AICCRA PROJECT

Ghana Irrigation Sector Mapping

International Water Management Institute

IWMI WEST AFRICA - 2022

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Key elements for irrigation development

Multiple challenges weigh on the future of the most fragile farmers, particularly in the context of developing countries: climate change, dependence on rainfall, etc. Irrigation is one of the answers to these challenges to ensure food security at different levels.

Farmer-led irrigation development (FLI) in Africa has been expanding rapidly for several decades. It is one of the important levers of agricultural development, particularly in West Africa and Ghana.

A recent report (2021) by the International Food Policy Research Institute (IFPRI) highlights **5 key elements** to ensure irrigation development in this context:

- **Invest in knowledge, data, and monitoring.**

- **Establish the enabling environment for sustainable irrigation investments**

- **Adopt efficient irrigation technologies and improve scheme performance.**

- **Introduce economic incentives for irrigation sustainability.**

- **Develop and implement policies and programs that sustain irrigation's performance and future.**

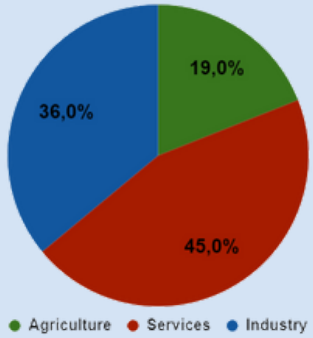
Agriculture in Ghana

Agriculture in Ghana is **one of the main economic sectors** of the country and therefore represents a major stake in the development of the country. The context varies greatly per region and the various crops that are grown locally.

Ghanaian farmers are primarily small-scale, with farms not exceeding 2 hectares. The techniques used remain **traditional**: farmers use the hoe and cutlass and mechanization is limited. Overall production is highly dependent on rainfall and soil factors.

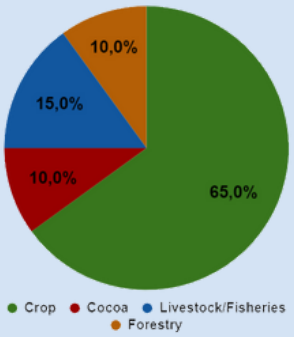
Faced with the **challenges of food security and climate change**, the development and adoption of irrigation is promising to respond to the ghanaian agriculture issues in the future.

- The distribution of Ghana's GDP shows the importance of agriculture, which accounts for nearly **20% of the country's GDP** (Israel Embassy, 2020), ahead of the industrial and services sectors.



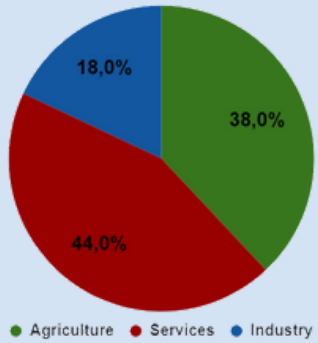
Distribution of Ghana's GDP by sector

- The crop sub-sector is well ahead of the other sectors. The crop sector and the cocoa sector together account for 75% of the agricultural GDP (Israel Embassy, 2020).



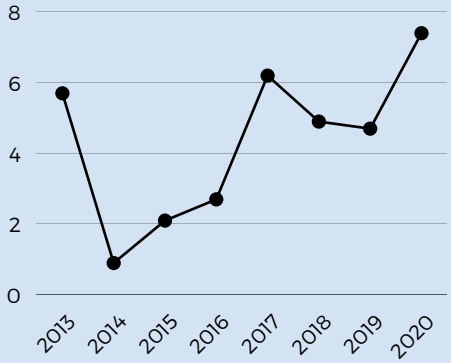
Distribution of Ghana's agricultural GDP

- **The sector is employing a large part of the population** providing job in a context of subsistence agriculture (Israel Embassy, 2020).



Distribution of the workforce in Ghana

- The agriculture sector is of paramount importance to the Ghanaian economy and has been growing steadily in recent years (MOFA, 2021).



Yearly growth of the agriculture sector

Irrigated Crops in Ghana

RICE

Rice is a **staple food** for most people in the world. Ghana also is promoting local rice production but still remains below consumption needs. The **northern region of Ghana** is the main producer of rice, accounting for 61% of the country's total rice production.

VEGETABLES

Vegetable consumption in Ghana remains **relatively low** compared to other African countries. But tomato production, in particular, has increased significantly over the past decade. The main crops are **tomatoes, peppers and onions** (Assibey-Yeboah, I. Koomen, 2019).

FRUITS

Fruit production plays a crucial role in the Ghanaian economy and is an important **source of export earnings**. Although tropical fruits are found throughout Ghana, commercial fruit production occurs mainly regions stretching from the middle belt to the south. The main fruits produced are **citrus, mangoes, bananas and pineapples** (Assibey-Yeboah, I. Koomen, 2019).

COCOA

Cocoa is one of the most important crops in Ghana, the **second largest exporter in the world**. It is grown in the Ashanti, Brong-Ahafo, Central, Eastern, Western and Volta regions. Much of the production is done by smallholder farmers and **irrigation development projects are being implemented** to boost cocoa production.

Crop	Area ('000 ha) in 2020	Annual production ('000 T) in 2020
Rice	291	973
Cocoa	1450	800
Mango	8	99
Pineapple	13	669
Banana	428	5811
Tomatoes	53	369
Onions	11	144

