



**COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH  
INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION  
(CSIR - INSTI)**



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**INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION**

# 2019 ANNUAL REPORT

## **CSIR-INSTI 2019 ANNUAL REPORT**

INSTITUTE FOR SCIENTIFIC AND TECHNOLOGICAL INFORMATION (CSIR-INSTI)  
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

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# List of Acronyms

<b>AEE</b>	-	Association of Energy Engineers
<b>AJOL</b>	-	African Journals Online
<b>ARI</b>	-	Animal Research Institute
<b>BRRRI</b>	-	Building and Roads Research Institute
<b>CARGS</b>	-	Competitive Agricultural Research Grant Scheme
<b>CARLIGH</b>	-	Consortium of Academic and Research Libraries in Ghana
<b>CLIMACCESS</b>	-	Climate Accessibility
<b>CSA</b>	-	Climate Smart Agriculture
<b>CSIR</b>	-	Council for Scientific and Industrial Research
<b>FAO</b>	-	Food and Agriculture Organization
<b>FRI</b>	-	Food Research Institute
<b>FST</b>	-	Farmer Segmentation Tool
<b>GAEC</b>	-	Ghana Atomic Energy Commission
<b>GES</b>	-	Ghana Education Service
<b>GISD</b>	-	Geospatial and Information Science Division
<b>GJAS</b>	-	Ghana Journal of Agricultural Science
<b>GJS</b>	-	Ghana Journal of Science
<b>GOG</b>	-	Government of Ghana
<b>GRAF</b>	-	Ghana Robotics Academy Foundation
<b>GSSTI</b>	-	Ghana Space Science and Technology Institute
<b>HPC</b>	-	High Performance Computer
<b>IITA</b>	-	International Institute of Tropical Agriculture
<b>INASP</b>	-	International Network for the Availability of Scientific Publications
<b>INSTI</b>	-	Institute for Scientific and Technological Information
<b>iSTEAMS</b>	-	International Sciences, Technology, Education, Arts, Management & Social Sciences Conference
<b>KML</b>	-	Keyhole Markup Language

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<b>MMDA</b>	-	Metropolitan, Municipal & District Assemblies
<b>MNO</b>	-	Mobile Network Operator
<b>NASA</b>	-	National Aeronautics and Space Administration
<b>NGO</b>	-	Non-Governmental Organization
<b>NITA</b>	-	National Information Technology Agency
<b>OWC</b>	-	Optical Wireless Communication
<b>PCB</b>	-	Printed Circuit Boards
<b>PGRRI</b>	-	Plant Genetic Resources Research Institute
<b>RELC</b>	-	Research-Extension-Farmer Linkage Committee
<b>RiSE</b>	-	Robotics Inspired Science Education
<b>SARI</b>	-	Savanna Agricultural Research Institute
<b>SIP</b>	-	Stepwise Investment Package
<b>SMART</b>	-	Society for Multidisciplinary & Advanced Research Techniques
<b>STEM</b>	-	Science, Technology, Engineering and Mathematics
<b>STEPRI</b>	-	Science and Technology Policy Research Institute
<b>S&amp;T</b>	-	Science and Technology
<b>STI</b>	-	Science, Technology and Innovation
<b>TEEAL</b>	-	The Essential Electronic Agricultural Library
<b>UAT</b>	-	User Acceptance Testing
<b>UAV</b>	-	Unmanned Aerial Vehicle
<b>VPN</b>	-	Virtual Private Network
<b>WRI</b>	-	Water Research Institute

**Membership of the Management Board (As at 31<sup>st</sup> December 2019)**

- |                             |   |   |
|-----------------------------|---|---|
| Dr. Paul Effah              | - | <b>(Chairman)</b> Management Consultant, Radford University College, East Legon, Accra.           |
| Ing. Kweku Asmah            | - | <b>(Member)</b> Ghana Institute of Engineers, Accra.  |
| Mrs. Genevieve Yankey       | - | <b>(Member)</b> Representative of Director General, Director of Administration, CSIR, Accra       |
| Dr. Mrs. Wilhemina Quaye    | - | <b>(Member)</b> Cognate Director, CSIR-STEPRI, Accra  |
| Dr. Seth Awuku Manteaw      | - | <b>(Member)</b> Director, CSIR-INSTI, Accra   |
| Mrs. Lucy P. Dzandu         | - | <b>(Member)</b> Deputy Director, CSIR-INSTI, Accra  |
| Dr. Mohammed – Sani Abdulai | - | <b>(Member)</b> Senior Lecturer and Consultant, African Centre for Development Informatics, Accra |
| Mr. Kobina Asmah Jr.        | - | <b>(Member)</b> CEO, Type Company Limited, Accra  |

**In Attendance**

- |                     |   |  |
|---------------------|---|--|
| Mr. Joseph Anyen    | - | Accountant, CSIR-INSTI, Accra                                |
| Mrs. Dorothy Awanyo | - | <b>(Secretary)</b> Administrative Officer, CSIR-INSTI, Accra |

**Membership of the Internal Management Committee (As at 31<sup>st</sup> December 2019)**

Dr. Seth Awuku Manteaw	-	Director/Chairman
Mrs. Lucy P. Dzandu	-	Deputy Director /Head, Geospatial and Information Science Division
Mrs. Dorothy Awanyo	-	Head, Administration Division
Dr. Agnes Decardi-Nelson	-	Head, Printing and Publishing Science Division.
Dr. Paul A. Danquah	-	Head, Communications Division
Ing. Michael Wilson	-	Head, Electronics Division
Mr. Mohammed Zainudeen	-	Head, Fluid Science Division
Mrs. Ivy Koranteng	-	Representative, Senior Staff Association
Mr. Dennis N.D. Dodoo	-	Chairman, Trade Union Congress
Mr. Benjamin Folitse	-	Representative, Research Staff Association
Ms. Cordellia Busumtwi	-	Secretary

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**Dr. Seth Awuku Manteaw**  
**Director, CSIR-INSTI**

## Foreword

Understandably, the first and arguably the most important and historic activity for the year was the official induction of the newly appointed Director of the CSIR-Institute for Scientific and Technological Information (CSIR-INSTI). The official induction of the newly appointed Director set the tone for the implementation of activities outlined for the year. It also offered the opportunity for the Director to share his vision for the Institute; a vision underpinned by a drive towards enhanced resource mobilisation, effective technology transfer of CSIR's research outputs, deepened research collaborations to increase the Institute's project profile and enhanced visibility for the Institute.

Progress was made towards the establishment of a National High-Performance Computing Centre at the CSIR-INSTI to serve as the state-of-the-art data processing hub for the scientific community. Work on the provision of infrastructure to host the Centre was completed during the year. Besides, the Institute took delivery of the High-Performance Computers, which were

stationed in the Server Room to prepare the ground for installation. The outstanding tasks will be completed next year for a smooth take-off. The project remains one of the flagship projects of the Institute.

In a bid to deepen its technology transfer activities and leverage on CSIR's research outputs, the CSIR-INSTI, with the support of the Canadian sponsored-Modernising Agriculture in Ghana Programme (MAG), commenced a project to document agricultural technologies generated by agriculture-based institutes of the CSIR for the last 10 years into a Manual. The Manual seeks to make for easy reference and promote enhanced awareness about current technologies developed by agricultural-based institutes of the CSIR.

The second phase of this project will involve the setting up of a digital agricultural innovation hub to among other things map and digitise agricultural lands, assets and input supplies for easy access; apply technologies to improve collaboration among value chain actors; develop new digital applications for the agricultural sector and digitise farms and list them as stock which farmers can reference as collateral to access loans and capital from financial institution.

The various technical Divisions of the Institute continued with the implementation of research projects and programmes and the provision of key services on request as will be contained in this Annual Report. The CSIR-INSTI remains committed to its strategic role of leveraging on the technological accomplishments of the CSIR and deploying the use of communication systems and electronic tools to sustain this activity in the most efficient manner.

The Institute is grateful to the Government of Ghana, development partners and friends for the support in the execution of its mandate. It is my honour and pleasure to present CSIR-INSTI's Annual Report for 2019.



# EXECUTIVE SUMMARY

The year 2019 was a fruitful and eventful one for the Institute. Divisions carried out various research projects, some of which were completed. Besides, the Institute discharged its mandate through the provision of services and product manufacturing. The following highlights provide a summary of some of the activities carried out in 2019.

**Impact Assessment of a Robotics Inspired Science Education Programme on Student Performance and Understanding in STEM Subjects:** The use of robots in training students for critical thinking and practical skill acquisition was experimented on students between 12 and 21 years. The research showed that this training approach has a positive impact on students' understanding and inspired students in attaining higher education in STEM-related subjects.

**Climate Smart Cocoa Implementer App for Cocoa Extension:** The Smartphone app as well as an electronic user guide was developed for the IITA. Extension officers and Cocoa Farmers now have a tool for access to information for conducting tailor-made stepwise investment pathway training in accordance with the CSA package for local farmers.

**Urban Vegetable Farmers' Appreciation of Insurance in the Greater Accra Region of Ghana:** Conclusion drawn from the study was that about 60% of urban vegetable farmers were willing to participate in and pay for an insurance scheme. Results demonstrated that majority of the farmers upheld the idea of crop insurance due to diseases and pest menace in vegetable farming and therefore wished to purchase insurance contracts, even though they generally wanted to avoid crop losses caused by extreme weather-related disasters. Majority of the respondents who did not wish to participate in such a crop insurance programme stated that the onus was on the state to provide them with the required financial support and to compensate all the financial losses of the vegetable crops caused by natural diseases and pests instead of collecting money from them.

**Information Security: Usage of Anti-Malware, Implementation of Business Continuity and Disaster Recovery Plans:** In the context of anti-malware, third party mobile devices, laptops and computers tend to be the most infected systems within the Ghanaian government ministries and the most challenging threat that has not been properly countered is the advanced persistent threat. In the business continuity context, much as practices were observed to be generally poor, IT disaster recovery readiness is however relatively better with regular backups being a prominent feature.

**Design and Implementation of a LiFi Test-Bed:** Research showed that uploads via 0° or 180° positioning between transceivers and illuminating devices tended to produce low transmission

speeds. Further research is required to confirm this observation and also identify factors possible for interference and localised transmission speeds.

**Robotics Training Programmes:** The training programme uses the Versatile LEGO Mindstorm Robots to engage students in various tasks. Success stories from the programme include the students from the Methodist Girls Senior High School who won gold at the 2019 Robofest World Championship held in Michigan, USA from 19<sup>th</sup> to 21<sup>st</sup> May 2019 after having taken part of their training at the CSIR-INSTI.

Saturday Robotics Club Sessions are held at the Electronics Division of the Institute from 9am to 12pm every Saturday at a fee of GH¢350/month with a target group of students between the ages of 6 to 15 years. The club is made up of teams, in accordance with the World Robots Olympiad Standard of six (6) members per team. One team took part and placed 4<sup>th</sup> on the National Ranking at the Elementary category of the RiSE 2019 competitions.

**Ghana Journal of Agricultural Science & Ghana Journal of Science:** GJAS and GJS are the two leading science journals in the country published by the Institute. The *Ghana Journal of Agricultural Science* (GJAS) published Issues (1) and (2) of GJAS Vol. 54 (2019) made up of seven (7) and nine (9) articles respectively. The *Ghana Journal of Science* (GJS) also published Issues (1) and (2) of GJS Vol. 60 made up of five (5) and nine (9) articles respectively.

**Printing Services:** The Institute designs and prints for the Council and its Institutes as well as external organisations including West African Science Service Centre on Climate Change and Adapted Land Use and University of Professional Studies, Accra. Print-outs produced during the year included but not limited to annual reports, calendars, diaries, business cards, letterheads, envelopes, billboards, banners, flyers and brochures.

**Information resources:** The information resources collected by the Scientific Information Management Section for 2019 stood at 1097. These included journals/magazines, theses, annual reports, books and newspapers which were acquired through purchases, exchanges, donations, legal deposit and subscription and collaboration.

**Number of persons who used the library:** A total of 1188 clients from the Mamobi Community and its surroundings visited and used the library.

**The staff strength:** The staff strength of CSIR-INSTI stood at 71 as at 31<sup>st</sup> December 2019, comprising 25 senior members, 27 senior staff and 19 junior staff. Two staff members resigned in the first month of 2019. The Deputy Director of the Institute, Mrs. Lucy Payne Dzandu proceeded on retirement from the Council on 30<sup>th</sup> November, 2019. Three (3) other staff members, a senior member and two (2) junior staff also retired in 2019.

**Income Generated:** Total receipts for the year under review amounted Gh¢4,480,777 and payments totaled Gh¢4,493,119.38 with a negative net receipt of Gh¢12,341.99. The receipts are made up of salaries paid by GOG from the Consolidated fund amounting to Gh¢3,959,063.68. Internal Generated Fund (IGF) amounted to Gh¢307,490.97 and Donor Funds of Gh¢214,222.74. The IGF activities included Printing, Hiring of facilities, and Consultancy. The Payment of Gh¢4,493,119.38 for the period is made up of Compensation for Employees of Gh¢3,992,337.99, Goods and Services of Gh¢441,593.60 and Non-Current assets of Gh¢59,187.79.

# 1.0 INTRODUCTION

The mandate of the CSIR-Institute for Scientific and Technological Information (CSIR-INSTI) is to develop a national capacity and capability for the efficient and effective provision of scientific and technological information on demand for the benefit of research scientists, policy decision makers, industrialists, etc. in an appropriately packaged form for national development.

The Institute's operative objectives are to:

- Carry Out Research Into The Electronics/Communications And Promote Uptake Of Research Findings To End Users.
- Utilise And Develop Ict Tools And Communication Systems For Socio-Economic Development.
- Provide Sustainable Training Programmes In The Fields Of Ict And Consultancy Services Using Appropriate Technologies And Expertise.
- Adopt, Adapt And Master Known And Existing Technologies
- Conduct Research Into The Following Areas:
  - Intelligent Transport Systems (ITS)
  - SMART agriculture for sustainable green cities
  - High-performance data networks and Cybersecurity
  - Computer aided designs and Robotics
  - Predictive analytics and algorithm development
- Distinguish Itself In The Field Of Science Publishing And Ultimately Become A Leader In The Specialty In Ghana.
- Collect And Analyse Data For The Design And Construction Of Thematic Maps Using Digital Technologies To Depict Ghana's Resources And Development Potential To Aid Planning, Policy Decision Making, Research And General Education
- Collect, Process, Store And Repackage For Dissemination Science And Technology Information Embodying The Results Of Indigenous Science And Technology Research Activities As Well As Those Generated Elsewhere For The Benefit Of Planners In Government, Production And Manufacturing Concerns

- Support The Promotion Of Efficient Research And Development Activities In The Country Through The Provision Of Science And Technology Information Services Using Appropriate information processing and communication technologies
- Strengthen National Science And Technology Information And Infrastructure Through Effective Networking And Collaborative Activities

In fulfilment of its mandate, CSIR-INSTI continued to collect, organise, coordinate, manage and repackage for dissemination, STI resources on a national scale to facilitate technology transfer between the developers or producers of technologies to enhance and accelerate the adaptation and diffusion of these technologies.

The divisions at the institute under which activities were undertaken were:

- Communications
- Electronics
- Fluid Science
- Geospatial and Information Science
- Printing and Publishing

The supporting divisions were:

- Accounts
- Administration



## 2.0 COMPLETED RESEARCH PROJECTS

### 2.1 Impact Assessment of a Robotics Inspired Science Education Programme on Student Performance and Understanding in STEM Subjects

**Research Team:** Wilson M., Twum-Barimah Y. & Okraku-Yirenkyi Y.

**Start Date:** August 2018

**Completion date:** August 2019

**Actual Cost of Project:** GH¢6,000.00

**Sponsors:** None

**Collaborating Institution:** Ghana Robotics Academy Foundation (GRAF)

**Location:** Nationwide

#### Major Findings

In Ghana, one main issue raised by industry is that many university graduates lack skills which complement their technical knowledge such as problem solving skills and team work. In an attempt to address this problem and to prepare students with adequate skills for the 4th industrial revolution, many countries and institutions have resorted to varying methodologies of implementing STEM-based learning either as part of regular education or outside school hours.

To improve the efficiency and throughput of the education system in this era, it remains critical to explore efficient techniques and tools to augment the current delivery mode in schools targeted at improving STEM, creativity and critical thinking skills development. This research work committed to demystifying science through futuristic educational transformation and helping students to succeed.

The research output was a proven and unique system for learning that has never been more relevant: a hands-on, minds-on approach– the core of which is the enduringly engaging and versatile LEGO brick and Lego Mindstorm Programming Environment – designed to help students take ownership of the learning process, enable them to actively develop the problem-solving skills and collaborative outlook necessary to become creators, not just consumers of knowledge.

The research work has made bare the power of its hands-on technology and curriculum in engaging and motivating students to learn science, technology, engineering, and math concepts, while equipping them with the real-world knowledge and 21st century skills required to be successful and competitive in today's global society.

A survey was conducted on randomly sampled 150 competitors during a national robotics competition to gather data for evaluating the impact and effectiveness of the 2018 RiSE programme. Below is a summary of the survey output.

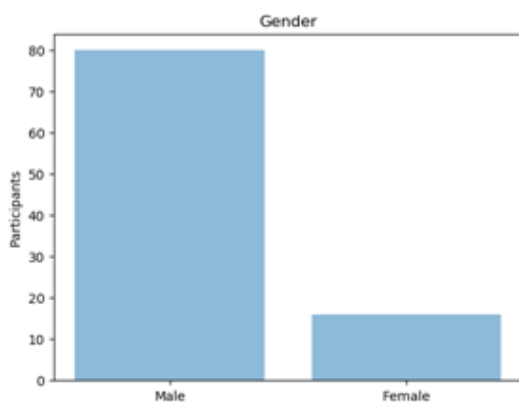


Fig. 1: Participants Gender Distribution

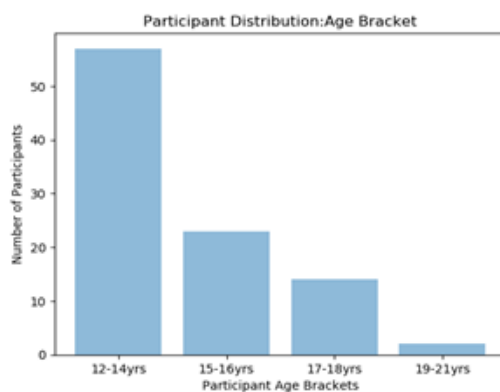


Fig. 2: Participants Age Distribution

The survey had 64% response rate of which 83% were male students and 17% were female students as shown in **Fig. 1**. The age distribution of participants is as shown in **Fig. 2 and Fig. 3**. About 59% of the students forming the majority of participants were between ages 12 – 14years. Approximately 24% of participants were between ages 15 – 16years and 15% of participants were between ages 17-18years. There were just 2% of participants between ages 19-21years.

