



**FOOD RESEARCH INSTITUTE OF
THE COUNCIL FOR SCIENTIFIC AND
INDUSTRIAL RESEARCH (CSIR-FRI)**



Annual Report 2009

FOOD RESEARCH INSTITUTE

Council for Scientific and Industrial Research

P. O. Box M20, Accra, Ghana

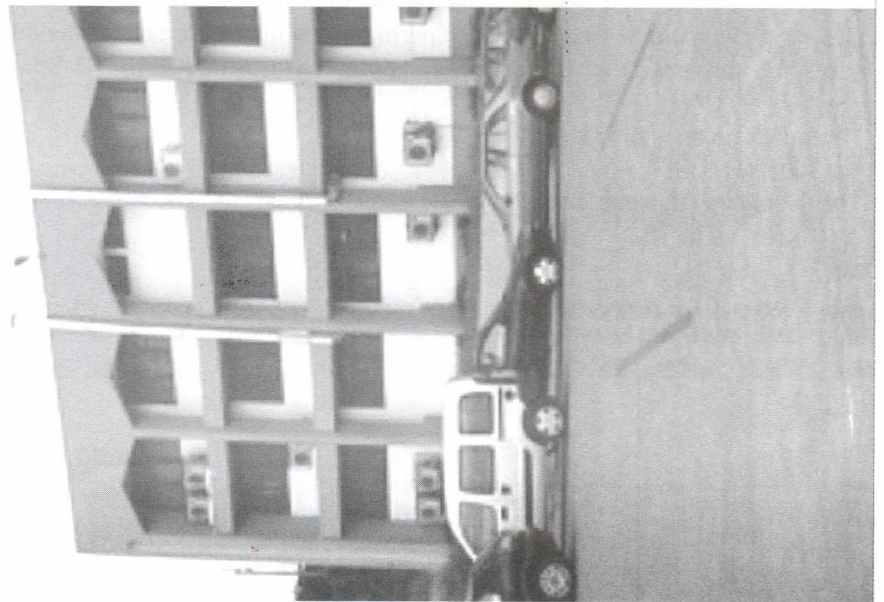
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CSIR-Food Research Institute

Annual Report 2009



Published by:

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Council for Scientific and Industrial Research
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The Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR) is an internationally recognized centre of expertise in research into problems of food processing and preservation, storage, marketing, distribution and utilization, in support of the food industry and also to advise the Government of Ghana on its food policy.

This publication is an output of the CSIR-FRI. The views expressed are solely that of the Institute.

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This publication should be cited as follows:

The CSIR-Food Research Institute (2009) Annual Report CSIR-FRI, Accra, Ghana

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APPENDICES

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LIST OF ACRONYMS

BNARI	–	Biotechnology and Nuclear Research Institute
C: AVA	–	Cassava Adding Value to Africa
CCID	–	Central Commercialization and Information Division
CID	–	Commercialization and Information Division
CSIR	–	Council of Scientific and Industrial Research
CSU	–	Client Service Unit (CSU)
EU	–	Engineering Unit
FMD	–	Food Microbiology Division
FRI	–	Food Research Institute
GAEC	–	Ghana Atomic Energy Commission
GoG	–	Government of Ghana
GTZ	–	German Technical Services
HACCP	–	Hazard Analysis and Critical Control Points
HQCF	–	High Quality Cassava Flour
IFG	–	Internally Generated Fund
IIR	–	Industrial Research Institute
ISU	–	Industrial Service Unit
KNUST	–	Kwame Nkrumah University of Science and Technology
MiDA	–	Millennium Development Authority
MoFA	–	Ministry of Food and Agriculture
MOU	–	Memoranda of Understanding
MU	–	Mushroom Unit
NGO	–	Non-Governmental Organization
PTB	–	Physikalisch Technische Bundesanstalt
PEF	–	Private Enterprise Foundation
PRO	–	Public Relations Officer
PSPU	–	Pilot-Scale Production Unit
RTIMP	–	Root and Tubers Improvement and Marketing Program
RTO	–	Root and Tuber Organizations
RTPDU	–	Root and Tuber Products Development Unit
SME	–	Small and Medium Scale Enterprise
TTSP	–	Technically Trained Service Provider
UCC	–	University of Cape Coast
UDS	–	University of Development Studies
UNIDO	–	United Nations International Development Organization
WIAD	–	Women in Agriculture Development Directorate

MEMBERS OF CSIR-FRI MANAGEMENT BOARD

1.	Dr. Osei Boeh-Ocansey	Director-General, PEF	Chairman
2.	Dr. P-N.T. Johnson	Ag. Director, CSIR-FRI	Member
3.	Dr. E.B. Hagan	Director, IIR (Cognate)	"
4.	Dr. (Mrs.) R. Entsua-Mensah	Deputy Director-General (CSIR)	"
5.	Mr. Timothy A. Osei	Chartered Accountant	"
6.	Prof. Josephine Nketsia-Tabiri	Director, BNARI, GAEC	"
7.	Mr. Charles Debrah Asante	Cocoa Processing Company	"

MEMBERS OF CSIR-FRI INTERNAL MANAGEMENT COMMITTEE

- | | | | |
|-----|----------------------------|---|---|
| 1. | Dr. P-N. T. Johnson | - | Ag. Director |
| 2. | Dr. W. A. Amoa-Awua | - | Head Food Microbiology Division |
| 3. | Dr. (Mrs.) K. Kpodo | - | Head, Food Chemistry Division |
| 4. | Dr. N. T. Dziedzoave | - | Ag. Head, Food Proc. & Engineering Division |
| 5. | Dr. J. T. Manful | - | Head, PPSU-FPED |
| 6. | Ms. J. Aggrey-Yawson | - | Ag. Head of Administration |
| 7. | Dr. (Mrs.) M. Ottah Atikpo | - | Head, ISU-FMD/ |
| 8. | Mr. D. Blay | - | Head, EU-FPED |
| 9. | Mr. C. Tutu-Aikins | - | Ag. Head, Accounts |
| 10. | Dr. C. Tortoe | - | President Local RSA |
| 11. | Mr. D. Asiedu | - | Chairman, Staff Welfare Committee |
| 12. | Mr. Ben Awotwi | - | Chairman, SSA-FRI |
| 13. | Mr. M. Amoo-Gyasi | - | Chairman, TUC |
| 14. | Ms. Mary Halm | - | Quality Manager |
| 15. | Mr. S. Nketia | - | Scientific Secretary |

