designed to use sprinkler irrigation but this has not been used since 2005. |
| The Mankessim scheme, Central Region | Completed in 1978. Of the potential irrigated area of 260 ha only 17 ha were developed and 10 ha are in use. Operated under the JISM model, the ISC recovery was 49-72% from 1999 to 2003, but it has increased following a farmer training program. |
| **Small reservoir-/dugout-based communal irrigation** | |
| Bulpela small reservoir, Tamale, Northern Region | Used for domestic purposes, livestock and dry-season gardening. Farmers irrigate plots of 0.1-0.25 ha each. In 1992, the reservoir was desilted by GIDA and the Tamale Metropolitan Assembly. Shallow ponds are filled with water through a network of canals, and farmers use buckets and watering cans to apply water to crops. |
| The dugout at Kokrompe | Constructed in 1974 for an orchard. Now it is used for growing pepper and seedlings and as a source of domestic water. Farmers draw water with buckets. It is fast silting up and rehabilitation has been carried out six times at a total cost of about GH¢1,200. Farmers are part of an active WUA and use the dugout for free. |
| The Besease dugout | Formed when the Accra-Kumasi highway was built. It benefits a community of 5,000 cultivating 2 ha each. Farmers hire land and pay GH¢75 per year for unrestricted water use. |

Conventional irrigation schemes face a variety of **constraints** including: siltation; lack of equipment and funds to develop the whole potential area; long distance between farmland and water source or storage unit; poor infrastructure (either from the outset or due to inadequate O&M); limited crop storage; lack of credit; and disputes between livestock owners and farmers over land.

## Summary

Despite the slow down in public investment in irrigation in Ghana, the irrigated area is increasing because of private investment. This seems to have been facilitated by the availability of pumps, even though the cost is high. However, the emerging irrigation sector does not have adequate support services, such as extension or engineering, to maintain the equipment.

Unlike public irrigation systems, which seem to be primarily designed for rice production, the major crops grown under emerging irrigation systems are horticultural crops and vegetables because of their profitability.

Generally, irrigation potential is huge but is underexploited in Ghana. Renewed attention to the sector is likely to change this but the modalities of crafting smallholder-friendly irrigation investment plans are a challenge. Outgrower systems may be one way of doing this, but they are as yet unproven on a large scale. Access to pumping technologies is also changing the face of irrigation.

## Recommendations

- Bring existing schemes up to capacity before embarking on new schemes.
- Reform policies and institutions to address the requirements of the emerging sector.
- Develop the AWM research capacity.
- Review import and trade policies on irrigation equipment to support emerging irrigation systems.
- Assess groundwater potential and plan for its use.
- Develop the capacity of entrepreneurs to harness the international market potential.
- Support the rural energy sector to reduce pumping costs.

## References

Kortatsi, B.K.; Frempong, D.G. 1995. Integrated hydrogeological approach to borehole sitting for the elimination of waterborne diseases in the Dahomeyan Rock areas of Ghana. Proceedings of the Geological Society of Africa (GSA), Conference. Nairobi, Kenya, pp.573-586.

This briefing note is based on a report by Regassa Namara. The report was compiled from regional reports by Lesley Hope, Busia Nambu Dawuni, Benedictus Agbeko, Ebenezer Appiah, Asare Mintah, Eric Sarpong Owusu, Wilson Agyei Agyare, Bernard Keraita, G. Kranjac-Berisavljevic, B. Z. Gandaa and M. Akuriba. These reports are internal but if you would like a copy please contact the Project Secretariat (awmsolutions@cgiar.org).