

Report of scoping mission - Blue Green Irrigation Ghana

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Executive summary

Ghana has great potential for irrigated agriculture. The main water source for irrigated agriculture is the Volta River System, the White Volta, the Black and Red Volta as the main tributaries in the North and Lake Volta in the South. In addition, on both sides of the Volta river(s), arable flat lands are available and, especially in the North, labour is also available. However, the enabling environment for developing market-oriented agriculture is challenging. Commercial farms are currently facing issues related to social but also to financial barriers. Cooperative models to involve smallholders are still evolving. Nonetheless, several companies are successful and are developing strategies to optimize their agricultural practices with innovative technology such as smart irrigation, subsurface drainage systems and improved soil management. Successful in-grower models show potential to scale up improved farming practices.

The establishment of Water Users Associations (WUAs), which will function as operational water managers at the local level of the irrigation schemes, offer the opportunity to link efficient water management to sustainable agricultural development, since the linkage to markets is part of the mandate of WUAs. Comprehensive programs could contribute to an integrated 'holistic' development approach to irrigated agriculture. Dutch partners could support technical, financial and social aspects of such an approach. River basin management and water efficient farming practices cannot be considered as standalone activities. Therefore, planning tools and information-based research are required to define not only the strategy, but also the implementing activities at several levels of operations.

Dutch companies and knowledge institutes offer services and products that could be relevant to implement in partnerships with Ghanaian companies or the public sector. This scoping mission identified several potential interested partners, particularly from the private sector. More detailed needs of these companies will be identified in the upcoming weeks, through one-on-one in-depth interviews. Based on the information acquired during this scoping mission, as well as the proactive attitude of their Ghanaian counterparts, acquisition for the mission in October will start and we will be able to select fitting Dutch companies from the water-agri-food sector to the Blue-Green context present in Ghana.



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1. Introduction

Upon request of the Embassy of the Kingdom of the Netherlands (EKN) in Ghana, in October 2019, a trade mission to Ghana will take place to identify the opportunities to improve water supply and sustainable water management for agricultural development. GMV/FME and the Netherlands-African Business Council (NABC) have been selected to execute this assignment, in cooperation with RVO, NWP and EKN Ghana. Due to the specific focus on water and irrigation for agriculture, NABC works together with land, water and food expert Peter Prins. The assignment consists of a scoping mission, and a trade mission with (preferably) a delegation of private and public representatives later this year in October.

2. Background

West Africa is a focus area of the Dutch Ministry of Foreign Affairs. The northern part of Ghana (Ivory Coast and Nigeria) must cope with the impact of climate change and drought. Extreme weather events, harsh conditions for agriculture, lack of technology and knowledge affect yields from agriculture and livestock populations, which in turn negatively affects food in these regions. Ghana is experiencing 2 different rain season patterns: a uni-modal rainfall regime in the North and a bi-modal rainy season in the South. For both regions and patterns, rains have become more erratic, their onset is often later, and they have become less predictable in general, challenging farmers' planning. However, Ghana has the potential for agricultural development and year-round production, due to the abundance of water resources and relatively suitable soil properties. Moreover, due to the dryness in the North, disease pressure is easier to manage. Irrigation is the key for improving yields and the livelihood of people. Thus, strengthening the resilience of farming systems is an important step towards improved food security. Unfortunately, the irrigation infrastructures currently present in Ghana supply water to only 2% of the potential irrigated area of 1.9 million hectares. Improved agricultural water management requires investments, capacity building, and technology related to the effectiveness and efficiency of irrigation.

3. Objectives

Objectives of the assignment are:

- Identification of challenges in Ghanaian agriculture, related to water management issues;
- Giving insight in the most promising solutions that Dutch technologies and expertise could offer;
- Enabling involvement of the Dutch sector by providing them information about specific opportunities (and Ghanaian demands);



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- Provide a clear idea on and input for the mission program (elements) in October 2019.

Although the focus will be on the activities in Ghana, experts (Government and knowledge institutes) from Nigeria and Ivory Coast will be invited to join the second stage of the project (mission in October).