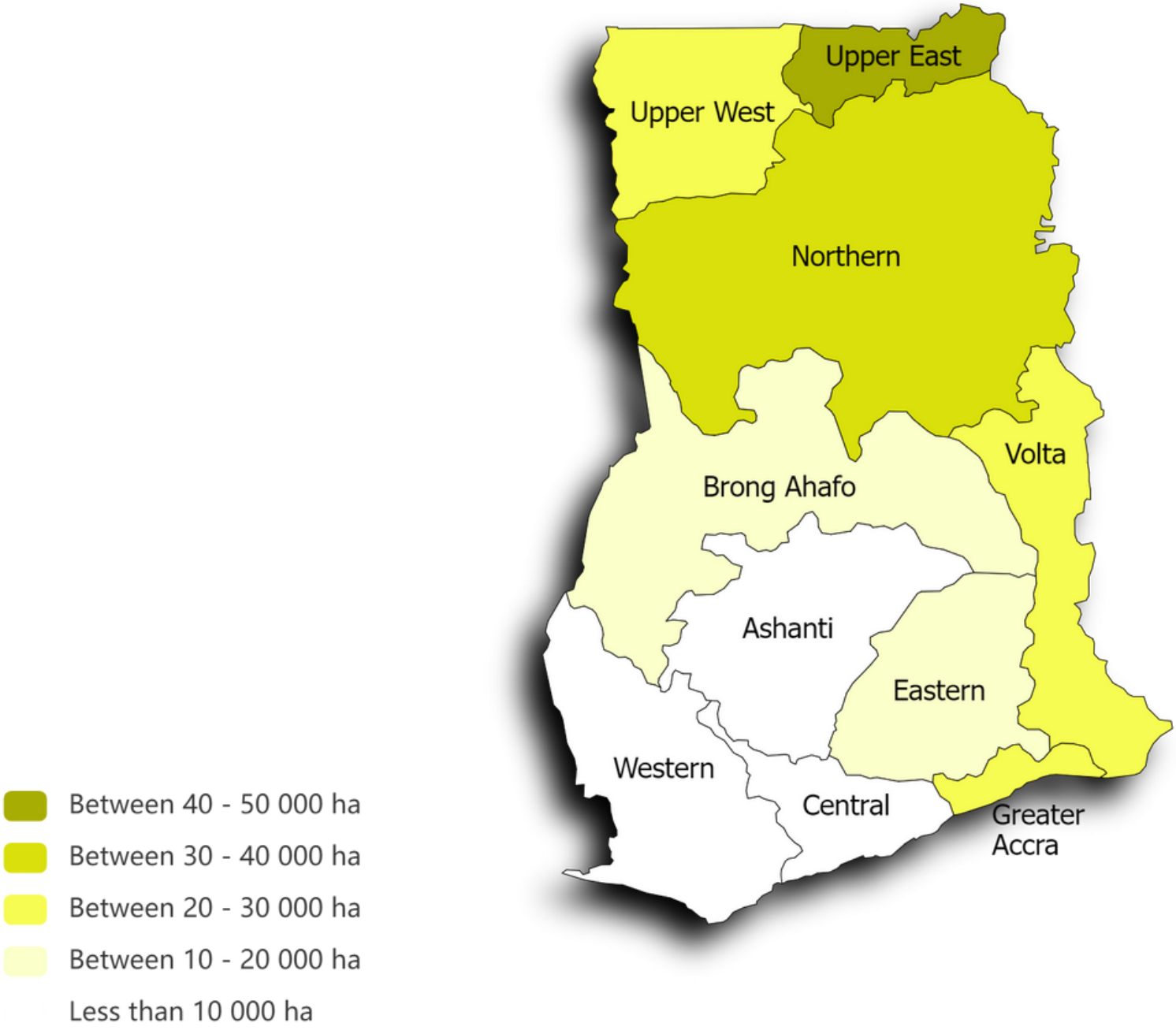
Yearly agriculture production in Ghana for a selection of crops (MOFA, 2021)

Irrigation in Ghana

KEY ELEMENTS

- Nearly **6.8 million ha** are under cultivation in Ghana (MOFA, 2021).
- But only **3,18%** of the cultivated land is irrigated, just over **220,000 ha**.
- **84% (189,000 ha estimated)** of informal irrigation: developped by farmers themselves.
- Over **700,000 farmers** could benefit from small-scale irrigation development (ILSSI, 2019).
- The irrigation potential is estimated between **0.36 and 1.9 million ha** (IFPRI, 2011).
- **130,000 ha to 190,000 ha** could be suitable for small-scale irrigation development in the Upper East region (IWMI, 2022).

Irrigation area repartition



Estimated irrigated area per region in Ghana

(World Bank, 2018)

Policies and Programmes

Irrigation development policies in Ghana date back to the 1960s and the Ghana Irrigation Development Authority (GIDA) was established in the late 1970s. This authority is responsible for the **formal irrigation development**: identification, implementation and maintenance of government irrigation projects.

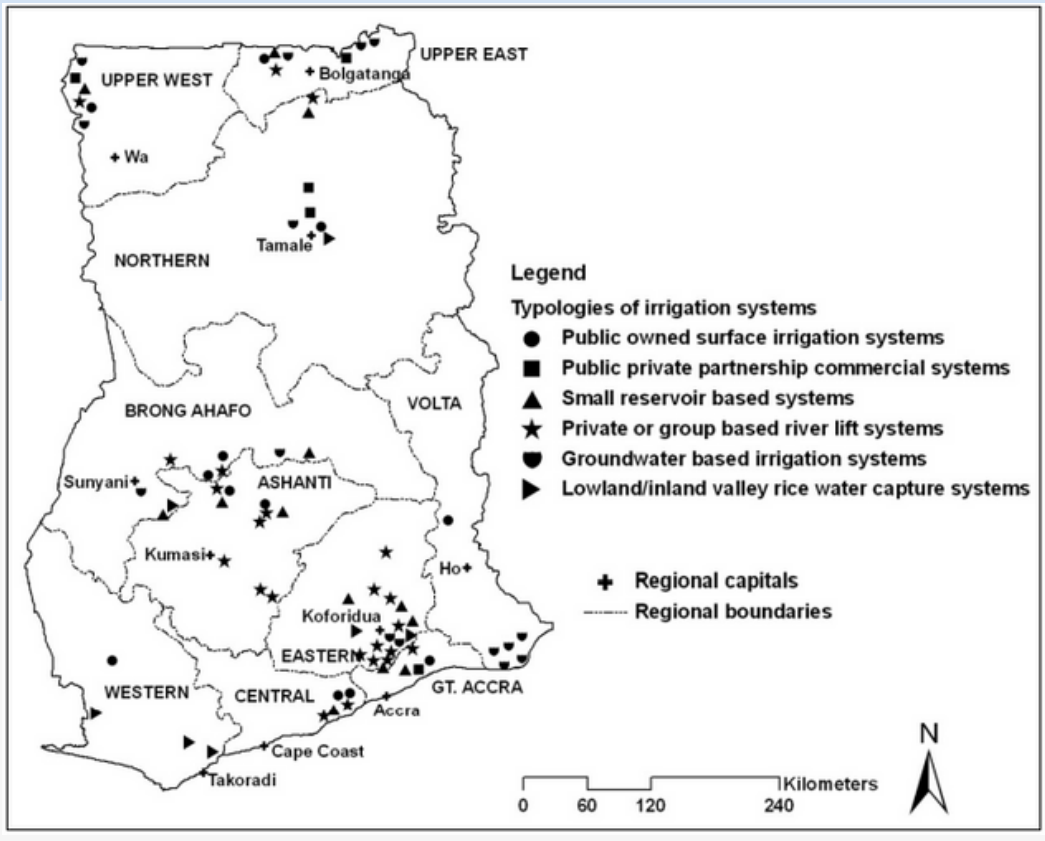
The policies implemented are as follows:

- **Performance and Growth**: Ensure production capacity and respond to new irrigation projects by involving the relevant public and private authorities.
- **Socio-economic inclusion**: Work towards a socio-economic balance, according to the resources available.
- **Responsible production**: Progress towards environmentally friendly performance and irrigation practices.
- **Improved services**: To propose new sustainable irrigation solutions to public and private irrigators.

