Developing Resilient Farming Systems in Northern Ghana

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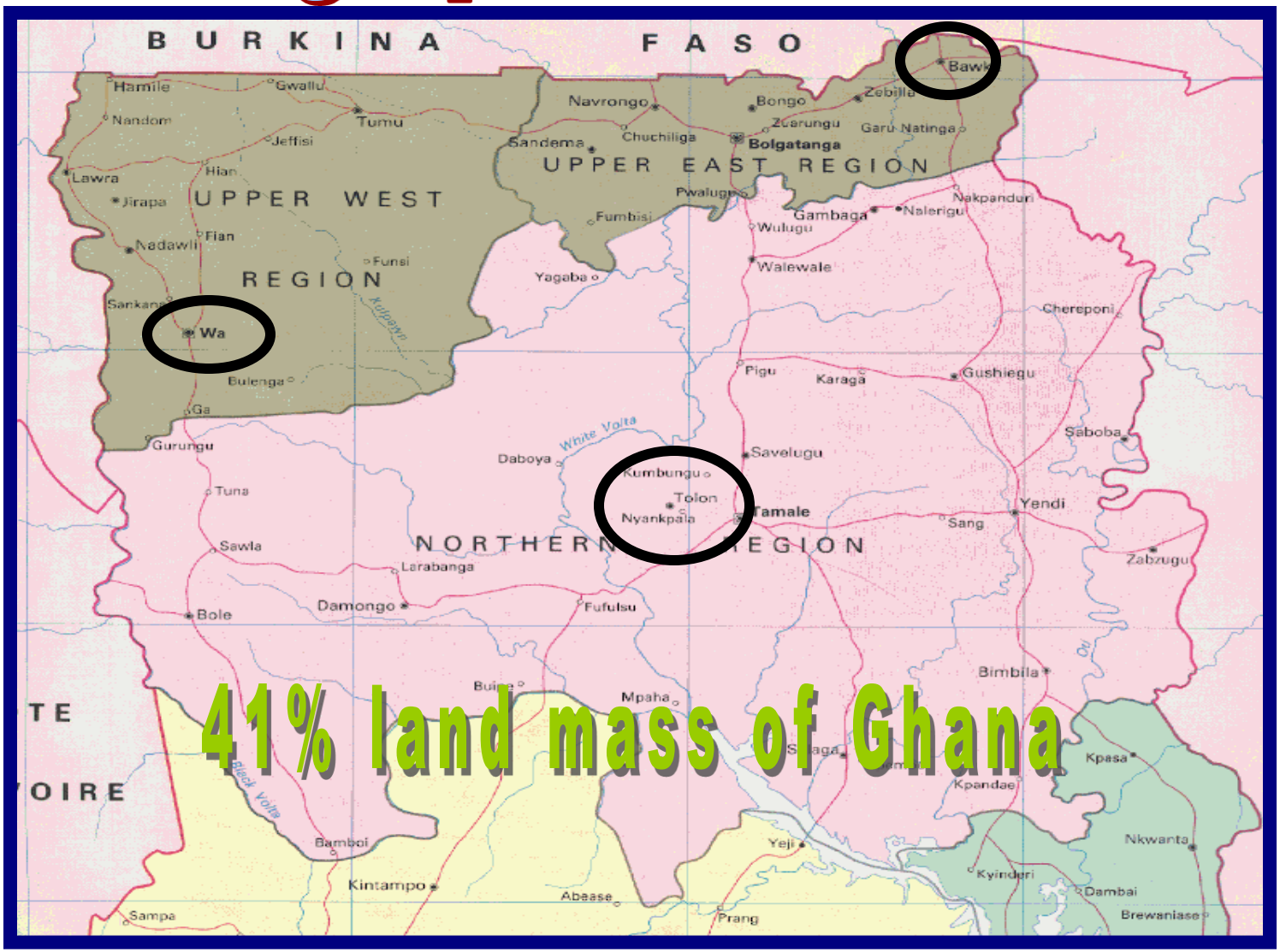
Brief about CSIR-SARI and Research Strategy