4. Findings

4.1 Interventions public sector

When it comes to water management for agriculture, the government is involved in almost every case. In Ghana, the Ghana Irrigation Development Authority (GIDA) is the irrigation authority. The Water Resource Commission (WRC) is responsible for the water bodies (clean and safe water). GIDA not only plays an important role in planning and realization of the irrigation infrastructure, but also in daily operations such as maintenance. Farmers are obliged to pay an irrigation service fee to GIDA and a water use fee to the WRC (collection can be challenging however). Unfortunately, a lot of irrigation schemes are neglected due to bad maintenance, financial barriers and high prices of energy for pumping. Hence, farmers and other stakeholders suggested that GIDA should step back from the execution and operational aspects of public irrigation schemes and move these responsibilities to local parties and users. Remaining GIDA responsibilities would then be quality control and inspections.

By decree, announced in 2016, Water Users Associations (WUAs) will take over the role of GIDA at the local level. Cooperatives on the irrigation schemes have been dissolved for the WUAs to take over. In principal, the farmers should form the WUAs. However, currently GIDA is supervising the development of the WUAs to support this process. Currently 14 WUAs have been established and registered in 2018 in the Kpong Irrigation Scheme (northeast of Accra). These WUA's are in their pilot phase and have not been formally inaugurated yet. GIDA intends to roll out the WUA structure and formation to other parts of the country, but financial resources might reduce the pace of this process.

The phase of establishing WUAs offers an opportunity for other (Dutch) parties to get involved in modernizing water management and organization in the country. In addition, WUAs are responsible for connecting farmers to markets. The combination of water management and improving agricultural development are important ingredients for a 'holistic' approach: economic, technical and social aspects come together and when tuned in the right way, lead to sustainable and resilient farming systems.

Currently, the irrigation facilities mainly support rice cultivation. Examples of diversification are scarce and continuous cropping leads to (soil) depletion. In terms of water efficiency and cost recovery, high value crops (vegetables, fruit) could be an alternative for rice. These crops will require a different (lower) ground water table than



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rice, implying that the fields of more sensitive crops needs to be planned carefully to avoid conflicts between rice growers and the growers of high value crops. In short, the establishment of WUAs offers the following opportunities for Dutch-Ghanaian collaboration:

- education of farmers; extension services (improved cultivation practices, crop diversification, efficient water use)
- technical cooperation (technical expertise & training)
- training of leaders of farmers' groups and cooperatives
- training of WUA board members, particularly in achieving a self-sustaining (independent executive) authority in terms of finance and governance. Development of a sustainable (business) model for the WUAs. (this action should be linked to the partners of the Blue Deal, led by Dutch Water Boards).
- introduction of information technology (soil testing, monitoring soil moisture)

The Japanese organisation for development cooperation (JICA) is involved in capacity building exercises in the Kpong area. JICA works closely together with GIDA. In case the Netherlands intends to set up bilateral collaboration in the Kpong or other irrigation schemes, it would be good to build on the experiences of the JICA-GIDA collaboration within the Kpong scheme.

Table 1: overview water related services and technology that could support public facilities in Ghana

Service and technology	Target group
Improving water governance	Water Users' Associations
Detailed mapping groundwater resources / aquifers	Ministries, GIDA, WRC, drinking water suppliers
Improving water management at catchment level (irrigation, flood protection, drainage)	Ministries, GIDA, International donors, investors
Improving storage options (pans, basins, tanks)	Ministries, GIDA, International donors, investors



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4.2 Interventions private sector

4.2.1 Commercial Farming

Ghana's agriculture sector shows great potential for commercial farming, due to the presence of natural resources, appropriate road infrastructure and increasing demand for agricultural products (opportunity for import substitution). Despite this positive environment, the existing large-scale initiatives struggle with several constraints. Based on desk research and interviews with local stakeholders the following disadvantages were mentioned:

- Tribal issues, hampering the opportunities to make use of land and water;
- Issues surrounding the tenure of land: commercial investors intend to give scale to their operations and to safeguard long term agreements of leasing the land;
- Dysfunction of outgrower schemes: farmers don't perform well and are not willing to pay back;
- Lack of investors;
- Low productivity and high labour costs (competitive disadvantage on the world market).
- High energy costs/ unreliable power source
- For irrigation equipment providers: markets are not well identified and there is little market information available

In-grower schemes could offer smallholder farmers a feasible alternative to develop towards commercial farming. Flexible arrangements could include economic incentives to perform well, including the supply of fertilizers and seeds, access to irrigation and extension services. BIFH is an example of such a model. Farmers grow maize and groundnuts on designated fields serviced by a central pivot irrigation system.

