



Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program

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Trip Report: Ghana and Burkina Faso 15-29 August 2008

Theo A. Dillaha, Program Director
SANREM CRSP, Virginia Tech

Purpose of Trip: To investigate the possibilities for SANREM CRSP Phase IV collaboration in Ghana and Burkina Faso, particularly in association with GLOWA Project partners.

Sites Visited: USAID Offices, U.S. Embassy, Accra, Ghana
International Water Management Institute (ISMI), Accra, Ghana
Council for Scientific and Industrial Research (CSIR), Accra, Ghana
Field site in Ejura, Ghana
CSIR Soil Research Institute, Kumasi, Ghana
Soil Science Department, Kuwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana
CSIR – Crops Research Institute, Kumasi, Ghana
CSIR – Savannah Agricultural Research Institute, Kumasi, Navrongo, and Tamale, Ghana
GLOWA Global Change and Water Resources in West Africa Conference, Ouagadougou, Burkina Faso
Ministere de L'Environnement et du Cadre de Vie, Ouagadougou, Burkina Faso
University for Development Studies (UDS), Tamale, Ghana

Description of Observations:

There are many challenges in Ghana, especially in the north, but country seems to be developing. Decent roads, lots of construction, but economy needs a manufacturing base to provide more jobs. Most growth seems to be in service sector. Farmers are using fertilizers but not at recommended rates and yield responses are poor. Higher rates of use are found on commercial plantations, especially those for export crops (mangos, etc.). There also seems to be extensive use of organic fertilizer sources but supply is inadequate for amount of crop production. Farmers are using pesticides for vegetables (extent unknown). Once project funding ends, introduced technologies tend not to be maintained according to researchers.

Universities (Univ. of Ghana, KNUST, and UDS) appear to have very capable faculty. KNUST and UDS faculty “reportedly” more involved in field research and extension type activities. Council for Scientific and Industrial Research (CSIR and its subunits) seem to have good scientists and facilities. Inadequate base support. Programs largely project/donor driven. Transportation is probably largest research related expense. Vehicles and drivers are essential. Tamale seems to be a good headquarters for work in Northern Ghana. Good infrastructure. UDS a good partner. Traffic not bad yet. GLOWA-Volta scientists reported that Ghana was much easier to work in than Burkina because of Burkinabe bureaucracy and required paperwork and approvals for field work.

Newly established Volta River Basin Authority (Ouaga) would be good to partner with for water basin watershed management. Desperately need basin scale watershed modeling capability for reservoir management and flood control and forecasting. Conservation with Wolframe Laube (Senior Researcher, ZEF, Univ. of Bonn): Convinced that Atankwidi watershed is an excellent place to work. Estimates that 45% of agricultural production is from small-scale irrigation, which farmers are adopting and would expand with more capacity building.

List of Contacts Made:

Contact	Affiliation	Email
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Dr. Yaw Opoku-Ankomah, Director	Council for Scientific and Industrial Research (CSIR) Water Research Institute, Accra, Ghana	vrbp@africaonline.com.gh
Wolframe Laube, Senior Researcher (PhD on irrigation and reservoirs in Atankwidi)	University of Bonn, ZEF	wlaube@uni-bonn.de
Charles A. Biney, Director CSIR-WRI and future Executive Director Volta Basin Authority	Water Research Institute of the Council for Scientific and Industrial Research and future Executive Director	
Prof. Charles Quansah, Consultant in Natural Resources Management	Dept of Crop and Soil Sciences, Kwame Nkrumah Univ. of Science and Technology, Kumasi, Ghana	equqnsah2002@yahoo.com.uk

Appendix – Field Notes

Meeting: USAID/Accra
8:30-9:00am and 11:30-12:15pm, August 18, 2008
USAID Offices, U.S. Embassy, Accra, Ghana

Participants: John Mullenax, USAID/EGAT, Advisor on Presidential Initiative to End Hunger in Africa; Theo Dillaha, Program Director SANREM CRSP, Virginia Tech

Agenda:

- Identification of potential SANREM Phase IV activities in Ghana and region and how Phase IV will work to address Mission applied research needs
- Discussion of possible SANREM collaboration with the German GLOWA-Volta project
- Discussion of SANREM Associate Award mechanism

Meeting Notes:

SANREM Phase IV: Theo explained that SANREM is in the process of designing the Phase IV SANREM research program in collaboration with USAID Bureaus and Missions, the methodology we are using to solicit Mission input, and progress to date in this area.