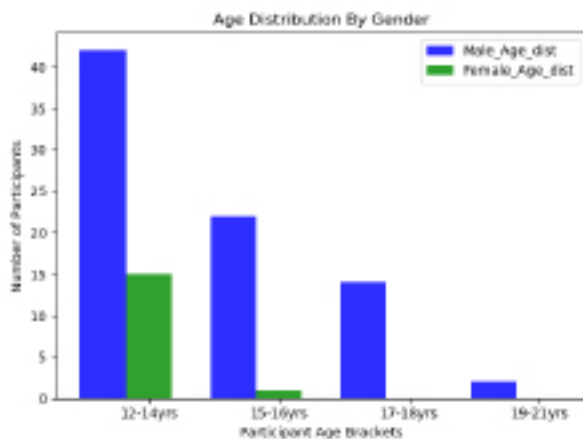


Fig. 3: Age groups by Gender Distribution

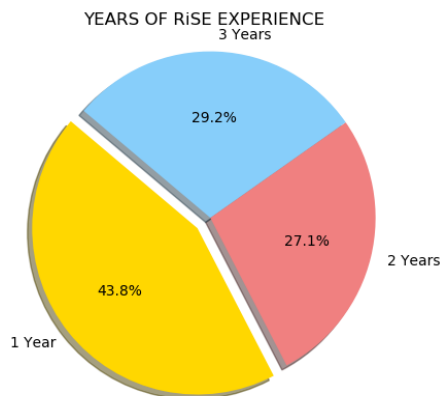


Fig. 4: Years of RiSE Experience

The response of the survey as visualised in **Fig. 4**, shows that 29.2% of the students had been in the RiSE programme for 3years and above, 27.1% had been in the programme for over a year up to two years and 43.8% of students forming the majority had been in the programme for less than a year. All students reported varying levels of benefits of the RiSE programme as detailed in the following visualisation of students' response to specific questions.

#### extent of improved understanding on the role of science and technology in everyday life

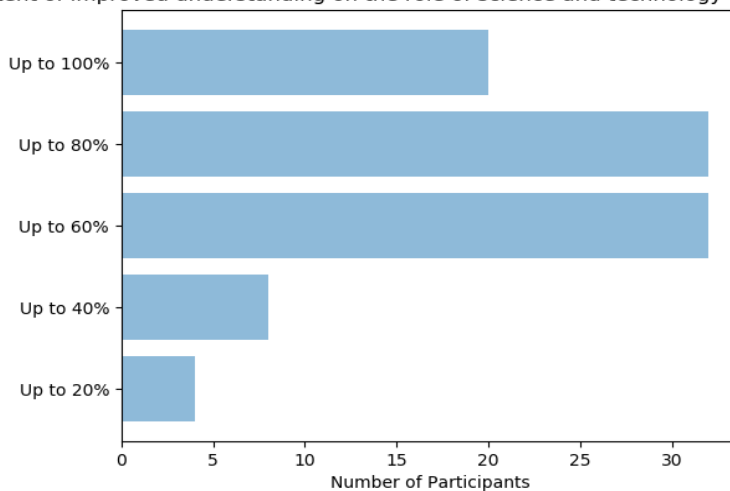


Fig. 5: RiSE impact on STEM practicality

to what extent has robotics made the study of STEM related subjects more fun and easier

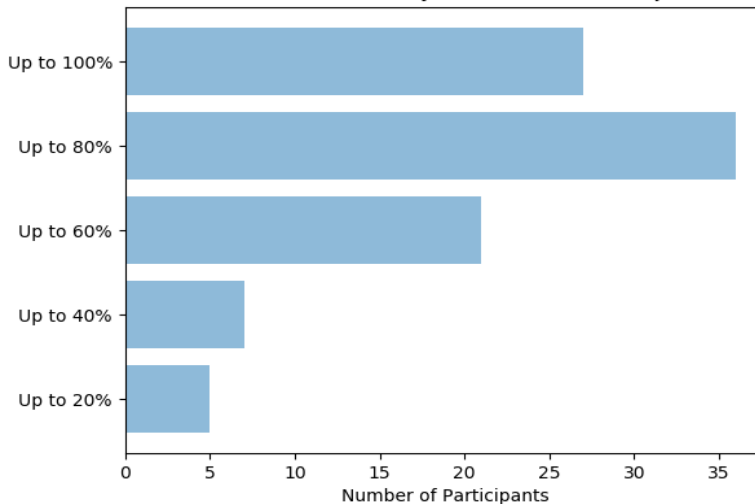


Fig. 6: RiSE impact on STEM studies

Fig. 5 and Fig. 6 show the respondents reported of RiSE impact on their understanding of the role of STEM in everyday life and an the extent to which the programme has made the study of STEM-related subjects easy and fun. About 67% of students reported between 50 – 80% improvement in their understanding of the role of science and technology in everyday life. It showed that 21% of students reported between 80 – 100% improvement in same and 12% reported up to 40% improvement in their understanding of the role of science and technology in everyday life through the RiSE programme.

In responding to the degree to which robotics had made the study of STEM-related subjects fun and easy, 66% of the students reported between 60 – 100% improvement, 29% of students reported between 30 – 60% improvement and the remaining 5% of students reported up to 20% improvement.

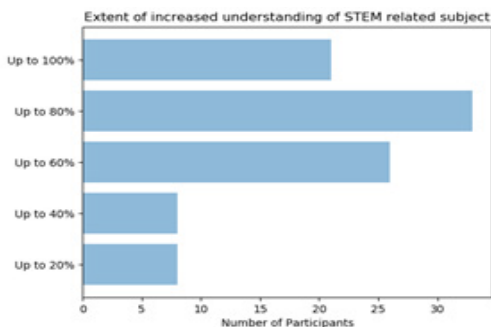


Fig. 7: RiSE impact on STEM understanding

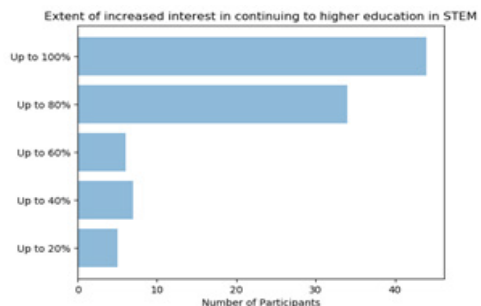


Fig. 8: RiSE impact on STEM interest

In **Fig. 7**, 80% of the students responded to over 40% improvement in their understanding of STEM – related subjects in their regular classrooms. The remaining 20% of students reported up to 40% improvement. With the objective of the RiSE programme being to inspire students for higher education especially in fields related to STEM, the response of the survey ascertained that the programme was achieving its core objective. As seen in **Fig. 8**, Over 81% of students responses showed between 60 – 100% interests in continuing to higher education in science, technology, engineering or mathematics (STEM) with a majority of them having interests between 80-100%. The remaining 19% of students showed varying interests up to 60% chances of continuing to higher education in STEM-related fields.

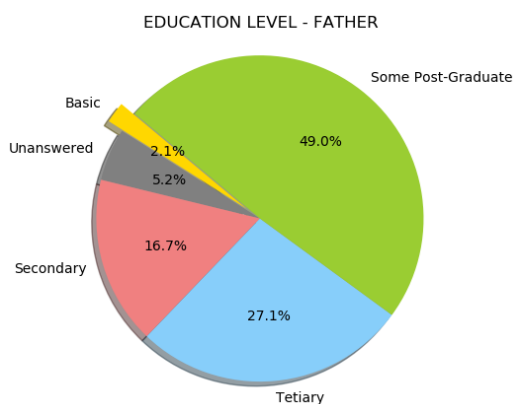


Fig.9: Father's Education Level

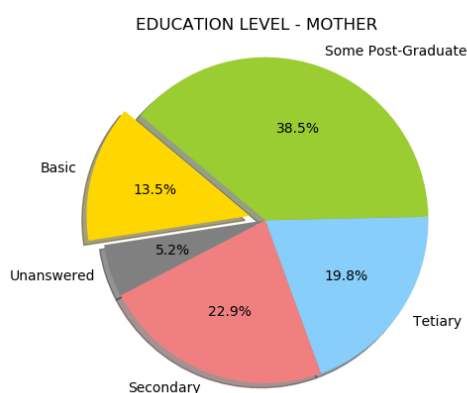


Fig. 10: Mother's Education Level

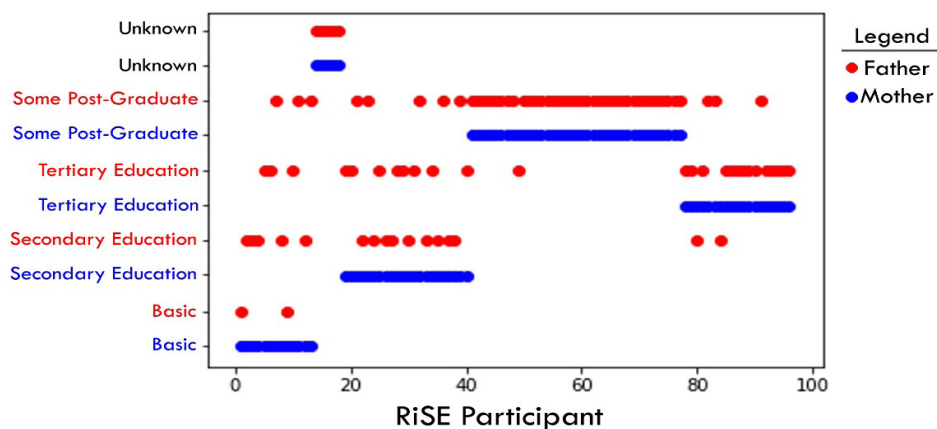
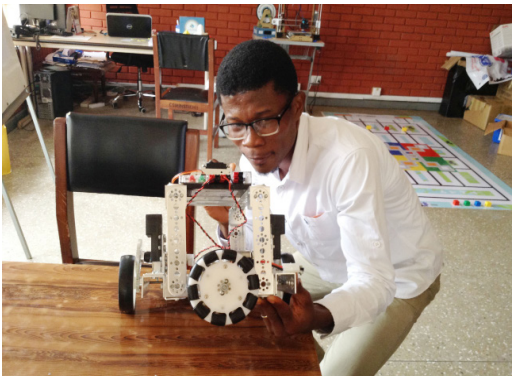


Figure 11: Parent's education level per participant

*Fig.9-11* matches students to parent's education level. In details, 39% of the students in the RiSE programme came from homes where either or both parents had some form of post-graduate level of education. About 22% of students came from homes where either or both parents had some form of second cycle education. It further showed that 20% of students came from homes where either or both parents had some form of tertiary education, while 14% of the students came from homes where either or both parents had some form of basic education and the remaining 5% of students refused to reveal their parents' educational background.

## Conclusion

A tacit approach to training students for critical thinking and practical skills acquisition using robots is experimented on students between 12-21 years. The survey conducted and responses analyzed establish that this training approach has a positive impact on student's understanding and in inspiring students for higher education in STEM-related subjects. The output of this project will serve as a springboard for CSIR-INSTI's robotics training programme currently being piloted on Saturdays and to run as part of the Institutes proposed Makerspace project.



Ing. Michael Wilson with one of the robots used in training students



Students taking part in a robotics class session

## Expected Beneficiaries/Potential Impact

Beneficiaries are:

- Ghana Education Service and Ministry of Education
- Ghana Robotics Academy Foundation
- Proposed CSIR-INSTI Makerspace

## Conference Papers Produced

Two (2) conference papers were produced from this project and were presented at the 11th Annual International Conference on Global Business: Engineering, Energy, Agriculture, Health and IT which took place in Miami, United States. The paper titles are as below:

1. Impact of the Robotics inspired Science Education Programme on Education in Ghana
2. Design and Navigation Technique of an Underground Mine Inspection Robot

## 2.2 Climate Smart Cocoa Implementer App for Cocoa Extension

**Research Team:** Wilson M., Twum-Barimah Y., Ohene-Affih B. & Kessey M.B.

**Start Date:** April 2019

**Completion date:** September 2019

**Actual Cost of Project:** USD4,000.00

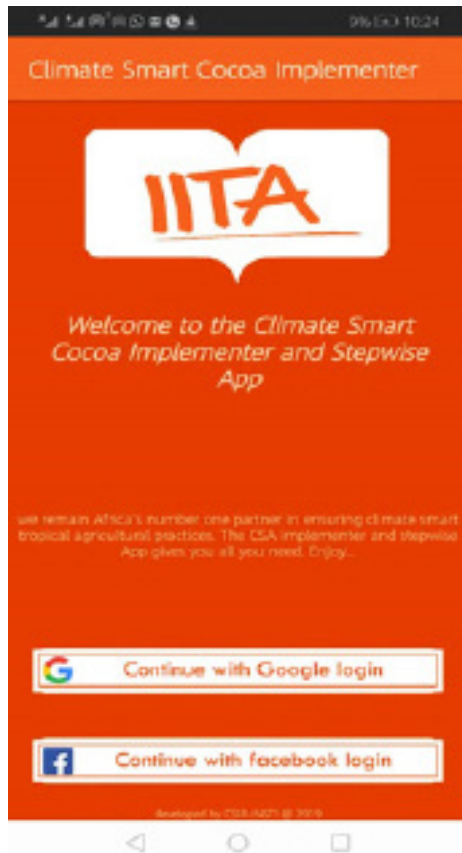
**Sponsors:** International Institute of Tropical Agriculture (IITA)

**Collaborating Institution:** IITA

**Location:** Accra

## Major Findings

The Climate Smart Cocoa Implementer Mobile App was successfully completed and delivered to the IITA as the main deliverable of the project. The mobile application combines a Farmer Segmentation Tool (FST) and Stepwise Investment Package (SIPs) and also maps the farmers' clusters and the CSA Packages for easy use by the end users (Extension workers from both private and public companies). The App is currently being piloted by IITA staff on the field. A complete documentation of the Apps functionality also being used as a user guide was developed as part of project deliverables.



User Interface of Climate Smart Cocoa Implementer App



First Page of Climate Smart Cocoa Implementer App User Guide

#### STEPWISE: ZONE SELECTION



Step by Step usage of the Zone Selection portion of the App

## Expected Beneficiaries/Potential Impact

Beneficiaries are:

- Extension Officers
- Cocoa Farmers

Extension officers now have a tool for access to information for conducting tailor made stepwise investment pathway training in accordance with the CSA package for local farmers.



## 2.3 Urban Vegetable Farmers' Appreciation of Insurance in the Greater Accra Region of Ghana

**Research Team:** Folitse B.Y., Manteaw S.A., Akpotosu B.W. Bekoe S. & Martey F.

**Start Date:** July 2017

**Completion date:** January 2019

**Actual Cost of Project:** GH¢10,000.00

**Sponsors:** Government of Ghana (GOG)

**Collaborating Institution:** Ghana Meteorological Agency, Research and Applied Meteorology Department

**Location:** CSIR-INSTI

### Major Findings

This study examined urban vegetable farmers' appreciation of insurance in the greater Accra region of Ghana. It was revealed that crop insurance demand among urban vegetable farmers in Accra was high. The results demonstrated that majority of the farmers upheld the idea of crop insurance due to diseases and pest menace in vegetable farming and therefore wished to purchase insurance contracts. Even though they generally wanted to avoid crop losses caused by the extreme weather-related disasters, the percentage of the farmers willing to participate in and pay for an insurance scheme was only nearly 60.0%, which indicates a high demand for crop insurance. Most of the respondents who did not wish to participate in such a crop insurance programme stated that given the current increase in general price levels of vegetable products in Accra, the onus was on the state government to provide them with the required financial support and to compensate all the financial losses of the vegetable crops caused by natural diseases and pests instead of collecting money from the them.

Educating urban vegetable farmers in Accra about diseases and pests, which is the major cause of the increased occurrence of such events in Accra, as well as building awareness of the benefits of insurance contracts in protecting farmers' livelihoods if they are hit by natural disasters is indispensable if demand for crop insurance is to increase in the future. In addition, government bodies such as the National Disaster Management Organization (NADMO) of Ghana need to divert the focus of their programmes from post-disaster management strategies towards pre-disaster risk reduction policies. Our findings also point out that governmentally subsidized crop insurance schemes are needed to attract the small farmers to purchase insurance contracts. Government – backed crop insurance schemes may build the trust of the farmers in the insurance products

and could be synergistic to the private sector. In this way, cost-shared and spatially targeted crop insurance schemes in Ghana especially among vegetable crop farmers could prove a useful pre-disaster risk reduction and management tool for mitigating and lowering the future financial losses and risks caused by natural disasters.

### Expected Beneficiaries/Potential Impact

Beneficiaries are:

- Small Scale Pineapple Farmers
- Agricultural Extension Agents
- Information Managers
- Policy Makers
- NGOs
- Government Information Agencies

### Publications from Project

Assessing Farm Record Keeping Behaviour among Small Scale Pineapple Farmers in the Nsawam Adoagyiri Municipality, Ghana.

## 2.4 Design and Implementation of a LiFi Test-bed

**Research Team:** Gordon V., Peh B., Wilson M. & Twum-Barimah Y.

**Start Date:** November 2017

**Completion date:** June 2019

**Actual Cost of Project:** GH¢10,000.00

**Sponsors:** CSIR-CRGS

**Collaborating Institution:** None

**Location:** CSIR-INSTI

## Major Findings

The key finding suggested that uploads via 0 or 180 degrees positioning between transceivers and illuminating devices tended to produce low transmission speeds. Ultimately, future research is required to confirm this observation and also factor cases of possible interference and localised transmission speeds.

## Expected Beneficiaries/Potential Impact

Network Administrators and End Users are typical beneficiaries of this research. The findings suggest that for optimal upload speeds in LiFi transmission, the angles of 0 or 180 degrees are not ideal. Other angles ranging from 30 to 135 degrees are relatively better for optimal upload speeds. The findings however do not provide any prominently striking indication of best angles and distance for download speeds. It is suggested that future research is done on LiFi with consideration of possible interference and localised transmission speeds.

## Publications from Project

Paper titled “An Experimental Assessment of Li-Fi Data Communication” submitted to *Ghana Journal of Science*. Awaiting feedback.

