PRESENTATION TO DTI DELEGATION

Overview of Research and Development Efforts at CSIR-Ghana

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Director-General

WEDNESDAY, 13TH JANUARY, 2016
HISTORICAL PERSPECTIVE OF CSIR AND FUTURE DIRECTION

1958 - 1969
FOCUS ON AGRICULTURE
CREATION & REORGANISATION
GOV’T ECONOMIC RECOVERY PROGRAMME

1970 - 1985
PERIOD OF STAGNATION FOR CSIR

1986 - 1995
MAJOR LEGISLATIVE REFORM (ACT 521)

1996 - 2005
COMPREHENSIVE REFORM LEADING TO GROWTH
THREE-FOLD STRATEGY – R&D, COMMERCIALISATION & GRADUATE SCHOOL

2006 - 2014
FOCUS ON PRIVATE SECTOR PARTICIPATION & COMMERCIALISATION

2015 - 2024
POLICY CHANGES NECESSITATING REFORMS
CHANGES TO FORM AND FUNCTION OF CSIR
FOCUS ON ECONOMIC SECTORS
CSIR VISION MISSION AND MANDATE

CSIR VISION

SCIENCE FOR WEALTH CREATION

CSIR MISSION

1. To generate and apply innovative technologies
2. Exploit S&T for socio-economic development
3. Improve scientific culture of the civil society

CSIR MANDATE (14)

1. Scientific advice to Minister, MESTI
2. Co-ordinate all aspects of scientific research in the country
3. Promote the commercialization of research results
4. Dissemination of the research results
5. Liaise with international and local bodies and organisations, in particular, the universities and the private sector on matters of research
6. Perform such other functions as may be determined by the Minister

INSTITUTIONS

1: Head Office
2: Thirteen (13) Research Institutes
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 (INSTIT - 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)
- Soil Research Institute (SRI - Kwadaso)
- Water Research Institute (WRI - Accra)
- Biotechnology and Biomedical Research Institute – Proposed by Council
CSIR NATION-WIDE
NUMBER OF SCIENTISTS IN DIFFERENT CATEGORIES AND INSTITUTES

Research Scientists – 525
Senior Admin Staff – 120
Technologists – 985
Other Staff (junior) – 2010
TOTAL – 3,640

PHD Holders – 35%
[Range of 20% (Engineering based) - 60% (Agric based)]

23 May 2016
NEW CSIR RESEARCH AGENDA

3 Research Thematic Areas
1. RTA1 – Food Security and Poverty Reduction
2. RTA2 – Biomedical and Public Health Research
3. RTA3 – Climate Change, Environmental Conservation & Green Technologies

4 Research Thematic Areas
1. RTA4 – Materials, Bio-Products and Manufacturing
2. RTA5 – Electronics and Information, Communication & Technology
3. RTA6 – Energy and Petroleum
4. RTA7 – Technology for Society (National Development)

Research Pillar 1 / Goal 1
Increased Agricultural Productivity, Sustainable Natural Resources Development and Improved Public Health

Research Pillar / Goal / Outcome 2
Increased Industry Productivity and Socio-Economic Development

CSIR, ACT 521

AGRICULTURE, FORESTRY & FISHERIES
HEALTH & MEDICINE
ENVIRONMENTAL

INDUSTRY & NATURAL SCIENCES
SOCIAL SCIENCES
P1: FOOD SECURITY AND POVERTY REDUCTION
FOOD SECURITY & POVERTY REDUCTION: Sub-Programmes

- P1.1 Grains, and Legumes
- P1.2 Root, Tubers, Horticultural (Vegetables & Fruits) and Industrial Crops
- P1.3 Trees and Plant Resources (Natural Products)
- P1.4 Livestock and Poultry
- P1.5 Fisheries and Aqua-culture
- P1.6 Mechanisation, Agro-Food Processing [Agri-business?] and Value Chain Promotion (Cross-Cutting)
CLIMATE CHANGE & ENVIRONMENTAL CONSERVATION

The New Toyota Cowrolla!
CLIMATE CHANGE, ENVIRONMENTAL CONSERVATION & GREEN TECHNOLOGIES: Sub-Programmes

- P2.1 Soil, Water and Biodiversity Conservation
- P2.2 Climate Change Mitigation (Including REDD+)
- P2.3 Climate Change adaptation and Social Development
- P2.4 Pollution and Waste Management, (Including Bio-Remediation)
- P2.5 Green Technologies for Sustainable Development
MATERIAL SCIENCE AND MANUFACTURING
MATERIAL SCIENCE & MANUFACTURING: Sub-Programmes

- P3.1 Material Science (Wood, Metals, Integrated Materials)
- P3.2 Industrial Products (Bio-Resource and Bio-Products Engineering)
- P3.3 Nanotechnology and Nano Products
ENERGY AND PETROLEUM
ENERGY AND PETROLEUM: Sub-Programmes

- P4.1 Oil & Gas, including Cathodic Protection System
- P4.2 Renewable Energy (including Bio-energy and Bio-gas)
- P4.3 Energy Products, including Bitumen
- P4.4 Metrology and Industrial Engineering
BIOMEDICAL AND PUBLIC HEALTH
BIOMEDICAL AND PUBLIC HEALTH:
Sub-Programmes