Ghana research needs and suggestions:

- John shared copies of the Ghana Ministry of Agriculture Strategic Plan for 2008-2010 (January 2008) and the Draft Ghana Investment Framework (CSIR) for Sustainable Land Management (SLM) in Ghana (March 2007). Review for Government of Ghana priorities.
- Green production
- Conservation farming
- Review past SANREM activities in region for ideas
- Improving private operations (cassava growers)
- There is a Ghana natural resources management group. What are their needs and capabilities?
- Huge potential for drip irrigation
- Many needs with cacao. Stephen Weiss (?) is knowledgeable of issues.
- USAID started sustainable tree crops sector program previously.
- Many issues associated with cacao.
 - Is cacao a sustainable and profitable cropping system in the long run?
 - Can cacao be mechanized?
- Norwegians have proposed a large palm oil industry. Would palm oil be sustainable in Ghana?
- A large Jatropha plantation project has started. Too early for oil production. Will it work? Environmental issues?

Misc. Notes:

- Investment Framework for Sustainable Land Management in Ghana focuses on capacity building in SLM to address environmental problems associated with sediment and nutrient losses and transborder watershed management. Capacity building needed for:

- Soil and water conservation
- Graduate students and faculty development
- Monitoring, data collection and analysis
- Program and practice evaluation
- Savannah Agricultural Research Institute
- What are the human and institutional capacity needs that SANREM could address during Phase IV?

To Do:

- Provide John with copy of trip notes and description of possible future SANREM future activities.
- Send John additional details on Associate Award mechanism.
- Ideas on how SANREM might contribute to the Investment Framework for Sustainable Land Management in Ghana.
- Brief on Foster Agblevor's biodiesel research and potential applications. More interested in use of municipal solid waste as a feedstock as organic biomass is currently heavily used for other endeavors (livestock feed, etc.)

Meeting: International Water Management Institute and Council for Scientific and Industrial Research (CSIR)
 11:00 am, August 19, 2008
 IWMI Office, Accra, Ghana

Participants: Paul Vlek, Univ. of Bonn; Dr. Yaw Opoku-Ankomah (CSIR); Boubacar Barry, IWMI Director, Ghana; Theo Dillaha, Program Director SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek updated Dr. Yaw on GLOWA-Volta and possibilities for a new project. Dr. Yaw very appreciative of training (PhDs) provided through GLOWA.
- Theo Dillaha provided overview of SANREM CRSP and possibility of a Phase IV project. Also discussed Borlaug Leap program for Africans and sent link to info.
- IWMI doing lots of good work. Largely project driven. Boubacar Barry seems outstanding (PhD in Agricultural Engineering at Purdue). Work in following areas: treadle pumps and irrigation, wastewater reuse, night soil reuse, reservoir management, principle GLOWA-Volta logistical partner and Barry is GLOWA-Volta country coordinator.

Meeting: CSIR Water Resources Institute - Challenge Program for Water and Food
 12:00 pm, August 19, 2008
 IWMI Office, Accra, Ghana

Participants: Winston E. I. Andah, CSIR; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Theo Dillaha provided overview of SANREM CRSP and possibility of a Phase IV project and research needs.

- Winston involved in several Challenge Program activities. Josh Faulkner worked on one having to do with reservoir hydraulics/hydrology.
- Research needs: increasing water productivity in rainfed systems

Meeting: Council for Scientific and Industrial Research
 1:00 pm, August 19, 2008
 CSIR Office, Accra, Ghana

Participants: Emanuel ?-Benoah, (retiring Sept. 1) Director CSIR; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project. Paul invited him to spend two months at ZEF to help prepare the new proposal on climate change and land use.
- Theo Dillaha provided overview of SANREM CRSP.
- Suggested follow-up on Un University project on sustainable land use.
- Served on Peanut CRSP Board with S.K.
- Forestry Research Institute CSIR doing work on forest rehabilitation in riparian zones for stream protection and aquifer recharge

Meeting: Ejura, Ghana
 1:00 pm, August 20, 2008
 Field site in Ejura, Ghana

Participants: Mrs. Fosuin, Ph.D. student, KUNST and ZEF; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Observed two of Mrs. Fosuin's field sites in Ejura. She is evaluating maize yields as a function of various soil amendments for her Ph.D.