## 2.5 Information Security – Usage of anti-malware, implementation of business continuity and disaster recovery plans, vulnerability assessment and penetration tests

**Research Team:** Danquah P.A., Gordon V., Prikutse F. & Bekoe S.

**Start Date:** December 2018

**Completion date:** September 2019

**Actual Cost of Project:** GH¢21,000.00

**Sponsors:** CITSYS Limited

**Collaborating Institution:** Ghana Government Ministries and Ghana Micro-Finance Companies.

**Location:** Accra

## Major Findings

In the context of anti-malware, third party mobile devices, laptops and computers tend to be the most infected systems within the Ghanaian government ministries and the most challenging threat that has not been properly countered is the advanced persistent threat. In the business continuity context, much as practices were observed to be generally poor, IT disaster recovery readiness is however relatively better with regular backups being a prominent feature.

## Expected Beneficiaries/Potential Impact

Policy makers and Information Security Practitioners.

## Publications from Project

### Conference Proceedings:

Danquah P. (2019), A Baseline of Malware Infections and Anti-Malware Deployment in Ghanaian Government Ministries, Proceedings of the 20th iSTEAMS Multidisciplinary Trans-Atlantic GoingGlobal Conference KEAN University, New Jersey, USA

Danquah, P. (2019), An Empirical Exploration of Web Applications' Vulnerability Assessment: A Case Study Approach, Proceedings of the 15th iSTEAMS Research Nexus Conference Chrisland University, Abeokuta, Nigeria

### Journal Articles

Danquah, P., Bekoe, S. and Prikutse, F. (2019), Information Security Practices and IT Disaster Recovery Readiness: An Assessment of Ghanaian Government Ministries, Information Technologist Journal

Danquah, P., Bekoe, S. and Gordon, V. (2019), Information Security Practices and IT Disaster Recovery Readiness: An Assessment of Ghanaian Micro-Finance Companies (Yet to be published)

## 3.0 ON-GOING RESEARCH PROJECTS

### 3.1 Poultry Incubator

**Research Team:** Twum-Barimah Y., Wilson M. & Gordon V.

**Start Date:** May 2017

**Duration:** 4 years

**Budget:** GH¢45,000

**Sponsors:** Search ongoing

**Collaborating Institution:** None

**Location:** CSIR-INSTI

#### Introduction

Research on the possibility of using direct Sun Power as the main heating element for Bird Egg incubation with Solar Panel as the main power supply. Cost of egg production is highly reduced when free direct Sun is scavenged to produce the heat needed for the hatchery. In addition, the integrated Solar Power paves way for Egg hatchery production to be established even in rural areas where there is no electricity.

#### Objectives

To provide efficient, high hatch rate, solar driven and affordable Incubator for Poultry Farmers leading to an increasing bird production in support of food security and sustainability.

#### Materials and Methods

The previous top lid method has been modified such that a close-contain setting is used. Actually, a Styrofoam type container is used as the container. The power interface is designed to have Solar Power as main Power Input. To arrive at the right parameter settings for excellent hatchery, a data logger results simulation is employed. For early warning and quick response action, a channel is developed for real time communication.

## Results

An incubating box, systems control Unit, sensor network and the tray control motor are all assembled together. The Temperature setting seems fairly good however unpractical system is used to control the internal humidity. Different setup are being tested to arrive at good levels of humidity generation and control. A humidifier Control Set is identified and should help solved any instability in this parameter control. Meanwhile, experiment still continue in try to achieve a more stable value with the current local setting.

## Way Forward

Setting out various design test model for the experiment to be carried out. Much attention is kept on the humidity control. A humidifier control systems is identified and an order would be placed to purchase the system for the project. Alongside, we are still looking for some partners to support with the financial constraint of the research work as the project suffers serious financial support.

### 3.2 Ubiquitous Computing for Location Based Tourist Attraction

**Research Team:** Wilson M., Peh B., Gordon V. & Twum-Barimah Y.

**Start Date:** September 2017

**Duration:** 28 months

**Budget:** GH¢556,000.00

**Sponsors:** Search Ongoing

**Collaborating Institution:** None

**Location:** 10 Selected Regions of Ghana

## Introduction

The World Travel & Tourism Council (WTTC) expected Ghana's tourism industry to expand by 5.6% in 2016 and maintain an annual growth rate of 5.1% per annum from 2017 through to 2027. The tourism sector, however, recorded its worst performance in the first quarter of 2017.

A growth in tourism has a corresponding growth in many aspects of the economy including the hospitality industry and the trade sector.

With a number of internationally-branded hotels in Accra (As at May 2017, there were 2, 723 hotels

and lodges in Ghana.), there is the expectation of an increase in the number of business travelers to the country as the government embarks on a number of initiatives to stimulate economic growth.

Coupled with the government's intention concerning making improvements in transport infrastructure, with the construction of a third terminal at Accra's Kotoka International Airport and allocation of funds for the repair of roads to popular tourist destinations, the missing link there is an efficient platform to advertise these tourist sites to visitors who visit Ghana in any way possible.

Attracting tourists to our tourist sites seems to be a primary challenge to the tourism sector especially in the 3 northern regions. According to the Ghana statistical service report in 2015, domestic tourism was lowest in the three regions of the North. According to the report, 3,588,086 tourists traveled from one region to another within the year under study. Of this figure, only 12.1 percent or 434,000 persons traveled to the three regions of the North altogether. The survey, however, revealed that the Ashanti region attracted the highest number of domestic tourists. The region had as much as 670,972 tourists visiting in 2015.

In this proposed research work, we consider investigating the driving forces of tourism and looking into how ubiquitous and mobile computing coupled with recent technologies like augmented reality, 3-D Printing, and GIS can be adopted for a location-based tourism advertising and an overall improved tourist experience.

## Objectives

To exploit the use of web/mobile computing and Geo-Information data in unleashing a disruptive wave of new tourism experience in Ghana.

## Materials and Methods

In this work we introduce a novel approach to documentation of both documented and undocumented tourist towns, festivals, heroes, etc. from indigenous people and other authentic sources. Gathered information is investigated for authenticity and is digitally associated with a QR code. The generated codes will be replicated and tagged on all artifacts and places connected to the documentation. We envisage the creation of local content on tourism from the people of Ghana. Drones will be used where applicable to capture a virtual tour of popular tourist sites and linked up to a web portal where tourist can have a feel of these places before a planned visit.

3-D printing technology is used to print artifacts related to various tourist sites and these artifacts are tagged QR codes that links to documented information about the artifacts. Location based services is being used to advertise nearby tourist towns and sites through a custom mobile

application. The novel feature of the Ghana Portal mobile App is its “birdeye search” feature which prompts users via a notification service anytime they get into a 50Km radius where a documented tourist site is located. The App also includes a navigation feature to direct interested users to visit these sites or artifacts where they can also use the mobile App to scan tagged QR codes to know more about these sites or artifacts in the absence of a tour guide.

## Results

The project commenced in the last quarter of 2017 with the registration of the project’s domain and hosting of the projects official website. Cost for domain registration and website hosting has been handled by MIPH consult as part of its contribution to the project. Development of the project website has been successfully completed by a team at the CSIR-INSTI and is currently being managed by same team with the help three National Service persons of the Institute. The website is available at [www.ghanaportals.com](http://www.ghanaportals.com).

The Mobile version of the Ghana Portal platform commenced in February 2018 by an in-house team at the CSIR-INSTI lead by Ing. Michael Wilson and Ing. Yaw Twum Barimah with assistance from two national service persons and the Communications Division. The App is currently at its testing stage and being prepared for piloting. The project was demonstrated during the CSIR-INSTI Open Day celebration as part of the 60<sup>th</sup> Anniversary of the CSIR. The project is technically completed but waiting for commercialisation. A journal paper is also being put together for publication.

The Web Portal has been updated with relevant information.



Homepage of Ghana Portal Platform



Information on one of the Gold Coast historical sites as captured by the App



## Way Forward

The project is still seriously challenged with financial support and is looking out to engage a third party whose role will solely be to commercialise the project output. QR Codes for documented sites so far will have to be printed and a proposed launch date for a commercialised version of the portal scheduled with commercial partner.

Discussions have commenced with a consultant to the Ghana Tourism Authorities. A general invitation through the Ghana News Agency has also been sent to corporate Ghana to come for discussions towards commercializing the research output.

### 3.3 Production and Development of Fuel Cell/ Biogas

**Research Team:** Zainudeen M.N. & Kwarteng M.

**Start Date:** July 2019

**Duration:** 6 months

**Budget:** GH¢6,000.00

**Sponsors:** Self

**Collaborating Institution:** GAEC, CSIR-IIR

**Location:** CSIR-INSTI

## Introduction and Justification

The development of new methods of production and use of renewable energy sources that suit the economic and the geographical conditions of the developing countries will be required in order to solve the problems of energy crisis and climate change. Fossil resources were given much attention in the past before climate change became a major concern. The time has come where attention should now be shifted from fossil fuels to renewable energy sources. The anaerobic bio digester process is not a new technique of converting waste material into usable product. However, there is a need for further investigation to improve the process especially in this era of climate change. Conventionally, the anaerobic digestion (AD) process should occur in a strict anaerobic environment without available oxygen. Such aerobic (oxygen presence) invasions can or may deteriorate the performance of the digestive system. Under these conditions, i.e. oxygen deficient environment, biogas is produced. Biogas is a combustible gas consisting mainly of methane and carbon dioxide. Carbon dioxide being one of the principal greenhouse gases, its concentration in the atmosphere is increasing expeditiously since the advent of industrialization.

## Objectives

The main objective is to study the pH and temperature of the anaerobic digestion process.

The specific objectives are:

- To evaluate the influence of pressure on biogas production.
- To examine the effect of pH and temperature on biogas production.

## Materials and Methods

A soldering iron was used to create two holes on the digester; one at the top and the other at the side for fixing of the PVC pipes of equal heights to the digester. Cow dung was obtained from an animal pen unit and properly weighed on a balance. It was then mixed with tap water of equal volume. The feedstock was fed into the digester through the inlet pipe with a funnel fitted to the top. It was ensured that the feedstock volume was half the volume of the digester. Temperature and pH were checked daily using a pH meter and a thermometer to ensure consistency of values obtained. The gas produced was collected inside an inner tube of a motorbike tyre.

To ensure the process occurred anaerobically, the digester was painted black to prevent the penetration of sunlight. An outlet pipe was connected to the digester to serve as a pathway for biogas into the gas collector.



Experimental set up of the Biogas Project

## Expected Beneficiaries

People in the remote and rural communities of the West-African sub-region.

## Results

Experiment on the biogas digester was started and the parameters of concern were temperature and pH. The values for pH and temperature obtained each day for 21 days were recorded and graphs were plotted for temperature and pH against retention time.

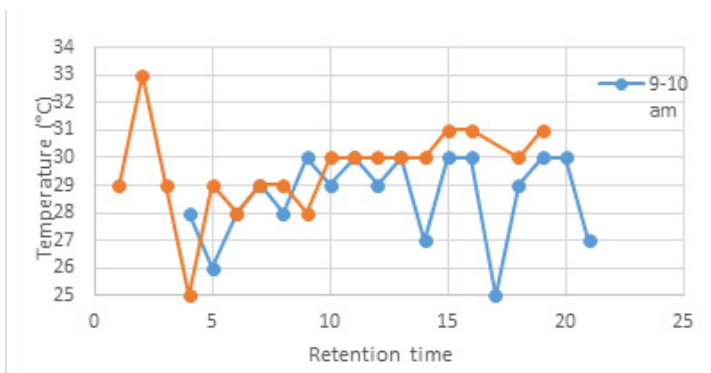


Fig 1: A plot graph of Temperature against Retention time at certain time intervals



Fig 2: A plot graph of pH against Retention Time at certain time intervals

## Discussion

Figure 2 shows the variation of pH over the period of digestion. The pH ranged from 5.8 to 6.2. There is no significant change in pH during the first week of digestion. The initial decrease in pH started to drop fast and reached minimum values after 14 days. Temperature was recorded twice daily throughout the digestion period. Figure 1 shows the temperature variation profile over a retention time of 21 days. Temperature ranged from 25°C to 33°C throughout the retention time.

Temperature and pH values were recorded in the morning and afternoon only. As the temperature increased the population of the enzymes also increased as expected. This suggests that temperature and pH have an influence on the growth rate of the microorganisms.

## Way Forward

A new set of digester with three different feedstock shall be set up during the next quarter.

### 3.4 Climate Change Resilience in Urban Mobility

**Research Team:** Kofie R.Y. & Allotey A.N.M.

**Start Date:** June 2018

**Duration:** 5 years

**Budget:** USD289,182.83

**Sponsors:** Ministry of Foreign Affairs of Denmark

**Collaborating Institutions:** University of Ghana, Legon & University of Copenhagen, Denmark.

**Location:** Accra

## Introduction

The project aims at identifying research-based strategies for increasing climate change resilience within urban mobility, accessibility and transport in Accra, Ghana. It is to establish a comprehensive understanding of the physical and factors that determine resilience to climate change impact on mobility and accessibility in Accra metropolitan area (AMA). This is being accomplished by enhancing research capacity in the field, introducing new methods for mobility analysis, new methods for predicting urban floods, and by devising policy and planning measures to advance the sustainable urban development agenda. The research and capacity building is expected to lead to reduction in inequality in access to mobility and, thereby, reduced

vulnerability of local communities challenged by unsustainable spatial development practices and increase frequency of extreme weather events.

## Objectives

- Identify strategies for increasing climate change resilience within urban mobility, accessibility and transport in Accra, and
- Investigate how these strategies may be integrated in the urban planning and decision-making process.

The project aims to:

- Enhance research capacity in the field, introduce new methods for mobility analysis, new methods for predicting urban floods, and
- Devise policy and planning measures to advance the sustainable urban development agenda.

## Materials and Methods

The project is applying a combination of quantitative and qualitative methods to address the objectives of the different work packages. The quantitative methods include questionnaire surveys, computerized analysis of local and city-wide elevation models, satellite images as well as GIS-based analysis of the urban transport networks in terms of risk of flooding, connectivity and level of redundancy. A small UAV “drone” is being applied to collect local elevation data for evaluation purposes. A city-wide elevation model based on satellite images would be obtained for the project. The qualitative methods include focus groups, key informant interviews, field observations, in-depth qualitative interviews and participatory community workshops.

## Results

- Inception workshop successfully organized on 27th June 2018 at Alisa Swiss Hotel, North Ridge, Accra.
- Reconnaissance survey undertaken with all collaborating researchers.
- Statistical and metrological data as well as satellite imagery have been acquired
- Carried out community entry exercise by visiting all the selected study sites and interview key informants (Adenta, Pokuase, Santa Maria / Auntie Aku and Gleffe/ Mpoase).

- Flew Drone with LiDAR mounted, at three (3) places namely, University of Ghana, Legon, Santa Maria/ Auntie Aku in the Ga Central Municipal Assembly and Adenta in the Adenta Municipal Assembly.
- Community profiling has been completed by filling gaps identified in previous field survey for socio-economic survey to take off.

Households, Municipal and District Assemblies, opinion leaders, researchers and policy makers tend to be beneficiaries of the project.



Researchers on the field taking data



Inception Workshop with Relevant Stakeholders



Flooding at Abossey Okai Spare Parts on 18<sup>th</sup> October 2019



Flooding at Korle Gonno on 18<sup>th</sup> October 2019

## Way Forward

Socio-economic survey will be carried out from June to July 2020. Besides, images from drone will be processed, while the remaining work packages being worked on.

### 3.5 Exploring the Constraints of Accessing Agricultural Credit by Small Scale Oil Palm Farmers: The Case of Kwaebibirem District, Eastern Region, Ghana

**Research Team:** Folitse B.Y., Manteaw S.A., Koranteng I.M. & Ampofo-Addo A.S

**StartDate:** July 2018

**Duration:** 18 months

**Budget:** GH¢8,000.00

**Sponsors:** GOG

**Collaborating Institution:** District Department of Agriculture

**Location:** CSIR-INSTI

#### Introduction

Agricultural growth in Ghana is increasingly recognized to be central to sustainable economic development. The sector plays a very significant role in addressing food insecurity, poverty alleviation and human development challenges. According to MoFA (2007), the agricultural sector in Ghana is plagued with challenges such as credit access which is one of the most prevalent tools for spinning agricultural development. Again Anang, Sipiläinen, Bäckman and Kola (2015) posits that, access to agricultural credit remains a critical challenge to smallholder farmers and small scale oil palm processors in many developing countries including Ghana. This is because smallholder agricultural enterprises often require small loans which are difficult to administer while majority of them also lack the needed collateral to be able to borrow from formal sources (Anang et al, 2015). Where collateral requirements are met, the sheer size of potential borrowers always seems to exclude others from borrowing. Consequently, smallholder agricultural enterprises have been marginal participants in the credit market in many developing countries.

Credit provision is one of the principal components of rural development, which helps to attain rapid and sustainable growth of agriculture. Rural credit is a temporary substitute for personal savings, which catalysis the process of agricultural production and productivity. To boost palm oil production and productivity, processors need to have credit to enable them purchase palm nuts. Schmidt and Kropp (1987), stated that access to financial services by smallholders is normally seen as one of the constraints limiting their benefits from credit facilities. However, in most cases the access problem, especially among formal financial institutions, is one created by the institutions mainly through their lending policies. Most studies conducted in the area of access to agricultural credit have not adequately attempted to investigate factors hindering the access to agricultural credit by small scale oil palm processor groups and yet credit is critical

input in agricultural value chain. On account of this background, this study was undertaken, to fill the information gap on the constraints of accessing agricultural credit by small scale oil palm processors in the Kwaebibirem District in the Eastern region, Ghana. This study aimed to answer the question; what are the constraints of accessing agricultural credit by small scale oil palm processors in the Eastern Region of Ghana.

## Objectives

The objectives of the project are to:

- Identify the socio-economic characteristics of small scale oil palm farmers.
- Examine the factors affecting access to credit by small scale oil palm farmers.
- Determine the factors that influence access to credit by small scale oil palm farmers.
- Define how farmers choose their source of credit small scale oil palm farmers.
- Ascertain constraints faced by small scale oil palm farmers in credit acquisition.

## Materials and Methods

### Sampling procedure

The population of the study was made up of all small scale oil palm farmers in the Case of Kwaebibirem District in Eastern Region of Ghana. To determine the sample size, a two-stage sampling procedure (purposive and random) was used to ensure each household had equal chance of being selected in the sample. A total of 660 households that had accessed credit in the last one year were randomly selected. This gave a total sample size of 220 households.