GIDA maintains **22 major projects for nearly 17,000 ha of irrigated land** (MOFA, 2021). The Tono and Kpong irrigation projects are leading the way in terms of area (around 2500 ha). The targeted beneficiaries are small-scale farmers, but many schemes are not functional or under rehabilitation due to lack of maintenance.

In addition, two programs are more focused on small-scale irrigation:

- The Small-Scale Irrigation Development Project (SSIDP): 22 schemes.
- Small Farms Irrigation Project (SFIP): 6 schemes.



Public Irrigation Schemes

Currently, there are **22 major government irrigation schemes** under management in Ghana covering over 13,000 ha (led by the Tono and Kpong irrigation projects). These schemes are financed mainly from abroad by international collaborating agencies: initially by China, Russia, Japan, Taiwan, etc. and now with the support of the UN and the World Bank. These systems directly benefit small farmers (**11,000 households**).

Many smaller reservoir-based irrigation schemes (lower than 210 ha of irrigated land) have also been launched over time (E. Acheampong & al, 2014, E. Sekyi-Annanet al., 2017, Sekyi-Annan et al., 2018).

- 1,000 small and medium-scale schemes have been constructed in Ghana alone over the past few decades.
- More than 200 of which are within Ghana's upper East region.

This type of solution, under conditions of constant monitoring and support, can have a strong impact on local agriculture. Other large-scale projects are planned for the near future, such as the Pwalugu Multipurpose Dam, which is expected to irrigate 25,000 hectares in the Upper East and North East regions of the White Volta River.

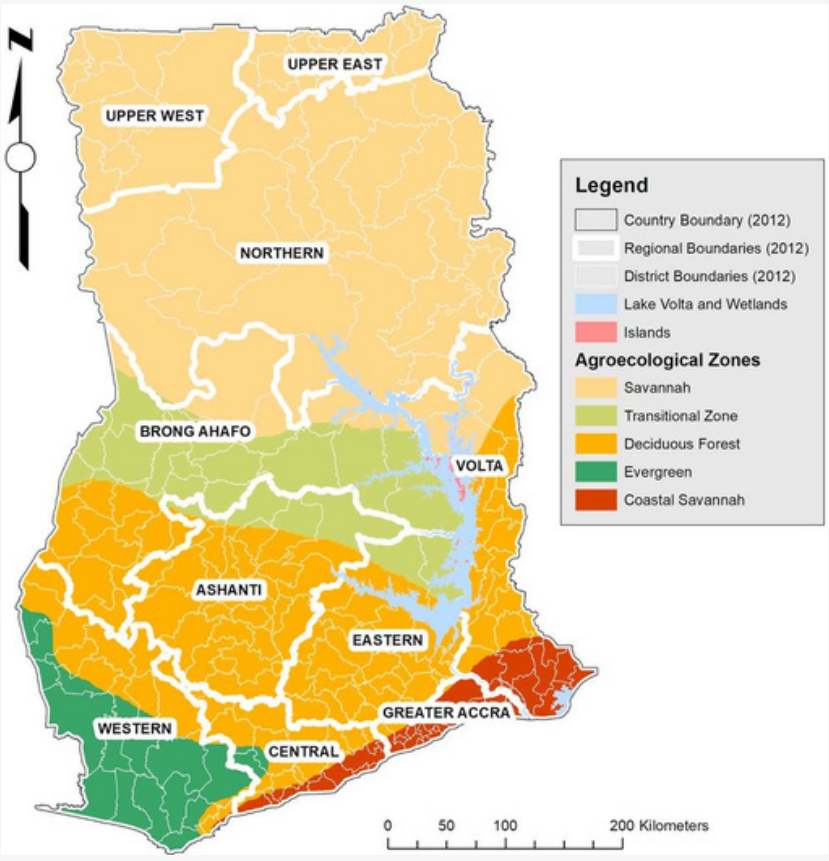
Schemes	Area developed (ha)	Irrigation type	Targeted crops
Ashaiman	155	Gravity	Rice and vegetables
Dawhenya	200	Gravity and pumping	Rice
Kpong	2786	Gravity	Rice and vegetables
Weija	220	Pumping	Vegetables
Afife	880	Gravity	Rice
Aveyme	60	Gravity and pumping	Rice
Kpando Torkor	40	Pumping	Vegetables
Mankessim	17	Pumping	Vegetables
Okyereko	81	Gravity and pumping	Rice
Subinja	60	Pumping	Vegetables
Tanoso	64	Pumping	Vegetables
Sata	34	Gravity	Vegetables
Akumadam	65	Pumping	Vegetables
Anum Valley	89	Gravity and pumping	Rice
Amate	101	Pumping	Rice
Dedeso	20	Pumping	Vegetables
Kikam	27	Gravity and pumping	Rice
Bontanga	450	Gravity	Rice and vegetables
Golinga	40	Gravity	Rice and vegetables
Libga	16	Gravity	Rice and vegetables
Tono	2490	Gravity	Rice and vegetables
Vea	850	Gravity	Rice and vegetables

Public irrigation schemes details (IFPRI 2011)