SAVANNA AGRIC RESEARCH INSTITUTE

Making Agricultural Research Responsive to Farmer Needs and National Development

Geographical Mandate



Technical Mandate

SARI conducts research into food and fibre crop farming in North Ghana for the purpose of introducing improved technologies to enhance agricultural productivity

Crops covered include:

Sorghum, Millet, Rice, Maize; Cowpea, Peanuts, Soybean, Bambara, Pigeon pea; Yam, Cassava, Sweet & Frafra potatoes; Cotton; Vegetables

Farming Systems Research

- Enhances understanding of community setting and the socio-economic environment with which farm production decisions are made.
- Provides a mechanism through which stakeholders can forge partnerships to identify farmers/community needs and capacity.
- ***Puts Farmers First.***

Technical Support Service	Clients	Deliverables
Integrated pest management of cowpea and cotton	Farmers, Cotton Companies	Reduce insecticide use by farmers and its attendant health hazards; Environmentally friendly botanicals recommended
Soil fertility maintenance through the use of leguminous cover crops	Farmers, NGO, MoFA	Improves soil structure and fertility, thus ensuring higher crop yields
Socio-economic surveys and preparation of District Profiles	NGOs, investors, Decentralised Agencies	Baseline information for development and general planning.
Preparation of District Agricultural Investment potential	Decentralised Agencies, NGOs	Agricultural development and investment potential; Business Plan
Crop-livestock integration	Farmers, NGOs, MoFA	Ensures proper integration of livestock and crop production
Fertilizer recommendation for various crops and soil types	NGOs, farmers	Maintenance and increased production
Laboratory analytical services (Plant and soil sampling)	Farmers, MoFA, NGOs, Researchers	Investigates mineral use efficiency in the various soil types.
Advisory and training	Farmers, NGOs, MoFA	Technology transfer, information publication and dissemination, advisory services on soil utilisation for sustainable agriculture
Agrochemical testing	Farmers, NGOs, Cotton Companies	Ensures sustainable and judicious use of agrochemicals
Striga control	Farmers, NGOs, MoFA	Ensures optimum production of sorghum, maize and cowpea

Collaborators

- Internal:
  - CSIR Institutes; MoFA; MDAs; Universities
  - NGOs – WVI, ActionAid, OIC, TechnoServe, CARE , ACDEP
  - Farmers

- **International:**
  - CGIAR Centers – IITA, AfricaRice, ICRISAT, CORAF/WECARD
  - EU – DFID (UK), GIZ, Bonn Univ. Germany),
  - Various Universities, USA & CANADA –
  - Various CRSPs (USAID) involving > 5 Universities, CIDA, EMBRAPA

Major challenges to agricultural production in the Guinea savanna of Northern Ghana

Major challenges

- Rapid human population growth with changing dietary demands
- Increased pressure on land
- Increase in agricultural intensification
- Climate change
- Increase incidence and severity of diseases, insect pests and drought

Poor soil

Competition between crops and livestock for resources

- In smallholder farming systems there are conflicts over the use of the precious crop residues for:
- *soil cover and organic matter replenishment*
- *livestock feed*
- *housing,*
- *craft materials and*
- *energy source.*

Competing uses of crop residues

Stover removed and stored for fencing, fuel or roofing

Stover removed and used for weaving baskets

Stover removed and stored for feeding livestock

Stover removed and used for feeding livestock

Livestock graze freely on crop residues

Drought

- Trend of decreasing rainfall and increasing temperatures
- Probability of drought is highest at the start and end of the growing season
- Timing of deficits is unpredictable

Making farming systems resilient

- Capacity of agricultural development to withstand or recover from **stresses and shocks**

Making farming systems resilient

- Requires **technologies and practices** that build on agro-ecological knowledge and enable smallholder farmers to cope with **environmental degradation and climate change** in ways that maintain sustainable agricultural growth

- Developing agriculture with resilience depends on **science**, **technology and innovation**

Making farming systems resilient

- Requires **sustainable intensification** - getting more from less on a durable basis.