EXECUTIVE SUMMARY

Food Research Institute (FRI) is one of the 13 Institutes of Council for Scientific and Industrial Research (CSIR). The goal of the Institute is to assist in poverty alleviation through creation of opportunities for generating and increasing incomes within the micro, small, medium and large scale food industry; contribute to food security, foreign exchange earnings and the application of cost-effective food processing technologies that are environmentally friendly.

The Institute's main objective is to introduce suitable or appropriate technologies to help reduce post-harvest losses and also to provide technical support for the development and growth of the local food processing industry. The Institute conducts market-oriented applied research and provide technical services and products to the private sector and other stakeholders and provides scientific and technological support to the growth of the food and agricultural sectors of the national economy.

CSIR-FRI continued to be a fulcrum of national development planning in 2009. It provided technical and analytical services to industry as well as research and consultancy services to governmental and international development agencies. The institute generated more funds than it did in 2008. Analytical services for Microbiology and Chemistry for example, increased substantially during the year. The Food Microbiology Division (FMD) undertook 158% more samples than in 2008 for enterprises and companies and did 195% more samples for individuals than in 2008. In money terms, FMD generated a gross of GH¢239,421.50 in 2009 as compared to GH¢119,301.70 in 2008. The Mushroom Unit of the FMD recorded an increase in gross revenue from GH¢8,794.00 in 2008 to GH¢11,523.20 in 2009 representing an increase of 131.5%. The Chemistry Division received 569 samples for analyses. This represented a 33% increase over the 428 samples received in 2008. This generated a gross income of forty five thousand, six hundred and nineteen Ghana cedis (GH¢45,619.00)

as against thirty four thousand, seven hundred and fourteen Ghana cedis (GH¢4,714.00) for 2008. This represents an increase of 31.4% over 2008.

The Institute faced some serious financial challenges. There was delay of Government subventions to meet commitments under personnel emoluments, administrative, research and investment activities. Government releases were inadequate to meet our projected expenses.

A number of publications were made in refereed journals including the Critical Reviews in Microbiology, International Food Research Journal, Journal of Human Ecology, Science Direct, Journal of Root Crops, Journal of Food Process Engineering, International Journal of Biological and Chemical Sciences, International Journal of Consumer Studies, African Journal of Biotechnology, Ghana Journal of Agriculture Science, Journal of Ghana Science Association. There were also number presentations made at international conferences such as the 2nd African Conference on Edible and Medicinal Mushrooms in March, 2009 as well as some consultancy reports.

The Millennium Development Authority (MiDA) contracted the CSIR-FRI as a Technical Training Service Provider to train fifteen farmer-based Organizations in the West Mamprusi and Savelugu-Nanton Districts of the Northern Intervention Zone for under the MiDA Agricultural Project.

A number of training workshops for processing of fruits and vegetables were organized in collaboration with the Women in Agriculture Development (WIAD) of the Ministry of Food and Agriculture- (MoFA), Accra.

The Institute received a number of visitors including the Honourable Minister, Miss Sherry Ayittey and her deputy Dr. Edward K. Omane Boamah. Dr. Abdullahi Baba Salifu, Director-General of CSIR also visited the Institute on many occasions.

1.0 ADMINISTRATION DIVISION

Introduction

During the review year, the Administration Division continued to provide support services and created an enabling environment to facilitate effective and efficient performance of work by all the Divisions of the Institute.

Staff Strength

Staff strength at the end of 2009 stood at 176. This was made up of the following categories of staff (Table 1). Details of staff and their positions are shown in Appendix I.

Table 1.1: Staff Strength

Category of Staff	Number
Senior Members	45
Senior Staff	61
Junior Staff	70
Total	176

Appointments

Dr. P-N.T Johnson (Principal Research Scientist and the Deputy Director), was appointed as the Acting Director with effect from 1st July, 2009. Also, Dr. Nanam Tay Dziedzoave [Senior Research Scientist and Head of the Root and Tuber Processing Demonstration Unit (RTPDU)] of the Food Processing and Engineering Division (FPED) was appointed Acting Head of the Division. His appointment took effect on 1st August, 2009. The following were also given temporary appointments:

- Ms. Angela Adams: Technologist in the Food Microbiology Division.
- Messrs Kojo Adamu, Richard Ohimeng Boateng, Emmanuel Tetteh Kpatey, Edmund Gyapong, Joseph Adivor and Daniel Obeng: Labourers.

Promotions and Upgrading

Sixteen staff members were promoted as shown in Appendix II.

Human Resource Development

The Institute continued to grant training

opportunities to staff to enable them acquire skills and knowledge needed to enhance their performance. Twelve (12) members of staff were under training while seven (7) members of staff had completed their training during the reporting period as shown in Appendix III.

Resumption of Duty after Study Leave

Messrs. Charles Diako, Eric Ofori, Mrs. Linda Hagan and Ivy Yawson and Ms. Matilda Dzomeku, Bernice Kudjawu returned to post after successfully completing their various courses of study.

Internal Transfer

Mr. Luke Anak, (Senior Labourer) was transferred to the Engineering Unit after he upgraded himself in that field.