### Data collection and analyses

Data for this study were derived mainly from primary source collected with the use of structured questionnaire. Snowball sampling technique, that is using the contacted respondents to identify subsequent respondents, this was used to contact 220 respondents for this analysis. The data was collected from across the Kwaebibirem District in the Eastern Region. The data were captured into the SPSS spreadsheet and analysed through the binary logistic regression modelling technique. The main aim of the analysis was to determine the factors influencing access to credit in the study area.



## Results

The reviewing process has been completed and the technical report is in its final stage.

## Way Forward

The technical report will be submitted to CSIR-INSTI.

### 3.6 Information Needs and Obstacles of Small Scale Farmers In Developing Countries: A Case Study Of Small Scale Farmers In The Volta Region, Ghana

**Research Team:** Folitse B.Y., Asante I.K., Akpotosu B.W. & Manteaw S.A.

**Start Date:** June 2018

**Duration:** 18 months

**Budget:** GH¢8,000.00

**Sponsors:** GOG

**Collaborating Institution:** Department of Agriculture, Nsawam Adoagyiri Municipal Assembly, Nsawam

**Location:** CSIR-INSTI

## Introduction

Information is considered a vital resource, alongside land, labor, capital and skills. People need information for their day-to-day activities and for the development of their environment and their selves (Mtega 2012). Information is an important factor in the sustained development of any society since getting the required information on time helps to reduce uncertainty and improves the quality of decision made in solving agricultural problems. In this information society, information and knowledge play a key role in ensuring sustainable development (Koutsouris, 2010). Farmers' information seeking behaviour is hindered by its poor relevance, usefulness and lack of technical advice for follow-up (Babu, Glendenning, Asenso, 2011). Access to and usage of information is necessary for improving rural people's livelihood (Etebu, 2009). Despite its key role in socio-economic development, very few rural small scale farmers in developing countries have access to adequate information. Haki, and Elimu (2005) describe lack of information as one of the major problems facing people in Kilosa district of Morogoro region in Tanzania. In most

cases, information provision in rural areas takes place through socio-economic development projects; however, developers do not view information provision as their first priority (Meyer and Boon 2003).

The development of a society largely depends on access to information. The flow of information from and to rural small scale farmers is an essential precondition for eradication of widespread poverty in rural areas (Parvin, Azim, and Sultana, 2007). Therefore, lack of agricultural information is a key factor that has greatly limited agricultural advancement in developing countries. In Ghana, farmers rarely feel the impact of agricultural innovations, either because they have no access to vital information or because it is poorly disseminated. Moreover, no one can categorically claim to know all the information needs of farmers, especially in an information-dependent sector like agriculture in which there are new and rather complex problems facing farmers every day. If agricultural development programs are to work, African governments must undertake new approaches to information dissemination and management that stem from a clear understanding of farmers' information needs (Ozowa, 1995).

Similarly, Folitse, Sam, Dzandu, and Osei (2018) stated that farming is one occupation that depends on the constant flow of information. However, most farmers find it difficult to identify when they have the need for information. Again, most rural small scale farmers in Ghana may resort some few information centres for meeting their information needs. Furthermore, even if these centres are available, they are not well resourced with best materials and personnel who can professionally handle the information needs of these farmers. This disturbing development has force most rural small scale farmers to depend more on unscientific and less reliable sources like their friends and traditions handed over to them from generations for their information needs.

## Objectives

- Find out the information needs of small scale farmers
- Examine the awareness of information sources of small scale farmers
- Determine the information sources consulted by small scale farmers
- Establish the challenges faced by small scale farmers in accessing and using information sources

## Materials and Methods

### Sampling procedure

The population for the study were small scale farmers in the Volta Region of Ghana. There are twenty-five (25) districts and municipalities in the Volta Region. A multistage sampling technique was used to select the respondents for the study. The sampling technique was chosen because it allows larger clusters to be subdivided into smaller, more targeted groupings for the purposes of surveying (Agresti & Finlay, 2008). At the first stage, a simple random technique was used to select 50% of the twenty-five municipalities and districts in the region. At the second stage, a list of communities was obtained from Ministry of Food and agriculture (MOFA) offices. One third (1/3) of the number of communities was randomly selected in each district or municipality. At the third stage, the list of registered small scale farmers was collected from MOFA offices in each of the districts and municipalities and five (5) small scale farmers were purposively selected from each community and interviewed. In all 128 out 382 communities were selected for the study. This was done based on time and resources available. The sample size of farmers for the study was three 640.

### Data collection and analysis

Qualitative data were collected through structured interview schedules. Six hundred and forty (640) structured interview schedules were administered by the researchers with two research assistants from each community. The research assistants were trained on interviewing skills as well as meaning and interpretation of each item on the interview schedule of farmers to collect data for the study. This study employed descriptive statistical analysis methods; mainly frequency, ranking and percentages were employed. Quantitative data was analysed using a software package called Statistical Package for Social Sciences (SPSS) version 20.0. The interview schedules elicited responses pertaining to small scale farmers' demographic characteristics, information needs as well as their sources, access to and utilization of information. Relationships between farmers' demographic characteristics and their information related variables (needs, sources, access, awareness, and constraints) were tested using percentages and chi-square statistics.

## Results

The technical report has been completed and would be submitted for editing.

## Way Forward

An article is being produced and suitable Journal will be selected for publication.

### 3.7 Evaluation of the impact of reintroducing the CSIR newsletter to the Council and clients

**Research Team:** Sawyerr A., Zainudeen M.N., Decardi-Nelson A. & Adotevi E.J.

**Start Date:** September 2018

**Duration:** 8 months

**Budget:** GH¢5,000.00

**Sponsors:** CSIR-INSTI

**Collaborating Institution:** None

**Location:** CSIR Institutes and Donor Organizations in the Greater Accra Region

#### Introduction and Justification

Newsletters are an extremely valuable marketing tool used by organizations. One of the most important tasks of an organization is to maintain contact with its customers or clients (Hobbs, 2004). In addition, because of time constraints and production schedules, newsletters may not be the best medium for announcing upcoming events such as tours and demonstrations. An alternative is to announce those events via a simple flyer or postcard, which can be designed, printed, and distributed within a few days (Broussard & Floress, 2007). Developing a newsletter programme with a solid audience would prove to be a very valuable marketing asset to CSIR. This study would help determine why the CSIR newsletter became defunct and also if it was a useful resource for the organisations and target audience.

#### Objectives

To determine what accounted for the demise of CSIR newsletter and to conduct a needs assessment of the newsletter's purpose to the information and education needs of CSIR's target audience.

Specific objectives include:

- To determine if the newsletter is a useful resource for your target audience (CSIR staff and clients)
- To determine whether the defunct newsletter increased reader knowledge of key issues and organization practices

- To quantify the acceptance rate of the newsletter among staff and client if it is reintroduced.
- To determine what readers did learn as a result of the newsletter.
- To explore way of sustainably publishing the newsletter.

## Materials and Methods

A questionnaire-based survey will be used to collect data. The population for the study comprised staff within CSIR and 5 selected donor agencies. The MS Excel and SPSS software would be used to analyse the results.

## Results

Data analysis is ongoing.

## Way Forward

Respondents from CSIR are being narrowed down to Research Scientists, since they would be the major beneficiaries of the production of the newsletters. Therefore, the list of the Research Scientists from all 13 CSIR institutions are being compiled, so that the appropriate sample size determined and questionnaires distributed to them.

## 3.8 CSIR-MAG Project on Documentation of CSIR Agricultural Technologies

**Research Team:** Manteaw S.A., Folitse B.Y. & Mahama S.

**Start Date:** May 2019

**Duration:** 1 year

**Budget:** GH¢40,000.00

**Sponsors:** MAG

**Collaborating Institution:** Coordination Unit of MAG, CSIR Head Office, CSIR Agriculture-based Institutes (ARI, CRI, FRI, FORIG, SCRI, PGRRI, SARI, WRI)

**Location:** CSIR-INSTI

## Introduction

The Modernizing Agriculture in Ghana (MAG) programme is a technology-dissemination led intervention supported by the Government of Canada. Per the intermediate outcomes, MAG is designed, among other things, to lead to “Increased adoption of relevant production-enhancing technologies by men and women farmers in Ghana.”

## Objectives

The Coordination Unit of the MAG at the CSIR Head Office in an attempt to address the problem of lack of awareness about existing CSIR agricultural technologies, in May 2019 commissioned the CSIR-Institute for Scientific and Technological Information (CSIR-INSTI) to document agricultural and agricultural related technologies developed by institutes of the CSIR for the last 12 years from 2007 to 2019.

The Project was designed to:

- Promote enhanced awareness about current technologies developed by the CSIR
- Make for easy reference by stakeholders attending District and Regional Planning Sessions of the RELCs
- Publicise the work of scientists and inspire confidence for support
- Close the seeming gap that exists between current CSIR agricultural technologies and farmers’ awareness about these technologies.

## Materials and Methods

The third quarter of the year was devoted to two major activities, namely

1. Nation-wide sensitization visit to all the eight CSIR MAG implementing institutes to create awareness about the project and validate the instrument for the data-collection
2. Data-collection

The fourth quarter of the year was dedicated for entry of inputs (provided by the Institutes) into a framework designed for the project, fine-tuning the inputs, editing the final draft to prepare camera-ready copy for stakeholder validation, followed by final printing and distribution.



Dr. Seth Awuku Manteaw, Director of CSIR-INSTI, presenting to Scientists during the sensitization meeting

## Results

Outputs/Deliverables

Fine-tuning of Inputs

Inputs (Technologies) were received from eight CSIR MAG Implementing Institutes of the CSIR, namely;

1. CSIR-Animal Research Institute, Accra
2. CSIR-Crops Research Institute, Fumesua, Kumasi
3. CSIR-Forestry Research Institute of Ghana, Fumesua, Kumasi
4. CSIR-Food Research Institute, Accra
5. CSIR-Oil Palm Research Institute, Kusi-Kade
6. CSIR-Plant Genetics Resources Research Institute, Bunsu
7. CSIR-Savanna Agricultural Research Institute, Nyankpala Tamale
8. CSIR-Soil Research Institute, Kwadaso, Kumasi
9. CSIR-Water Research Institute, Accra.

The technologies were validated and fine-tuned by the CSIR-INSTI, the MAG implementing Institute and subsequent entry of inputs into the framework designed for the project.

## Data Entry

In all two hundred and five technologies were entered. The data had been printed out and sent for preliminary editing. The breakdown is as follows:

Technology	Number	Technology	Number
Cereals	40	Mushroom	2
Fibres	3	Non-Ruminants	10
Fish	10	Roots/Tubers	20
Forestry	18	Ruminants	9
Fruits	8	Soils	10
Legumes	34	Tree Crops	33
Medicinal Plants	2	Vegetables	6

## Way Forward

The edited manuscript is to be subjected to a validation process, bringing on board all the key stakeholders including the source of the data (agricultural research scientists); extensionists; farmers and copy editors. This will give way for the final printing and distribution, preferably in February 2020 to bring the project to an end.

The progress so far made in implementing the project has been positive and successful. The Institute has succeeded in keeping to the timelines. It is expected that by the end of February, subject to a successful validation, the document (printed hard copy) will be ready for distribution to bring the curtains down on the project.



### 3.9 Adoption, Awareness and Impacts on Livelihoods of CSIR Agricultural Technologies on Women in Agriculture in Ghana

**Research Team:** Bekoe S., Aboagye L.M., Osei-Kofi P.S. & Sackey T.A.

**Start Date:** Yet to start

**Duration:** 2 years

**Budget:** GH¢15,000.00

**Sponsors:** CSIR-INSTI

**Collaborating Institution:** CSIR-PGRI

**Location:** CSIR-INSTI

#### Introduction

Agriculture is an area of immense importance in Africa given that food supply and security is an area of concern. Again, the UN 2030 Agenda for Sustainable Development Goals (SDGs) # 2 stresses the need to end hunger, achieve food security, improved nutrition and promote sustainable agriculture worldwide. Acceleration of production and employability of individuals can only be achieved through the utilisation of technology (Kapur, 2018). This is confirmed by the fact that addition to varietal improvement by research institutes in Bangladesh contributed to productivity increase, intensification and diversity in farming systems (Kashem and Faroque, 2010). Several factors affect the choice of farmers to adoption of one form of agricultural technology or the other. Access to credit, higher education levels, access to extension advisory services and members of agricultural associations are factors more likely to promote adoption of new technologies according to Uaiene (2016). Anang (2018) also conducted a study which showed that the household head gender, level of production specialisation, household size and farm location are factors which have effect on the decision to jointly adopt high-yielding crop varieties and farm mechanisation. Economic factors such as farm size, expected benefits from technology adoption and off-farm activities, social factors such as age, educational level and gender as well as institutional factors including access to information and extension services were identified as factors which have an impact on the adoption of modern agricultural production technologies by farmers in the Upper East Region of Ghana (Akudugu 2012).

## Objectives

- Examine awareness of CSIR Agricultural Technologies by women in agriculture in Ghana
- To find out the utilisation/adoption of CSIR Agricultural Technologies by women in agriculture in Ghana
- Determine the impacts of CSIR Agricultural Technologies on women in agriculture in Ghana
- Examine the challenges faced in using CSIR Agricultural Technologies
- Suggest strategies in scaling up CSIR Agricultural Technologies in Ghana

## Materials and Methods

Using a Survey methodology, the study seeks to gather data through focus group discussions, semi – structured interview questionnaire, personal observation and participatory video approach from 1000 farmers in Ghana across communities close to CSIR Agricultural research institutes. The sample size will be derived using stratified and purposive sampling techniques. Purposive sampling will be used to select the farmers and regions to be included in the study. John and Christensen (2004) argue that purposive sampling relies on the decision of the researcher, based on some well-known criteria. The 1000 will be selected purposively. The quantitative data to collect from semi-structured questionnaire will be coded and summarised prior to analysis by using the Statistical Package for Social Sciences (SPSS). The investigators will utilize descriptive statistics, such as frequencies, percentages in data analysis. Qualitative data for this study will be analysed using the NUD.IST Vivo (Nvivo) software package. This software will be considered useful for this project because most of the data will be qualitative. For the purpose of this project, processes such as arranging the data, reflecting on the data, learning from the data and making sense of the data will be carried out simultaneously with the data collection process

## Results

Implementation of the project is yet to start.

## Way Forward

There are ongoing efforts to solicit support from funding organisations.

### 3.10 Design of a Paperless Memo System for Corporate Communication in CSIR, Ghana

**Research Team:** Adjah J., Wilson M., Sawyerr A. & Kalognia J.

**Start Date:** August 2019

**Duration:** 18 months

**Budget:** GH¢10,000.00

**Sponsors:** Self-sponsorship

**Collaborating Institution:** None

**Location:** CSIR-INSTI

#### Introduction

In this technological age, great strides are continuously made at cutting down timelines in the corporate world. In the area of communication today, many media are incorporated to allow the sending and decoding of messages at a fast rate.

Memos or Memorandum are the main form of communication within an organization. Even though paper systems are still relevant, it has its demerits of paper wastage and long channels of information sharing from sender to receiver. In order to create a working ecosystem in which management reduce the use of papers and time spent printing and sending memos to every department, this project seeks to design and test an electronic memo for CSIR-INSTI.

#### Objectives

- To develop, test and deploy a paperless memo system for CSIR-INSTI.
- To commercialize a successfully tested and deployed electronic memo system for other institutes in CSIR and others.

#### Materials and Methods

A develop-test-train-pilot-deploy approach will be used for this implementation. The following steps will be adopted for the implementation.

- A detailed requirements analysis will be carried out to define and refine terms of reference

- The system will then be developed and implemented on a test environment
- The development team will carry out User Acceptance Testing (UAT) on the test environment
- Following a successful UAT, a preproduction version will be deployed and tested in a pilot usage for production readiness. Any pending issue will be fixed by the development team based on feedback from the pilot group
- User training will then be carried out to prepare respective staff and extension officers for operating the solution
- The production environment is then prepared for GO-LIVE
- Go –Live
- Delivery of documentation (User Guides)
- The test environment will be preserved for troubleshooting and reproduction of errors during support periods

## Results

Researchers are developing Interface for the desktop version.

## Way Forward

The project team is currently planning to complete the interface design for the next stage of developing the full application.

### 3.11 An Empirical Study of the Relationship between General Colour Preference and Professional Background Among Staff of CSIR-Ghana

**Research Team:** Adjah J., Bekoe S., Decardi-Nelson A. & Kalognia J.

**Start Date:** July 2019

**Duration:** 18 months

**Budget:** GH¢10,000.00

**Sponsors:** Self-sponsorship

**Collaborating Institution:** None

**Location:** CSIR-INSTI

## Introduction

This study proposes to analyse and document a pattern of colour preferences from a cross-section of staff of the Council for Scientific and Industrial research (CSIR, Ghana). Several studies have been conducted over the years on theories and application of colours (Chou & Chen, 1935; Beebe, 1949; Granger, 1952; Saito, 1996). Studies have also been done to ascertain the correlation between personal backgrounds and colour preferences (Liu et al 2001; Ou et al, 2003; Hurlbert & Ling, 2007; Fortmann-Roe, 2011; Schloss et al, 2012, 2016; Baniani & Yamamoto, 2014; Annamary et al, 2016). Many reasons account for this situation, all linked to internal (psychological) and external (social) influences. Studies have shown that colour preference differs among people, and at different stages of life (references). The changing world of technology has diversified the use and application of colour in the printing and publishing industries. In view of the forgoing, it is very important to conduct this research to explore why clients (CSIR staff) prefer certain colours over others because in the world of printing, colours are the driving force. In CSIR, colours are employed in the design of diverse print artefacts such as scholarly journals, magazines, business cards, annual reports among others.

## Objectives

- To explore colour preferences / choices from professionals (staff) in CSIR institutes.
- To find out if there are correlations between colour preferences and variables such as education, age and gender.
- To make appropriate recommendations to staff / clients of CSIR on issues regarding colour choices.

## Materials and Methods

This research employs both quantitative and qualitative methods for data collection.

### Qualitative

Qualitatively, questionnaires will be administered to CSIR staff, which entails asking them to select their favourite colours from a printed sheet.

### Quantitative

Results collated from this assessment will be summarized in charts and graphs to draw inferences from the data set.

## Results

Out of 100 questionnaires administered for this study, results from 45 respondents in CSIR-IIR, WRI and INSTI have been gathered for further analysis.

## Way Forward

The researchers will continue to gather data from respondents in other CSIR Accra-based Institutes.

