Stakeholder Consultation Report

Feed the Future Innovation Lab for Small-Scale Irrigation: Ghana

Workshop proceedings documentation

Tamale, Ghana • 15 April 2014






"The Feed the Future Innovation Lab for Small-Scale Irrigation works to enhance food security and reduce poverty by developing and introducing gender-sensitive, small-scale irrigation systems into food and agriculture production on small farms."

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Workshop Participants

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1. Introduction and Background

1.1. Background

The Feed the Future Innovation lab on Small-scale Irrigation is a cooperative research project that aims to increase food production, improve nutrition, protect the environment and accelerate economic development through improved access to small-scale irrigation technologies.[1] The project will contribute to the overall aims through piloting and modelling high potential interventions in small-scale irrigation and irrigated fodder production. The project takes a partnership and engagement approach to ensure continual learning; responsiveness to local demands, needs and realities; support for national goals and initiatives; and the uptake of outputs and recommendations by farmers, researchers, policymakers and investors. The research will be implemented in Ethiopia, Ghana and Tanzania.

The International Water Management Institute (IWMI) will lead research and engagement in the target countries, in partnership with the International Livestock Research Institute (ILRI) and the International Food Policy Research Institute (IFPRI), with overall project leadership from Texas A & M University. The North Carolina Agriculture and Technology is also a partner on the project. Research implementation will be carried out with national partners in each country.

1.2. Stakeholder consultation

As an initial activity in Ghana, project partners convened a one-day consultation with national stakeholders in Ghana towards sharing prior research on small-scale irrigation and fodder production, as well as prioritizing with stakeholders the opportunities and needs for research on the potential interventions within the Ghanaian context. The meeting also served as an initial consultation with stakeholders for future dialogue, networking and partnership development.

The Stakeholder Consultation Workshop was held at the Modern City Hotel in Tamale on 15th April 2014.

2. Objectives of the Workshop

2.1. Objectives

- To share research and experiences on small-scale irrigation and irrigated fodder interventions
- To propose promising small-scale irrigation and integrated fodder interventions for further in-depth research and field-level piloting

2.2. Expected Outputs

- Identified sets of interventions, experiences and research on small-scale irrigation
- Prioritization of potential intervention for small-scale irrigation and irrigated fodder

[1] Project website: **ilssi**.**tamu**.edu/
For more information on Feed the Future in Ghana: http://www.feedthefuture.gov/country/ghana

3. Participants

The consultation brought together Government of Ghana agency officials, university and international scientists and researchers, non-governmental organizations, private contractors and farmers from irrigated farms and water users' associations. Key institutions were represented, including the following: Ghana Irrigation Development Authority (GIDA); Ministry of Food and Agriculture (MoFA); Water Research Institute (WRI), Animal Research Institute (ARI) and Savannah Agricultural Research Institute (SARI) all of the Council for Scientific and Industrial Research (CSIR); Water Resources Commission; Ghana Commercial Agriculture Project; and various departments of the University for Development Studies. Several farmers with irrigation experience also participated to share their challenges. In addition, the GIDA Board Chairman participated in the workshop to represent GIDA and bring his experiences as a commercial farmer using various irrigation methods. The full list of participants can be found in the Annex of this report.

4. WORKSHOP PROCEEDINGS

4.1. Opening

The workshop was opened with a prayer by Mr. Jakper Naandam, the Head of the Department of Animal Science, University for Development Studies.

Dr. Nicole Lefore, a research manager for IWMI, welcomed participants. She recounted her own experiences on the farm in the US, as she comes from a farming family and community. She explained some of the universal problems associated with water use as a common resource, especially multiple uses of common water sources. She briefly outlined the objectives of the cooperative research project and those of the workshop. She emphasized the importance of the workshop in shaping the research content of the project so that farmers will benefit, and that the research outcomes would contribute to achieving the wider objectives of USAID Feed the Future in Ghana and other countries.

4.2. Expectations of Participants

Participants were asked to state their expectations of the workshop; specifically what they think will be achieved at the end of the workshop. Most expectations highlighted were improved water productivity and reducing irrigation costs and increasing knowledge of farmers on agriculture water management for integrated crop and livestock production.

List of stated expectations of participants (largely unedited):

- Share and learn about practices in small scale irrigation (SSI) as well as challenges and possible solutions.
- Obtain information on the application of simple appropriate water lifting and pumping devices in irrigation in the sub-region.
- Learn about water harvesting technologies as they apply to irrigation.
- Nexus of livestock and water provision is very under-researched.
- Learn where the feasible irrigation water resources (shallow groundwater and surface water) for SSI are in northern Ghana and the likely yields with regards groundwater and irrigable area associated with surface water.

- Learn more about the hydrogeology of northern Ghana.
- Find solutions to some problems affecting irrigation farming in northern Ghana.
- Learn how to combine aquaculture and crop farming in irrigation systems in Ghana.
- Discuss how irrigation could improve the livelihood of small farmers and how to maintain the dams.
- Get in-depth knowledge of SSI and integrated fodder interventions.
- Identify research gaps in the impact of climate change on livestock and irrigation farming.
- Seek solutions to some of the teething problems in irrigation and how to make irrigation farming attractive to the youth.
- Deliberate on how high costs associated with irrigation particularly those using pumps can be reduced.
- Share and learn about methods, technologies, challenges and solutions with regards SSI.
- Learn more about irrigation and water management.
- Deliberate on how to improve and sustain water management in small earth dams and how small-scale farmers can maximize profit.
- Discuss linkage of research with SSI for food security.
- Discuss how irrigation in northern Ghana will be restructured to incorporate animal husbandry; that is crop-livestock integration, at irrigation sites.
- Discuss how surface run-offs can be harnessed for animal production (watering and fodder production).
- Discuss rangeland irrigation for fodder production.
- Learn adaptation strategies of crop farmers with respect to irrigation and livestock production.
- Deliberate on the most effective ways of harvesting water for crop, animal and domestic use to mitigate the effects of the long dry season in the north and the reality of climate change.
- Output of workshop will eventually improve the lot of the Ghanaian irrigation farmer.
- Understand the principles/opportunities in using irrigation for fodder development and how livestock farmers can adopt and invest in irrigation for their production.
- Know what irrigation infrastructure, for example, number of small scale schemes, the project will bring.
- Discuss experiences of irrigators and their difficulties and priorities for piloting some SSI practices.
- Know the kinds of SSI technologies that should be adopted, how they will impact on food security, who the target beneficiaries are and what help the farmers will get.