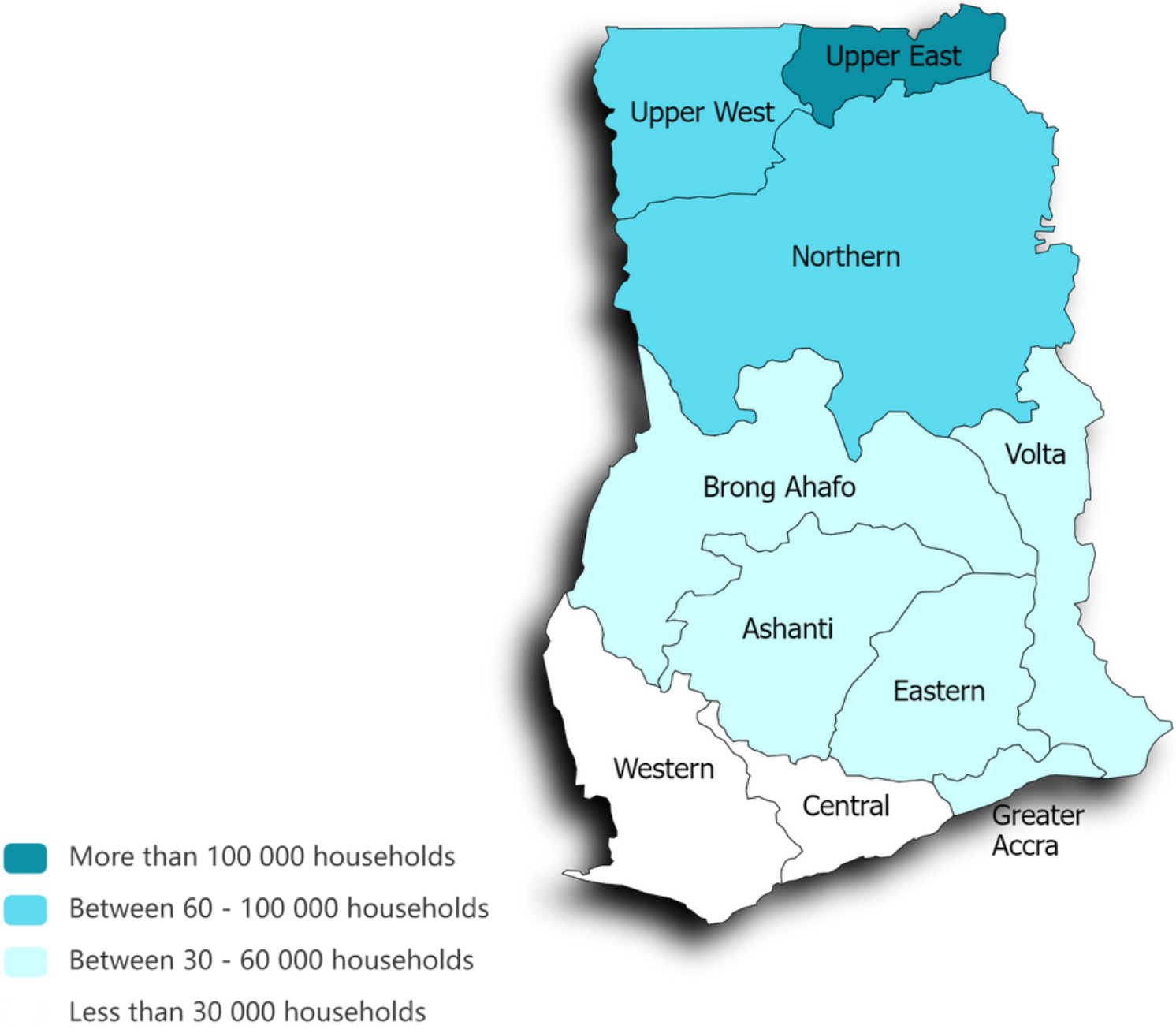
Farmer-Led Irrigation

KEY ELEMENTS

- **Farmer-Led Irrigation Development (FLID)** is conducted at the farmer or community level. Under FLID, the farmer is responsible for the investment through to the use and maintenance of the irrigation system and the management of the water and land associated with that system. This practice is found at different scales, but the majority is represented by smallholder farmers.
- Farmer-led irrigation development (FLID) is represented by **95% of smallholder farmers** (IFPRI, 2011).
- **70 %** of the irrigated area is managed by farmers using shallow wells irrigation.
- Most of the smallholder irrigators cultivate less **than 2 ha.**
- **49% of FLID is held in the Savannah ecological zone** in the North part of the country (Northern, Upper East, Upper West regions) (World Bank, 2020).
- **26% of FLID is held in the Costal Savannah ecological zone** in the South East part of the country (Central, Greater Accra and Volta regions) (World Bank, 2020).



Households repartition



Estimated number of smallholders farmers households using irrigation

(World Bank, 2018)

Irrigation technologies

Because FLID is done at the farmer level, multiple technologies are used. With a wide variety of water sources and technologies available, farmers tailor solutions based on their crops, techniques and land management (IFPRI, 2011).

WATER SUPPLY TECHNOLOGIES

- **Small motorized pumps**

Small motorized pumps running on diesel or gasoline are used by small farmers. **Water is pumped from nearby water sources** that are directly accessible. These resources are then distributed by simple methods such as **pipes, buckets or gravity**.

- **Large motorized and electrical pumps**

Heavier technologies exist for farmers who irrigate **larger areas**. Diesel or electric pumping systems are used and water is distributed by gravity in most cases, but also with center pivot irrigation. This situation is however less widespread.

- **Manual techniques**

Simpler methods are also commonly applied. The use of manual irrigation techniques based on **buckets and watering cans** is often found on smallholder farms, usually around 2 ha. Water is usually obtained from **groundwater wells or springs**.

- **Solar irrigation systems**

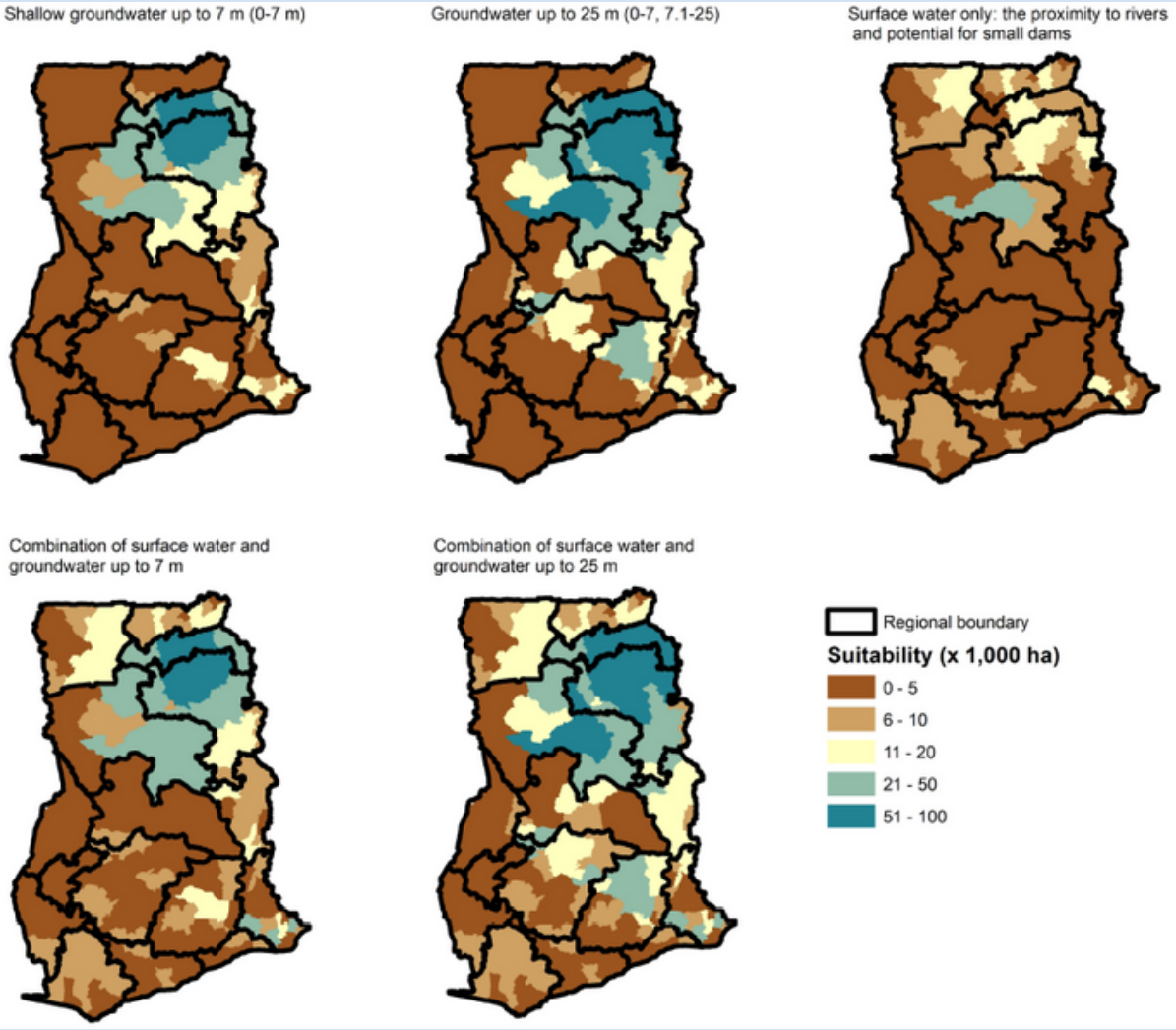
Several initiatives are being developed in Ghana to provide solutions based on solar irrigation technologies. The **potential of solar is fast rising** due to decreasing costs, increased availability in Ghana and energy prices growing.