### 3.12 Cell Phone Signal Booster

**Research Team:** Danquah P.A, Prikutse F., Gordon V., Wilson M. & Twum-Barimah Y.

**Start Date:** December 2019

**Duration:** 18 months

**Budget:** GH¢20,000.00

**Sponsors:** Ongoing

**Collaborating Institution:** None

**Location:** CSIR-INSTI

## Introduction

Cellular signal is broadcast from towers that are installed by the Mobile Network Operator (MNO) s. The closer you are to a tower, the stronger the cell signal is going to be. As you move further away from the tower, the signal becomes weaker, which we call attenuation, until at some point it becomes too weak to hold a call or transfer data. Being too far away from a cell tower is the most common reason for weak cell signals, and the one you will often experience if you live or travel in very rural areas, at the basement of buildings and in the corners of some rooms.

The presence of obstacles also causes poor or erratic cell signal. Obstacles such as a mountain, hill or building between the cell tower and the cellular device will result in a weak signal. One may also experience this cell signal problems if the cellular device is at the bottom of a valley or underground. Signal is not usually able to penetrate through large obstacles. The cell signal may bounce off of other hills or buildings and reach the cellular device through reflection, in which case the received signal will be weaker and may fluctuate up and down, or may go off completely.

One could also experience weak or poor signals as a result of the construction materials that

make up the building or vehicle in which the cellular device is. Brick, block, concrete, sheet metal and wire mesh are some of the construction materials that are known to block cell phone signals. In certain areas, the cell signal outside the building may be usable, but drops significantly once the cellular device gets into the room.

This project therefore seeks to design and construct a cellular booster or amplifier that will enhance mobile phone signal reception in areas where the cellular signal from the MNOs is very weak. The cell phone signal booster will improve weak signals from any of the MNOs in Ghana, and will be useful in rooms, basements, compounds and any other location where MNOs signals are weak.

## Objectives

- To design a cell phone signal booster for subscribers of MNOs in Ghana
- To build a cell phone signal booster for subscribers of MNOs in Ghana

## Materials and Methods

This project is broken down into the following: The design stage, the drawing and simulation stage, the construction stage and the testing stage.

The design stage will help in determining the values of each component to be used in the circuit. Softwares such as TinyCAD, OrCAD, EAGLE among others will be used in designing Printed Circuit Boards (PCB). For the purpose of this project, Dip Trace software will be used to design the PCB. It has four modules which include schematic capture, component, pattern editor, 3D modeling and PCB Layout editor. It also supports Windows, Mac, and Linux.

The cell phone signal booster circuit will be drawn using Advanced Design System (ADS) Radio Frequency (RF) software. Simulation will be done with this same software.

After obtaining desired results, the circuit will be constructed on a printed circuit board with the components that were determined during the design stage. An input antenna will be built from scratch, and used alongside an existing output antenna.

The cellular signal in decibels (dB) prior to boosting will be measured and compared to the cellular signal after boosting. This will form part of the testing stage and will be done repeatedly in order to arrive at conclusive results.

## 4.0 PROGRAMMES AND ACTIVITIES

### 4.1 Communications

The Communications Division has the mandate to research and develop tools, equipment and communication systems aimed at solving electronics and communication problems for national development.

#### Websites

Staff of the Division developed the CSIR-INSTI website: [insti.csir.org.gh](http://insti.csir.org.gh). Details of Researchers as well as areas currently being researched in can be found on the website.

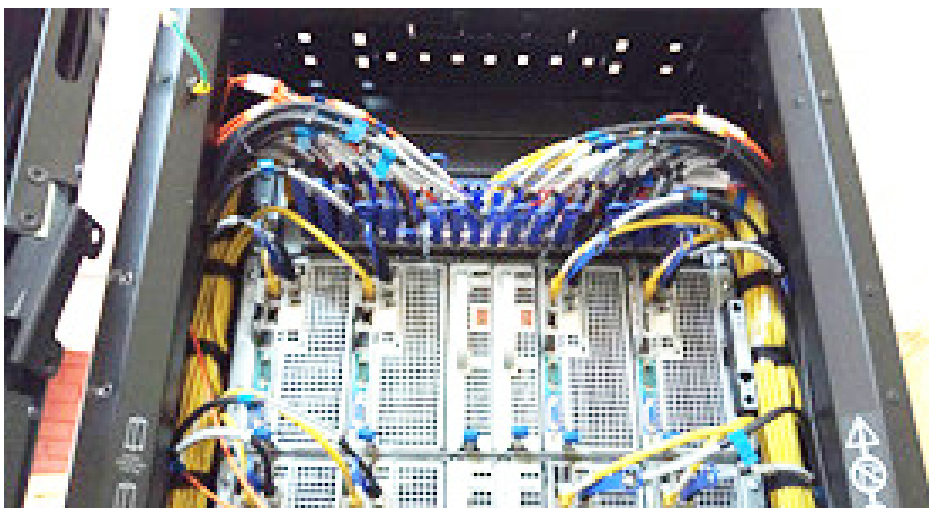
#### National High Performance Computing Centre (NHPCC) Setup

In support of the quest to set up a National High Performance Computing Centre at the premises of the Institute by the Ministry of Environment, Science, Technology and Innovation (MESTI), the Electronics and Communications Divisions assisted in the clearing of HPC racks from the Tema Harbour by the 18<sup>th</sup> of January 2019 after the arrival of the vessel carrying it on 26<sup>th</sup> December 2018. The two Divisions also supervised the installation of CCTV and Biometric Access Locks for the NHPCC and GIRCC, and worked in collaboration with Electricity Company of Ghana to evaluate power quality at CSIR-INSTI and the cost for electrical installation needed for smooth operation of the HPC. A draft of the governance structure and operational plan of the NHPCC was also put together by the National Technical committee with representatives from both Divisions.



Back View-Nodes of HPC





Frontal View-Nodes of HPC

## 4.2 Electronics

The mandate of the Division is to research into the development of next generation electronics tools aimed at solving electronics and communication problems for national and social-economic development.

### Robotics Training Programmes & Boot Camp 2019

Robotics Training has become synonymous to the Electronics Division of CSIR-INSTI. Versatile LEGO Mindstorm Robots are used to engage students in various tasks. The training programme which began in 2018 had its first session for this year held from 3<sup>rd</sup> to 9<sup>th</sup> January 2019 at the Conference Room (ground floor) of the Institute. In all twelve (12) students, nine (9) from Methodist Girls Senior High School, Mamfe, and 3 from Wesley Girls Senior High School, Cape Coast, took part in the 24-hour programme spanning over one week. The students from the Methodist Girls Senior High School went on to participate and win gold at the 2019 Robofest World Championship held in Michigan, USA from 19<sup>th</sup> to 21<sup>st</sup> May 2019.

The Second Training Programme, Robotics Boot Camp 2019 in collaboration with the Ghana Robotics Academy Foundation (GRAF) was held from 12<sup>th</sup> to 15<sup>th</sup> August 2019 at the CSIR-INSTI Conference Room (1st Floor). The session saw 35 students and teachers ranging from 6 to 21



Methodist Girls Senior High School Students at CSIR-INSTITI Robotics Training Programme



Methodist Girls Senior High School Contestants with Winning Trophy in Miami, USA

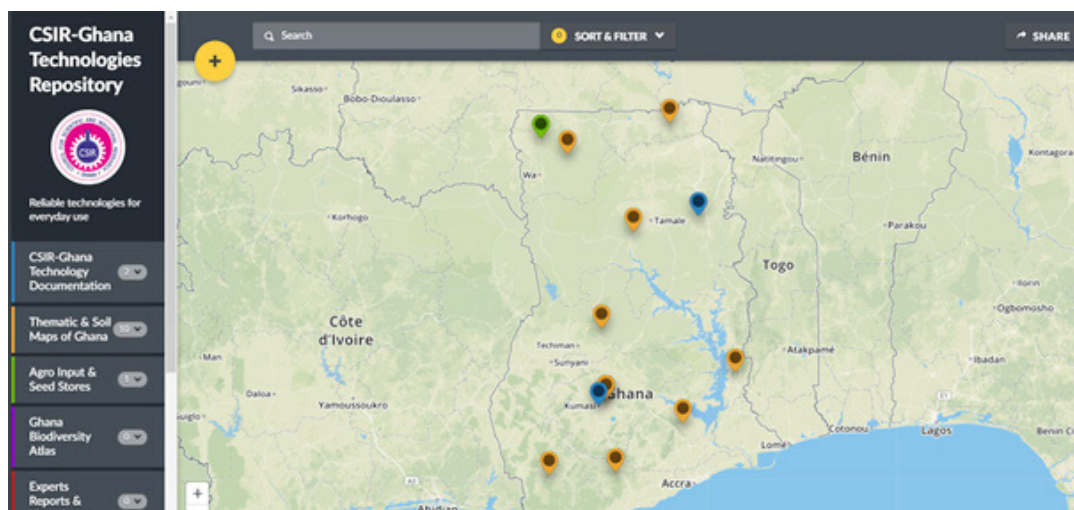
years from all over the country taking part in hands-on robotics activities. This session served as the springboard for the Saturday Robotics Club Sessions being held at the Electronics Division of the Institute from 9am to 12pm every Saturday at a fee of GH\$350/month with a target group of students between the ages of 6 and 15 years. The club is broken down into teams in accordance with the World Robots Olympiad Standard of six (6) members per team. One team took part and placed 4<sup>th</sup> on the National Ranking at the Elementary category of the RISE 2019 competitions.

## 2<sup>nd</sup> Annual Biodiversity Forum

On 28<sup>th</sup> March 2019, the Biodiversity Forum (BIMF) held a forum during which CSIR-INSTITI was identified as a major partner whose interest are aligned with its goal of mobilising, managing, serving and using biodiversity data and information. This decision was arrived at on account of CSIR-INSTITI being in the process of establishing a NHPCC to provide timely and readily accessible data for its target communities. The Institute was therefore officially invited to present options for possible collaborations, this was carried out successfully by the Electronics Division.

## Digital Agriculture Innovation Hub (DAIH) in Support of MAG Project

The Electronics Division in support of the Modernizing Agriculture in Ghana (MAG) Project sponsored by the Government of Canada, developed an online repository/database for hosting information being gathered on CSIR technologies with a frontend visualisation dashboard. The project would be fully implemented in 2020.



Front-end Snapshot of Online Repository Portal

## CNN Documentary

The Electronics Division's Makerspace pilot programme was hosted and featured in a CNN documentary on Robotics activities in Ghana through the Ghana Robotics Academy Foundation on 6<sup>th</sup> December 2019. The documentary would air from 1<sup>st</sup> to 4<sup>th</sup> February, 2020.

## 4.3 Fluid Science

The Fluid Science Division has the mandate to design and produce fuel cell for the production of Brown's Gas for energy generation, to introduce water in Ghanaian fuel mix through the use of fuel cell and an ability to design and conduct experiments on fluids, as well as to analyse and interpret data.

## 4.4 Geospatial and Information Science

This Division consists of two sections; the Scientific Information Management Section and the Geographic and Information Systems Section.

### 4.4.1 Scientific Information Management Section

This Section provides scientific and technological information services for the CSIR and analogous institutions, learned and professional associations and societies, the industrial sector, students and the general public under the collection development, cataloguing and classification and user services technical sub-sections.

#### 4.4.1.1 Collection Development Sub-section

The collection development sub-section is responsible for acquiring books, collecting data, both print and electronic resources of science and technology information and other science materials for the Library. It is also in charge of providing specific and general guidelines for the selection and acquisition of new materials through purchases, exchanges, soliciting or donations, legal deposit or through subscription and collaboration. It is also responsible for data collection to feed all databases created by the Scientific Information Management Section. A number of diverse materials were received during the year 2019, a summary is given in Table 1.

Table 1: Summary of statistics of materials received in 2019

Type of Material	Number of Copies Received	Percentage
Theses	55	5.0
Journals/ Magazines	25	2.3
Books		
Newspapers: Daily Graphic	432	39.4
Ghanaian Times	432	39.4
Spectator	72	6.6
Mirror	72	6.6
Annual Reports	9	0.8
<b>Total</b>	<b>1097</b>	<b>100</b>

All materials were stamped, accessioned, registered into their notebooks and forwarded to the Cataloguing and Classification sub-section for classification. Copies of the journals were also keyed into the journal database accordingly.

#### 4.4.1.2 Cataloguing and Classification Sub-section

Cataloguing and Classification sub-section processes all materials acquired from the Collection Development section by cataloguing, classifying, labelling and entering data on all documents received into databases.

#### CSIR Thesis Database

During the year, the section initiated the development of the CSIR Thesis Database where details of all submitted CSIR staff theses were electronically catalogued and classified by being given class numbers. A total of fifty-eight (58) theses have been catalogued and forty-seven (47) classified so far.

## CSIR Annual Reports

An inventory of CSIR Annual Reports is being created. The aim of this project is to digitise all CSIR Annual Reports, currently, a manual inventory has been created.

### 4.4.1.3 User Services Sub-section

The user services sub-section is a public service counter where users are provided direction to library materials, expertise on multiple kinds of information from multiple sources and advised on library collections and services. The section assists clients in the identification and retrieval of information to satisfy user needs. These services are provided through both digital and manual information retrieval of books, periodicals, abstracts, theses, newspapers and reference materials for scientists, consultants and students. Manual searches are done using catalogue cards, while search engines such as Google, Dogpile, Yahoo and Yandex are used for digital searches.

The section uses foreign databases to retrieve information for clients. The foreign databases used by the reference section to search information users are; Access to Global Online Research in Agriculture (AGORA), Health Inter Network Access to Research Initiative (HINARI), Online Access to Research in the Environment (OARE), Journal Storage, African Journals Online (AJOL), PubMed, Directory of Open Archive Journals (DOAJ), Proceedings of the National Academy of Sciences (PNAS), Bioline International, Open Directory – Science: Agriculture: Publications: Journals. The section has also benefited from the free-The Essential Electronic Agricultural Library (TEEAL) distributed by the TEEAL Project at Mann Library, Cornell University.

The User-service also offers service in Referrals, Research Advisory, Selective Dissemination of Information (SDI), Current Awareness and Question and Answer. WiFi hotspots are also provided to users.

## Community Service

As part of its community service, clients from the Mamobi Community were allowed to use the facility. During the period under review a total of one thousand one hundred and eighty eight (1188) clients from the Mamobi Community and its surroundings visited and used the library.

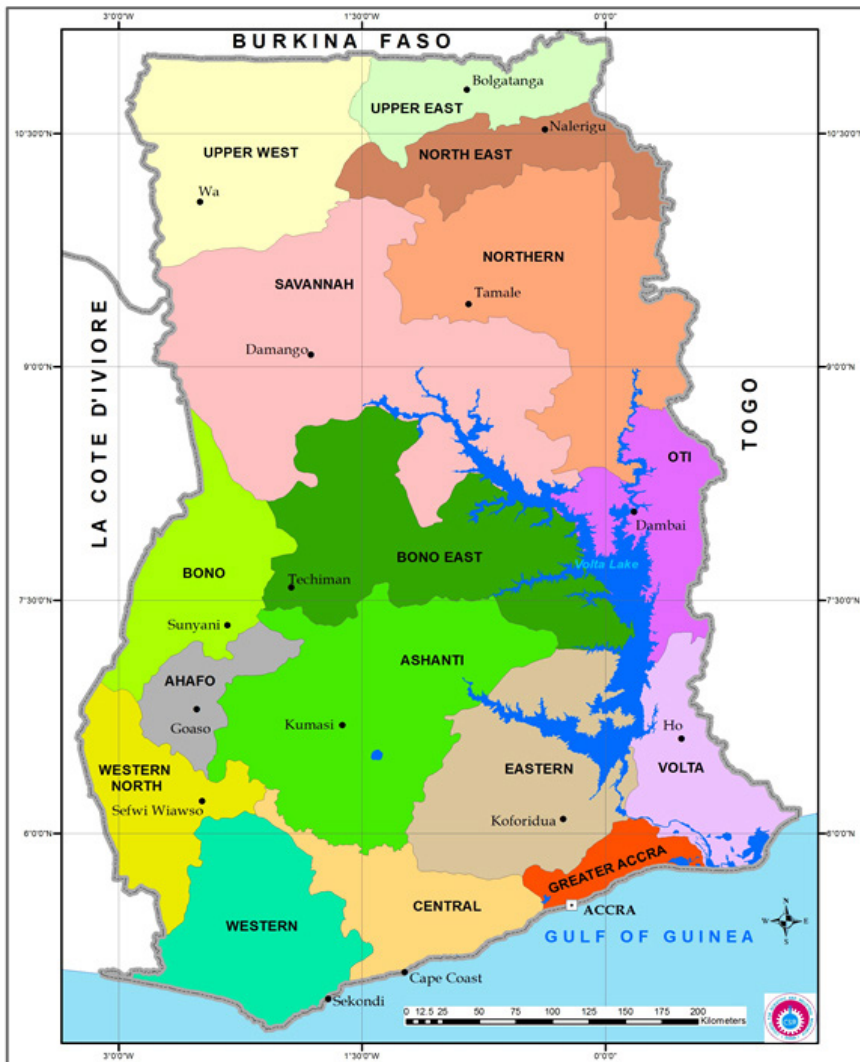
### 4.4.2 Geographic Information System Section

The mandate of this section is to collect data for the design and construction of Thematic Maps that depict contemporary geographic knowledge on Ghana at the national, regional and district levels. It is also to answer to the need of clients for special or customised maps and to use its existing capacities to train individuals and institutions on techniques of spatial data documentations using Geographic Information.

## New Regional Map

The section developed a database and produced the new Regional Map of Ghana capturing all sixteen (16) regions with their demarcated boundaries and respective capital towns.

Doors are open for collaborations into the production of sixteen (16) regional specialised maps with focus on current natural resources, population, etc.



16 Regional Map of Ghana produced by CSIR-INSTI

## **Spatial Database Development.**

A Spatial Database was being developed for the Road Network in the country. Road update files saved in KML format for all twenty-six (26) and twenty-seven (27) Metropolitan, Municipal and District Assemblies (MMDAs) of the Northern and Brong Ahafo regions respectively, as well as some of the Upper East region, were converted to Shapefile format using the Expert GPS Software. Cleaning and Editing of the Brong Ahafo Shapefiles were also started, while that of the eleven (11) and thirteen (13) MMDAs in the Upper West and four (4) Upper East regions were completed.

Base Maps for MMDAs in Upper East Region were designed and composed. The base maps developed contain the following themes:

- District boundary
- Settlements
- Topography
- Rivers/streams
- Road network

Meta data sets were developed for the Brong Ahafo and Northern regions.