4.3. Summary of Presentations

Two presentations were made to introduce the topics of small-scale irrigation and also irrigated fodder production. The presentations were based on discussion papers. The purpose of the presentations was to provide an overview of existing research and knowledge and to stimulate dialogue on the gaps and needs for future research. The presentations were made by Professor Saa Dittoh of the University for Development Studies (UDS), who was also the facilitator of the workshop and Dr. Naaminong Karbo, Director of the Animal Research Institute (ARI) of the Council for Scientific and Industrial Research (CSIR), Ghana. An informal, impromptu 'presentation' was also made by the Chairman of the GIDA Board following the formal presentations.

4.3.1. " Feed the Future Innovation Lab for Small-Scale Irrigation in Ghana: Experiences and Alternative Technologies for Water Delivery and Management"

Presented by Saa Dittoh (UDS); Prepared by Saa Dittoh (UDS) and Nicole Lefore (IWMI)

Prof. Dittoh's presentation drew substantially but not exclusively from the discussion paper titled "Promising Small-Scale Irrigation and Fodder Interventions in Ghana" that was prepared for the workshop and shared with participants in advance. The presentation highlighted the relevance of SSI, emphasizing the fact that SSI has generally been more successful than large and medium scale irrigation systems in Ghana and the West African sub-region; the main reason for the poor performances of the latter being governance inadequacies. He outlined the irrigation typologies in northern Ghana and some of the Sahel countries. He used pictures to show some of the problems and opportunities that exist in both surface water and groundwater irrigation systems in the West African sub-region. He then discussed the findings of Gates Foundation funded Agricultural Water Management (AWM) Solutions Project and other researches and identified some research and capacity building gaps in SSI in Ghana.

4.3.2. "Feed the Future Innovation Lab for Small-Scale Irrigation in Ghana: Opportunities and Challenges to Integrate Fodder"

Presented by Dr. Naaminong Karbo; Prepared by Augustine Ayantunde, Amare Haileslassie, Alan Duncan and Dr. Karbo

The presentation discussed the livestock production systems in Ghana and the constraints to livestock production. It noted that in Ghana about 90%, 30%, 35%, 40% and 25% of cattle, sheep, goats, pigs and poultry respectively are produced in the three northern regions of the country. Livestock production in the country however face a myriad of problems ranging from absence of improved breeds, inadequate feed and water, and poor housing to high cost of veterinary drugs, lack of access to credit and low prices for livestock products. The presentation also pointed out that at least 50% of livestock products in Ghana are produced by smallholders with low external inputs. A survey on fodder production in irrigated sites indicated that it (fodder production in irrigated sites) does not currently exist in Ghana but there is great potential especially as crop-livestock integration systems are promoted and intensified.

4.3.3. Chairman of the Board, GIDA: Overview of experiences, challenges

The Board Chairman (former Director of MoFA) is farming with irrigation, and grows mango and butternut squash, among others. He made the following points to participants for further consideration:

- Farmers are not making any money from irrigation. The risks involved in irrigated agriculture are too high, especially the relatively large-scale investments. The cost of inputs, including electricity, is unbearable.
- Added to these problems is the fact that there is no production manual on any irrigated crop from MOFA, GIDA or the research institutes to give some direction on what to do. He explained that though a lot of noise is made about producing butternut squash for export neither MOFA nor any other institution has made efforts to understand the crop.

Irrigators are on their own; there is virtually no scientific direction. He indicated that his irrigated mango trees are drying up but the mango trees of those who did not irrigate in the same area are not.

- These issues are a clear indication of our lack of adequate knowledge of irrigated agriculture. Irrigation research is thus very important. Hopefully the proposed research will not go the way of others where the interest is to test technologies, write reports and papers, instead of aiming at development and the betterment of the people.
- We need ways to blend public and private investment that are beneficial for irrigated farming.

4.4. Plenary Discussions and Feedback

Following the presentations and comments from the GIDA Board Chairman, participants had open deliberations on the issues presented and any that were omitted that they felt important to include. This led to lively discussions around key subjects, which are outlined below.

4.4.1. Irrigation

Challenges

- We have no irrigation extension. There is a need for capacity for extension in irrigation, using training at the field level.
- Irrigated farming is too expensive. Watering is very costly, e.g. electricity cost is too high.
- Farmers are relying on government to support them because they don't make enough money on irrigated farms.

Governance

- There is need to **emphasize the failure of irrigation governance** rather than failure of management of irrigation systems when discussing the problems besetting medium- and large-scale irrigation systems because what happens in most irrigation sites go far beyond the powers of the scheme management.
- The community sets rules and there is supposed to be **reward and punishment**. Punishment for wrong doing by irrigators has been very difficult, because of political, social and other interferences and considerations. He asked "how can one punish an in-law for misuse of water under the present institutional and regulatory arrangements? Unless there is a good system to reward and punish people in the irrigation systems very little improvement can be achieved."
- Have to **innovate on governance, institutional systems** so things work well.
- Nkrumah (Ghana's first President) had plans for irrigation so it is good to see it finally coming along.
- Communal means it is for 'nobody' – so we need to know how to govern SSI so that it can reduce poverty, increase productivity and improve nutrition
- There are problems with **small earth dams**; who controls and manages them. Institutions and communities deny responsibility. Then there is the damage of livestock to the dams.

GIDA – Institutional issues and clarifications

- The representative of the Chief Executive of the Ghana Irrigation Development Authority (GIDA) pointed out that in Ghana the distinction between formal and informal irrigation

systems no longer exist. GIDA has now come up with five **irrigation business packages** which make the distinction between formal and informal irrigation redundant. The five packages are:

  - **Micro-smallholder** schemes involving groundwater and wastewater use mainly for vegetable production.
  - **Community-managed** small- to medium-scale systems.
  - **Large-scale systems based on public-private partnership** models.
  - **Market-oriented commercial** farm irrigation.
  - Enhanced **water management in rainfed** agriculture (aim is mainly to stock water to lengthen the production period).
  - It is being made mandatory that private people going into irrigation of significant size need **certification by GIDA**.

- GIDA has a team working on packages for each of the categories.
- "Who should be in charge of irrigation in Ghana, agronomists or engineers?" It was noted that the **conflict between engineers and agriculturists** has weakened GIDA.