Peer to peer sharing, for instance through demonstration projects, can help to disseminate knowledge and to stimulate the adoption of improved farming practices. However, local networks of communication and knowledge sharing should play a stronger role in order to ensure structural change. Farmers' organisations/associations could support a strategy to foster transition of current agricultural practices to modernized ones, by mobilizing and strengthening their networks, and by active dissemination. However, farmers in Ghana are not well organized yet. Farmer organizations and cooperatives are often political. From the interviews, only two farmer organizations were mentioned as well organized, namely the VEPEG and SPEG. The current cooperative structure in Ghana is lacking due to trust and cultural issues (individualist/short-term trade mentality) and, accordingly, the organization of farmers as it is does also not look like the ideal model (without an aggregator/ off-taker).

Diversification could be another strategy for commercial farmers. Circular farming systems, making use of green cover crops, compost and manure will improve the organic matter balance and physical structure of the soil. Keeping animal husbandry in (semi) closed systems on or near the arable farm could be a diversification that fits well with the principles of circular systems. The arable part of the company could produce animal feed or other inputs (maize, sorghum, soy and straw), while solid manure is needed for soil fertility. Poultry (layers, broilers) or cows for meat production could be complementary pillars of agricultural enterprises.

4.2.2 Innovative technology

A wide array of interventions is available to achieve improved water management for agriculture and water efficient farming practices. It is evident that the availability of water sources is crucial, whether it is fresh surface water or groundwater. Governance of the river basin or a small-scale catchment, and access to irrigation infrastructure determines the feasibility of irrigation at the farm level. However, water efficiency is not only a matter of having enough water available at the fields.

Soil testing is necessary to improve soil management and to foster an accurate use of nutrients. Knowledge of the requirements of the specific crops is relevant, just as information about the soil properties. When the soil fertility is poor, the root system of crops will also develop poorly. As a result, the crop will be sensitive to drought and yields of the crop will be low. When the physical structure and percentage of organic matter of the soil are insufficient, the water buffering capacity will be low and water logging is a serious risk.



Bad soil structure and symptoms of salinization

Irrigation can be changed from traditional flooding systems to advanced techniques such as sprinkler and dripping systems. Several companies are already marketing such products in Ghana, and provide basic equipment such as dripping hoses, pipes, pumps and sprinklers. The challenge is to get maximum profits out of their portfolio, and the customer reducing improving the cost/benefit ratio of their products. Automation of the system, based on remote control and alternative connectivity could let the systems perform better, saving water and costs of fuel and labour. Solar driven equipment (low pressure and low energy consumption) and remote control via sensors connected via 'LoRa' (long range) technology would also be a solution. This kind of equipment is suitable in areas where internet connection is available but not of high quality. Dutch companies have experience in this kind of complicated but very beneficial designs. In terms of solar-powered pumps, Hortifresh is currently piloting a financial instrument for solar powered pumps for irrigation.

Drainage is another option for improving water management at the field level. Due to climate change, Ghana is dealing with erratic rainfall and frequent extreme precipitation events during the rainy season. Water logging can cause crop stress, pests and diseases. Artificial subsurface drainage is not applied in Ghana yet but could be a solution for quick discharge of water when wet conditions affect the crop health and cause run-off. Although initially only meant to discharge excess of water, drainage systems are also currently also developed to have a dual function of draining and a subsurface infiltration system. The capillary rise will lead to hydration of the rootzone, being an effective way of irrigation. Evaporation will be less, compared to surface irrigation techniques. Clogging of subsurface drains can be prevented by wrapping the drains (envelope works as filter). In Ghana there is no experience with envelopes. In the Netherlands it is common practice.