The World Bank (2020) divides the typologies of small-scale irrigation systems into these categories:

- Small-scale pump irrigation systems sourcing from rivers and streams.
- Small-scale pump irrigation systems using dams and dugouts.
- Shallow wells (in valley bottoms) systems using ground water.
- Deep wells and borehole systems using ground water.
- Community-managed small-scale dam or dugout irrigation systems.
- Peri-urban irrigation using wastewater, pipe-borne water, and streams.
- "Unplanned" irrigation around reservoirs (dams) using excess surface water and seepage from dams.

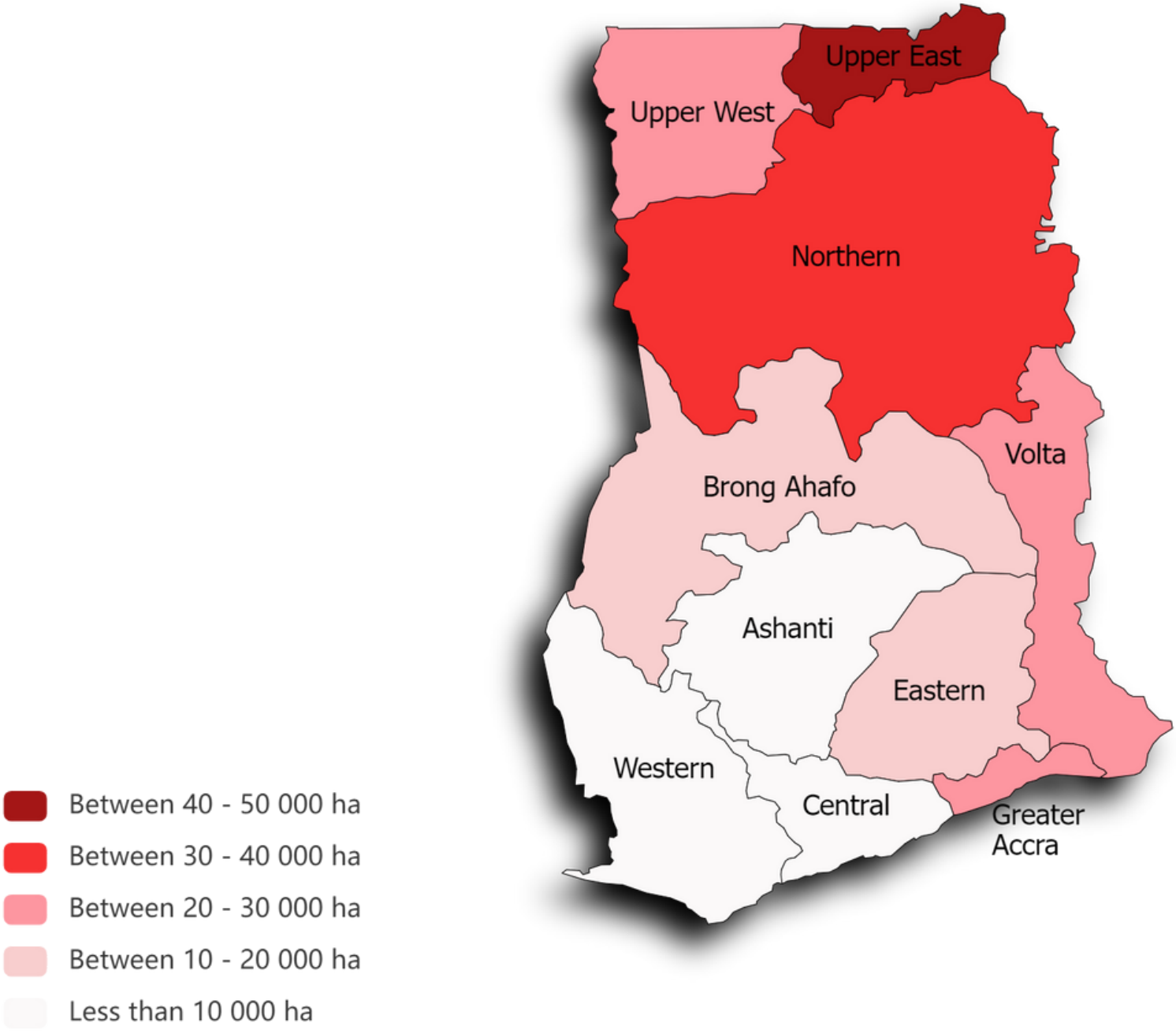
Solar irrigation

- **Solar Powered Irrigation Systems** uses solar energy through panels to pump water. Its usage allows to detach from the dependance on fuel and risk of fluctuating prices.
- This is a great **economic and environmental alternative** for smallholder farmers.
- The development of the sector remains limited but has an great potential (IWMI, 2021).
- **2.3 millions ha** could be suitable for solar pumping development in Ghana (ILLSI, 2021).
- The North of Ghana in particular appears to be the most promising area (challenging climate, high water demand and availability).