## **4.5 Printing and Publishing**

The Printing and Publishing Division is divided into two (2) Sections; the Printing Section and the Science Publishing Section. For the year under review, the Division undertook the following activities:

### **4.5.1 Printing Section**

This Section has the mandate to provide printing and reprographic services for the production of scientific, technical literature and other printing services and products to support the socio-economic development of the country.

The section executed to perfection a number of both internal and external jobs which included but were not limited to the following:

Table 2: List of main projects implemented by printing division

No	Organization/Individual	Description
1	UPSA	Textbook – Business Statistics for Managers 1 <sup>st</sup> Edition
2	WASCAL	Programme Design
3	Ibrahim Asante	Business Card
4	CSIR	Diaries
5	CSIR	Calendars
6	CSIR – ARI	Letterheads
7	CSIR – BRRI	Letterheads
8	CSIR – BRRI	Flat Files
9	CSIR – CC	Business card
10	CSIR – CRI	Letterheads
11	CSIR – CRI	Business Cards for Director
12	CSIR – CRI	Flags
13	CSIR – CCST	Billboard
14	CSIR – DG	Business Card
15	CSIR – FRI	2018 Annual Report
16	CSIR – Head Office	60 <sup>th</sup> Anniversary Dinner Programme
17	CSIR – Head Office	60 <sup>th</sup> Anniversary Dinner Media Stand
18	CSIR – Head Office	60 <sup>th</sup> Anniversary Dinner Back Drop Banner
19	CSIR – Head Office	60 <sup>th</sup> Anniversary Citations
20	CSIR – Head Office	Mango Project Brochures
21	CSIR – Head Office	Mango Project Posters
22	CSIR – Head Office	Accounting Manual
23	CSIR – Head Office	Thanksgiving banner
24	CSIR – Head Office	Thanksgiving Programme
25	CSIR – Head Office	DDG and DA Farewell Programme Design
26	CSIR – Head Office	Citations
27	CSIR – IIR	Letterheads



28	CSIR – INSTI	2016 Annual Report
29	CSIR – INSTI	2018 Annual Report
30	CSIR – INSTI	Flyers and Pull-ups
31	CSIR – INSTI	Citations for Retirees
32	CSIR – RELC	Banner



Samples of products from the Printing Section

#### 4.5.2 Science Publishing Section

This Section is mandated to publish the *Ghana Journal of Agricultural Science* (GJAS) and *Ghana Journal of Science* (GJS) as well as other S&T literature emanating from the national and international scientific community. It is also mandated to conduct R&D projects aimed at aiding policy decision makers, scientific publishing industry, planners, researchers and the general public. The journals have performed creditably well both locally and internationally. They have also served as outlets for the research findings of CSIR scientists and invariably assisted in their promotions, while enhancing their image internationally. GJAS and GJS are Open Access Journals, distributed under the terms of the Creative Commons (CC) License [CC BY 4.0].

## Ghana Journal of Agricultural Science

The Ghana Journal of Agricultural Science published Issue (1) and Issue (2) of GJAS Vol. 54 (2019) on the AJOL website. Seven (7) articles were published in the first issue and nine (9) articles in the second.

Table 3: Articles published in Vol 54 (1) of the GJAS

No	Title	Authors
1	Evaluation of efficacy of false yam ( <i>Ipomoea oliviformis</i> ) as surface protectant against rot pathogens of white yam ( <i>Dioscorea rotundata</i> Poir)	E. N. K. Sowley, F. Kankam, R. M. Nsarko
2	Diallel analysis of maize inbred lines for agronomic traits in nitrogen stress and optimal conditions	D. J. Ogunniyan, D. K. Ojo, S. A. Olakojo, O.A. Talabi
3	Effect of added dietary lysine and methionine above recommended levels, on growth performance, breast meat yield and financial returns in broilers	T. N. N. Nortey, E. A. Quarshie, R. Owusu-Bremang, E. Agyei-Henneh, N. S. Frempong, C. R. Stark.
4	Phytoremediation potential of two maize varieties cultivated on metal-particulate-contaminated soil	M. B. Adewole, B. O. Oyebanji, K. Igbekele
5	Perceptions of grasscutter ( <i>Thryonomys swinderianus</i> ) farmers on production technologies in the Agona West Municipality, Central Region – Ghana	B. Y. Folitse, S. A. Manteaw
6	A Study of the Publication pattern in CSIR – Plant Genetic Resources Research Institute	P. S. Osei-Kofi, L. M. Aboagye, S. Bekoe, L. Dzandu, L. D. Acheampong
7	Manure characteristics of small ruminants fed agro by-products in the guinea savannah agro-ecological zone of Ghana	K.O. Ansah, C. Antwi, E.L.K. Osafo, S. Enning & H. Adu-Dapaah

Table 4: Articles published in Vol 54 (2) of the GJAS

No	Title	Authors
1	Assessment of nutrients status of areas supporting optimum oil palm ( <i>Elaeis guineensis</i> Jacq. L) cultivation in Ghana	I. Danso, S. A. Okyere, E. Larbi, F. Danso, B. N. Nuertey
2	Polycyclic aromatic hydrocarbon and microbial load of naturally preserved smoked African mud catfish <i>Clarias gariepinus</i> (Burchell, 1822)	A. A. Ayeloja, F. O.A. George, A. A. Akinyemi, O. O. Atanda
3	Physicochemical properties and sensory attributes of local snacks fortified with powdered fish processing by-products and an underutilised fish species	L. Abbey, M. Glover-Amengor, L. Hagan, F. P. Mboom
4	Biomass yield and fodder quality of Napier grass ( <i>Pennisetum purpureum</i> ) as affected by Pigeon pea ( <i>Cajanus cajan</i> ) intercrop and planting distance	E. A. Tenakwa, S. Cudjoe, T. Ansah
5	Analysis of seed yam varieties, sources and quantity demanded by farmers in major yam producing districts in Ghana	P. Boadu, R. Aidoo, K. Ohene-Yankyera, U. Kleih, T. Abdoulaye, J. Orchard, N. Maroya, M. Owusu, S. Bekoe
6	Primates crop raiding situation on farmlands adjacent to South-West of Mole National Park, Ghana	E. D. Wiafe
7	Variations in the level of resistance to root-knot nematodes ( <i>Meloidogyne</i> spp.) infestation among ten cowpeas ( <i>Vigna unguiculata</i> L. Walp.) genotypes	F. Kankam, E. N.K. Sowley, J. Adomako, A. Boateng
8	Industrialization of cassava sector in Ghana: progress and the role of developing high starch cassava varieties	K. O. Dankwa, B. B. Peprah
9	The Livestock Sector and its contributions to the Protein and Energy needs of the Nigerian Population	M. M. Inyeinyang, I. G. Ukpong

## Ghana Journal of Science

The Ghana Journal of Science published Issue (1) and Issue (2) of GJS Vol. 60 (2019). Five (5) articles were published in the first issue and nine (9) articles in the second:

Table 5: Articles published in Vol 60 (1) of the GJS

No	Title	Authors
1	Effects of Fish Cage Culture on Water and Sediment Quality in the Gorge Area Of Lake Volta In Ghana: A Case Study Of Lee Fish Cage Farm	L. K. Osei, R. Asmah, S. Aikins, A. Y. Karikari
2	A Low Cost Synthesis and Characterization of CuO Nanoparticles for Photovoltaic Applications	A. A. Yankson, A. Kuditcher, G. N. Gebreyesus, M. N. Y. H. Egblewogbe, J. K. A. Amuzu, E. A. Armah
3	Assessment of Nutrients Levels in Groundwater Within the Lower Pra Basin of Ghana	M. K. Dorleku, A. O. Affum, C. K. Tay, D. Nukpezah
4	Use and Management of Medicinal Plants by Indigenous People in Boji Dirmoji District, Western Ethiopia	I. O. Duguma, M. A. Mesele
5	Production of Biodiesel from Marine Macroalgae Occurring in the Gulf of Guinea, Off the Coast of Ghana	G. K. Ameka, L. K. Doamekpor, A. A. Amadu, A. P. Amamoo

Table 6: Articles published in Vol 60 (2) of the GJS

No	Title	Authors
1	Storage Temperature Influences Post-Harvest Quality of Wild Plum ( <i>Ximmenia Americana</i> L.) Fruit	V. E. Emongor, G. Ramagonono
2	Microbiological Contamination of some Fresh Leafy Vegetables Sold in Cape Coast, Ghana	L. Yafetto, E. Ekloh, B. Sarsah, E.K. Amenumey, E.H. Adator
3	Phytochemical Screening and In-Vitro Antimicrobial Activity of False Yam ( <i>Icacina oliviformis</i> ) Extracts on Microbes	R. Seidu, A.K. Quainoo, S.J. Cobbina, L. Quansah
4	A Linear Model for the Collection of Institutional Plastic Wastes in Ghana: A Case of the Council for Scientific and Industrial Research –Institute of Industrial Research (CSIR-IIR)	A.B. Yeboah, S. Odei, E. Anabila

5	The Effect of the Decline on Pottery in Ghana and Socio-Economic Implications on Potters	S. Nortey, E. Asiamoaso
6	Acute Hypoglycaemic Activities and Fatty Acid Profile of Seed Oil of <i>Moringa</i> oleifera Lam	M.B. Busari, H.L. Muhammad, E.O. Ogbadoyi, F.O. Badmos
7	Prevalence of <i>Giardia species</i> in Cattle Faecal Matter in Selected Farms in Weija and Knpong Major Water Supply Heads to Accra, Ghana	G.T. Mensah, A.K. Annang, P.F. Ayeh-Kumi, J.A. Oppong, S. Niampoma
8	A Quality Control Scheme for a Commercial Pozzolana Plant: A Case Study of Pozzolana Ghana Ltd.	J. Sarfo-Ansah, K.A. Boakye, E. Atiemo, R. Appiah
9	Promoting Partnership with Traditional Authorities in Development Projects: A Model for Community Infrastructure Project Delivery in Ghana	E. Osei-Tutu, E. Adinyira, A.P. Ofori, R. Asamoah, S.J. Ankrah

#### 4.6 The President's Tour of the Eastern Region – CSIR-OPRI Durbar

As part of the President, His Excellency Nana Addo Danquah Akuffo Addo's tour of the Eastern Region, a Durbar was held at the CSIR-Oil Palm Research Institute (CSIR-OPRI) to demonstrate the products and services produced as a result of research by CSIR over the years. The Chief Marketing Officer of CSIR-INSTI, Mrs. Akua Boateng Agyenim, the Head of the Science Publishing Section, Mr. Akilakpa Sawyerr, an Electronics Division Technical Officer, Mr. Benjamin Ohene-Affih and a National Service Personnel, Ms. Aniekan Gerald Umanah representing the Institute were present to display rich diverse products.

Other dignitaries present at the function included the Minister of Environment, Science, Technology and Innovation, Prof. Kwabena Frimpong Boateng, the Minister for Trade and Industry, Mr. Alan Kyeremanten, Minister for Information, Mr. Kojo Oppong Nkrumah, CSIR Director General, Prof. Victor Kwame Agyeman, CSIR Deputy Director General, Prof. Paul Pinnock Bosu, CSIR-FORIG Director, Prof. Daniel Ofori and various Chiefs of the Traditional area.



CSIR-INSTITI's exhibits



His Excellency Nana Addo Danquah Akuffo Addo at the stand of CSIR-INSTITI



Some dignitaries observing various exhibits

## 4.7 International Collaborations

### 4.7.1 DevFest Accra 19

Google Developer Group Accra, a non-profit software developers group co-led by Mr. John Paapa Awotwi, a Technical Officer of the CSIR-INSTITI Communications Division, in collaboration with the Institute held this year's edition of DevFest dubbed "**DevFest Accra 19**" at the premises of the Institute on 14th September 2019. The programme saw 650 people from 11 different African Countries; Ghana, Nigeria, Kenya, Code D'Ivoire, Benin, South Africa, Uganda, Burkina Faso,

Mauritania, Tanzania and Cameroon, meeting to discuss software issues related to Android, Firebase, Google Cloud Platform, Google Assistant, Flutter, machine learning with TensorFlow and Mobile Web.



“DevFest 19” Attendees taking a group picture at the forecourt of CSIR-INSTI

#### 4.7.2 iSTEAMS CSIR-UG Conference 2019

The Society for Multidisciplinary and Advanced Research Techniques (SMART), International Centre for Information Technology and Development Southern University, Baton Rouge, LA, USA, in collaboration with CSIR-INSTI organised the 21st International Science, Technology, Education, Arts, Management & Social Sciences Conference held from 14<sup>th</sup> to 16<sup>th</sup> November 2019 on the theme “*Global Ecosystem for Nurturing Multidisciplinary Research Innovations*”. The Welcoming and Keynote Address was given by the Director of the CSIR-INSTI, Dr. Seth Awuku Manteaw on the topic; The Democratisation of Research: Using the Inter-disciplinary Pathway for Effective Knowledge Construction and Innovation. There were statements from Prof. Longe Olumide and Prof. Richard Boateng. The Director of the Institute was conferred with the fellowship of SMART and other participants, including five (5) staff of CSIR-INSTI were inaugurated into the society, they were; Mr. Joshua Kalognia, Dr. Stephen Bekoe, Ing. Michael Wilson, Ing. Frank Prikutse and Ing. Yaw Twum-Barimah. The Electronics and Communications Divisions also took the opportunity to award a citation to the outgoing Deputy Director of the Institute, Mrs. Lucy Payne Dzandu.



The conference consisted of presentations at the CSIR-INSTI conference room (upper floor) and a visit to the University of Ghana Graduate Business School. Presenters and respective topics included:

Table 7: iSTEAMS 2019 Presentations

No	Topic	Presenter
1	The Role of the Physical Environment in Public Library Regeneration in Nigeria	- Abatan S.
2	Effect of Millet Chaff as Organic Amendment on Sodic-Soil and Rice PRODUCTION	- Zakari M.D.
3	Design and Economic Viability Analysis of a Solar Photovoltaic Based Microgrid for an Off-Grid Community in South-Western Nigeria	- Odesola I.F.
4	Resource Utilization and Failure Detection Using Deep Learning in Grid Computing Environment	- Aliyiu G. (via Skype)
5	An Automated System for Examination Venue Notification and Seats Arrangement for The Federal Polytechnic, Bida, Niger State, Nigeria	- Akinbola A.K.
6	A Web-Enabled S.I.W.E.S. Management System for Directorate of Industrial Placement	- Akinbola A.K.
7	Modified Uniform Distribution	- Osowole O.I

The Seminar Committee, chaired by Dr. Paul Asante Danquah on behalf of the Institute spearheaded the organization of the programme.

Further information in relation to the conference and other iSTEAMS programmes could be found on [www.isteams.net](http://www.isteams.net)





Dr. Seth Awuku Manteaw conferred with the Fellowship of SMART with his citation



Mrs. Lucy Payne Dzandu with her citation



Presentation via Skype



Participants at the program

#### 4.8 Internal Seminars

A number of different seminars was organised internally for staff of the institute on various topics to help build the professional capacity of the Institute as a whole. Details are specified in Table 8.

Table 8: Internal Training/Presentations 2019

No	Date	Topic	Resource Person(s)
1	28/02/2019	Technical Writing	Dr. Richard Kofie
2	25/05/2019	Update on CSIR-INSTI Research Projects	CSIR-INSTI Research Staff
3	29/08/2019	Project Bidding for Income Generation	Dr. Seth Awuku Manteaw & Dr. Paul Boadu

#### 4.9 Visibility

CSIR-INSTI had its turn of the MAG Documentary video recording with the Interview crew of GTV on 9<sup>th</sup> October, 2019. Divisional research projects and activities were explained by Heads of Division and their representatives. The story would be aired on GBC news on selected days at 7pm and 10pm in January 2020.

#### 4.10 Conference Facilities

CSIR-INSTI has two conference rooms, one on the ground floor with a capacity of forty (40) people and the other on the first floor with a higher capacity of one hundred (100) people, both which provide the right kind of atmosphere for a wide range of meetings. In addition, the forecourt of the Institute is very spacious, serene and well-kept and is suitable for any outdoor occasion, be it formal or informal.

During the year, various organisations rented the conference facilities of the Institute, some of which have been clients over the years, they include the Consortium of Academic and Research Libraries in Ghana (CARLIGH) and the Association of Energy Engineers (AEE).



Conference Room on First Floor of CSIR-INSTI



Conference Room on Ground Floor of CSIR-INSTI

## 5.0 ADMINISTRATION AND FINANCIAL ISSUES

### 5.1 Administration

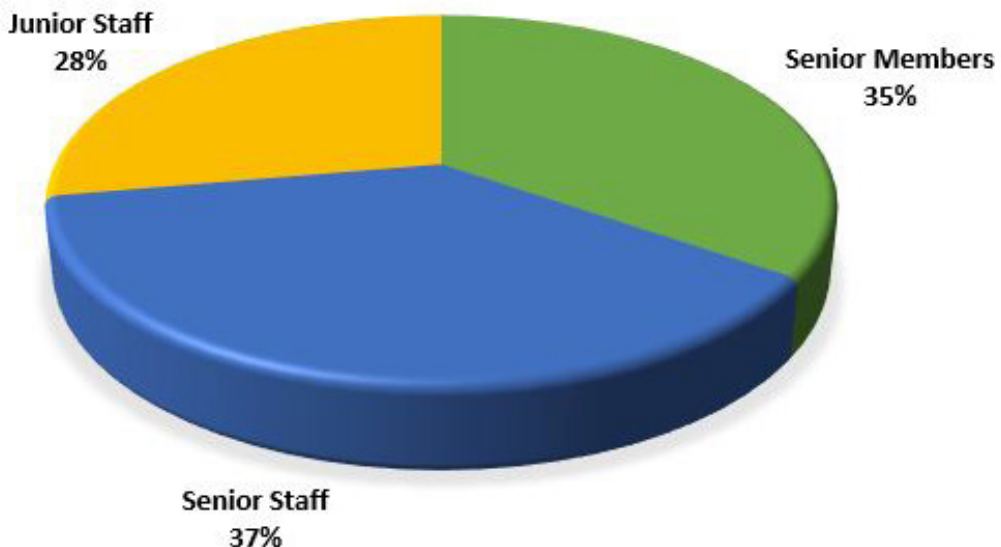
The smooth, efficient and effective day-to-day running of the Institute was facilitated through the support of the Administration Division. The implementation of directives, policies, rules and regulations of the Council were carried out by the Division.

