CSIR-SAVANNA AGRICULTURAL RESEARCH INSTITUTE

Research into market-driven and climate smart crop varieties: tolerance to biotic and abiotic stresses

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Outline Of Presentation

- Profile of CSIR-SARI
- Vulnerability of agriculture in the mandate area of CSIR-SARI
- Research approach
- CSIR-SARI's crop improvement strategies
- Current climate smart product profiles
- Research to address industrial needs
- Improved crop varieties developed by CSIR-SARI
- Future research issues

PROFILE Of CSIR-SARI

- One of the 13 research institutes under the CSIR
- Based in Nyankpala with mandate over the five regions of northern Ghana
- The mandate area covers the Guinea and Sudan savannah ecologies of Ghana
- Characterised by a monomodal rainfall pattern which is erratic
- Intermittent drought is also common during the rainy season

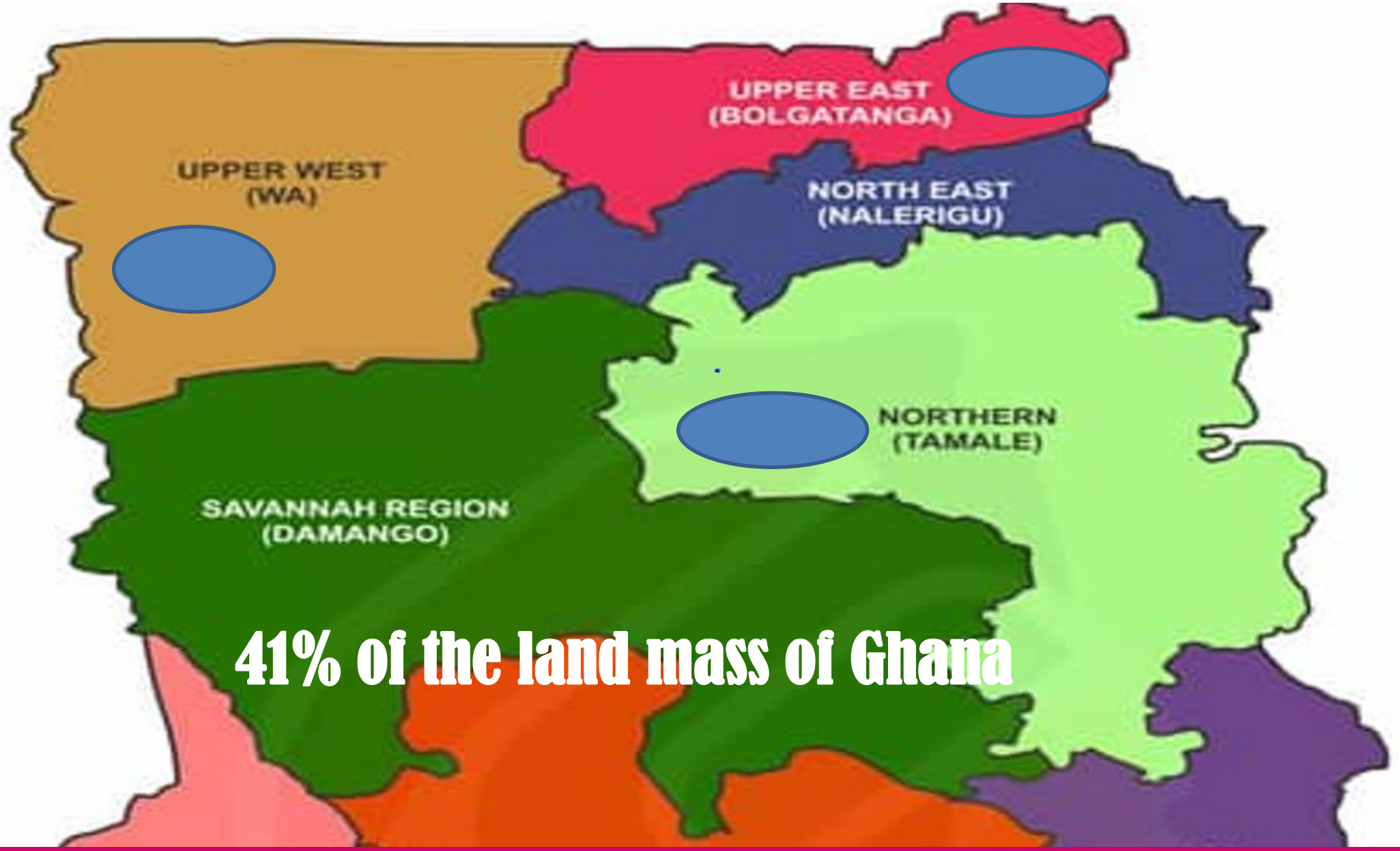
Technical Mandate

CSIR-SARI conducts research in into food and fibre crop farming in Northern Ghana for the purpose introducing improved technologies that will enhance overall agricultural productivity

Crops covered include:

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

Geographical Map of Mandate Area



41% of the land mass of Ghana

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RESEARCH APPROACH

THE FARMING SYSTEMS RESEARCH (FSR)

- **NR-FSRG** Northern Region Farming Systems Research Group, located at Nyankpala, the head office of SARI.
- **UER-FSRG** - Upper East Region Farming Systems Research Group, located at Manga near Bawku
- **UWR-FSRG** - Upper West Region Farming Systems Research Group, located at Wa.
- **SSG-** Scientific Support Group based at Nyankpala, works mostly on-station.

Each of these Teams houses a Research Extension Liaison Committee (RELC) Coordinator

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The Farming System Research Approach (FSR)

RELCs

End-user group/market

Planning meetings

NRFSRG

Farmers, Consumers, Processors, etc

UEFSRG

Scientific Support Group

UWFSRG

Participatory research (PVS/PPB): design of product profile

Characteristics of agriculture in the mandate area

Climate change; Intermittent and terminal drought conditions that disrupt the farming systems, etc