Support services for irrigated farming, including extension

- Government provides **no direction for irrigated farming, no manuals or training**. When people want information from MoFA on irrigated farming, they give them his (Chairman of the Board) phone number.
- Also no **support on choice of variety/crops for water productivity**. For example, some mangoes require less water, but other trees on the market require a lot of water and the trees are dying. Government promotes certain crops, but there is no support on production and water requirements.
- Lack of irrigation extension personnel and an **irrigation extension manual** was raised as a serious concern. The GIDA representative replied that it has always been an important issue of concern to GIDA and there are attempts to revive the Kpong Irrigation School so that the capacity of extension personnel can be built in various aspects of irrigation. The Head of Department of Mechanization and Irrigation Technology of UDS then pointed out that they have developed an irrigation extension curriculum for in-service training of agricultural extension personnel. It was however pointed out that if that curriculum was developed without input from key stakeholders such as GIDA, MOFA and various irrigation groups, then it cannot serve the purpose being advocated. It was again pointed out that an irrigation extension worker must be one with knowledge in several disciplines; engineering and mechanization, agronomy, horticulture, agricultural economics and extension; even nutrition and animal science and several other areas. The curriculum must be broad-based. The Head of Department was advised to subject the curriculum to scrutiny by relevant stakeholders in irrigation. As there is no funding for the irrigation school, it was advised to finish the manual and get it to be used in the various agricultural colleges in the country.
- UDS has short course and in-service training within Department of Mechanization and Irrigation Technology, which requires 2 weeks per year. The course is multi-purpose and irrigation should be integrated into that course.

Drip irrigation

- iDE is piloting drip with low cost kits (incl water storage and pump). Cost is GHC 1000 (USD 385); too high. Have to look for ways to **decrease cost and build a market chain** on drip.
- A participant pointed out that a lot can be done to save water in all irrigation systems. She pointed out that there is need to **emphasize increased water productivity**, which can be done through other methods than drip. She said that drip irrigation, though potentially useful, is not a panacea to our irrigation problems. Others agreed with her and pointed out that drip irrigation is difficult to manage especially by illiterate farmers.
- GCAP experience: **Small farmers are struggling with drip**: cost, cutting lines during land clearing.
- **Alternatives for drip can be more cost effective**, e.g. use of gourds on a 15 acre mango plantation works well.

4.4.2. Livestock

Challenges

- People in Northern Region allow livestock to go through farms, dams, water ways, etc. Roaming livestock causes **damage and conflict**. And cattle rustling is a big problem.
- Need to look at **water demands of livestock**. If over-using water on crops, there are consequences for livestock watering.
- Need land use plans on irrigated areas, which include livestock and fodder.
- Need stock taking to be able to **match livestock demands to water availability**. This was done at individual dams and schemes, but needs to be updated and considered more broadly.

Opportunities

- There is a **feed market emerging** in Bolgatanga, Upper East Region.
- **Fodder banks** should be looked at, e.g. GCAP on the Accra Plains has a fodder bank. But there is no livestock in the area. Currently doing a feasibility study on 11,000 ha (GCAP+JICA).
- Should consider research not only on ruminants, but **target crop with specific livestock** choice, e.g. pigs, sheep, goats, cattle, poultry, guinea fowls etc. Species specific to the crop produced and market opportunity, e.g. vegetable production with pigs. Irrigators should not be dogmatic with regards the kinds of livestock to target.
- We need to look at hot to **re-tool existing irrigation schemes to consider livestock**.
- Animal **enclosures** are key with fodder development. Solves nuisance problems on farms and roads, and you get the manure for the crops.

Governance and institutional issues

- Need more **collaboration** between GIDA and ARI.
- Burkina Faso is a good example of **district level by-laws**, because big laws at national level are not even known at district level. Need to consider different levels of governance for regulating livestock. “Animals are not indisciplined, human beings are.”
- A participant felt that in designing irrigation infrastructure hardly any thought is given to livestock thus very little is known about the livestock water demand in the dry season. He felt not much policy considerations are given to livestock in the country.

- Integrating crops and livestock in irrigation sites will be difficult. Crop-livestock integration in irrigation sites will be destructive to canals and will cause major conflicts. Special dugouts should be made for livestock.
- Others pointed out that the notion that "livestock is destructive" has to be discarded; crop-livestock integration is possible with **effective planning and by-laws** are made to regulate activities. Good and sustainable governance structures have to be put in place.
- With respect to the raising of livestock in irrigation sites it was pointed out that GIDA is now involved in integrated water management and thus livestock and fisheries especially aquaculture can easily be incorporated. An example is already being shown by Wienco Limited (an agribusiness firm) in its irrigation scheme located in the "overseas" area of the Northern Region where provision has been made to incorporate livestock production.

Aquaculture and irrigation schemes

- Locals do not have a tradition or skills in fishing. Chiefs call migratory fishermen to harvest fish, but the local people cannot buy the same fish from their own community irrigation schemes because it is too **expensive**. So stocking with fish does not help the nutrition of the local community.
- In some schemes, women have the right to fish, but not rights to water livestock on schemes. Opportunities to add fingerlings in cages to ponds and reservoirs and in large systems. Government and NGOs stock them and then provide feed. It **gives women work** and then they can harvest the fish. One NGO is
- There was general agreement that **aquaculture can be integrated effectively in irrigation** sites. Indeed there are examples in several places in Ghana. Also women have a much greater control when it comes to fish production. There is an on-going pilot project reaching 4 communities (30 women, 10 men) by the Water Research Institute in collaboration with GIDA in relatively large reservoirs such as Bontanga and Golinga where women and men (in a ratio of about 3 to 1) are undertaking aquaculture using cages. The project is teaching fish rearing skills and subsidizing for 10 years.

4.5. Group Work Sessions: Discussion Key Points/Recommendations or Actions

Toward deeper engagement on subjects for further research, the workshop moved into group discussions. Two groups were formed, as follow:

Group 1 discussed:

A) Technical Issues and Challenges
B) Environmental Impact Issues

Group 2 discussed:

A) Social and Economic Issues (including gender and youth concerns)
B) Nutrition and health

4.5.1. Results of Group 1 Discussions: Technical issues

Technical issues	Areas for action and/or research
1. LIVESTOCK/FISH	
a) Integrated fish farms	- Above ground pounds (e.g. Tono) - Cages in dams

	- Fish in paddies
b) Integration of livestock	- Leave a portion of land for pasture and irrigate it (i.e. fodder production) - Create watering points for livestock
2. WATER ACCESS, DISTRIBUTION	
a) Water harvesting	- Contour bunds where appropriate (valleys for rice) - Dams, dugouts and dykes - Deep tubewells and boreholes
b) Affordability in large- and small-scale irrigation systems	- PVC pipes are cheaper (+ drill holes)
c) Shallow groundwater harvesting	- Wells plus linings and with concrete to collect run-off.
d) Water distribution systems	- Canals (using gravity) - Sprinkler - Drip
e) Efficient water lifting	- Electric pumps (0.5 hp pumps) - Wind and solar pumps
3. WATER SUPPLY, DEMAND AND QUALITY	
a) Groundwater (GW) supply/demand	- Sand dumps for stream banks - More data required to estimate GW quantities as well as demand.
b) GW quality	- Filters, water testing, allocate to right crops