Secondment

Dr. Pearl Adu-Amankwah, a Senior Research Scientist and the Head of the Commercialization and Information Division (CID) was seconded to the CSIR Head Office on 1st July 2009. She is currently the Acting CCID Director of the CSIR.

Attachment Training

The Institute continued to offer attachment training to a number of students from the various Universities and Polytechnics in the country. In all, 31 students undertook attachment training in the Institute.

National Service

A number of National Service Personnel were posted to the Institute during the year. They were attached to the various divisions.

Vacation training

Five (5) students from University of Development Studies (UDS), Kwame Nkrumah University of Science and Technology (KNUST) and University of Cape Coast (UCC) were attached to the Food Microbiology Division during their long vacation.

Visitors

The Sector Minister Ms. Sherry Ayithey, the Deputy Minister Dr. Edward K. Omane Boamah and the CSIR

Director-General Dr. A. B. Salifu visited the Institute on 30th July, 2009. A team from the CSIR Head Office comprising Dr. Pearl Adu-Amankwa, the Acting (CCID) Director also paid a working visit to the Institute on Wednesday 29th July, 2009.



Fig. 3.1: The Minister for Environment, Science and Technology Hon. Sherry Ayittey and the Director-General of CSIR, Dr. A. B. Salifu visited the Institute

Retirement

During the year, the Director of the Institute, Dr. W.A Plahar proceeded on leave prior to compulsory retirement after 34 years of meritorious service with the Institute and the CSIR. The under listed staff also proceeded on retirement:

- Dr. Seewu Noamesi (Research Scientist)
- Mr. Peter Toku (Principal Technologist)
- Mr. George Ohene Gyamfi (Chief Stores Superintendent)
- Mr. Ben Patrick Osae (Principal Technical Officer)
- Mr. Kojo Acquah (Senior Headman)
- Mr. Ben Ahiabu (Headman)
- Ms. Soshie Adjasey (Skilled Laborer)

Mr. Richard Mensah, Chief Technical Officer (Food Processing and Engineering Division) went on voluntary retirement.



Fig. 3.2: The former Director, Dr. Wisdom Plahar (middle) and his wife being presented with a gift by the Acting Director Dr. P-N. T. Johnson during his send-off party

Bereavement

Mr. William Fynn Kweku Christian, the first Ghanaian director of the Institute (1965-1970) passed on, on June 9, 2009. He was 79. Mr. Christian became a co-Director of the then Food and Agricultural Organisation/United Nations Development Programme's (FAO/UNDP) Food Research Project that was sponsored by the Government of Ghana that span from 1963-65. After the FAO/UNDP contract ended, Mr. Christian became the substantive Director of the CSIR-FRI in 1965.

During his career at CSIR/FRI, Mr. Christian was involved in the initial stages of the popular Food Research Institute Fish Processing Project that led to the development of the world famous Chorkor Fish Smoker.

2.0 ACCOUNTS DIVISION

Introduction

The Accounts Division is responsible for maintaining effective and efficient accounting and financial systems. The Division ensures that, the Institute is in compliance with the CSIR stores and financial regulations and other statutory legislations. The Division supports all the other Divisions to carry out their financial obligations for the smooth running of the Institute. It prepares the financial statement, annual budgets, and administers funds from donors. There are two main sections of the Division: Finance and Accounts, and the Stores. The Finance and Accounts Section is made up of the ledger, the payroll, procurement and the cash units. The Stores Section undertakes procurement duties, receives and issues items procured for effective running of the Institute. The items include chemicals, media, stationery, etc.

Major Activities

- The major activities of the Division include:
- preparation of financial statements for the Institute;
- preparation of financial report on Government of Ghana (GoG) funds and disbursements;

- ensure that funds from donors comply with programmed budgets;
- ensure compliance with taxation and other financial reporting regulations;
- manage the payroll function to ensure efficient processing systems and better control mechanisms;
- oversee both internal and external auditing of our books, review and analyze reports and give recommendations when appropriate;
- preparation of monthly and quarterly financial reports to CSIR Secretariat and other statutory bodies.

Accounting System

The accounting system of the Institute was assessed to be in-line with the stores and financial regulations of the CSIR. The system established is satisfactory for capturing financial data i.e. revenue, expenditure, assets and liabilities. Segregation of duties was found to be adequate and well spelt out with different staff responsible for different functions e.g. payroll, final accounts, cash receipts and payments, procurement etc. The financial overview is shown in Table 2.1.

Table 2.1: Financial Overview

Item	FRI Budgeted Income	Actual Income	Actual Expenses	Difference
	(GH¢)	(GH¢)	(GH¢)	(GH¢)
Personnel Emoluments	1,641,984.00	1,357,452.00	1,892,664.00	(535,209.00)
Administrative Expenses	373,050.00	19,944.00	140,582.00	(120,638.00)
Service Activities	115,000.00	-	-	-
Investment Activities	60,000.00	-	-	-
IGF (Gross Income)	-	380,592.00	261,729.00	118,863.00
TOTAL	2,190,034.00	1,757,988.00	2,294,975.00	(536,984.00)

The total receipts for the period amounted to GH¢1,757,988.00 of which 78% represents government subvention for personnel emolument and administrative expenses. Subvention under administration has been received to May 2009 as at time of reporting and no receipt has been made for services and investments.

CSIR-FRI Internally Generated Fund (IGF)

The total internally generated income yielded GH¢380,592.00 representing 22% of the total income. Out of this amount GH¢261,729.00 was spent on other expenses and for the provision of capital items such as furniture, fridges, etc. yielding a net income of GH¢118,863.00.

Constraints

These include:

- working under strict budgetary constraint.
- delay in receiving Government subventions to meet commitments under personnel emoluments, administrative, research and investment activities.
- Government releases which were

inadequate to meet our projected expenses.

