22ND MEETING OF COMSATS COORDINATING COUNCIL

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TIANJIN, CHINA
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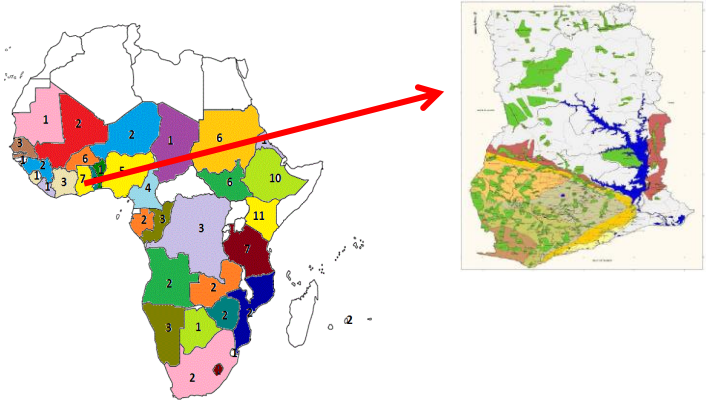
AFRICA AND GHANA



Introduction

- **The Council for Scientific and Industrial Research (CSIR) is the foremost Scientific and Technological Institution in Ghana.**
- **It has 13 Research institutes located throughout Ghana in all the agro ecological zones.**
- **The current strategic re-orientation of the CSIR has resulted in remarkable improvement in the quality of research programmes and outputs.**

CSIR INSTITUTES

- Animal Research Institute (ARI - *Accra*)
- Building and Road Research Institute (BRRI - *Fumesua*)
- Crops Research Institute (CRI - *Fumesua*)
- Food Research Institute (FRI - *Accra*)
- Forestry Research Institute of Ghana (FORIG - *Fumesua*)
- Institute for Scientific & Technological Information (INSTI - *Accra*)
- Institute of Industrial Research (IIR - *Accra*)
- Oil Palm Research Institute (OPRI – *Kade*)
- Plant Genetic Resources Research Institute (PGRRI - *Bunsu*)
- Savanna Agricultural Research Institute (SARI - *Nyankpala*)
- Science & Tech. Policy Research Institute (STEPRI - *Accra*)
- Soil Research Institute (SRI - *Kwadaso*)
- Water Research Institute (WRI - *Accra*)
- ***Biotechnology and Biomedical Research Institute – Proposed by Council***

CSIR Nation-Wide Location

CSIR CORPORATE RESEARCH THEMATIC AREAS

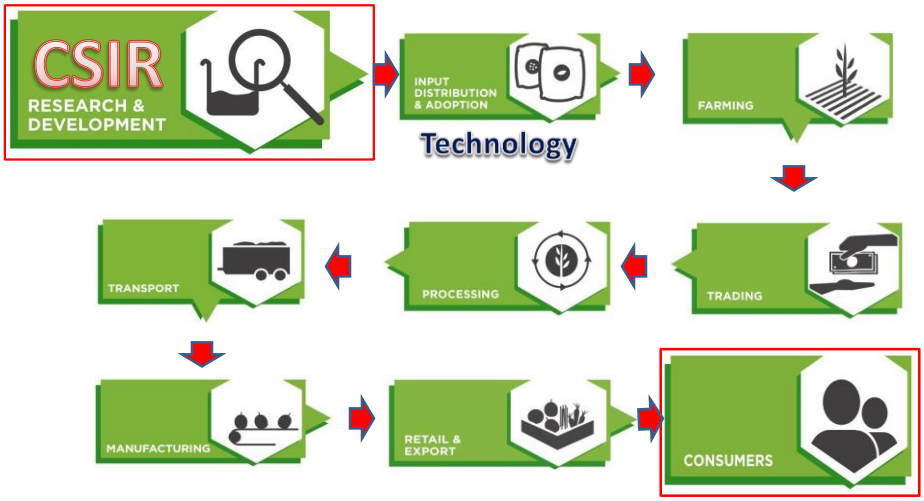
- Food Security & Poverty Reduction
- Biotechnology & Biomedical Science
- Materials, Built Environment & Manufacturing
- Electronics & ICT