Environmental issues	**Areas for action and/or research**
1. SOIL/CATCHMENT PROTECTION	
a) Reservoir siltation	- Regular de-silting - Prevention, buffer zones
b) Damage during/after dam construction	- Reclaim "borrowed" area - Re-vegatation
c) Soil erosion (embankment and upstream)	- Vertiver grass - Filter strip
d) Lake shore protection	- Shrubs, bamboos and fodder trees
2. WATER QUALITY MANAGEMENT	
a) Water borne diseases	- Education/awareness creation - Medical services - Protective clothing - Disinfectants
b) Chemical pollution of water bodies (fish)	- Encourage use of manure - Prevent run-off - Watering point locations - Education/awareness creation
c) Domestic waste disposal	- Toilets - Recycling - Composting organic waste

	- Intensify livestock production
3. SOCIAL AND BIODERVISITY	
a) Resettlement, displacement and loss of biodiversity	Key institutions to take action: - Environmental Protection Agency (EPA) - District Assemblies

Challenges	
1. TECHNICAL	
a) Livestock/Fish	- Information flow: Technical agents and training - Infrastructure: Dams and distribution
b) Water Access and Distribution	- Information flow between institutions and stakeholders
c) Water Supply, Demand and Quality	- Affordable appropriate technology for users (small farmers) - Appropriate policy
2. ENVIRONMENTAL	
a) Soil/Catchment Protection	- Funding effectiveness and targeting
b) Water Quality Management	- Climate change and variability
c) Social and Biodiversity	- Human resource development/education - Depopulation - Post harvest and marketing problems

ACTION	**FOLLOW UP**
1. Continue to expand small scale irrigation infrastructure and water harvesting. For example, Rice Sector Support Program (RSSP).	Issa
2. Fodder production at irrigation site. For example, allocate land for pasture and rotate. Also have fodder shrub "banks".	Herbert
3. Promote privatization of fodder production (as in 2). For example, bailing fodder.	Peter
4. Fish ponds (above ground) and cages privatization	Baba
5. Expand productive/economic trees in buffer zones. For example Tono, Vea, Ghana Social Opportunities Project (Climate change subproject)	Vitus
6. Supply simple pumping devices. For example rope pump, soka pump and motor pump.	Bukari

4.5.2. Results of Group 2 Discussions: Social and economic issues

Opportunities	**Areas for action and/or research**
1. WOMEN	• Irrigation reduces work for women by bringing water closers; releases time for other things. • WUA by-law doesn't apply to domestic use. Water for domestic purposes comes before irrigation. Irrigated area will be reduced if domestic

	requirements are high. Water not used for irrigation is used by women. • Women get higher yields on irrigation schemes. • Irrigation schemes make an agreement on water allocation across groups; set quotas for land and water distribution. E.g. 40% women, 30% young men, 30% others (older men). • Preparation is better when women and youth are involved.
2. YOUTH	• Having access to water improved chances for marriage. Women prefer to marry men who provide access to water so they don't have to carry water. • Irrigation appears more to the youth than to older generations. • Reduces urban migration
3. NUTRITION/HEALTH	• Vegetables could increase the nutrition of the farmers but need sensitization. • Fish cages for improved nutrition on irrigation schemes. • Reduces health bills with improved nutrition
4. OTHER	• Cannot ignore water and soil management. Have to integrate in the research. • Understanding water harvesting and distribution of water across time on the fields. • Increased income may be used for priorities such as improving housing. • Creation of more water bodies helps to improve the environment and livelihoods. • Systematic crop-livestock integration can reduce conflicts.

Challenges	Areas for action and/or research
1. LIMITATION OF ACCESS TO LAND AND OTHER RESOURCES, E.G. SUPPORT SERVICES	• Governance of irrigation systems is very unclear. Access to irrigated land should for example be related to ownership of the land but that relationship is not clear. There is need for written agreements on the principles governing the use of the irrigated areas. • There is also need for bye laws for livestock to be housed in the nights. That will help to make fencing unnecessary. • Fencing is very expensive and is a major limitation to irrigated agriculture by small farmers. • Silting of dams is a key limitation. • Many small farmers (especially women) are

	constrained with regards resources (cash) and as such cannot participate in irrigation schemes. • The Village Savings and Loan Associations (VSLAs) are yet to be available in many localities. They also have their constraints. • There are no irrigation extension personnel to help farmers with technical knowledge. • Energy (fuel, electricity, solar etc.) is a serious constraint. Cost is too high.
2. IRRIGATED FARMING COSTS/ FARMING AS A BUSINESS	• Some farmers cannot pay water levy or for leases. • Market access issues (e.g. seeds, etc). • Some people won't use their own cash to invest and wait for NGOs or government to invest for them. • Irrigation farming not treated as a business. • Livestock not treated as business/investment. People leave livestock to roam on roads at night in Northern Region (ask them: would they leave cash on the road). Some NGOs give training on record keeping or training women on different forms of marketing (selling door to door, markets, etc.). • Energy costs are increasing the cost of irrigation. • Irrigated agriculture is business and irrigators must understand basic business principles. There is need for training for farmers in records keeping. • Farmers have to diversify into other crops/enterprises. • Scheduling crops through seasons on schemes might help avoid gluts.
3. GOVERNANCE AND/OR INSTITUTION ISSUES	• Land access problem for women and youth, and access to water for irrigation. Can't use irrigation water for vegetables at the house, so it is only for irrigated farms. • Women are not forthcoming in managing WUAs and schemes, though they achieve increased productivity relative to men. • Nearly every district has an irrigation scheme, e.g. dam. Districts set up WUAs, but these are not often sustained. • District Assembly need to back the chiefs on enforcing by-laws, but usually they don't. Not consistent at District level and D.A.s don't play the role they should with by-law enforcement. • Outgrower schemes should include sensitization on health, business, etc. • D.A.s say there are no funds available and they don't support requests for dams.

	• GIDA does not provide backstopping for D.A.s on irrigation development/management. • Government giving away pumps did not help. The pumps do not address the issue of managing pests and diseases that come with irrigated farming. • Need to create platforms for stakeholders to give feedback to GIDA on the business lines and the packages they are developing.
4. HEALTH/NUTRITION	• There is an increase in malaria around irrigation schemes. When a new scheme is developed, there is the need to sensitive the community on use of bednets. • Dams can have issues with diseases, including for livestock.