- lack of co-operation in meeting deadlines for accounting for imprest taken by staff.
- Imprest taken by staff in 2008 was GH¢7,108.27 showing an increase of 60%.

Main activities in the year

The following activities for the Division were accomplished:

- the 2010 annual budget was prepared awaiting defense at the ministries;
- the 2008 final accounts was prepared and audited awaiting signature by management;
- all statutory reports to the ministries, CSIR and other statutory organizations were made;
- major entries for the 2009 final accounts have been made to December.

Commercial Accounts For Year Ending 31st December 2009

The commercial accounts for the year ending 31st December 2009 are shown in Appendix IV.

3.0 COMMERCIALISATION AND INFORMATION DIVISION

Introduction

The basic task of the Commercial and Information Division (CID) is to coordinate the commercial activities of all the other Divisions in order to generate income for the Institute. The CID is made up of the Client Services Unit and Library and Publications Unit.

Client Service Unit

The Client Service Unit (CSU) is the interface between the CSIR-FRI and its clients for analytical services in microbiology, chemistry and mycotoxin. It also facilitated other services such as drying of products, sale of mushroom, and training. The CSU received a total of 2,333 samples that amounted to GH¢311,091.99 (Table 3.1).

Table 3.1: Total amount generated by Mycotoxin, Chemistry and Microbiology in 2009

ANALYSES	NO. OF SAMPLES	R REVENUE (GH¢)
Mycotoxin	299	3,888.00
Chemistry	569	47,483.95
Microbiology	1,524	239,720.04
TOTAL	2,322	311,091.99

Library and Publications Unit

CSIR-FRI's library provides and disseminates information in the field of food science and technology, nutrition, food microbiology, aflatoxin and mycotoxin, agricultural economics and food engineering in the country.

The library has about 4000 books and over 200 back issues of scientific journals in its stock. The library also currently has a subscription for ten scientific journals.

The clientele of the library has extended beyond the Institute's research and technical staff to include students from the various universities and polytechnics in the country. The library is also

patronized by lecturers, farmers, industrialists, journalists, civil servants and public servants, consultants and many others. On the whole, the clientele acknowledge that the information provided was useful but there was the need to improve the current stock.

Queries received during the period included processing, preservation and post harvest handling of the commonly grown crops and foods eaten in the country, oil processing, shelf life of the major food types, agro-chemicals, extrusion of some food products, food analysis and food balance sheet for Ghana, mushroom cultivation, fish smoking, osmotic dehydration, methods of food preservation, food hygiene practices, HACCP in food processing.

The library enjoyed the availability of internet connectivity making it possible for the Institute's research scientists and technical staff to access full text articles browse the internet and access their electronic mails.

The photocopy machine that was acquired during the previous year continues to render immense services to the clientele that patronize the library. The users of the library made the following recommendations:-

- acquisition of current publications to replenish the outdated stock
- acquisition of more computers to enable the library operate an internet services

Media relations were as usual excellent. The media was regularly monitored. There were no adverse comments in the media networks. Several articles were published in the *Daily Graphic* including a feature on the Second African Conference on Edible and Medicinal Mushrooms that was held in March. A number of events that were hosted by the Institute were posted on the CSIR and FRI websites

Internal relations

The Public Relations Officer (PRO) as usual, wrote citations for retiring members of staff.

Exhibitions

The PRO mounted exhibitions at the 2nd African conference on Edible and Medicinal Mushrooms held at the Noguchi Memorial Centre for Medical Research in May and at the Conference of the World Association of Technological and Research Organization (WAITRO) at the College of Physicians, Accra.

Meetings

The PRO and Scientific Secretary attended a meeting of the CSIR Committee and PROs and Scientific Secretaries.

Visitors

Fifty-five (55) students from the Mona Lisa School and 9 from New Achimota School also visited the Institute.

4.0 FOOD PROCESSING AND ENGINEERING DIVISION

Introduction

The Food Processing and Engineering Division is the largest Division in the Food Research Institute. Its main role is to undertake research and development activities in food processing to add value to staple food crops. It also helps many clients wanting to start up food processing centres as well as offer a number of processing services to clients. The Division is made up of the Pilot-Scale Production Unit (PSPU), the Engineering Unit (EU), and the Root and Tuber Products Development Unit (RTPDU) at Pokoase.

The Pilot-Scale Production Unit (PSPU)

The Process Control Laboratory under the Unit provided various analytical services for several clients. The breakdown of services provided is shown in Table 4.1 as follows:

Table 4.1:

Services provided by the Process Control Laboratory

Type of Analysis	Number of Clients	Number of Samples Analysed
Pasting Characteristics	5	72
Moisture Content	7	80
Water Activity	7	65
Total soluble solids	3	31
Physical Quality of Rice	1	3
Colour Determinations	5	56

The Unit also provided various technical services to clients as listed below (Table 4.2):

Table 4.2:

Technical services provided to clients

Type of service	Number of Clients	Quantity of Products Handled
Roasting of Groundnut	1	22 bags
Roasting of Coffee	1	100kg
Drying of <i>Banku</i> Mix	1	2 bags
Drying of <i>Moringa</i> Leaves	8	8 bags
Drying of Soya Beans	4	4 bags

Table 4.2 cont.