- P5.1 Plant and Animal Health (Pathology, Entomology, Micro-Biology, Molecular Biology, Cell Biology)
- P5.2 Genetics, Germplasm Conservation, Bio-prospecting and Bio-processing
- P5.3 Bio-Informatics, Bio-Physics and Bio-Chemistry
- P5.4 Biomedical, Biosafety and Ethics
ELECTRONICS AND ICT
ELECTRONICS AND ICT: Sub-Programmes

- P6.1 Computing and Software Systems (Electronic and Computing Engineering)
- P6.2 Electrical and Electronic Systems and Design
- P6.3 Information and Communication System, including Geographic and Management Information System
- P6.4 Robotics and Mathematical Sciences
SCIENCE AND PEOPLE
SCIENCE AND PEOPLE: Sub-Programmes

- P7.1 Policy and Governance
- P7.2 Statistical, Social and Economic Research
- P7.3 Culture, Indigenous Knowledge and Community Improvement
- P7.4 Technology for Livelihood and Wealth Creation
ACHIEVEMENTS AND AREAS FOR COLLABORATION
ENERGY RESEARCH

WIND

OIL & GAS

BIO-FUEL
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.

process
ENVIRONMENTAL BIOLOGY

• Enhancement of public health status through sound environmental and water pollution control strategies.
  – Assessment of bacteriological water quality.
  – Identification and control of water-borne, water-related diseases.
• Oncho or river blindness is a parasitic disease caused by *Onchocerca volvulus* transmitted by the blackfly vector (*Simulium damnosum*).

• Transmission intensity usually higher in fertile river valleys where many villages have been abandoned.
SURFACE WATER

• Water resources for agriculture: Livestock and irrigation.
• Hydrographical surveys.
• Appropriate rainwater harvesting systems for domestic and industrial supply.
GROUND WATER: PROVISION OF WATER

• Ground water exploration.
• Drilling of wells for communities, etc.
• Assessment of water quality.
• Construction of infiltration galleries behind dams.
ROADS AND HOUSING - Promoting Local Building Materials

- CSIR-BRRI low cost technology employing **bricks** and **pozzolana** cement.
- Pozzolana can replace up to 40% of cement for construction.
- Reduces cement price by at least 18%.
- Improves resistance of cement against sulfates attack.
- Production facility at BRRI produces 300 bags/day.
ADHESIVES

• HQCF good extender for the manufacture of plywood.
  – Technology minimizes wear on cutting tools due low ash content.
  – Provides tack to the glue and promotes faster and more complete cures.
• Total adhesive mix is 20% HQCF and 80% Wheat Flour.
• Contribution of cassava adhesive alone to plywood industry amounts to US$900,000 per annum.
• Offers employment for the youth.
ADHESIVES: HIGH QUALITY CASSAVA FLOUR

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TRADITIONAL MEDICINE

• “... Science without tradition can produce technicians but not cultured men; tradition without science can breed learned but not rational men”

• **Herbal Pharmacopoeia** to integrate traditional herbal medicine.
CROPS IMPROVEMENT

- Varieties of crops spanning the Ghanaian staple spectrum:
  - Cereals: Maize, Rice, Sorghum & Millet
  - Grain Legumes: Cowpeas, Peanuts, Soyabean, etc.
IMPROVED versus FARMERS’ VARIETIES

IRR for maize = 70%

Maize

Rice

Graph showing yield (t/ha) for different varieties of maize and rice.
LIVESTOCK AND POULTRY

• TECHNOLOGIES:
  – Least cost feed production using various agro-industrial by-products as feed for cattle and small ruminants.
  – Promotion of locally produced vaccines for livestock and poultry.
  – Technology for sustainable management of rangelands.
FISH FARMING: TILAPIA IMPROVEMENT AND PRODUCTION

• CSIR developed the improved “Akosombo Strain” of Nile Tilapia 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 produces over 5,000,000 fingerlings annually and over 30,000 improved brood stocks for supply to farmers annually.
AGRO PROCESSING AND VALUE ADDITION

- **CSIR-Food Research Institute** has array of agro-processing/value addition technology.
- A number of commercial convenience foods in the Ghanaian and external market.
The concentration of heavy metals beyond acceptable limits in soils and food crops grown in galamsey communities render the crops poisonous to humans and wildlife.

As a result, the CSIR-SRI has, through several years of pollution management studies associated with mining, developed simple and sustainable pollution management technologies that are able to transform such degraded environments into productive ecosystems.
CLIMATE CHANGE - MITIGATION AND ADAPTATION

MITIGATION measures deal with the causes of climate change; e.g. reducing energy consumption and using clean technologies.

ADAPTATION measures deal with the impacts of climate change; e.g. managing watersheds for reducing landslides or developing alert systems.
BIOTECHNOLOGY

• PCR-based studies to enhance:
  – *Marker Assisted Selection (MARS).*
  – *Introduce plant protection, yield and nutrient enhancing genes.*

• Cognizant of cost to farmer of biotech products.
THANK YOU