Meeting: CSIR Soil Research Institute
 9:30 am, August 21, 2008
 Kumasi, Ghana

Participants: J. O. Fening, Director CSIR Soil Research Institute; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project.
- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs.
- CSIR starting program to increase carbon sequestration in soils.
- Dr. Fening was involved in the development of the Investment Framework for Sustainable Land Management in Ghana and would be willing to collaborate in developing a SANREM associate award proposal in support Ghana SLM.

Meeting: Soil Science Department, Kwame Nkrumah University of Science and Technology

11 am, August 22, 2008
KNUST, Kumasi, Ghana

Participants: Dr. E. Y. Safo, Associate Professor of Soil Science; Prof. Charles Quansah, Consultant in Natural Resources Management; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project and discussed Mrs. Fosin's research progress and program.
- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs and potential partners. Sent info on Bourlag-Leap program.
- Edward _____? Finishing PhD at University of Ghana, Legon on carbon sequestration in soils. He would be a potential SANREM partner.
- Charles Quansah indicated that he was the principal author of the Investment Framework for Sustainable Land management in Ghana. Ghana is starting to implement the framework.
- Charles also principal author of the national strategy to fight deforestation and desertification.
- Cofi Bois? Is doing work on conservation agriculture.
- Economics have been neglected in the sustainable land management strategy. Need additional work on economics of SLM.

Meeting: CSIR – Crops Research Institute

1:00pm, August 21, 2008
Kumasi, Ghana

Participants: Hans Adu-Dapaah, Director and Chief Research Scientist, CSIR Soil Research Institute; Ben Banful, Senior Agronomist; Isaac S. Banning, Information Scientist CSIR Crop Research Institute; Osei-Yeboah, Research Scientist; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project.
- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs.
- Director gave a PowerPoint presentation on the activities of the Soil Research Institute. Mission is very similar to SANREM's, promoting sustainable agriculture. "Research for Development"
- Try to get a copy of the PowerPoint via email from the director.

Meeting: CSIR – Savannah Agricultural Research Institute

1:00pm, August 21, 2008
Kumasi, Ghana

Participants: Abu Iddrisu, CSIR Savannah Agricultural Research Institute; Matthias Fosu, CSIR-SARI; A. B. Salifu, CSIR-SARI; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project.
- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs.
- Overview of SARI activities by Salifu, new Director of CSIR. Focus on agricultural research in the northern savannah region of Ghana.

Meeting: CSIR – Savannah Agricultural Research Institute

4:30 pm, August 22, 2008

Tamale, Ghana

Participants: Abu Iddrisu, CSIR Savannah Agricultural Research Institute; Matthias Fosu, CSIR-SARI; A. B. Salifu, CSIR-SARI; Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project.
- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs.
- Overview of SARI activities by Salifu, new Director of CSIR. Focus on agricultural research in the northern savannah region of Ghana.

Meeting: CSIR – Savannah Agricultural Research Institute

11:am, August 24, 2008

Navrongo, Ghana

Participants: Wilson A. Agyare, Research Scientist, CSIR-SARI (but joining Agricultural Engineering Dept. at KNUST to teach soil and water conservation engineering in November 2008); Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Paul Vlek provided update on GLOWA-Volta and possibilities for a new project.
- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs.
- Fertilizer use in northern Ghana:
 - Increasing dramatically but applying less than half recommended amounts.
 - Responses to fertilizer applications are marginal because of low application rates.
 - Tend to buy one or two bags of mixed fertilizer and apply to all cropland at less than agronomic rates.
 - Crop yields best around homes (compound fields) where more manure and household waste is applied.
 - Observed many agricultural chemical shops. Pesticides presumably.