Remote sensing or infrared images (by drones) could be an appropriate method to locate disrupted growth at large-scale plantations, for instance on banana fields. The technique could be used as early warning tool, for timely crop protection treatment and prevention of outbreaks of pests and diseases.

Several technologies or innovative practices could be meaningful to the farmers in Ghana. Not all technologies are feasible for distinguished types of farmers. The table indicates the suitability of the technology.



Drone with various cameras (e.g. thermal, near infrared)



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Table 2: overview water related services and technology that could support the private sector in Ghana

Service and technology	Target group
Soil testing	Smallholders, Commercial farmers
Remote control and automation irrigation system (pumps, valves, dripping system)	Commercial farmers
Soil moisture sensors	Commercial farmers
Remote sensing and drone images	Commercial farmers
Climate adaptive drainage systems	Commercial farmers
Robust (stress tolerant) seeds and inputs	Smallholders, Commercial farmers
Capacity building, e-learning	Smallholders, Commercial farmers
Renewable energy (wind, solar, water)	Smallholders, Commercial farmers
Appropriate finance	Smallholders, Commercial farmers

4.3 International funding / Finance

Although several large-scale initiatives comprise substantial areas of agricultural land, not all these fields are in use for agricultural means. The complete design and construction of adequate water supply and irrigation equipment, preparation of the land (levelling, improving soil fertility), mechanization and eventually subsurface drainage require considerable investments. Moreover, the workers and management of farms need to be skilled to carry out their responsibilities in a proper way.

The existing banking sector in Ghana seems to be reluctant to provide loans for agriculture investments. Even the ADB (previously known as Agricultural Development Bank) seems to reconsider its position in the agricultural sector, apparently due to negative experiences with farmers (repayment issues). In addition, interest rates are extremely high (> 20%).

Private investors could play a key role in accelerating agricultural development in Ghana. By linking these commercial farms to in-grower schemes (or efficient WUA's), smallholders will get the opportunity to gain experience in operating their farm as a business. Leaders of farmers' organisations in Ghana recognize and emphasize the need for private sector driven transition of agriculture in the country.



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Another opportunity is the Ghana Incentive-Based Risk Sharing System for Agricultural Lending (GIRSAL), which is capitalized with Funds of the African Development Bank, together with the national government of Ghana. Several value chains are focused on this scheme that provides loans for agricultural investments. Poultry is one of the selected value chains. Investments related to the chain can be supported, such as irrigation for animal feed production (maize, soya bean, etc.), when used as input for feeding chickens.

On a smaller scale, it is interesting to monitor the HortiFresh pilot on the use of solar powered pumps with various farmer groups in Ghana. This pilot serves to test a financial instrument, enabling farmers or farmer groups to purchase a solar powered pump. In case the pilot is successful, HortiFresh will fund the solar powered pumps for farmers, in the form of a loan, which is being repaid by the farmers in terms.

5. Conclusions

- Ghana has potential for development of (irrigated) agriculture due to the availability of abundant natural resources and a basic infrastructure (irrigation, roads). In the North, there is also abundance of labour;
- Water Users Associations are a new vehicle to improve water management at the local level and to boost agricultural development. The Netherlands could support this development from the onset by offering a programmatic approach, including aspects of capacity building, technical assistance (also as an opportunity to involve the private sector) and finance.;
- Linking public irrigation schemes to private properties is an issue that needs to be solved, for instance by donor driven projects. Projects should embed a holistic approach, taking technical, financial and social aspects into consideration;
- New activities should be linked to existing activities and projects of Dutch partners as much as possible, to achieve synergy (e.g. HortiFresh, Blue Deal DWA, JICA).
- Some private businesses could be an entry point for next steps. Examples: a pilot for remote sensing and automation of the irrigation devices; a pilot/ demonstration of the use of drainage, potentially with a local manufacturer of plastic pipes, irrigation equipment and drainage.
- Dutch or local Private funded initiatives (such as IWAD, BIFH, BlueSkies, Whytebage International Ltd.) could be entry points for collaboration as well. One of the recommendations from the scoping is to encourage private sector driven initiatives as driver for structural change.