#### 5.1.1 Management of INSTI

A seven-member Management Board and an eleven-member Internal Management Committee with Dr. Paul Effah and Dr. Seth Awuku Manteaw as respective chairmen managed the Institute for the period.

#### 5.1.2 Staff Strength

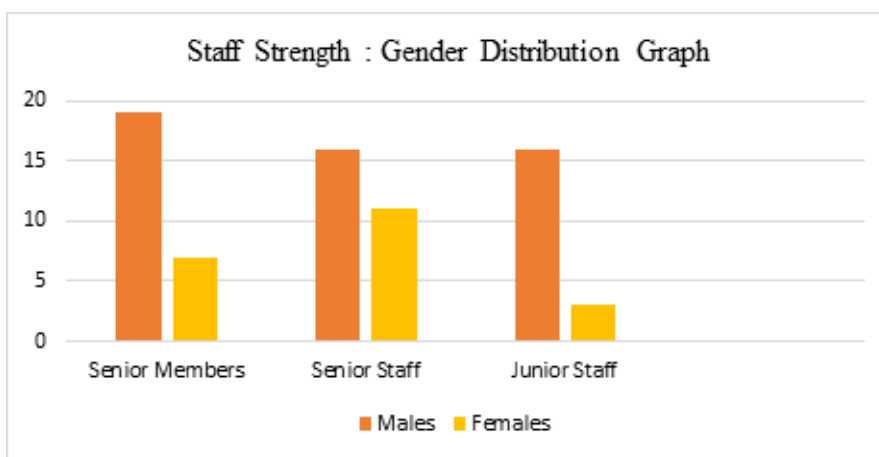
The staff strength of the Institute stood at 71. This is made up of 23 Core and 2 Non-core Senior Members totaling 25, 27 Senior Staff and 19 Junior Staff. The staff strength and gender distribution are shown below. A detailed list of staff is recorded in Appendix III.



Staff Strength: Categories

Table 9: Staff Strength: Gender Distribution

Gender	Senior Members	Senior Staff	Junior Staff	Total
Males	18	16	16	50
Females	7	11	3	21
<b>Total</b>	25	27	19	71



Staff Strength: Gender Distribution Graph

### 5.1.3 Induction

The new Director of the Institute, Dr. Seth Awuku Manteaw was officially inducted on the 22<sup>nd</sup> of January 2019 at the CSIR-INSTI Conference Room (1st floor). Some members of the Management Board, including the Director of Administration, Mr. Issahaku Adam were some of the dignitaries present. The induction was performed by the Director General of the CSIR, Prof. Victor Kwame Agyeman.



Dr. Seth Awuku Manteaw and Dr. Mohammed Sani Abdulai, a member of the Management Board in a handshake



The Dignitaries at the High Table



Dr. and Mrs. Seth Awuku Manteaw being prayed for by Dr. Samuel Obeng Manteaw, of the School of Law, University of Ghana

#### 5.1.4 Appointments

Mrs. Lucy Payne Dzandu, Principal Librarian was officially appointed as Deputy Director of the Institute effective 1<sup>st</sup> May 2019. Before her appointment, she had been serving since 16<sup>th</sup> June 2018 as the Acting Director.

#### 5.1.5 Staff Promotions

Several Staff were successfully promoted to various grades during the year 2019 with varying effective dates.

Table 10: List of Staff Promotions

No	Name	Division	Previous Grade	Promotion Grade	Effective Date
1	Dr. Paul Asante Danquah	Communications Division	Research Scientist	Senior Research Scientist	1 <sup>st</sup> July 2018
2	Dr. Stephen Bekoe	Geospatial and Information Science	Scientific Information Officer	Senior Scientific Information Officer	1 <sup>st</sup> July 2019
3	Mr. Eric Sam	Printing and Publishing	Senior Technical Officer	Principal Technical Officer	1 <sup>st</sup> January 2020
4	Ms. Doris Kumiwa	Administration	Senior Clerk	Administrative Assistant	1 <sup>st</sup> January 2018

### 5.1.6 New Employment

After interviews held on 30<sup>th</sup> January 2019, the following eleven (11) officers were employed to fill various vacant positions as a result of retirements and resignations in the Institute. Seven (7) being MPhil and four (4) being BSc holders in diverse disciplines.

Table 11: Newly employed staff for 2019

No	Name	Grade	Division
1	John Annor	Chief Technologist	Geospatial and Information Science
2	Frank Lemdi Prikutse	Principal Technologist	Communications
3	Maame Birago Kessey	Principal Technologist	Electronics
4	John Adjah	Principal Technologist	Printing and Publishing
5	Joshua Kalognia	Principal Technologist	Printing and Publishing
6	Tracy Adjeley Sackey	Scientific Secretary	Directorate
7	Akua Boateng Agyenim	Chief Marketing Officer	Directorate

8	John Paapa Awotwi	Technical Officer	Communications
9	Benjamin Ohene-Affih	Technical Officer	Electronics
10	Yaw Owusu-Ayirebi	Technical Officer	Printing and Publishing
11	Samiratu Abdulai Mamah	Technical Officer	Printing and Publishing

### 5.1.7 Staff Transfer

Mrs. Naa Aku Mingle, Librarian, was transferred to the Institute from CSIR-Building and Roads Research Institute (CSIR-BRRI) on 1<sup>st</sup> May 2019.

### 5.1.8 Regrading of Staff

Dr. Mahamuda Alhaji Mahamudu, Scientific Information Officer, was regraded upon submitting his PhD certificate in Information and Communication Engineering effective 15<sup>th</sup> June 2019.

### 5.1.9 National Service Persons

In support of training newly graduated students, the Institute accepted, assigned to various divisions and trained the following fifteen (15) National Service personnel. They assumed duty on 1<sup>st</sup> September 2019.

Table 12: National Service Personnel

No	Name	Institution	Division Attached To
1	Adjei Enoch	University of Ghana	Geospatial & Info. Science
2	Alhassan Michael Arafat	Cherkasy State Technical University	Electronics
3	Ameyaw Eunice Darley	Accra Technical University	Administration
4	Azuma D. Yvonne	University of Ghana	Administration
5	Baidoo Emmanuel	Ghana Technology University College	Communication
6	Boateng Mabel	KNUST	Printing and Publishing



7	Buatsi Edmund	Ghana Technology University College	Electronics
8	Dusi Moses	University of Ghana	Geospatial & Info. Science
9	Umanah Aniekan Gerald	University College of Mgt. Studies	Administration (Marketing)
10	Gidisu Erica	KNUST	Communications
11	Kwarteng Marilyn	KNUST	Fluid Science
12	Lamprey Doreen	Takoradi Technical University	Printing and Publishing
13	Sefa Kofi Elvis	University of Professional Studies	Administration
14	Tetteh Nii Ayi Prince	Accra Technical University	Accounts
15	Tsibu-Darko Dorcas	University of Ghana	Geospatial & Info. Science

#### 5.1.10 Staff Durbars

Meetings were held for interactions between staff of the Institute to promote communication. During such discussions, staff were informed on decisions taken at DMC, sought clarifications on various Institutional issues and made recommendations and suggestions to move the Institute forward. Junior and Senior staff had their first durbar for the year on 18<sup>th</sup> February 2019, while Research Staff held their meeting on 19<sup>th</sup> February 2019. General durbars for all staff were held on the 4<sup>th</sup> of June and 12<sup>th</sup> of September 2019.

#### 5.1.11 Study Leave

As part of the Institute's policy on training, four (4) members of staff successfully completed their studies in various programmes during the year 2019.

- Dr. Mahamuda Alhaji Mahamadu, Scientific Information Officer, completed his programme at the Southwest Jiaotong University, Chengdu, China and was awarded a PhD in Information and Communication Engineering on 15<sup>th</sup> June 2019.

- Atta Ampofo-Addo Snr., Chief Library Assistant, completed his programme at the Ghana Institute of Management and Public Administration and was awarded an MSc in Management Information Systems on 1<sup>st</sup> June 2019.
- Esther Opoku, Chief Library Assistant, completed her programme at the Central University College and was awarded an MBA in Human Resource Management on 16<sup>th</sup> November 2019.
- Yvonne Azuma, Senior Clerk, completed her programme at the University of Ghana and was awarded a Diploma in Public Administration on 28<sup>th</sup> July 2019.

The following members of staff were also granted study leave to continue their education at various Institutions locally and internationally.

Table 13: Staff on fulltime: /partial study leave with pay

No	Name	Institution	Programme	Duration	Start Date / Expected Completion	Remarks
1	Wilson M.	Kwame Nkrumah University of Science and Technology	PhD Computer Engineering	4 years partial leave with pay	Sep 2019 – July 2023	
2	Zainudeen M.N.	University of Ghana	PhD Nuclear Engineering	4 years partial study leave with pay	Aug 2018 – July 2022	
3	Kabutey F.T.	Harbin Institute of Technology, China	PhD Environmental Science and Engineering	3years full-time study leave with pay	Sep 2015 – July 2018	Extended to 2020
4	Kumiwa D.	University of Cape Coast Tema Campus	Diploma in Business Studies	3years partial study leave with pay	Aug 2015 – July 2018	

#### 5.1.12 Resignation

The following staff resigned from service of the Council:

- Ms. Doreen Appiah, a Chief Library Assistant of the Geospatial and Information Science

Division with effect from 2<sup>nd</sup> January, 2019.

- Mr. Benjamin Peh, a Principal Technologist of the Communications Division with effect from 9<sup>th</sup> January, 2019.

### 5.1.13 Retirement

A number of staff gracefully went on pension:

- Mrs. Lucy Payne Dzandu, the Deputy Director of the Institute retired on 30<sup>th</sup> November 2019 as a Principal Librarian. She served the Council for 19 years after being employed as an Assistant Librarian. She served in many capacities as the Head of Cataloguing and Classification Section of the then Library and Documentation Division and was instrumental in the changing of the name of Library and Documentation Division to its current name of Geospatial and Information Science Division, the First Female Acting Deputy Director as well as Acting Director.
- Mr. Jeffrey Yeboah, Principal Technologist retired from service on 1<sup>st</sup> July 2019 after working with the Council for 11years. He began his career as a Principal Library Assistant.
- Mr. Dennis Nii Dodou Doodoo retired on 26<sup>th</sup> September 2019 after 38 years of service, rising from Accounts Clerk Grade 1 to Chief Purchasing Assistant.
- Mr. James Sam retired from service during the period under review. He served the Council for 23 years. Mr. James Sam started his employment career with the Council as a Literate Helper and rose to the position of Senior Accounting Assistant before his retirement on 4<sup>th</sup> August 2019.

## 5.2 Accounts Division

The objectives of the Accounts Division for the year 2019 included:

- Capture financial transactions and prepare timely, accurate and transparent financial reports
- Ensure payroll duties are fulfilled
- Ensure adequate internal control procedures are put in place to safeguard the assets of the Institute
- Actively assist, support and guide management in making sound financial management decisions
- Take active role in setting the annual budget, monitor the budget and do variance analysis.

## FINANCIAL STATEMENT FOR 2019

Total receipts for the year under review amounted Gh¢4,480,777 and payments totalled Gh¢4,493,119.38 with a negative net receipt of Gh¢12,341.99. The receipts are made up of salaries paid by GOG from the Consolidated fund amounting to Gh¢3,959,063.68. Internal Generated Fund (IGF) amounted to Gh¢307,490.97 and Donor Funds of Gh¢214,222.74. The IGF activities included Printing, Hiring of facilities, and Consultancy.

The Institute projected to earn GH¢340,505.00 from IGF for 2019. There was a shortfall of GH¢33,014.03 due to shortfall in revenue from the Hire of Facilities.

The Payment of Gh¢4,493,119.38 for the period is made up of Compensation for Employees of ¢3,992,337.99, Goods and Services of Gh¢441,593.60 and Non-Current assets of Gh¢59,187.79.

There was no GOG subvention received for Goods and Services during the year 2019.

Below is summarized Statement of Receipts and Payments and the Financial Position as at December 31, 2019.

Table 14: INSTI Statement of Receipts and Payments for the year ended December 31, 2019

	ACTUAL 2019	ACTUAL 2018
	GH¢	GH¢
TOTAL RECEIPTS	4,480,777.39	3,819,815.20
TOTAL PAYMENTS	4,493,119.38	3,755,841.53
EXCESS/(DEFICIT)	<b>-12,341.99</b>	<b>63,973.67</b>

Table 15: Summary State of Affairs as at December 31, 2019

	2019	2018
CURRENT ASSETS	238,000	231,000
NON-CURRENT ASSETS	79,000	30,000
LIABILITIES	161,000	184,000
NET ASSETS/(LIABILITIES)	156,000	77,000
NET WORTH	<b>156,000</b>	<b>77,000</b>

# APPENDIX I

## Publications

### Refereed Journal Papers

Moller-Jensen, **Allotey, A.N.M., Kofie, R.Y.**, Yankson, P.W.K. et.al (2019). What is Urban? A Critical Comparison of Satellite-based Estimates of Accra's Spatial Growth, *Journal of Environment and Planning B: Urban Analytics and City Science*

Møller-Jensen, L & **Allotey, A. N. M.** (2019). Consistency in Remote Sensing-based Urban Mapping for Growth and Mobility Analysis. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Volume XLII-4/W16, 2019

Baada, F. N. Ayoung, D. A. & **Bekoe, S.** & Azindow, F. B. (2019). Resource constraints and quality Public Library service delivery in Ghana. *International Information & Library Review* Vol. 51 (4)

Baada, F. N. A., Baayel, P., **Bekoe, S.** & Banbil, S. (2019). Users' Perception of the Quality of Public Library Services in the Greater Accra Region of Ghana: An Application of the LibQUAL+ Model. *Library Philosophy and Practice. (e-journal)* (digitalcommons.unl.edu)

Osei-Kofi, P. S., Aboagye, L.M., **Bekoe, S., Dzandu L.D.**, Acheampong L.D. (2019). A study of the Publication Pattern in CSIR – Plant Genetic Resources Research Institute. *Ghana Journal of Agricultural Science*. Volume 54 (1), 56-66

Boadu, P.A, Aidoo, R., Ohene-Yankyera, K., Kleih, U., Abdoulaye, T., Orchard, J., Maroya, N., Owusu, M., & **Bekoe, S.** (2019). Analysis of Seed Yam Varieties, Sources and Quantity Demanded by Farmers in Major Yam Producing Districts in Ghana. *Ghana Journal of Agricultural Science*. Vol 54(2) 45-57

**Danquah P.A.** (2019). A simulated comparison of performance beyond inherent metrics for Open Shortest Path First (OSPF) and Exterior Gateway Routing Protocol (EIGRP). *Journal of Digital Innovations & Contemporary Research in Science, Engineering & Technology*. Vol 6 No 4, 2018

[dx.doi.org/10.22624/AIMS/DIGITAL/V4N4P3](https://dx.doi.org/10.22624/AIMS/DIGITAL/V4N4P3)

**Danquah, P.A.** (2019). Route Redistribution: Beyond Inherent Metric. *International Journal of Computer Networking, Wireless and Mobile Communications (IJCNWMC)* ISSN (P): 2250–1568; ISSN (E): 2278–9448 Vol. 9, Issue 2, pp.7-14

**Danquah, P.A.,** Bibi D. & Dzahene-Quarshie B. (2019). Forecourt Operations Management System for Oil Marketing Companies: The Ghanaian Context. *Computing, Information Systems,, Development Informatics & Allied Research Journal*. Vol 10 No 4, Pp 23-40. [www.cisdijournal.org](http://www.cisdijournal.org). DOI Affix-<https://doi.org/10.22624/AIMS/CISDI/V10N4P3>

**Danquah, P.A., Bekoe, S. & Prikutse F.** (2019). Information Security Practices and its Disaster Recovery Readiness: An Assessment of Ghanaian Government Ministries. *The Information Technologist*, Volume 16 (2)

**Decardi-Nelson, A.,** Rahman, A. & Mante E. (2019). Perceptions of Shop Operators on Packaging of Made-In-Ghana Products. *Journal of Applied Packaging Research*. Vol 11 (1) No 4, Pp 3

Rahman, A., Afrifa, K.A. & **Decardi-Nelson, A.** (2019). Packaging Design and Environmental Sustainability: Evaluating the Plastic Carry Bag for Effective Design. *Africa Development and Resources Research Institute Journal, Ghana*. E-ISSN: 2343-6662 Vol 28 No 8(5), Pp1-20

**Folitse, B.Y., Manteaw, S.A.** (2019). Perceptions of grasscutter (*Thryonomys swinderianus*) farmers on production technologies in the Agona West Municipality, Central Region. *Ghana Journal of Agricultural Science*, Volume 54, (1), 47-55

Asumeng M. A. & **Folitse B.Y.** (2019). Occupational Hazards, Safety Culture and Safety Behaviour: A Study of Fishermen in Jamestown, Accra. *Ghana Social Science Journal*, Volume 16, Number 1, 1-22

**Wilson M.,** Okraku-Yirenkyi Y. (2019). Design and Navigation Technique of an Underground Mine Inspection Robot. *Journal of Engineering and Economic Development; Beverly Hills*, Vol 5, Issue 2, 1-10

**Wilson M.,** Okraku-Yirenkyi Y. (2019). Impact of the Robotics Inspired Science Education (RISE) Activities on Education in Ghana. *Journal of Engineering and Economic Development; Beverly Hills*, Vol 5, Issue 2, 11-22

## Conference Papers

**Danquah P.A.** (2019). A Baseline of Malware Infections and Anti-Malware Deployment in Ghanaian Government Ministries, Proceedings of the 20th iSTEAMS Multidisciplinary Trans-Atlantic GoingGlobal Conference KEAN University, New Jersey, USA

**Danquah, P.A** (2019). An Empirical Exploration of Web Applications' Vulnerability Assessment: A Case Study Approach, Proceedings of the 15th iSTEAMS Research Nexus Conference Chrisland University, Abeokuta, Nigeria

Møller-Jensen, L & **Allotey, A. N. M.** (2019). Consistency in Remote Sensing-based Urban

Mapping for Growth and Mobility Analysis. 2019 6th International Conference on Geomatics and Geospatial Technology (GGT 2019), 1–3 October 2019, Kuala Lumpur, Malaysia

**\*Wilson, M.,** Okraku-Yirenkyi Y. (2019). Impact Assessment of a Robotics Inspired Science Education Program on Student Performance and Understanding in STEM Subjects. 11th Annual International Conference on Global Business: Engineering, Energy, Agriculture, Health and IT; Miami; United States; 21<sup>st</sup> & 22<sup>nd</sup> June 2019

**Wilson, M.,** Okraku-Yirenkyi Y. (2019). Navigation Technique for Autonomous Underground Mine Inspection Robots. 11th Annual International Conference on Global Business: Engineering, Energy, Agriculture, Health and IT; Miami; United States; 21<sup>st</sup> & 22<sup>nd</sup> June 2019.