- Significant agricultural trends
 - More fertilizer use
 - Large-scale commercial mango production
 - More commercial plantations in north and elsewhere: Jatropha, mangos, palm oil
 - Maize production is moving north with improved varieties and displacing sorghum and millet
 - SARI has little funding for long-term programs. Work on what they get grants for and then move on with little long-term assessment. Not addressing sustainability of interventions.
- SARI is located in a shell building with plenty of space for new offices. Would just need walls, windows, doors, and utilities.
- Tour of Atankwidi watershed
 - Grain yields 0.5 to 1.5 Mg/ha (with good management 3-5 Mg/ha possible)
 - Crops: maize, dryland rice, peanuts, sorghum, millet, potatoes (small plots), cassava, soybeans (minor), tomatoes, eggplant, chili
 - Most land used for grazing. Much of pasture land looked very poor and overgrazed. Reportedly due to low fertility.
 - Many shea nut and baobab trees
 - Many multiple hectare reservoirs with water used for small scale irrigation (5 to 15 ha) downstream
 - Significant maintenance problems with irrigation canals. Managed locally.
 - Visited one drip irrigation project downstream of a reservoir. Project had recently ended. Not sure if it would be continued but equipment still in place and useable. Used for vegetable production during dry season.
 - Drip irrigation supplies can be ordered locally but unknown if any farmers have ordered after project ended. No follow up.
 - Observed limited Striga in cassava fields.
- Some conservation farming work in the area. Challenge is that residue can drop from 7 to 8 Mg/ha after harvest to 1.5 Mg/ha at planting due to termites, grazing by livestock and wildlife, and other domestic uses. May still have 50% cover at planting (estimated by Wilson).
- Winston can provide some research data/reports on how erosion control has improved soil carbon and quality.
- Not much evidence of use of controlled grazing because no planning at local community and land is communal. Key would be getting chief to agree on and implement a controlled grazing plan.
- Key to community level changes is convincing the chief and then getting the chief to promote as they control local land tenure/use.
- New national fertilizer program starting. Government providing 50% subsidy. Higher global fertilizer prices have not hit northern Ghana yet, so impacts on fertilizer use unknown.
- Livestock: #1 goats, #2 cattle, #3 sheep, #4 pigs
- Donkeys and cattle used as draft animals and for plowing.
- Most families have chickens and ducks. Saw a few larger poultry houses.

Overall Ghana Observations:

- Many challenges, especially in the north but country seems to be developing. Decent roads, lots of construction, but economy needs a manufacturing base to provide more jobs. Most growth seems to be in service sector.
- Farmers using fertilizers but not at recommended rates and yield responses are poor. Official commercial fertilizer use figures believe to be half of actual use according to some researchers since official figures do not account for imports by large plantations. Higher rates of use on commercial plantations, especially those for export crops (mangos, etc.).
- Extensive use of organic fertilizer sources but supply is inadequate for amount of crop production.
- Farmers are using pesticides for vegetables (extent unknown).
- Once project funding ends, introduced technologies not maintained according to researchers.
- Universities (Univ. of Ghana, KNUST, and UDS) appear to have very capable faculty. KNUST and UDS faculty “reportedly” more involved in field research and extension type activities.
- Council for Scientific and Industrial Research (CSIR and its subunits) seem to have good scientists and facilities. Inadequate base support. Programs largely project/donor driven.
- Transportation is probably largest research related expense. Vehicles and drivers are essential. Best to partner with IWMI or others to provide vehicles and drivers.
- Tamale seems to be a good headquarters for work in Northern Ghana. Good infrastructure. UDS a good partner. Traffic not bad yet.
- GLOWA-Volta scientists reported that Ghana was much easier to work in than Burkina because of Burkinabe bureaucracy and required paperwork and approvals for field work.
- Newly established Volta River Basin Authority (Ouaga) would be good to partner with for water basin watershed management. Desperately need basin scale watershed modeling capability for reservoir management and flood control and forecasting. ***Should check with John Mullenax to see if USAID would be interested in supporting a capacity building effort in this area.***
- Conservation with Wolframe Laube (Senior Researcher, ZEF, Univ. of Bonn): Convinced that Atankwidi watershed is an excellent place to work. Estimates that 45% of agricultural production is from small-scale irrigation, which farmers are adopting and would expand with more capacity building.

GLOWA Global Change and Water Resources in West Africa Conference

August 25-28, 2008

Ouagadougou, Burkina Faso

Notes and Thoughts:

- Africa Monsoon Multidisciplinary Project (AMMA) very interesting and might provide useful data and partners.
- GLOWA-Volta seemed to be much more successful in terms of research and capacity building than GLOWA-Impetus (Morocco and Benin). Impetus did not have much in the way of local partners.