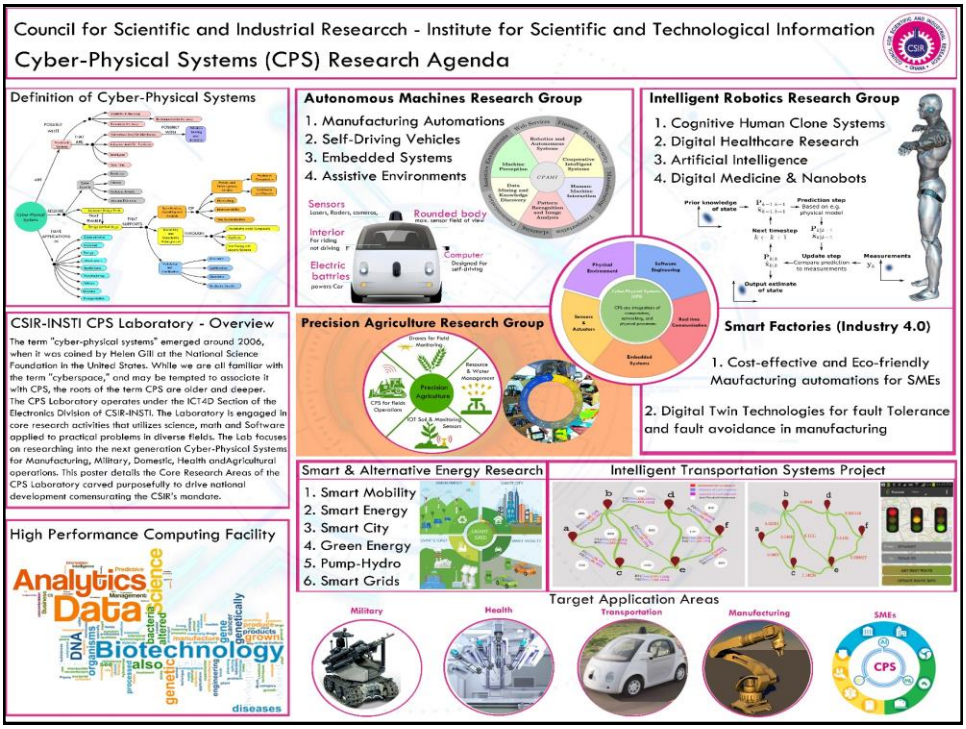
Centres of Excellence

- Science & People / Technology for Society
- Energy & Petroleum
- Climate Change & Environmental Conservation

STRATEGIC ROLE OF THE CSIR

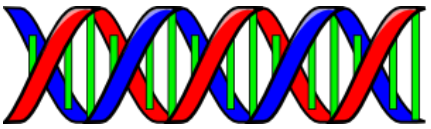
Agribusiness Value Chain





1. BIOTECHNOLOGY FOR CROP PRODUCTION

BIOTECHNOLOGY APPLICATIONS



- **PCR-based studies to enhance:**
  - *Marker Assisted Selection (MARS).*
  - *Detection of plant and animal diseases and enhancement of yield.*
- **Cognizant of cost to farmer of biotech products.**

AREAS OF FOCUS

- CROPS
  - Cereals (Maize, Rice, Sorghum)
  - Roots & Tubers (Yam, Banana etc)
  - Horticultural Crops
  - Tree Crops
- Food Processing

2. BIOTECHNOLOGY FOR ANIMAL PRODUCTION

Assisted Reproductive Technology

- Artificial insemination
- In-vitro Fertilization
- Embryo Flushing

Production of Transgenic Animals (collaborative research)

- Less smelly pigs
- More and better meat on their bones
- Fast growing animals
- Improved treatments for diseases
  - Trypanomosis resistant cattle e.g. Mzema cattle in Kenya

ADVANCES IN LIVESTOCK AND POULTRY PRODUCTION

- **TECHNOLOGIES:**
  - **Cattle and Small ruminants.**
  - **Poultry.**
  - **Technology for sustainable management of rangelands.**

ADVANCES IN FISH FARMING: *TILAPIA IMPROVEMENT AND PRODUCTION*

- **Improved "Akosombo Strain" of Nile Tilapia has been developed which grows 25-30% faster than the wild and other local stocks.**
- **This strain currently forms the backbone of freshwater aquaculture in Ghana, Ivory Coast and Mali.**
  - ***Production rose from 550MT in 2000 to over 27,000MT in 2012.***
- **CSIR, Ghana produces over 5,000,000 fingerlings annually and over 30,000 improved brood stocks for supply to farmers annually.**

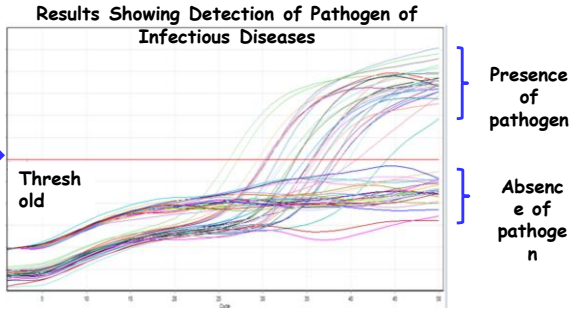
3. ADVANCES IN BIOMEDICAL AND PUBLIC HEALTH RESEARCH

- **Enhancement of public health status through sound disease control, environmental and pollution control strategies.**
  - ***Identification and control of water-borne, water-related diseases***
  - ***Communicable and non-communicable disease Control***

DETECTION OF PATHOGEN OF INFECTIOUS DISEASES

- A DNA-Based assay for detection of pathogen of infectious diseases using real-time PCR (qPCR) approach.
- This method is highly sensitive for diagnosis of schistosomiasis, STH infection, onchocerciasis, malaria etc. and able to detect infections even at very low level that cannot be detected by microscopy.
- This technology is very useful for monitoring and surveillance of these diseases by the control programs

Real-Time PCR Machine



COLORIMETRIC LOOP MEDIATED ISOTHERMAL AMPLIFICATION TECHNIQUE

Colorimetric loop mediated isothermal amplification (LAMP) technique is a highly sensitive assay developed for detection of infectious pathogens of *Mycrobacterium ulcerans* (Buliri ulcer).