Drying of <i>Tuozafi</i>	1	2 bags
Drying of Cocoyam	3	1 bag
Drying of Fruits	2	25 crates
Drying of <i>Hausa Koko</i>	1	1 bag
Drying and dehulling of <i>Agushie</i> seeds	1	100kg
Dehulling of beans	3	5 bags

The Engineering Unit (EU)

In addition to the routine maintenance of processing, analytical machine and equipment of all Divisions of the Institute, the Unit also constructed a number of processing machines and equipment either ordered by Institute's clients or under various donor-funded projects. These included:

- Two (2) Hammer Mills for FRI Clients constructed within the year.
- Relocation & Reinstallation of 2 cassava presses and a Slicer at the RTPDU Pokoase
- Development of a Centrifuge Press for Cassava Processing is under progress at the FRI Workshop.
- The Development of an Ethanol Distilling Equipment from cassava is also in progress at the FRI Workshop, under the C: AVA Project.
- Construction of dryers for the Methodist University and the Building and Roads Research Institute (BRRI).

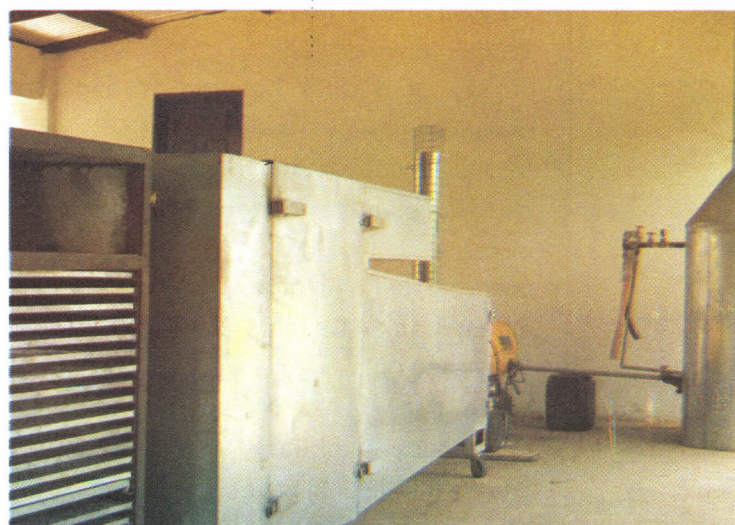


Fig. 4.1: Fruit and vegetable drier fabricated in the Food Processing and Engineering Division

The Root and Tuber Products Development Unit (RTPDU)

During the year the Root and Tuber Products Development Unit (RTPDU) processed 10.3 tons of fresh cassava as well as reprocessing of 18.6 tons of fermented cassava dough and 6 tons of pre-dried cassava grits. The total product output from these operations was 16.3 tons of dried *agbelima* grits, 847 kg of *kokonte* flour, 260 kg of starch and 121 kg of high quality cassava flour (HQCF).

Donor-Funded Project Activities

(a) The Cassava: Adding Value For Africa (C: AVA) Project

Activities for this project include:

- Eleven service providers contracted and funded to deliver specific outputs on project (6 NGOs, 2 Extension Service Providers, and 3 Technical Service Providers).
- Key capacity strengthening activities for service providers undertaken are as follows: Training in Supply chain management (6 NGOs), & planting material multiplication techniques
- Key capacity strengthening activities of farmers, farmer processors and small-scale processors undertaken as follows:
 - o Organization of 6616 farmers into 279 farmer groups, 1198 farmer processors into 54 farmer processor groups,
 - o Training of 138 farmer groups in Planting material multiplication & Good agronomic practices, Weed control, Group dynamics and Business management.
- Training of 56 farmer processor groups in the production of HQCF.
- Supply of 19,860 bundles of improved cassava planting material to 6,616 farmers.
- Establishment of 106 acres of improved cassava planting material multiplication plots.
- Loan portfolio guarantee (LPG) established at Ecobank, Gh. Ltd. in the sum of (\$209,000.00)
- Three rural banks (Amanten and Kassei Community Rural Bank, Wanfie Rural Bank and Ga Rural Bank) have signed memoranda of understanding (MOUs) to extend credit to

intermediaries against the LPG

- Credit has been extended to six (6) medium-large scale intermediaries up to a total sum of US\$114,285.71.
- A total of 450.56 tons of cassava products have been produced and supplied by nine intermediaries into the value chain, since project inception.
- Linkages have been established between nine (9) intermediaries and forty eight (48) end-users since project inception.
- Demonstrations and training activities in the utilization of HQCF in plywood production were undertaken for eight (8) plywood companies
- Demonstrations and training activities in the utilization of HQCF in bakery products have been undertaken for one (1) biscuit manufacturer.
- Company orders totaling 785 tons per month obtained from ten of these end users.
- One stakeholder meeting was organized for all project implementation partners.

(b) Millennium Development Authority (MiDA) Agricultural Project

Activities carried under this project were:

- Training needs were assessed for Farmer Based Organizations (FBOs) in the West Mamprusi and Savelugu Nanton Districts for Bomanga Farmers Group (Loagri No.2), Tuvuu Behigu Farmers Group (Tuvuu), – Ningbani Felia Maize Farmers Group (Wuntumbri), Kpansim Manga FBO (Goriba), Kubagna Farmers Group (Kategri) and Mallem Meng Farmers Group (Gbeo), Bang Bebu Viela Farmers Group (Nyeko), Galinburi Farmers Group (Nyeko), and Tung Teeya (Nyoligu).
- Action Business Plans were also developed for:
Bomanga Farmers Group (Loagri No.2), Tuvuu Behigu Farmers Group (Tuvuu), – Ningbani Felia Maize Farmers Group (Wuntumbri), Kpansim Manga FBO (Goriba), Kubagna Farmers Group (Kategri) and Mallem Meng Farmers Group (Gbeo), Bang

Bebu Viela Farmers Group (Nyeko), Galinburi Farmers Group (Nyeko), and Tung Teeya (Nyoligu),

Training and Other Services to User Agencies

These include:

- Samples of amylose analysed for the Rice Quality Coalition of the International Rice Research Institute (IRRI)
- Technical training in HQCF production and the preparation of various bakery products from HQCF, for cassava processors in the Volta, Brong Ahafo and Greater Accra Regions under the C:AVA project.
- Stage One Training of Farmer Based Organization in the West Mamprusi and Savelugu-Nanton Districts under the MiDA Project
- Training Workshop for Agricultural Extension Agents of MoFA/WIAD, in Fruits and Vegetables Processing.