- GLOWA-Volta main accomplishments: >50 African PhDs and knowledge of the effects of climate change on onset of rainy season. Likely to be delayed by up to a month in Northern Ghana and Burkina (by 2030s?)
- GLOWA-Volta developed glossaries of water and agricultural actors in Ghana and Burkina on the GLOWA-Volta website at: http://131.220.109.9/actors_institutions.html

Meeting: **Ministere de L'Environnement et du Cadre de Vie**
 August 27, 2008
 Ouagadougou, Burkina Faso

Participants: Georges Yameogo, Directour, Ministere de L'Environnement et du Cadre de Vie;
 Paul Vlek, University of Bonn; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs.
- Georges very interested in capacity building opportunities in environmental assessment, GIS analysis, and modeling.
- Currently working with Gray Tappan, Hughes STX, EROS Data Center, Sioux Falls, SD 57198, E-mail: tappan@edcserver1.cr.usgs.gov who is providing remote sensing data.
- Institut de l'environnement et des recherches agricoles (INERA) is a good partner to work with in Burkina (Georges)
- Forestry contacts University of Ouagadougou/UFRVST botanic laboratory (?)
- Georges directs Ministry of Environment monitoring programs. Interests in soils livestock, forage management, water, water productivity, demographics

Meeting: **Local farmer**
 11 am, Sept. 3, 2008
 Navrongo, Ghana

Participants: Jacob ?; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Described agricultural production issues in northern Ghana
- With irrigation can have wet season crop plus one or more dry season crops in the river valleys.
- Rivers dry up but wells can be dug in or near river beds (and deepened as the dry season progresses). More well off farmers have small pumps (as low as \$250) but most farmers use buckets and then irrigate by hand.
- Irrigated crops planted in depressions about a meter long. Water poured in basins so it is concentrated around plants.
- Irrigated crops include tomatoes, chilies, onions. Irrigation is very profitable.
- Huge problem is livestock management. Challenge is that government requires children to go to school now so there is no one to look after livestock while children are in school. Consequently, livestock do a lot of damage to crops and particularly vegetables.

- Men do land preparation generally. If soil hard, men make holes with dribble stick and women follow along and plant seeds. If soil is soft, women just push seeds in.
- Crops usually weeded 2 to 3 times per crop.
- Fertilizers seriously underutilized because of inadequate access to credit.
- Current year a challenge because of late on-set of rainy season.
- Millett, sorghum, and maize common in north. Guinea maize increasing.
- Conservation farming difficult because crop residues used for livestock feed, housing, fuel, etc.
- Small incentives are required to get farmers to try new practices.

Meeting: University for Development Studies (UDS)
 9:00 am, Sept. 4, 2008
 Tamale, Ghana

Participants: David Millar, Pro Vice Chancellor, UDS, Tamale; Gordana Kranjac-Berisavljevic, Dean of Students and Professor of Agricultural Engineering; Theo Dillaha, SANREM CRSP, Virginia Tech

Meeting Notes:

- Theo Dillaha provided overview of SANREM CRSP, potential for a Phase IV activity, and interest in identifying regional research needs. Also discussed Virginia Tech interest in establishing a campus in Africa.
- UDS is relatively new university (<10 years). UDS has four campuses in the north of Ghana (Tamale, Nyankpala, Navrongo, and Wa) and the only public university in the north.
- 8000 students currently with approximately 3000 agricultural students, one of the largest agricultural programs in Ghana
- 4-year trimester program with two trimesters of class room and lab work and 3rd trimester spent in field.
- Field trimester: Multi-disciplinary student teams go to communities for 8 weeks with faculty advisors (part of the time). First field trimester they assess community's problems and development needs. Later field trimesters identify and then try to implement solutions to problems and follow-up assessments. Program is similar to a program at Makerere University, Uganda. Pro Vice Chancellor Millar contributed to development of this program, as well as many other staff of the University.
- Prof. Millar suggested that an even better program was used at University of Zululand – community labs, lower level continuous engagement
 - Faculty picks community as a learning lab
 - Assesses community problems
 - Designs interventions
 - Implements interventions
 - Assesses interventions
- Prof. Millar provided several reports on African knowledge systems and farming systems in Africa that appear to be excellent resources.
- Cornell students have had program at UDS (Norm Uphoff, Margaret Kroma)
- Potential site for VT Africa campus, could provide land for building site

- Very interested in graduate education opportunities for faculty in agriculture and hydrology
- UDS works closely with government and NGOs of different types (international as well as local)
- Have Low Input Sustainable Agriculture (LISA) program by default since farmers can't afford chemical inputs. Also actively participated in the past in development of these methodologies, approaches and theories, and their implementation.