Low crop yields resulting from: Poor soils with low input use and use of low yielding varieties

Susceptibility of crops to diseases and pests

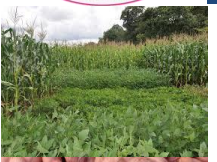
Characteristics of agriculture in the Guinea and Sudan savannah ecology

Poor market outlets

Sporadic outbreak of pests; fall armyworms, larger grain borer, etc

High postharvest losses and mycotoxin contamination (aflatoxins), etc

CSIR-SARI's crop improvement strategies







- The goal is to **develop end-user preferred crop varieties** that fit into the agro-ecologies of the mandate area,

- Crop varieties that can withstand the specific stresses of **low soil fertility**, **drought**, **pests** and **diseases** that characterize the farming environments of our mandate area

- **Produce breeder & foundation Seeds for mandate crops to enhance access**

- **Our varieties have high market demand;** cowpea, maize, rice, soybean and sorghum varieties are used in the National flagship programme

Current climate smart product profiles

Development of crop varieties resistant to **biotic stresses:**

- Fall Armyworm resistant maize varieties
- Aphid resistant cowpea varieties
- Cowpea varieties with resistance to macrophomina resistance
- Groundnut varieties that are resistant to early and late leafspot diseases
- Cassava varieties with tolerance to cassava green spider mite and mealybug damage
- Cowpea and maize varieties that are resistant to *Striga gesnerioides* and *S. hermonthica* respectively

Current climate smart product profiles cont'd

CSIR-SARI

Development of crop varieties with tolerance to **abiotic stresses**

- Neglected underutilized species that are climate resilient; fonio and frafra potatoes
- Heat tolerant tomato varieties
- Drought tolerant maize and cowpea varieties
- Nitrogen use-efficient maize varieties
- Early bulking and drought tolerant cassava varieties
- Early bulking sweetpotato varieties
- Sweetpotato varieties with stay-green attributes for dual purpose utilisation

Research to address industry needs

Development of industry-preferred crop varieties

- Sorghum varieties for premium brewing qualities for industrial use
- Dual purpose guinea and caudatum sorghum races for grain and biofuel utilisation
- Sweet sorghum varieties for ethanol production