Suitability for solar irrigation according to water resources (ILLSI, 2021)

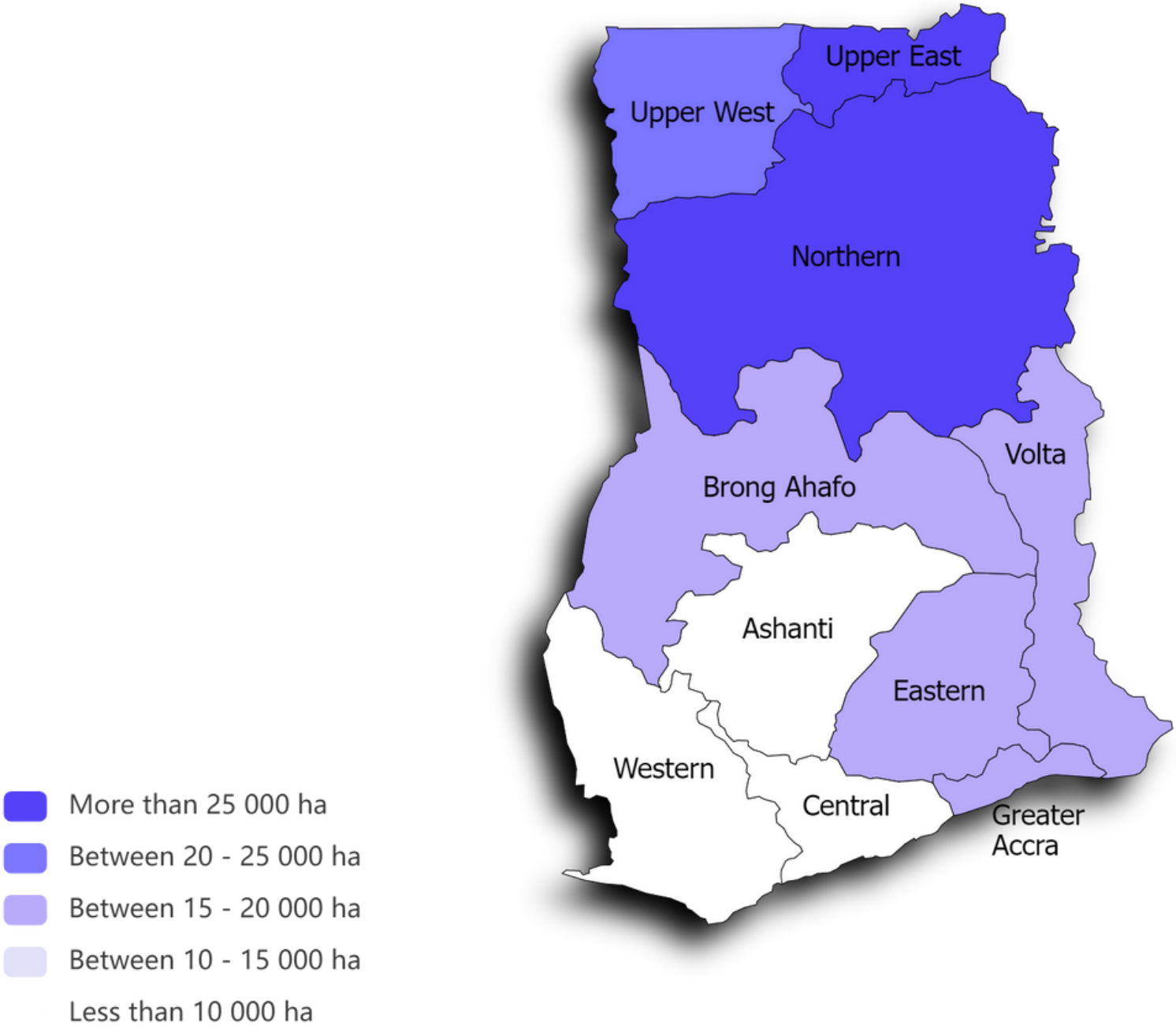
Smallholder irrigation area



Estimated smallholder irrigation area

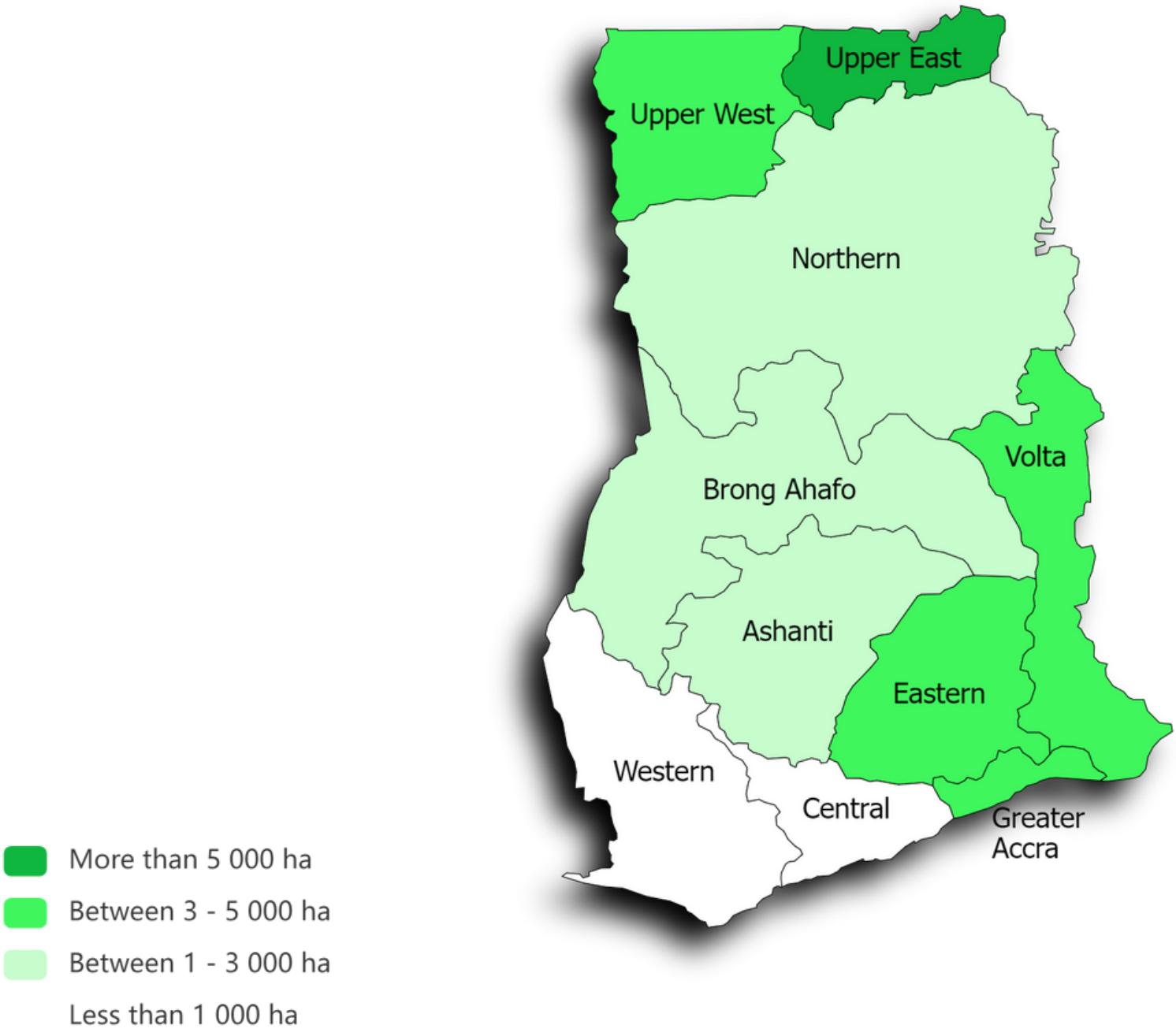
(World Bank, 2018)