Travels and Attendance at Workshops/Seminars

- Dr. Nanam Tay Dziedzoave attended a Communications Training Workshop organized by the Bill and Melinda Gates Foundation in New York, USA, from 21-24 October, 2009.

- Mr. Joseph Gayin attended the following workshops:
 - o Study on Bio-Waste (Organic Sidelines) generated by Fruit Dryers from 27th August, 2009.
 - o Strengthening RTOs and SMEs for Sustainable Development (held at the Ghana College of Physicians and Surgeons, Ridge Accra from 7th– 8th October, 2009.
- Dr. Kwame A. Vowotor and Mr. Joseph Gayin participated in a project proposal development workshop for the project “Improving post-harvest quality and packaging of rice, sorghum/millet and cassava products to enhance marketability in West Africa” at the Songhai Center in Porto Novo, Benin, 14th– 16th September, 2009.
- Drs. Kwame Vowotor and Charles Tortoe, Messrs. Joseph Gayin, Elvis Baidoo and B. A. Mensah, as well as Mrs. Charlotte Oduro-Yeboah, attended the Millennium Development Authority (MiDA) Refresher Course for Technically Trained Service Providers (TTSP) from 22nd– 26th May, 2009.

5.0 FOOD CHEMISTRY DIVISION

Introduction

The major function of the Food Chemistry Division is to give support to the commercialisation activities of the Institute by offering analytical services to Industry, local and International students, as well as training for students. It conducts applied research relating to chemical contaminants (mycotoxins) in foods and feeds as well as food flavour (aroma) analyses. The Division also offers consultancy services and advice to clients. The Division comprises two Units namely the Food Toxicology Unit and the Industrial Services Unit.

Analytical Services

During the year, the Division offered analytical services to several companies, establishments and individuals. A total of 569 samples were received by the Industrial Services Unit for analysis. This number represents a 33% increase over the 428 samples received in 2008.

The samples analysed included maize and maize products, *gari*, rice and rice products, fermented cassava flour, *tuo zaafi*, wheat flour, groundnut meal, soybean cake, pasta, potato chips, Sesame seeds, *Jatropha* seeds, cashew nuts, milk and milk products, soymilk, soy spices, biscuits, cocktail snacks, soybean cake, tuna, alcoholic beverages, wine, canned drinks, *pito*, fruit jellies, fruit chunks, *Noni* juice, energy drinks, sweets, layer concentrates, fish meal, fruit drinks and concentrates, molasses, tomato ketchup, pepper paste, dried pepper and ginger, sugar, iodated salt, snails in chilli sauce, *shito*, *Annato* seeds, palm wine among others.

The clients included Ghana Inspections Ltd., Eurofoods Ghana Ltd., WAMCO, Agricare Ltd., Irani Brothers Ltd., Ghana China Foods Ltd., Agro Project Ltd., Healthilife Beverages Ltd., Premium Foods Ltd., AMASA Agro Processing, Yedent Agro Processing Ventures, Ghana Nuts Ltd., Dry Food Processing Ltd., Foodtech Ltd., GTZ/ Ministry of Agriculture Projects (MOAP), Promasidor Gh. Ltd., Nkulenu Industries, Capital 02 Natural Products Ltd., Budget Cash and

Carry, Isbem Ventures, Triton Security Systems Ltd., Nanee Enterprise, Joss Mann Ltd., Amalgamated Feeds, Euninuk Ventures, Tantra Company Ltd., Neat Foods Ltd., Southwest Volta Resources International, Stongmen Ltd., E-Genes Foods, Goldstar Farms Co. Ltd., Pioneer Quality Import, Ghana Feedmillers Association, Vester oil mills, J Prid Company Ltd., Fresh Dreams Ventures, Kingdom Premium Fruits Ltd., Riverside Farms.

Analysis of the 569 samples generated a gross income of forty five thousand, six hundred and nineteen Ghana cedis (GH¢45,619.00) as against a gross income of thirty four thousand, seven hundred and fourteen Ghana cedis (GH¢4,714.00) for 2008. This represents an increase of 31.4% over the 2008 gross income.

During the year, the Toxicology Unit received a total of 230 samples for aflatoxin analysis as against 192 samples for the year 2008. This represents an increase of 20% over the previous year.

The samples consisted of peanut and peanut products, maize and maize products, *khebab* powder, rice and rice noodles, *gari*, millet *weanimix*, Hausa *koko* flour, *Banku* mix, pop corn, cocoa liquor, jams, soya meal, yam flour, spices, snack foods, potato chips, cashew nuts, palm kernel, wheat bran, cocoa beans, chicken mash, wheat flour, corn soya blend, *tom brown*, spaghetti, plantain *fufu*, cocoyam *fufu*. The clients included: Ghana China foods Ltd., Burger Food Industries, Agricare, Ghana Standards Board, Food and Drugs Board, Ghana Inspections Ltd., Ghana Agro-Food Company (GAFCO), OLAM Ghana Ltd., Supreme Brands Enterprise, Afrotropic Cocoa Processing, Food Tech Ltd., Ghana Nuts Ltd., Neat Foods Ltd., Waymel International Ghana Ltd., Isbem Ventures Ghana Ltd., C&S Foods Ghana Ltd., Strongmen Ltd., Great Wall Impex, Premium Foods Co. Ltd., Dry Food Processing Ltd., Kopacliff Company Ltd., Mikeafri Ventures among others.