*\*Adjudged best paper in the field of robotics at 11<sup>th</sup> Annual International Conference on Global Business*

### Newspaper Articles

**Decardi-Nelson A.** (2019, Feb 22). Provision of Adequate and Sufficient Product Information on Product Labels, The Usefulness. *Daily Graphic*. <http://www.graphic.com.gh/features/features/provision-of-adequate-and-sufficient-product-information-on-product-labels-the-usefulness.html>

# APPENDIX II

## External Training Workshop/ Conference/ Seminar

**Adjah J. ;** Participated in an AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.

**Agyenim A. B. ;** Participated in an AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.

### Allotey A.N.M. attended

- A General Meeting and Stakeholders Workshop on Man and Biosphere (MAB) Certification from 7<sup>th</sup> to 8<sup>th</sup> October 2019 at EPA Training School, Amasaman.
- A Training Seminar on Bridging the Gap: Science for the Public from 10<sup>th</sup> to 11<sup>th</sup> October 2019 at the Academy of Arts and Sciences, Accra.
- An Africa Geospatial Data and Internet Conference 2019 (AGDIC) under the theme “Shaping Africa’s Digital Future from 22<sup>nd</sup> to 24<sup>th</sup> October 2019 at the Accra International Conference Centre, Accra.

**Annor J. ;** Participated in an AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.

### Bekoe S. attended

- An MDAs Training and Compilation of Sustainable Development Goals (SGDs) Indicators Data and Metadata from 8<sup>th</sup> to 9<sup>th</sup> April 2019 at Alisa Hotel, Accra.
- An Impact Evaluation of West Africa Agricultural Productivity Programme Training Workshop for Data Collection in Ghana from 1<sup>st</sup> to 4<sup>th</sup> May 2019 at CSIR-STEPRI
- A Workshop on Science, Technology and Innovation (STI) Indicators Review from 13<sup>th</sup> to 14<sup>th</sup> June 2019 at the School of Nuclear and Allied Sciences (SNAS), Atomic.
- A Ghana E-Agriculture Content Evidence-Based Workshop from 22<sup>nd</sup> to 23<sup>rd</sup> July 2019 at MoFA E-Agriculture Resource and Call Centre, Accra.
- An Africa Geospatial Data and Internet Conference held at Accra International Conference Centre from 22<sup>nd</sup> to 24<sup>th</sup> October 2019 at the Accra International Conference Centre.



- The 2<sup>nd</sup> CSIR-RSA Scientific Conference themed “Managing Water and Environment for Sustainable National Development” from 22<sup>nd</sup> to 25<sup>th</sup> October 2019 at the Credit Unions Training Centre, Kasoa.

**Danquah P.A attended**

- A Civil Society Cyber Security Training from 21<sup>st</sup> to 22<sup>nd</sup> February 2019 at Alisa Hotel, Accra.
- A workshop for Development of Online Grants Management Systems from 14<sup>th</sup> to 15<sup>th</sup> October 2019 at UNCST, Kampala, Uganda.
- An Innovation Africa 2019 Summit from 3<sup>rd</sup> to 4<sup>th</sup> December 2019 at Movenpick Hotel, Accra.

**Decardi-Nelson A. attended**

- A Mentoring and Career Development for Early Career Research Scientists and Technologists Workshop on 24<sup>th</sup> January 2019 at CSIR-STEPRI.
- An Entrepreneurial Training Workshop from 19<sup>th</sup> to 21<sup>st</sup> February 2019 at CSIR-FRI.
- An AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.
- A Gender Mainstreaming In Higher Education and Research from 6<sup>th</sup> to 7<sup>th</sup> December 2019 at the IDL Conference Centre, KNUST, Kumasi.

**Folitse B.Y. ;** Participated in an AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.

**Gordon V. ;** Participated in a Mentoring and Career Development for Early Career Research Scientists and Technologists Workshop on 24<sup>th</sup> January 2019 at CSIR-STEPRI.

**Kessey M. B. ;** Participated in a PyCon Africa Conference from 6<sup>th</sup> to 10<sup>th</sup> August 2019 at the Bank of Ghana Auditorium at the University of Ghana, Legon.

**Manteaw S.A. attended;**

- An African Green Revolution Forum (AGRF 2019) themed “Leveraging Digital Transformation to Drive Sustainable Food Systems in Africa” from 3<sup>rd</sup> to 6<sup>th</sup> September at the Accra International Conference Centre, Accra.
- A Co-creation Dialogue for the USAID/CORAF Research, Extension and Advisory Coordination HUB (REACH) in West Africa from 9<sup>th</sup> to 10<sup>th</sup> September 2019 at the Royal Horizon Baobab Hotel, Somone, Senegal.

- The Opening Ceremony at the Maiden Conference of the African Plant Breeders Association (APBA) as the Special Guest from 23<sup>rd</sup> to 25<sup>th</sup> October 2019 at the Department of Economics, University of Ghana.
- A Technical Roundtable on Petroleum Revenues Spent on Agriculture on 24<sup>th</sup> October 2019 at Golden Tulip Hotel, Accra.
- The 15<sup>th</sup> Annual General Meeting of the Regional Universities' Forum for Capacity Building in Agriculture (RUFORUM) from 2<sup>nd</sup> to 6<sup>th</sup> December 2019 at the University of Cape Coast.

**Mingle N. A. participated;**

- An AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.
- A Gender Mainstreaming In Higher Education and Research from 6<sup>th</sup> to 7<sup>th</sup> December 2019 at the IDL Conference Centre, KNUST, Kumasi.

**Ohene-Affih B. ;** Participated in a PyCon Africa Conference from 6<sup>th</sup> to 10<sup>th</sup> August 2019 at the Bank of Ghana Auditorium at the University of Ghana, Legon.

**Opoku E. ;** Participated in a Gender Mainstreaming In Higher Education and Research from 6<sup>th</sup> to 7<sup>th</sup> December 2019 at the IDL Conference Centre, KNUST, Kumasi.

**Prikutse F.L. attended;**

- A creativity and Innovation Workshop in Commemoration of the World Creativity and Innovation Day on 2<sup>nd</sup> May 2019 at the Accra Digital Centre.
- A Workshop on Technology Innovation on 6<sup>th</sup> May 2019 at Accra Digital Centre.
- A Panel Discussion on the Development, Promotion and Benefits or Otherwise for Genetically Modified Organisms (GMO'S) In Ghana on 15<sup>th</sup> May 2019 at CSIR-STEPRI, Airport.
- An AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.

**Sackey T.A. attended;**

- A Panel Discussion on the Development, Promotion and Benefits or Otherwise for Genetically Modified Organisms (GMO'S) In Ghana on 15<sup>th</sup> May 2019 at CSIR-STEPRI, Airport.
- An AWARD LEPARD Workshop on Leadership from 10<sup>th</sup> to 14<sup>th</sup> June 2019 at Coconut Grove Regency Hotel, North Ridge.

**Sawyerr A. attended;**

- A Mentoring and Career Development for Early Career Research Scientists and Technologists Workshop on 24<sup>th</sup> January 2019 at CSIR-STEPRI.
- A Panel Discussion on the Development, Promotion and Benefits or Otherwise for Genetically Modified Organisms (GMO'S) In Ghana on 15<sup>th</sup> May 2019 at CSIR-STEPRI, Airport.
- A Seminar themed "A Research Evaluation of the Ghana National Scholarly Publishing System; 2008-2020" on 2<sup>nd</sup> August at CSIR-STEPRI, Accra.
- An Annual Review Meeting on Quality Management Systems as a Focal Person from 12<sup>th</sup> to 13<sup>th</sup> November 2019 at CSIR-SRI, Kumasi.

**Twum-Barimah Y. ;** Participated in a Mentoring and Career Development for Early Career Research Scientists and Technologists Workshop on 24<sup>th</sup> January 2019 at CSIR-STEPRI.

**Wilson M. attended;**

- A Mentoring and Career Development for Early Career Research Scientists and Technologists Workshop on 24<sup>th</sup> January 2019 at CSIR-STEPRI.
- A Training Workshop on Quality Management Systems for Focal Persons from 15<sup>th</sup> to 16<sup>th</sup> April 2019 at CSIR-SRI.
- An AWARD LEPARD Workshop on Gender Awareness on 10<sup>th</sup> June 2019 at CSIR Head Office.
- A National Connect Project Workshop themed "Mainstreaming Biodiversity into the Heart of Government Decision-Making-Invitation to Workshop on Development of Biodiversity Information Products" from 16<sup>th</sup> to 17<sup>th</sup> July 2019 at City Escape Hotel, Accra.
- An AfriCup Conference on Smart Cities and Open Innovation in Africa, What Opportunities for Startups? from 23<sup>rd</sup> to 25<sup>th</sup> September in Tunis.
- The 9<sup>th</sup> Innovation Africa Conference from 3<sup>rd</sup> to 5<sup>th</sup> December 2019 at Movenpick Hotel, Accra

**Zainudeen M.N. attended;**

- A Mentoring and Career Development for Early Career Research Scientists and Technologists Workshop on 24<sup>th</sup> January 2019 at CSIR-STEPRI.

# APPENDIX III

## Staff List as at 31<sup>st</sup> December 2019

### SENIOR MEMBERS

No	NAME	PRESENT DESIGNATION	QUALIFICATION
1	Dr. Seth Awuku Manteaw	Director/Senior Scientific Information Officer	PhD (Agricultural Extension); MSc (Agronomy); PG Dip.(Communication Studies); MA (Communication Studies)
2	Mrs. Lucy Payne Dzandu	Deputy Director/ Principal Librarian	MPhil (Library Studies); M.A. (Library Studies); PGDip (Education); BA (Hons) Sociology & Political Science
3	Mr. Joseph A. Anyen	Senior Accountant	MBA (Finance); I.C.A.; BSc.(Admin) Accounting Option
4	Dr. Albert N. M. Allotey	Senior Research Scientist	PhD (Geography & Resource Development);MPhil (Geography & Resource Development) BA (Hons) Geography & Resource Dev't
5	Mr. Benjamin Yao Folitse	Senior Librarian	MPhil (Agricultural Extension); M.A.(Library Studies); B.Ed. (Agric); Dip (Agric Ed.)
6	Mrs. Grace Obeng-Koranteng	Senior Librarian	M.A. (Library Studies); BA (Hons) Information Studies with History; Dip (Librarianship)
7	Dr. Paul Asante Danquah	Senior Research Scientist	PhD (Info. Technology); MSc. (Info. Security); BSc.(Hons) Computing
8	Dr. Stephen Bekoe	Senior Scientific Information Officer	PhD (Informatics); MSc. (Information Studies); BA (Hons) Publishing Studies
9	Mrs. Dorothy Awanyo	Administrative Officer	MBA (Human Resource Mgt) BA (Public Admin.); Dip. (Librarianship)
10	Dr. Agnes Decardi-Nelson	Research Scientist	PhD (African Art & Culture); BFA (Graphic Design)
11	Dr. Mahamuda A. Mahamadu	Scientific Information Officer	PhD (Information & Communication Eng.) M.Sc. (Electrical Engineering); BSc.(Hons) Computer Science / Statistics)

12	Mr. Felix Tetteh Kabutey	Scientific Information Officer	MPhil (Botany); BSc. (Applied Biology with Env. Sci.); Teacher's cert "A"
13	Mrs. Naa Aku Mingle	Librarian	MPhil (Information Studies) BA (Psychology & Linguistics)
14	Mr. Yaw Twum Barimah	Chief Technologist	MSc. (Telecom); BSc. Elec. & Computer Engineering
15	Mr. Victor D. Gordon	Chief Technologist	MSc. (Telecom; & Internet Telecom.)
16	Mr. Michael Wilson	Chief Technologist	MPhil. (Computer Engineering); PostGrad. (Wireless & Mobile Computing); CDAC; BSc. Computer Eng.;
17	Mr. Mohammed N. Zainudeen	Chief Technologist	MSc. (Chemical Eng.); BSc.(Hons) Chemical Eng.
18	Mr. Akilakpa Sawyerr	Chief Technologist	MPhil (Radiation Protection); BSc.(Physics)
19	Mr. Christian K. Lettu	Chief Technologist	MPhil (Dev. Geography); BA (Hons) Geography & Resource Development
20	Mr. John Annor	Chief Technologist	MPhil (GIS & Remote Sensing); B.A. (Geography)
21	Mr. Joshua Kalognia	Principal Technologist	MPhil (Radiation Protection); BSc. (Physics)
22	Mr. Frank Lemdi Prikutse	Principal Technologist	MSc. (Telecom Engineering); B.Eng. (Telecom Engineering)
23	Mr. John Adjah	Principal Technologist	MA (Communication Design); BA (Publishing Studies)
24	Mrs. Maame Birago Kessey	Principal Technologist	MSc. (Information Technology); BSc. (Computer Engineering)
25	Ms. Tracy Adjeley Sackey	Scientific Secretary	MPhil (Radiation Protection); BSc.(Physics & Computer Science)

## SENIOR STAFF

No	NAME	PRESENT DESIGNATION	QUALIFICATION
1	Mr. Edwin Adotevi	Senior Technologist	BA (Comm. Studies)
2	Mrs. Janet Otoo-Abedi	Chief Accounting Assistant	Diploma (Public Finance and Accountancy)
3	Ms. Bernice Acorlor	Chief Administrative Assistant	HND (Secretariaship & Mgt)
4	Ms. Cordellia Akua Busumtwi	Chief Administrative Assistant	Cert. (Private Secretary)
5	Mrs. Faizatu Yakubu	Chief Auditing Assistant	BCom ICA (Gh) Part III (Commerce)
6	Mrs. Margaret Ivy Koranteng	Chief Library Assistant	Diploma (Librarianship)
7	Ms. Esther Opoku	Chief Library Assistant	BA (Information Studies and Sociology); Diploma (Librarianship)
8	Mr. Atta Ampofo Addo Snr.	Chief Library Assistant	CIM (Level 1); BA (Info. Studies & Sociology)
9	Mrs. Akua Boateng Agyenim	Chief Marketing Assistant	MBA (Marketing) BA (Publishing)
10	Mr. Emmanuel E. Davidson	Chief Technical Officer	Cert. Basic Cartography
11	Ms. Sarah Mensah	Principal Accounting Assistant	Dip.(Public Finance and Accountancy)
12	Ms. Risikatu Lawal	Principal Accounting Assistant	BSc.(Accounting); DBS (Accounting); CIPS Cert. (Purch.&Supply)
13	Mr. Alex K. I. Ocansey	Principal Assistant Printer	Cert. (ITS) Snr.Sup/Mgt; N.V.T.I. Grade I Cert.
14	Mr. William K. Akpakli	Principal Security Officer	BA (Social Work with Psychology); SSSCE; BECE
15	Mr. Samuel Ankrah	Senior Accounting Assistant	Bachelor of Commerce; HND (Accountancy); SSSCE; BECE
16	Mr. Eric Sam	Senior Technical Officer	BFA (Animation), HND (Graphic Designing)
17	Mr. Robert Abomoi	Senior Security Officer	Security Trg. Module 3; M.S.L.C.
18	Mr. Roland A. Pappoe	Technical Officer	Cert (Linux Network Admin.); City & Guilds Grad. Dip.(Microtech) I & II
19	Mr. Eric K. Acquaye	Technical Officer	Advanced Certificate in Microsoft Certified Systems Eng. (GIMPA); SSSCE
20	Mr. Benjamin Ohene-Affih	Technical Officer	B.Eng.(Computer Science)
21	Mr. John Paapa Awotwi	Technical Officer	Bsc. Information Technology
22	Ms. Samiratu A. Mamah	Technical Officer	BA (Communication Design)
23	Mr. Yaw Owusu-Ayirebi	Technical Officer	BA (Graphic Design)

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24	Ms. Doris Kumiwa	Administrative Assistant	Dip (BCom Management) DBS (Secretariaship); Nat. Banking Coll.(Cert Cashier & Frontline Exec)
25	Mr. Cephas Awusie	Security Officer	Security Training Module I; G .C. E.'O' Level
26	Mr. Abdul Rahaman Iddrisu	Security Officer	Security Training Module I; M.S.L.C.
27	Mr. Timothy Kwamena	Assistant Transport Officer	Cert .(Trans Mgt); Intercity STC Coaches Ltd.; MSLC

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## JUNIOR STAFF

No	NAME	PRESENT DESIGNATION	QUALIFICATION
1	Mrs. Salamatu Abdul Mumuni	Senior Clerk	NACVET Cert.(Stenographer)
2	Ms. Yvonne D. Azuma	Senior Clerk	Dip. Business Administration
3	Ms. Lucy Akyempon	Senior Clerk	“O” level, DBS
4	Mr. Simon Angabe	Senior Security Assistant	Security Training Module I; MSLC
5	Mr. Nathan K. Aborgeh	Senior Security Assistant	Security Training Module I; M.S.L.C.
6	Mr. Fuseini Inusah	Senior Security Assistant	SSSCE
7	Mr. Charles Kulley	Junior Library Assistant	SSSCE
8	Mr. Bantie Habila Hussein	Junior Library Assistant	SSSCE
9	Mr. Enos Awusie	Traffic Supervisor	Intercity STC (Def. Driving Course); MSLC
10	Mr. Joseph Lamptey	Traffic Supervisor	Intercity STC (Def. Driving Course); BECE
11	Mr. Seth Asare	Artisan	Special Junior Tech. Super. Mgt Course, ITS – Accra; MSLC
12	Mr. Jonathan Sotie	Driver Grade I	NVTI (Motor Vehicle Mechanic I); BECE
13	Mr. Mathew Narteh Amoatey	Driver Grade I	City & Guild (Mech. Eng. Craft Practice); BECE; Driv. Lic “C”
14	Mr. Razak Ayidana Akambase	Supervisor Grade I	B.E.C.E.
15	Mr. Kojo Asanaab	Supervisor Grade I	B.E.C.E.
16	Mr. Isaac G. Amponsah	Supervisor Grade I	NVTI GD II
17	Mr. Robert Achandi	Supervisor Grade II	M.S.L.C.
18	Mr. Francis Ayarik	Supervisor Grade II	Nil
19	Mr. Abdul Wahab Usman	Senior Headman	Nil