5. LIVESTOCK	• Fencing/enclosures
	  ○ Areas not fenced: men watch for livestock at night.
	  ○ Fencing cost is high. In some areas, they will build mud walls and each person on scheme has to build a section.
	  ○ Issues of land ownership; have to resolve land boundaries before building fences.
	• By-laws on schemes include those for livestock. Some are effective, but it depends on how well they are enforced. E.g. In Upper East, tradition is to house livestock at night so they have a short on sight policy at night and landlord is given the animal killed to share out.
	• Greens on some irrigation schemes are already used for fodder.
	• Crop-livestock farming should be emphasized, using the bullocks for traction and selling the livestock at higher prices.

6. CONFLICT OF CROP PRODUCTION AND LIVESTOCK REARING	• Decision making must involve all grassroots stakeholders. Sensitizations must involve all WUA members and other stakeholders. • There should be engagement platforms to take decisions and fine-tune the organizational structures and systems for cropping and livestock rearing. • District Assemblies should create, implement and/or support by-laws to forestall conflicts.

Actions	
	• Effective planning is necessary • Appropriate institutions should be strengthened to propel change.

	• Effective sensitization of District Assemblies very necessary. • Action research to include other crops/enterprises will help to reduce risks of farmers. • Social electricity tariff for irrigated agriculture must be pursued. • Nutritional education/advocacy required. • Smallholder industries (processing) needed to deal with gluts and low prices.

4.6. Close of Workshop

The workshop came to a close with general comments by several participants. The emphasis was on *research aimed at finding solutions to problems that exist*. All agreed that without the development of irrigated agriculture, food and nutrition security in the northern part of Ghana will be a mirage. However the problems confronting irrigated agriculture currently are so daunting that without practically-oriented research to address the problems very little will be achieved. There was also agreement that livestock has been and will continue to be important to smallholder farmers especially with regards cash security and its promotion in irrigation sites will add value to irrigated agriculture. They claimed most of their expectations were met. Malam Awudu Abukari of UDS gave the closing prayer.

5. Emerging priorities for research/pilot intervention

The presentations, plenary discussions and group discussions have proposed a number of issues, ideas, concerns and opportunities which point to research priorities and pilot interventions. The following are potential research and intervention areas.

5.1. Irrigation technologies and costs/benefits

a) It is important to identify the factors responsible for the failure or success of irrigation systems in Ghana. Are SSI technologies really successful more successful than other types and sizes of schemes? Are farmers using SSI better off than other farmers? If they are, why are small-scale irrigators continuing to be poor?

b) Analysis of the feasibility of different SSI technologies in Ghana (with special attention paid to different drip irrigation systems).

c) Comparative analysis of different water lifting/distribution systems: Canal, sprinkler, drip etc.

d) Scenario (risk) analysis of irrigation profitability in northern Ghana.

5.2. Governance and/or institutional issues related to effectiveness of irrigation

a) A study of irrigation governance in Ghana to arrive at "ideal" governance arrangements of irrigated systems in Ghana.

b) Institutional solutions for enforcing by-laws related to water use.

c) Women and youth in irrigated agriculture: Challenges and Opportunities.

5.3. Livestock and fodder production

a) Is fodder for livestock a serious problem for farmers in northern Ghana? Will farmers allocate some of the very limited irrigated areas for livestock feeding?

b) Fodder is only one of the many problems of livestock production. How are the other problems going to be tackled alongside fodder production?

c) What kinds of crop-livestock systems will be acceptable and feasible in irrigated sites?

d) Analysis of the feasibility of crop-livestock integration systems in irrigated sites.

e) Analysis of the feasibility of aquaculture systems in irrigated sites.

f) Livestock water demand in the dry season in the northern regions of Ghana.

5.4. Other outputs of research for impact

a) Development of business plans/cases related to GIDA irrigation business package for micro and small-scale irrigators.

b) Contribute to curriculum for training of extension personnel on irrigation.

c) Capacity building of irrigation and agriculture personnel, as well as farmers in components of irrigated agriculture: crop-livestock integration, aquaculture, water harvesting, fodder production etc.

d) Provide platform for dialogue between irrigation/water institutions and livestock institutions, including government bodies and research institutions.

6. Significance of the workshop and next steps

This workshop provided the first platform for dialogue and knowledge sharing in Ghana under the ILSSI project. The workshop obtained the intended outcomes; it contributed to the process of identification and prioritization of potential research interventions on small-scale irrigation and fodder. The workshop also provided an excellent opportunity for identifying the interests and expertise, and developing the partnerships to implement the research. The issues outlined above from the workshop discussions will be considered alongside results of meetings held in April with individual stakeholders and institutions in Ghana, the existing research on which to build, and opportunities for partnerships.

The next steps to be taken include short-listing potential research interventions and sharing those with potential partners, followed by identification of potential research sites. The project will continue to share with workshop participants and other stakeholder the plans for research and opportunities for further collaboration.

7. Annex

7.1. Presentation 1

" Feed the Future Innovation Lab for Small-Scale Irrigation in Ghana: Experiences and Alternative Technologies for Water Delivery and Management"

FEED THE FUTURE INNOVATION LAB FOR SMALL-SCALE IRRIGATION

EXPERIENCES AND ALTERNATIVE TECHNOLOGIES FOR WATER DELIVERY AND MANAGEMENT IN GHANA

Presentation at stakeholder consultation, Tamale, 15/04/14

By

Saa Dittoh, UDS, Tamale

Nicole Lefore, IWMI

USAID THE TEXAS A&M UNIVERSITY SYSTEM IWMI ILRI

Relevance of Small Scale Irrigation (1/3)

- Agricultural production in Ghana and indeed the West African sub-region is dependent on rainfall.
- The rainy season in the arid and semi-arid areas are very short and rainfall erratic.
- In the three regions of northern Ghana (Northern, Upper East and Upper West), rainfall is between April/May to September/October.
- The total quantity of rainfall in the northern regions continues to be between 900mm to over 1000mm.
- Erratic distribution and delays in the rainy season are the challenges.
- Sometimes droughts and floods occur in the same year.

Relevance of Small Scale Irrigation (2/3)

- Over the years poverty in Ghana has declined.
- Poverty in the northern part however increased or decreased only marginally (compared to other regions) – see Table 1.
- Poverty rates are not unconnected with rainfall and reliance on rainfed agricultural practices.
- Small farmers are the most affected.
- Irrigated agriculture is obviously the means to overcome the limitation of unreliable rainfall.
- Irrigated agriculture in Ghana, however, remains largely insignificant despite the realization of its importance; less than two percent of the total cultivatable area (Namara et. al. 2011).