The Toxicology Unit also analysed 28 fresh and

smoked fish samples for histamine levels. Total charges for the 230 samples amounted to twenty five thousand, and forty eight Ghana Cedis (GH¢25,048). This figure represents an increase of 7% over the 2008 gross income.

The gross total for the two Units of the Chemistry Division was therefore seventy thousand, six hundred and sixty seven Ghana cedis (GH¢70,667.00). This amount represents an increase of GH¢12,517.00 (21%) over the gross income for 2008 (Table 5.1).

Table 5.1: Summary of gross income generated in 2009 by Chemistry Division

Quarter	Industrial Services Unit		Toxicology Unit	
	No of Samples analysed	Gross Income GH¢	No of Samples analysed	Gross Income GH¢
1st	122	9,594	67	6,100
2nd	127	9,426	78	7,620
3rd	172	14,218	39	4,860
4th	148	12,381	46	6,468
TOTAL	569	45,619	230	25,048

Industrial Attachment and Practical Training

During the year the following benefited from Industrial Attachment/Practical training in the Division:

- Christiana Brenu (KNUST) from 10th October 2008 - 30th March 2009
- Third year students from KNUST from 26th January – 30th January 2009
- Four students (Sandra Asante, Rhoda Atopla, Mawuli Anane, and Sylvia Coomson) from the Department of Laboratory Technology (UCC) were with the Division from 24th May - 19th July 2009.
- Phyllis Kuzor (UG) from 2nd July – 31st July 2009
- Ruth Quartey-Papafio (UG) from 3rd July - 4th August 2009
- Michael Effah (Accra Polytechnic) 20th July - 31st August 2009
- Huge Assomba from DANA, Benin was trained in aflatoxin analysis from 2nd to 30th September 2009.

Project Work

The following students from various institutions did their project work with the Division:

- Linda Bonah from UCC worked on the biochemical composition of Garfish from 12th December 2008 – 24th January 2009
- Gift Otoe from KNUST conducted her project work on characterization of oil from pepper seed from 13th - 30th January 2009.
- Selormey Gbeddy and Daniel Swanzy both from UCC did their project work on histamine in fresh and smoked fish from 14th January – 30th January 2009 and 18th March – 1st April 2009 respectively.
- Lydia Fianko from Cape Coast Polytechnic, project work on preservation of *Saamia* drink from 27th July – 5th August 2009

Accreditation of Chemistry Laboratories

Internal Audits

In compliance with the Accreditation Quality Manual, two internal audits were conducted during the year. These were held in April and November 2009.

External Audit

The external audit by SANAS was conducted on the 17th of August 2009. However, due to the unavailability of the auditor for the Chemistry laboratory, assessment of this laboratory was postponed till November. Management requirements in the Chemistry Division were however audited during this assessment. The Chemistry laboratory was finally audited on 24th and 25th November 2009. A total of eight non-conformances (five major and three minor) were noted during the audit. These have been duly corrected and the relevant documentation sent to SANAS through the Quality Manager.

Proficiency Tests

By the Quality Manual, the methods in use have to be subjected to proficiency testing once every year. The Division placed the orders for the test materials at the end of 2008 and the tests were conducted in March and April 2009 by the two laboratories. The Testing Body used was the Food Analysis

Performance Assessment Scheme (FAPAS) of the Central Science Laboratory of the U.K.

New Equipment

The Division took delivery of a new HPLC under the Physikalisch Technische Bundesanstalt (PTB) project

to be used for mycotoxin analysis. The equipment was installed by a representative of the manufacturers in France from 21st to 28th October 2009. Staffs of the Division were in addition, trained on the use of the equipment.