- Farmers need to increase agricultural productivity or produce more food and other agricultural products. **on less land, with fewer pesticides and fertilizers and less water**

Strengthening resilience

- Political
- Economic
- **Technological interventions**

Strengthening resilience

Drought can be addressed by:

- Building irrigation systems,
- **Improved water harvesting techniques,**
- **Agro-ecological technologies (Conservation farming and**
- **Breeding new crops or livestock that are tolerant to drought**

Strengthening resilience

- Several strategies which have been developed for the conservation of soil and water to maintain productivity include:

- **rainwater harvesting**
- live barriers
- **supplementary irrigation**
- **minimum tillage**
- **mulching**
- **bunded basins** and
- tree planting

Less Water, More Food,
Increased Income

Drip Irrigation Technology

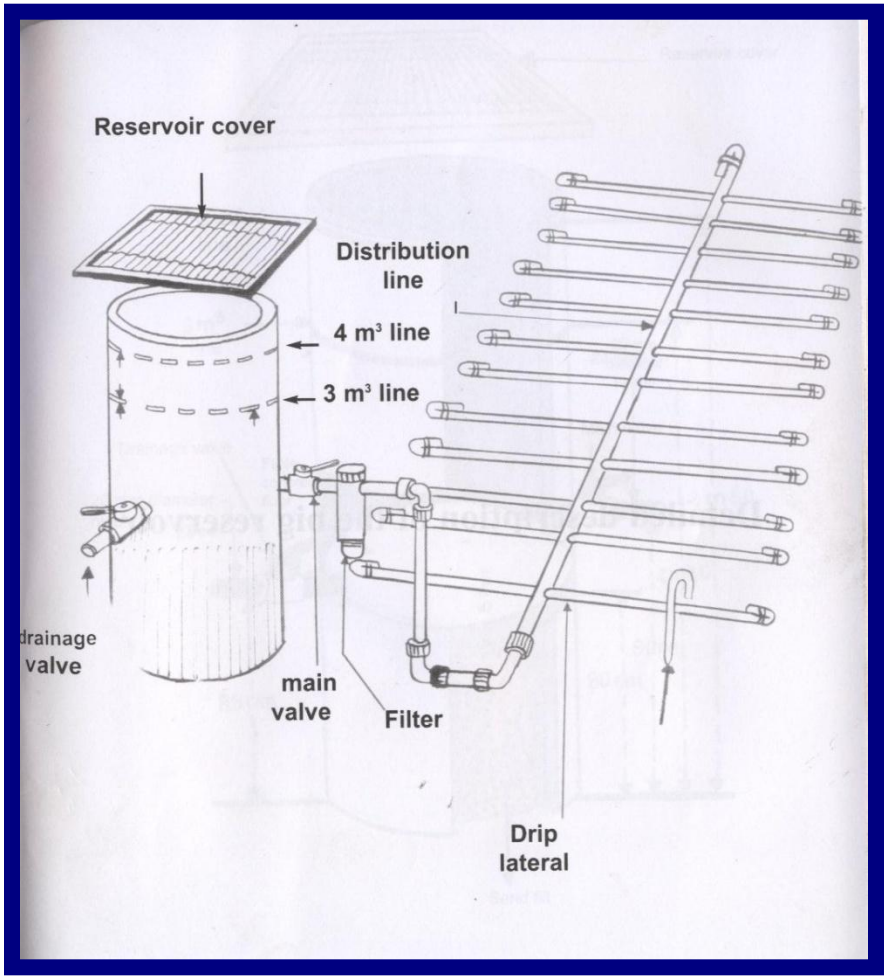
Common Irrigation Practices

or

- Labor intensive
- Poor water and nutrient management
- Low yields
- Poor quality of produce and negative environment

Irrigation Kit of AMG

- Low Pressure Drip Kit:
  - Taps/valves
  - Filter
  - Main distribution line
  - 500-700 m of laterals to the main distribution line
- Basic unit encloses an area of 25 x 20 m (500 m²).
- Water from reservoir or direct from dam.