This method uses DNA amplification technique to detect by a simple change colour from yellow to pink, using neutral red dye. This assay is most suitable for field based studies

LAMP Machine

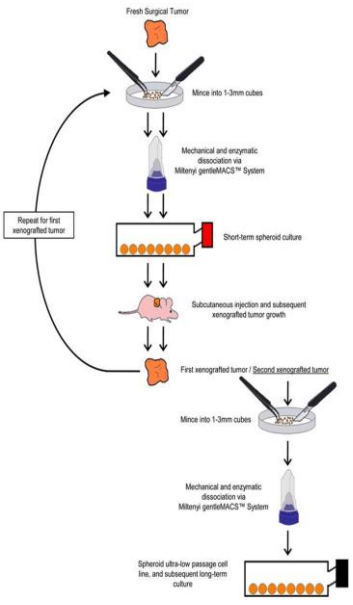
Results showing the detection of *Mycrobacterium ulcerans in Buliri ulcer patients*.

Tubes 1, 2, 5, 6, 7:colour change; Samples from patient showing ulceration but no Buliri ulcer infection indicating the absence of *Mycrobacterium ulcerans*

Tubes 3, 4, 7: A colour change from yellow to pink, indicating the presence of *mycrobacterium ulcerans, confirming* Buliri ulcer infection

Application of Tissue Culture for Cancer Research

- **Tissue Culture** involves the culturing of extracted cells from their tissue or organs in aseptic laboratory with environmental conditions same as in vivo.
- It plays a major role in cancer research by;
  - studying the basic difference between the normal cells and cancerous cells
  - studying the cause and mechanism of cancer
  - studying effective drugs to destroy cancerous cells
- Normal cells can be converted into cancer cells by using radiation, chemicals and viruses.
- Cell culture can be used to determine the effective drugs which will selectively destroy only cancer cells



VECTOR-BORN DISEASES MGT
ONCHOCERCIASIS CONTROL

- **Oncho or river blindness is a parasitic disease caused by *Onchocerca volvulus* transmitted the blackfly vector (*Simulium damnosum*).**
- **Transmission intensity usually higher in fertile river valleys where many villages have been abandoned.**

4. BIOTECHNOLOGY FOR INDUSTRIAL RESEARCH

FORESTRY RESEARCH: Allanblackia parviflora – Sonkyi Research

- Collaborative programme – CSIR, Unilever and World Agroforestry Centre, Nairobi
- Allanblackia Oil contains: **oleic – 45-58%** and **stearic – 40-51%**.
- Becel 79%, which is rich in Omega 3 and Omega 6 and designed in line with the Nordic Nutritional Recommendations (NNR)
- In discussions on appropriate technologies to use to address challenges

MULTIPLE USES - Allanblackia

- Oil used at industrial scale in food products.
- Locally oil used for cooking, soap making, etc.
- Wood for timber. Bark extracts in herbal medicine.
- Huge market for its oil – 100,000 tons/yr.

5. BIOTECHNOLOGY FOR ENERGY RESEARCH

BIOGAS TECHNOLOGY

- CSIR has introduced the biogas technology.
- The Ministry has currently developed a strategy for the diffusion of biotechnology in the construction of bio toilets.

International Collaboration

- CSIR/CORAF-WECARD/ECOWAS Project on Control of Mango Fruit Flies
- CSIR/EU HORIZON 2020 on Tropicsafe Project
- CSIR/IDRC (Canada) – Coconut lethal Yellowing Disease Project
- CSIR-NDRC of India on Ghana-India tomato project.

International Collaboration

- CSIR/Iowa State University (US) - Integrated Soil Fertility Management
- CSIR/Univ. of Illinois (US) - Soybean Improvement Programme
- CSIR/Oxford University (UK) – impacts of EL Nino on the Carbon Oxide of Tropical Forests

Conclusion

- The CSIR has continued to fulfill its mandate of co-ordinating Research and Development activities in Ghana.
- Within the past two years it has come out with not less than 10 new crop varieties to improve yield and nutrition
- There is greater collaboration with other International Research Institutions.
- CSIR-Ghana wishes to strengthen its links with COMSATS Members

THANK YOU