

## Autonomous Smallholder Shallow Groundwater Irrigation Development in Upper East Region of Ghana

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## Introduction

- Irrigation development is dominated by surface water based public systems
- Smallholder driven informal irrigation systems are increasingly becoming important: surface and groundwater utilization
- Groundwater resources in Ghana are not well understood
- The limited available information is very pessimistic about the groundwater potentials of Ghana
- Groundwater is usually reserved for domestic and livestock use
- Contrary to the official pessimism many farmers in Ghana are making use of shallow groundwater to generate

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## Objectives of the study

- To assess the drivers of shallow groundwater development
- To estimate the extent of shallow groundwater irrigation in white Volta basin
- To analyze the economics of shallow groundwater development
- To assess impacts: food security, poverty, employment, Income (value added), and
- To identify constraints to shallow groundwater development and suggest policy recommendations

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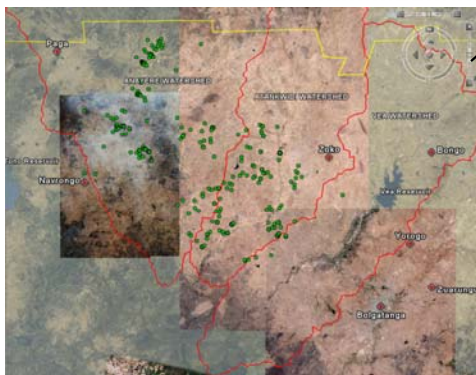


## Volta Basin & White



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## Typologies of smallholder shallow groundwater irrigation systems

Typology 1. Reverse seasonal shallow wells or dugouts



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## Smallholder Shallow Groundwater Irrigation Typology (Con' d)

Typology 2: Infield seasonal shallow wells



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## Smallholder Shallow Groundwater Irrigation Typology (Con' d)

Typology 3: Permanent Shallow wells

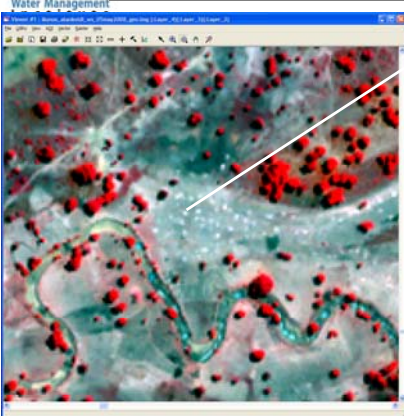


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## Shallow Ground Water Irrigation in Atankwidi Watershed, Ghana

Shallow dug Wells on high resolution satellite image



Quickbird 2.44m data for May 5, 2008 shown in FCC (RGB): 4,3,2.

The white bright dots are dug wells and land resources management for food, livelihoods and nature

## Localized application of water: High water productivity

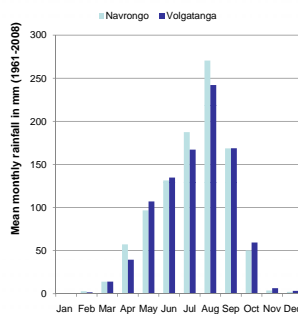


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## Drivers of shallow groundwater irrigation development

- Population pressure
- Road access to the region since 1990
- Uni-modal rainfall pattern and extended dry season
- Availability of tomato processing factory



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## Extent of shallow groundwater irrigation in White Volta basin

Typologies	Number of wells	Number of households	Area in Acre
In-field shallow well	5290	1603	1475.0
Riverine shallow wells	922	384	526.3
Permanent wells	666	512	261.3
	7508	2499	2262.6

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## Cropping patterns

	Tomato	Pepper	Others
Infield shallow wells	137.75	10.0	5.95
Riverine shallow wells	58.25	2.5	1.0
Permanent shallow wells	1.75	9.0	1.0
Total	197.75	21.5	7.95
%	87.0	9.5	3.5



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## Economics of shallow groundwater irrigation

- Investment costs
  - Mainly labor
  - Minimum fixed cost
- Production costs
  - Labor constitutes the lions share of the costs of production (50-90%)
- The profitability depends on the opportunity cost of labor



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## Socio-economic impacts of shallow groundwater development

- Generated employment for young people during dry season:
  - 359,511 man-days (or 1383 FTE)
  - Rural-urban migration!
- Significantly contributed to the village economy: About 1.6 million GHc (or US\$1.2 million )
- Reduced poverty among practitioners but did not eradicate it!
- Enhanced food security

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## Constraints and policy recommendations

- Land tenure insecurity: digging and re-filling every season
- Inadequate or no research and extension support
  - Well siting is based on trial and error or farmers own indigenous knowledge
- Drudgery: use of rudimentary implements
  - Thus only small fraction of the total storage volume of the aquifer is abstracted for irrigation
  - current use is only 5% of the average groundwater recharge
- Marketing
- Weak input supply system

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## Thank you



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