Drip Kit in the Field

- *Our system requires no reservoir*
- *Water taken directly from dam*
- *Deployed in Golinga, Navrongo, Binduri*
- *A plot of 500 m² of onion generates US$378 (COMPARE US$250 initial cost!)*

Breeding new crops

Drought tolerant maize released in 2012 collaboration with IITA, Nigeria

CSIR-Wang Dataa

CSIR-Tigli

CSIR-Ewul-boyu

CSIR– Bihilifa

CSIR-Sanzal-sima

Strengthening resilience

- Improved crop varieties into ecological agricultural systems can boost both productivity and resilience

Other technological interventions include:

- Mixed cropping that enable more efficient use and cycling of soil nutrients (intercropping, rotations, agroforestry, green manuring)
- Integrated and intensive crop-livestock systems,
- Conservation farming systems that use minimum or no-tillage
- Strategic placement of smaller amounts of fertilizers (microdosing) and herbicides
- Integrated pest management (IPM)

Mixing different crops in one field enables more efficient use and cycling of soil nutrients (intercropping, rotations, agroforestry, green manuring)

Integrating crop and livestock production offers ways to increase production while protecting the environment

Advantages of the integrated system

- Livestock and crops are produced within a coordinated framework.
- The waste products of one component serve as a resource for the other
- Manure is used to enhance crop production
- Crop residues and by-products feed the animals, supplementing often inadequate feed supplies, thus contributing to improved animal nutrition and productivity

Advantages of the integrated system

- Maintenance of the soil productive capacity
- Product diversification and higher yields and quality at less cost
- Reduction of crop pests (less pesticide use and better soil erosion control) and
- Reduction of rural urban migration and the creation of new job opportunities in rural areas

Conservation farming systems using minimum or no-tillage

Conservation farming with crop rotations can sustain and enhance the productivity of arable soils

Integrated pest management (IPM)

- IPM involves

- *integrating biological control,*
- *cultural practices such as modified planting date,*
- *disease- and pest-tolerant cultivars,*
- *and pesticides where necessary*

- This can increase the effectiveness of pest control and reduce overuse of pesticides

Strengthening resilience

- The crucial issue now is scaling up technologies to reach more farmers

Enabling environments

The government, the private sector and NGOs must work together to help develop

- resilient and sustainable intensification;
- combat land and water degradation; and
- build climate-smart agriculture

Enabling environments

- Ghana also needs more private investments and public–private partnerships that will promote increased production.

- These partnerships can also build the resilience of people by increasing the reach of successful **nutrition interventions** and building diverse livelihoods, particularly by focusing on rural women and young people.

Enabling environments

- We need strong political leadership.

- Improved governance and green economic tools can deliver sustainable agricultural development, food security and poverty eradication.

Resilient markets

- We also need resilient markets that enable farmers to increase production and generate income through innovation and taking risks, while ensuring food is available at an affordable price.

- Resilience can also be strengthened through more open trade policies to facilitate trans-border access to food.

- Creating grain stores and opening up trade across West Africa can reduce food price instability.

Concluding remarks

Government should work with the private sector to:

- Reduce food price instability
- Facilitate private investments
- Build better enabling environments
- Enable resilient and sustainable intensification
- Combat land and water degradation
- Build climate smart agriculture

Concluding remarks

- Scale up proven successful programs in conservation farming and IPM
- Develop agricultural systems that are efficient in terms of use of land, water and nutrients, including current technologies of agro-ecology

Concluding remarks

- Enable access to current plant breeding technologies, including biotechnology, to develop crop varieties and livestock breeds that are more productive and resilient
- Conserve and manage local germplasm, *in situ* and *ex situ*, for future breeding programs

Thank You!