Table 1: Poverty Incidence in Ghana 1991-2006 (Poverty line: GH¢371; Extreme poverty line: GH¢289) (Source: GSS, 2007)

Administrative Region	1991/92		1998/99		2005/06	
	% poverty incidence	% extreme poverty incidence	% poverty incidence	% extreme poverty incidence	% poverty incidence	% extreme poverty incidence
All Regions (Ghana)	51.7	36.5	39.5	28.8	28.5	18.2
Northern Region	**63.4**	**54.1**	**69.2**	**57.4**	**52.3**	**38.7**
Upper East	**66.9**	**53.5**	**88.2**	**79.6**	**70.4**	**60.1**
Upper West	**88.4**	**74.3**	**83.9**	**68.3**	**87.9**	**79.0**
Brong Ahafo	65.0	45.9	35.8	18.8	29.5	14.9
Volta	57.0	42.1	37.7	20.4	31.4	15.2
Central	44.3	24.1	48.4	31.5	19.9	9.7
Greater Accra	25.8	13.4	5.2	2.4	11.8	6.2

Relevance of Small Scale Irrigation (3/3)

- Numerous studies suggest that formal (modern) irrigated agriculture in West Africa, including Ghana, has been a failure to a large degree (Dittoh, 1991; Mariko et.al 2001).
- Informal (traditional small scale) irrigated production however appears to be performing relatively better.
- Also formal irrigation systems (surface water gravity systems) tend not to favor small, poor farmers (Pant, 1992).
- It follows from the above that improvements in informal irrigation is the path to using irrigated agriculture to reduce rural poverty and food and nutrition insecurity.

Experiences of irrigation practices (water delivery and management systems) in Ghana and West Africa

- Irrigated agriculture can be broadly categorized into:
  - formal and informal (i.e. public and small scale private);
  - small, medium and large; and
  - surface water and groundwater.
- All are important and their development and emphasis will depend on many factors.
- The broader concept of water management will entail more categorization.
- Table 2 gives a list of what was identified as irrigation typologies in Ghana (Dittoh et. al. 2009).
- All have their strengths and weaknesses.
- The pictures that follow are examples.

Irrigation Typologies in NG

1. Public large scale reservoir system	8. Private pump system
2. Public medium scale reservoir system	9. Public-private lowland capture system
3. Public small scale reservoir system	10. Private outgrower system
4. Public dugout system	11. Deep well system
5. Civil society small scale reservoir system	12. Riverine shallow well system
6. Communal or group pump system	13. Lowland shallow well system
7. Communal borehole system	

Small scale surface water systems in the Upper East and Upper West Regions (1/3)

Dorongo dam (UER) L – Dam drying up.

R – Water pumped to irrigate upland

Datuku dam (UER) L – Neglect of canals

R- Pumping seepage water to irrigate non-developed area (Why?)

Small scale surface water systems in the Upper East and Upper West Regions (2/3)

Gbedema-Kunkwa dam (UER) L – Very bad seepage from dam R- Lack of fencing, thus control of livestock is a problem

Sand bars in Goli dam (UWR)

Neglected canals in Bussa dam (UWR)

Small scale surface water systems in the Upper East and Upper West Regions (3/3)

Using surface water from Binduri (UER) and Golinga (NR) for drip irrigation. Golinga system no longer exists; and Binduri is almost on its way out.

Small scale surface water systems in the Segou Region of Mali

Gourd fetch irrigation - From the River Niger in Segou, Mali

Gourd fetch irrigation – from a dugout, Segou, Mali

GWI – Shallow wells; Ghana

Shallow well irrigation - UER

Shallow wells water conveyance methods; Motor pump is the preferred means

GWI Systems in other West African Countries (Niger and Burkina Faso

GW for drip irrigation – B/F, Mali, Senegal

GW for drip irrigation; B/F and Niger

AgW Management Solutions Project

- The Gates Foundation funded AgWater Management Solutions Project tried to identify water delivery and management technologies in Ghana that have potential for development.
- The aim was to help "unlock the potential of smallholder farming by focusing on agricultural water management".
- It tried to stimulate "pro-poor, gender-equitable AgWM investments, policy and implementation strategies through concrete, evidence-based knowledge and decision-making tools".
- The project showed that "enterprising smallholder farmers themselves are driving an agriculture water management revolution by using their own resources innovatively".

Identified AgW Management Solutions

1. Shallow groundwater,
2. Tube well (Borehole)
3. Private pump from rivers and streams
4. Communal pump
5. Large commercial pump from rivers
6. Out-growers
7. Private small dams/dugouts
8. Public private partnership (to include public surface reservoir systems)
9. Communal small dams/dugouts

Recommended AgWM Solutions

AWM solution	Beneficiary households (% of rural households)[a]	Area (% of total agricultural land)[b]	Estimated investment costs (USD)
Inland valleys can be used to increase the extent of rice cultivation. Improving water management, agronomic and post-harvest practices will all be required for success.	261,000-377,000 (7-10%)	391,000-565,000 (2-3%)	600/ha
Motor pumps can increase yields and incomes but problems need to be overcome in areas like financing, cost reduction (e.g. electricity supply), distance to pumps suppliers, poor operation practices and maintenance.	564,000-730,000 (16-20%)	451,000-584,000 (2-3%)	400/household
Small reservoirs need better management at all stages to reduce costs and improve equity.	74,000-163,000 (2-4%)	74,000-163,000 (1%)	750,000/m^3 of water stored
Outgrower schemes could provide a means to support smallholder farmers, including women, but they need facilitation, regulation and support.	Not calculated	Not calculated	Not calculated

Findings of other researches

- In West Africa (Burkina Faso, Ghana, Mali, Niger and Senegal) there is general preference of farmers for SSI systems (Dittoh et. al. 2010).
- Evaluations of Nigeria's Fadama Development Project have pointed to significant success of the Project (Kudi et. al. 2008; Abric et. al.2011).
- There are over 500 multipurpose small dams and dugouts in the three northern regions of Ghana and their performance have been rated better than medium and large scale dams (Namara et. al. 2011).
- Great potential for GWI in parts of the three northern regions have been indicated by both technical and socio-economic researchers (Obuobi, 2013; Dittoh et. al., 2013).
- It is claimed that without effective use of available GW resources, reducing poverty in SSA will be impossible (Foster et. al. 2008)

Irrigated Fodder Production in Ghana

- Livestock, especially in rural Ghana, is important for food and cash security.
- Though livestock is generally seen around irrigation dams, research and development work on irrigated forage production in Ghana is virtually absent.
- The absence of investment in irrigated fodder production could partly be attributed to extensive and semi-intensive livestock production systems in Ghana.
- Fodder banks were however established under rain-fed conditions in northern regions of Ghana in the 1980s and1990s.
- Several problems led to the collapse of the initiatives (see next paper).
- Potential for irrigated fodder production exist (see next paper).