Improved crop varieties developed by CSIR-SARI

Commercial maize varieties

- Sanzal-sima, Wang-dataa,
- Bihilifa, Kpari-faako,
- Suhudoo, Kunjor-wari,
- Wang-Basig, Denbea,
- Salin-kawana

- Key points to consider: Earliness, drought tolerance, Striga tolerance, high and stable grain yield,

Improved crop varieties developed by CSIR-SARI

Rice

- Gbewaa rice
- Gbewaa red
- Savanna rice
- Malimali
- Digan

Key points to consider: early maturity, Market demand, yield

Improved crop varieties developed by CSIR-SARI

Soybean

- Jenguma,
- Afayak,
- Favour
- Quarshie
- Suong Pungun

Key points to consider: Earliness, non shattering, yield ,

Improved crop varieties developed by CSIR-SARI

Sorghum

- Kapaala,
- Dorado

Key points to consider : Earliness, Resistance/tolerance to head bugs, striga and dry spells, brewing quality

Improved crop varieties developed by CSIR-SARI

Millet

- Akad-kom,
- Kaanati,
- Naad-Kohblug,
- Afribeh-Naara and
- Waapp-Naara

Key points to consider : Earliness, high yield, Resistance/tolerance to striga, dry spells etc

Improved crop varieties developed by CSIR-SARI

Cowpea

- Kirkhouse Benga 1 and
- Wang Kae are Aphid and Striga resistant cowpea varieties
- Padi Tuya,

- Key points to consider : Earliness, high yielding, striga resistance, resistance/ tolerance to key insect pests (Maruca pod borer, thrips, etc) and diseases

Improved crop varieties developed by CSIR-SARI

Groundnut

- SARINUT 1
- SARINUT 2
- Nkatie-sari,

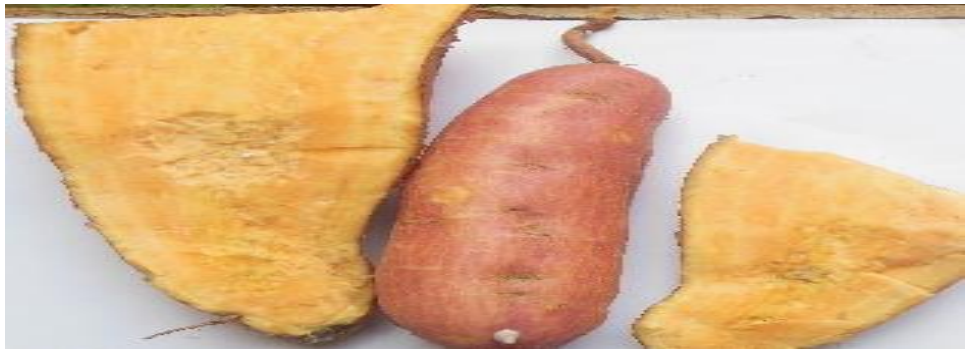
- Key points to consider : Earliness, high yielding, resistance/ tolerance to key
- insect pests and diseases
- Selection for fresh seed dormancy

Improved crop varieties developed by CSIR-SARI

- Sweetpotato
- CSIR SARI-Nan,
- CSIR-SARI-JanLow
- CSIR-SARI Diedi
- CSIR-SARI-Nyoribegu

Key points to consider : Earliness, high yield, betacarotene, anthocyanins,

Resistance/tolerance to sweetpotato weevil, stay-green/drought tolerance, high dry matter content for industrial processing, etc



Future research issues

- ✓ Development of crop varieties with extended shelf-life ; tomatoes, garden eggs, yam, etc
- ✓ Utilisation of speed breeding technique to maximize genetic gain
- ✓ The use of high throughput phenotyping and genotypic techniques
- ✓ Use of modern biotech tools; CRISPR, gene editing, GM, etc
- ✓ Marker assisted breeding to improve existing farmer preferred crop varieties through addition of novel genes
- ✓ Development and introduction of integrated crop, soil and pest management practices to minimize the effect of climate change yield and productivity of crops of interest


Thank you for listening