Smallholder farmers surface water irrigation area



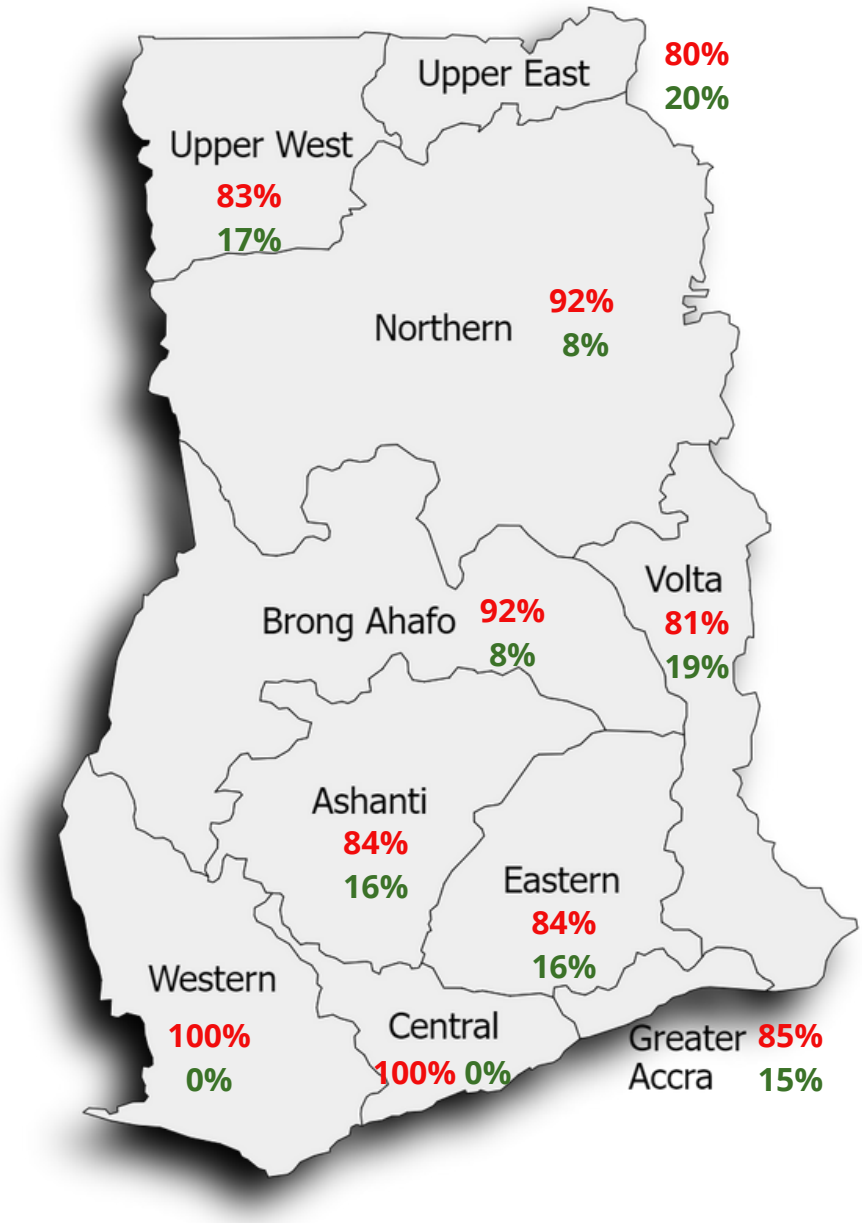
Estimated irrigated area where smallholder farmers use surface water for irrigation (World Bank, 2018)

Smallholder farmers ground water irrigation area



Estimated irrigated area where smallholder farmers use ground water for irrigation (World Bank, 2018)

Smallholder farmers irrigation type repartition



XX% Surface water irrigation
XX% Ground water irrigation

Estimated smallholder farmers irrigation type repartition

(World Bank, 2018)

Public and farmer-led irrigation

	Farmer-Led Irrigation Development	Public Irrigation Development
Investment/Maintenance	Financial burden on the farmer: need to ensure farmer's ability to access irrigation technology and financing	Dependence on external financing
Return of investment (African Union, 2020)	Average economic internal Rate of Returns (EiRRS) of **28%**	Average economic internal Rate of Returns (EiRRS) of **6%**
Irrigation expansion area (African Union, 2020)	**70-80%** of the future area	**20-30%** of the future area
Dependency	Ownership by the farmer	Dependence on the authorities that maintain and operate irrigation schemes
Support	Often, support is needed to guide the farmer in investment for irrigation	Support often comes with the presence of irrigation actors around the project

- **The sustainability of the largest systems remains hard to ensure**, often leaving only two options: dependence on external investments and financial aid or abandonment of the irrigation system.
- In Africa, farmer-led irrigation development has gained popularity in recent decades and is considered **one of the main ways to support agricultural development**.
- But **large-scale irrigation schemes are also a driver for small-scale irrigation** that benefits from a more favorable environment (policies, techniques and stakeholders) (P. Woodhouse & al, 2017). The most reliable model of irrigation development combines both scales.

Climate change and resilience

Climate change and agriculture

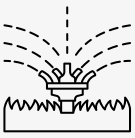
- Agriculture is highly **vulnerable due to its dependence on rainfall.** Climate change is likely to increase temperatures and decrease rainfall in the six agro-ecological zones (Asare-Nuamah Peter & Botchway Ebo, 2019).

- **The impact on crops will be strongly felt**: cassava and groundnuts in the south, groundnuts and sorghum in the north will be favored. Millet will be better adapted than maize and rice (A. Chemura, 2020; Etwire, Fielding & Kahui, 2017).

- The **economic impact** of climate change and variability weighs heavily on smallholder farmers. Anticipating the effects of climate change could prevent a major economic crisis.

Climate change and irrigation

The recommendations focus on communication, education on climate change issues, and adaptation through new techniques and adapted measures. The **promotion of irrigation technologies is a key pathway for creating resilience**.



- Studies show the **great potential of irrigation** as a smart technology in the face of climate change, ensuring an effective response to climate variability and extremes.

- Climate change adaptation strategies must be **tailored to each local context** using a horizontal approach. The use of local knowledge also improves the effectiveness of climate change adaptation solutions (L. Zvobgo, 2022).

- Farmers have already started to adapt their practices to climate change.. The means at their disposal remain limited, but the transition to irrigated agriculture also leads to an **increase in income up to 11%** (Agbenyo, 2022).