Implications for Ghana's irrigation aspirations

- Researches point to the resilience of SSI systems; while formal irrigations systems are facing problems, SSI systems continue to expand with and without support from government and other organizations across all of SSA.
- It thus make sense to advocate that SSI should be assisted to move from lower to more profitable levels to reduce poverty.
- It is also obvious that an effective method of development is effective integration of formal and informal systems to take advantage of the strengths of the different systems.
- Effective partnering with relevant stakeholders through dialogue and the development of trust and common understandings of development issues is important for progress to be made.

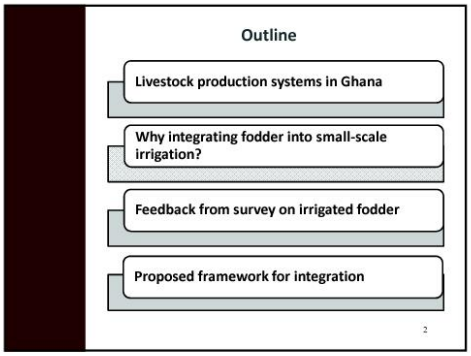
Research and Capacity Building Gaps on SSI in Ghana

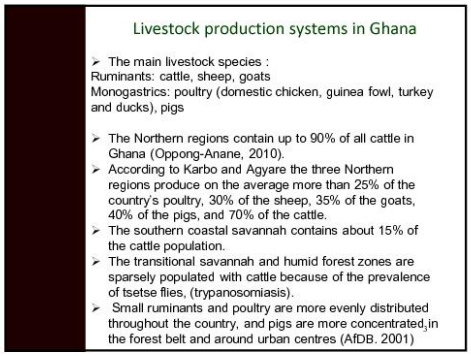
- The following gaps need to be tackled:
  - Test feasibility of the promising solutions identified by the AgWM Solutions project.
  - Market and value chain researches to tackle periods of gluts and very wide fluctuations in prices of irrigated produce.
  - Test potential for various SSI for different crops (in addition to the high value vegetables).
  - Development and use of irrigation extension curriculum to train irrigation extension personnel.
  - Test the feasibility of different types of drip irrigation in Ghana.
  - Test the feasibility of crop-livestock integration by irrigation households.

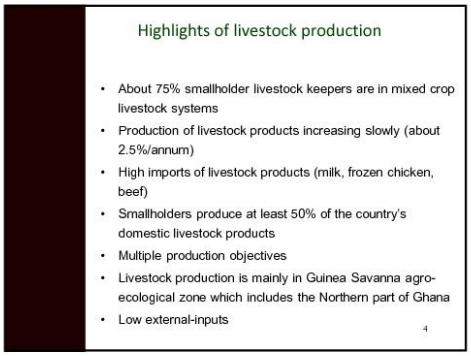
THANK YOU AND GOD BLESS YOU

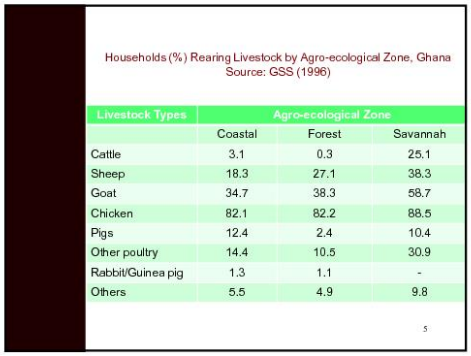
7.2. Presentation 2

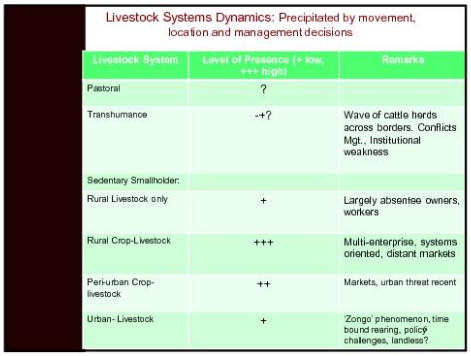
"Feed the Future Innovation Lab for Small-Scale Irrigation in Ghana: Opportunities and Challenges to Integrate Fodder"









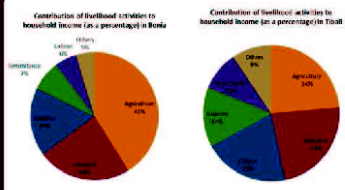


Livestock systems based on Type, labour, technology, investment level, etc.

Sedentary Crop-livestock systems:

- Rural Smallholder extensive system/ free range
- Rural Smallholder semi-intensive system/tethering/night housing
- Commercial intensive systems (exotic poultry, pigs, dairy)

Livelihood activities in Northern Ghana – Africa RISING project communities



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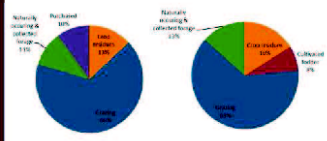
Sources of Ruminant diet in Northern Ghana – Africa RISING project communities



Bonia, Upper East Guo, Upper West

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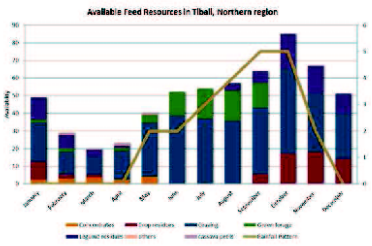
Available Feed resources in Africa RISING project site



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Constraints to Livestock Production

Constrains to livestock production in Africa RISING project intervention communities in Northern, Upper East and Upper West regions, and suggested solutions

Main problems	Suggested solutions
1. Poor housing	Support in cash for housing construction or housing package
2. High disease and mortality	Confinement of animals to reduce exposure and better access to veterinary services
3. Lack of improved breeds	Better management of the local breeds, buying the improved breeds and the supply of these breeds in the form of support.
4. Conflict with crops farmers	Confinement and herding of the flock
5. Inadequate feed	Collection and conservation of crops residue; subsidized concentrate feeds and training in better feeding practices
6 Low prices offered by marketing agents and processors for animals	1.Formation of farmer groups to negotiate good prices for members; 2.Weighing of animals and sell according to animals' weight.
8. Lack water in the dry season	Construction of dug-outs and small reservoirs and supply of materials for rain water harvesting.
9. Access to credit	Formation of farmers groups and cooperative to facilitate access to credit and external support.
10. High cost of veterinary drugs	Government subsidy and support from NGOs in form animal health service package.