ANNEX

Irrigation typology in Ghana

The study of irrigation equipment type and farmer type has not been accurately tracked quantitatively and qualitatively at the national level in Ghana, and precise tracking of this data remains complicated.

The most recent data comes from the World Bank's 2020 report on agricultural development in Ghana and is based on published and unpublished sources, interviews with field actors, and field visits (2018).

Acronyms used :
- FLID = farmer-led irrigation
- PLI = private large-scale irrigation
- PMI = private medium-scale irrigation
- SH-GWI = smallholder groundwater irrigation
- SH-SWI = smallholder surface water irrigation
- SH-UPI = smallholder urban and peri-urban irrigation

Region	Irrigation typology (sources of water)	Estimated areas (ha)	Estimated number of households	Major crops cultivated
Volta	SH-SWI (rivers and streams)	17,600	29,300	Shallots, tomatoes, sweet peppers, okra, rice, green maize, local leafy vegetables, exotic vegetables.
	SH-SWI (dams and dugouts) (only FLID)	1,550	7,750	
	SH-GWI (shallow and deep wells and boreholes)	4,500	22,500	
	SH-UPI (streams and shallow wells)	Negligible	0	–
	PMI (rivers, dams, and groundwater)	350	3 firms	Fruits (bananas, pineapple, and so on), maize, rice.
	PLI (rivers and dams)	4,200	3 firms	

ANNEX

Irrigation typology in Ghana

Region	Irrigation typology (sources of water)	Estimated areas (ha)	Estimated number of households/ farmers	Major crops cultivated
Upper East	SH-SWI (rivers and streams)	29,200	73,000	Onions, tomatoes, sweet peppers, leafy vegetables, mangoes, rice, green maize, eggs.
	SH-SWI (dams and dugouts) (only FLID)	7,500	25,000	
	SH-GWI (shallow and deep wells and boreholes)	9,400	31,000	
	SH-UPI (streams, shallow wells, wastewater, and pipe water)	6	40	Leafy vegetables.
	PMI (rivers, dams, and groundwater)	560	5	Onions, tomatoes, sweet peppers, leafy vegetables, mangoes, rice.
	PLI (rivers and dams)	750	1	
Upper West	SH-SWI (rivers and streams)	18,500	52,900	Onions, tomatoes, sweet peppers, leafy vegetables, mangoes, rice, green maize.
	SH-SWI (dams and dugouts) (only FLID)	2,200	11,000	
	SH-GWI (shallow and deep wells and boreholes)	4,100	20,500	
	SH-UPI (streams and shallow wells)	3	20	Leafy vegetables.
	PMI (rivers, dams, and groundwater)	320	3	Mangoes, rice, maize.
	PLI (rivers and dams)	0	0	–
Northern	SH-SWI (rivers and streams)	30,300	67,300	Onions, tomatoes, sweet peppers, leafy vegetables, mangoes, rice, butternut squash, green maize.
	SH-SWI (dams and dugouts) (only FLID)	3,200	12,800	
	SH-GWI (shallow and deep wells and boreholes)	2,850	11,400	
	SH-UPI (streams and shallow wells)	12	80	Leafy vegetables, green maize, lettuce, cabbage.
	PMI (rivers, dams, and groundwater)	880	6 farm enterprises	Rice, mangoes, seed sorghum, maize, soybeans.
	PLI (rivers and dams)	1,250	2 farms enterprises	

ANNEX

Irrigation typology in Ghana

Region	Irrigation typology (sources of water)	Estimated areas (ha)	Estimated number of households/ farmers	Major crops cultivated
Brong Ahafo	SH-SWI (rivers and streams)	15,150	33,600	Onions, tomatoes, sweet peppers, local leafy vegetables, exotic vegetables (lettuce, cabbage, and so on).
	SH-SWI (dams and dugouts) (only FLID)	2,400	12,000	
	SH-GWI (shallow and deep wells and boreholes)	1,540	7,700	
	SH-UPI (streams and shallow wells)	Negligible	0	Leafy vegetables, green maize.
	PMI (rivers, dams, and groundwater)	0	0	–
	PLI (rivers and dams)	0	0	–
Ashanti	SH-SWI (rivers and streams)	5,500	18,000	Onions, tomatoes, sweet peppers, leafy vegetables, mangoes, rice
	SH-SWI (dams and dugouts) (only FLID)	1,500	10,000	
	SH-GWI (shallow and deep wells and boreholes)	1,350	9,000	
	SH-UPI (streams, shallow wells, wastewater, and pipe-borne water)	25	16,500	Local leafy vegetables, exotic vegetables
	PMI (rivers, dams, and groundwater)	250	16,500	Tomatoes, local leafy vegetables, exotic vegetables
	PLI (rivers and dams)	0	0	–
Eastern	SH-SWI (rivers and streams)	14,450	32,000	Exotic vegetables, mangoes, green maize, rice
	SH-SWI (dams and dugouts) (only FLID)	1,250	6,250	
	SH-GWI (shallow and deep wells and boreholes)	3,020	15,100	
	SH-UPI (streams and shallow wells)	3	20	Exotic and local green vegetables, garden eggs
	PMI (rivers, dams, and groundwater)	320	3 firms	Maize, rice, exotic vegetables
	PLI (and dams)	0	0	–

ANNEX

Irrigation typology in Ghana

Region	Irrigation typology (sources of water)	Estimated areas (ha)	Estimated number of households	Major crops cultivated
Greater Accra	SH-SWI (rivers and streams)	15,500	25,800	Maize, exotic vegetables, rice.
	SH-SWI (dams and dugouts) (only FLID)	2,500	12,500	
	SH-GWI (shallow and deep wells and boreholes)	3,050	15,250	
	SH-UPI (streams, shallow wells, wastewater, and pipe-borne water)	90	600	Exotic vegetables, green beans.
	PMI (rivers, dams, and groundwater)	1,100	7 firms	Fruits (bananas), maize, rice, exotic vegetables.
	PLI (rivers and dams)	2,600	4 firms	
Central	SH-SWI (rivers and streams)	4,500	15,000	Exotic vegetables.
	SH-SWI (dams and dugouts) (only FLID)	1,250	6,250	
	SH-GWI (shallow and deep wells and boreholes)	Negligible	0	–
	SH-UPI (streams and shallow wells)	Negligible	0	–
	PLI (rivers and dams)	0	0	–
Western	SH-SWI (rivers and streams)	7,500	25,000	Rice, green maize, tomatoes, garden eggs, exotic vegetables.
	SH-SWI (dams and dugouts) (only FLID)	500	2,500	
	SH-GWI (shallow and deep wells and boreholes)	Negligible	0	–
	SH-UPI (streams and shallow wells)	5	35	Exotic vegetables.
	PMI (rivers, dams, and groundwater)	0	0	–
	PLI (rivers and dams)	0	0	–

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