Past R & D Efforts Addressing Fodder needs under Rain-fed Systems

Project	Year	Fodder Mgt. System	Remarks
GTZ/MoFA/ARI	1992?	Integrated SR housing and Feed gardens	Urea-treated rice straw, Stylo, Lucaena, Albezia, etc
CIPSEG	1994	Range improvement/Fodder banks /Seed gardens development	Stylo, Cajanus, Lucaena on individual/community plots
NARP	1997	Introduction of forage legumes in Farm system	Cajanus, Stylo, Centrocema intercrops/cereal
NLSP	?	Rangeland improvement	Stylo over sowing
LACOSREP I	2000	Groundnut haulm market	Loan to Women to produce
CSAS/GSAP	2004	Integrated shea/livestock by women	Styo/Cajanus Fodder banks

Housing/feed garden/Market/Shade/Solar dried Cajanus, Stylo and AIBPs for feeding to small ruminants

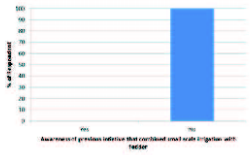
Why integration of fodder into SSI

- Opportunities created because of the livestock revolution need to be captured… irrigated fodder helps in improving feed availability and quality
- Growing demand for feed due to increasing number of livestock in peri-urban areas of Ghana which is largely driven by increased demand for livestock products.
- Availability of necessary facilities such as dams, rivers and small reservoirs for irrigation and the possibility of combining irrigated fodder production with vegetable production particularly in the late dry season when feed scarcity is acute.

Feedback from survey on irrigated fodder production in Ghana

Are you aware of any previous initiative which combined small scale irrigation with livestock feed interventions in Ghana?

No of respondents invited – 13
No who responded - 5



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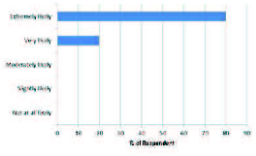
Feedback from survey on irrigated fodder production in Ghana

How likely will an introduction of fodder into small scale irrigation will improve the livelihood of smallholder farmers?

No of respondents invited – 13
No who responded - 5



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Feedback from survey on irrigated fodder production in Ghana

What could be the incentives for adoption of irrigated fodder production in Ghana?

- Growing dual-purpose crops particularly legumes such as cowpea, Cajanus cajans
- Better integration and intensification of crop-livestock systems
- Associating fodder production with vegetable production
- Development of peri-urban livestock feed market
- Market oriented livestock production

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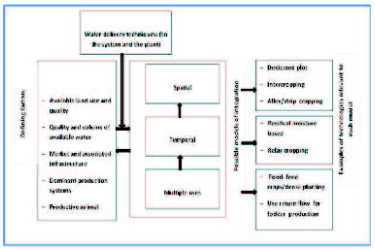
Proposed framework to integrating fodder into SSI



Simplified conceptual model to integrating fodder into small scale irrigation

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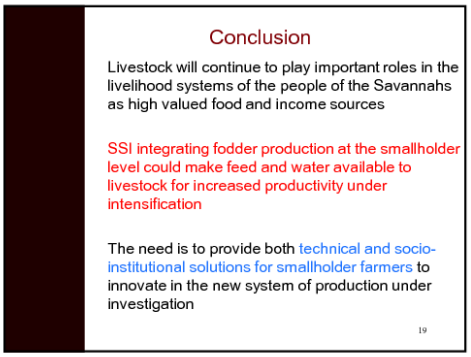
Conclusion
Livestock will continue to play important roles in the livelihood systems of the people of the Savannahs as high valued food and income sources
SSI integrating fodder production at the smallholder level could make feed and water available to livestock for increased productivity under intensification
The need is to provide both technical and socio-institutional solutions for smallholder farmers to innovate in the new system of production under investigation
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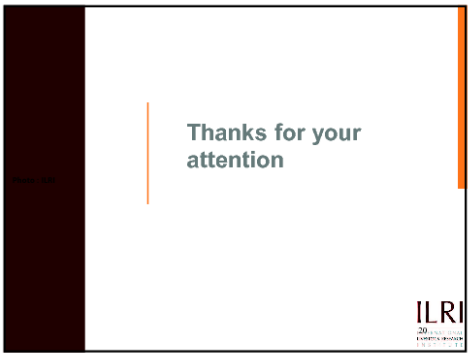
Thanks for your attention
ILRI

7.3. Participant List

Title	First	Middle	Last	Job Title	Dept	Organization
Mr	Awudu		Abukari	Lecturer	Faculty of Agriculture	UDS
Mr	Sylvester		Adongo	Rtd Dir Agric		MoFA
Mr	Aaron	Bundi	Aduna	Basin Officer	WRC	
Mr	Emmanuel	Charles	Akansighe	Program Mgr		CARIDA (Centre for Adaptive Rural Integrated Dev. Alternatives)
Dr	Felix	Jerry	Akpabey		WRI	CSIR
Mr	Anyagre	John	Akugre	Farmer		
Dr	Joseph		Amikuzumo	Snr Lecturer/Head of Dept	Food security and CC	UDS
Ms	Matilda		Anang	Farmer		
Mr	Samuel	Manu	Ansah	Reg Mgr, UE		GIDA
Mr	Joseph		Ayembilla	Dev Coord		NABOCADO
Mr	Vitus		Ayingayure	Reg Mgr	Northern Region	GIDA
Mr	Inusah	I	Baba	Researcher	SARI	CSIR
Mr	Issah	Alhassan	Bukari	MD		ICOUR (Irrig Co of UER)
Mr	Peter	K	Dakudzi	Reg Ag Eng	AESD	MoFA
Mr	Stephen		Debre	Zonal Coord	GCAP	MoFA
Dr	Herbert	Kwabla	Dei	Dean	Graduate School	UDS
Dr	Naaminong		Karbo	Director	ARI	CSIR
Mr	Karim	I	Kasim	MD		Kasim & Sons
Prof	Gordana		Kranjac-Berisavljevic	Professor	Agric. Mech and Irrigation	UDS
Mrs	Anna	Amankwah	Minkah			iDE Ghana
Mr	Kwesi	Asare	Mintah	Dep Dir	Planning, Budgeting, M & E	GIDA
Mr	Jakper		Naandam	Snr Lecturer/Head of Dept	Animal Science Dept	UDS
Mr	Andrew		Sampana	Farmer		
Dr	Saa		Dittoh	Lecturer	Food security and CC	UDS
Dr	Tim	Willson	Ellis	Snr Res	AWM	IWMI
Dr	Nicole	R	Lefore	Snr Res Mgr		IWMI