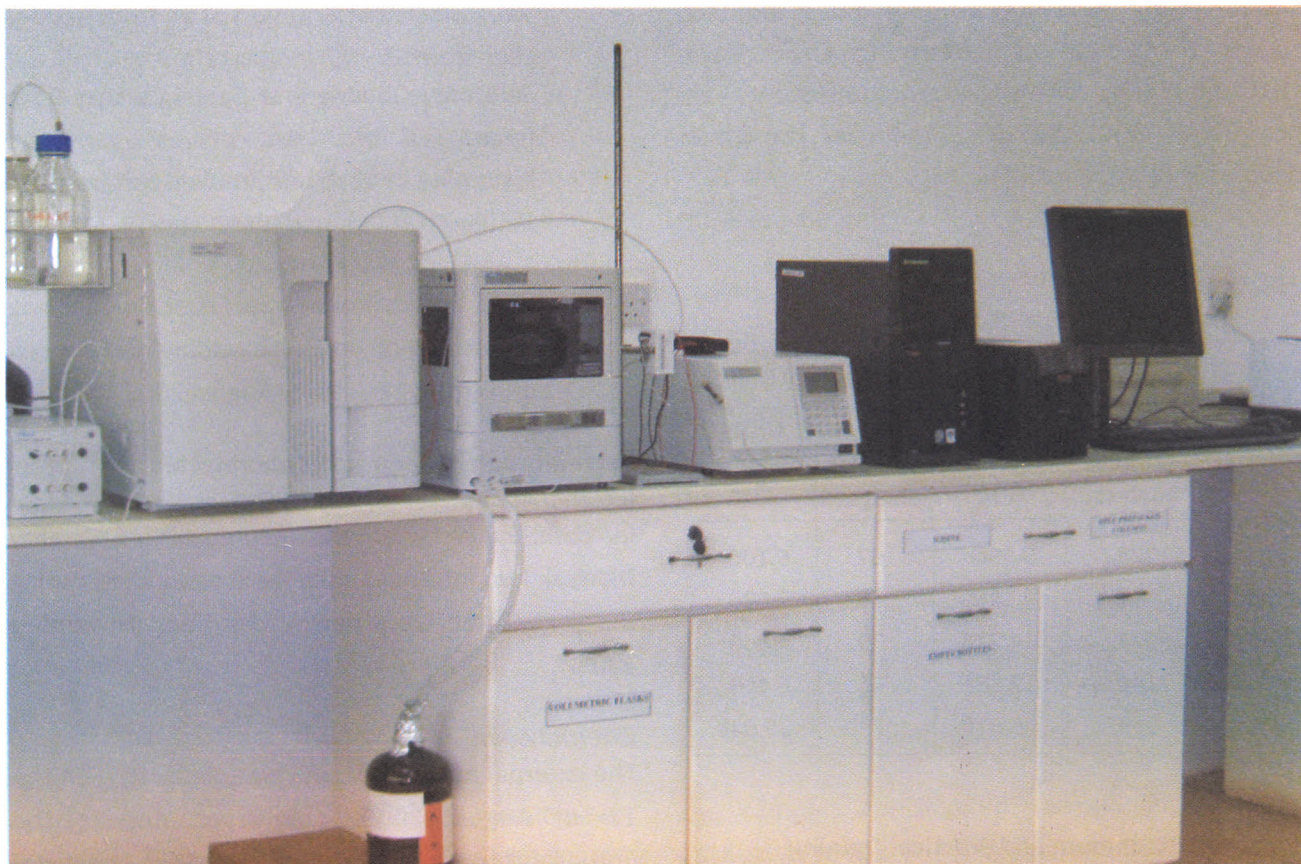


Fig. 5.2: New HPLC equipment obtained under the PTB project for mycotoxin analysis.

6.0 FOOD MICROBIOLOGY DIVISION

Introduction

The Food Microbiology Division is made up of the Industrial Service Unit (ISU) and the Mushroom Unit (MU). The ISU conducts important microbiology analytical services to food industries in Ghana and Food exporters. The MU serves as biotechnology center for mushroom research and development. It host the national mushroom spawn bank that is constantly being updated and reengineered to serve the good number of mushroom growers in the sub region. The Food Microbiology Divisions' main role is to undertake research and development activities in food safety and quality assurance to staple foods in Ghana.

Activities

The main activities carried out by the Food Microbiology Division (FMD) were:

- analytical services to clients (income generation);
- quality control of analysis: ISO 17025 accreditation;
- mushroom spawn and compost bags production and sales for income generation by the Mushroom Unit, and
- research.

Analytical services carried for customers

Routine analytical services were carried out for clients through the CID. A total 1,493 samples were analysed for clients involving a total number of 8,207 individual analyses (Figs 6.1 - 6.2). This was an improvement of 158% over the 943 samples analyzed in 2008 and 195% over the 4,218 individual analysis carried out in 2008. The most important clients during the year were Cadbury Ghana Ltd. and Pioneer Food Cannery.

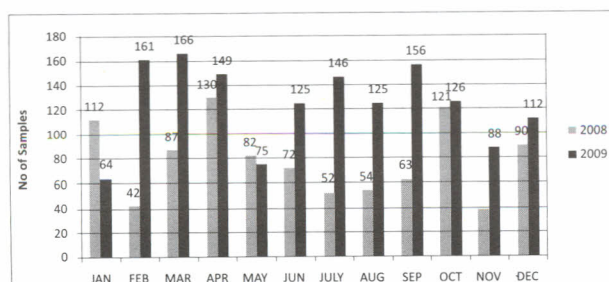


Fig 6.1: Number of samples analysed for clients in 2008 and 2009

The most important clients of the Food Microbiology Division in 2008 included Cadbury Gh. Ltd., Pioneer Food Cannery Ltd., Cocoa Processing Co. Ltd., West Africa Mills Ltd., Promasidor Ghana Ltd., Airways Catering Ltd., Burger Food Industries, Euro Food Gh. Ltd., and Ghana Inspection Ltd.

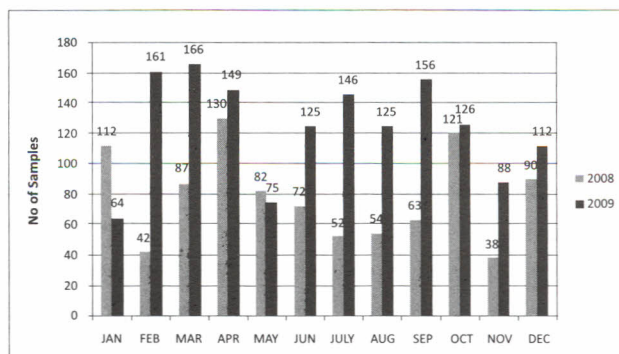


Fig 6.2: Number of individual analysis carried out for clients by FMD in 2008

Laboratory Quality Management System: ISO 17025 Accreditation

The quality of analytical services carried out for clients was assured by maintenance of the ISO 17025 for which the Food Microbiology Division has accreditation for 11 analytical methods namely:

- Enumeration of Yeasts and Moulds. ISO 7954, 1987 (E).
- Enumeration of presumptive *Escherichia coli*. ISO 7251, 2005.
- Detection of *Salmonella*. NMKL No.71, 1999, 5th Ed.
- Coliform bacteria detection in foods. NMKL No.44, 2004 6th Ed.
- Determination of *Bacillus cereus* in foods. NMKL No.67, 2003.
- Determination of aerobic microorganisms. NMKL No.86, 1999.
- Detection of thermo-tolerant coliform bacteria in foods after pre-incubation
- *Enterococcus* determination in foods. NMKL No. 68, 2004 4th Ed.
- Aerobic microorganisms and presumptive *Enterobacteriaceae* enumeration on surfaces and utensils No. 5 2001 5th Ed.
- Microbiological examination of fully preserved canned foods aerobic and

anaerobic. NMKL No. 59 2004 5th Ed.

- Enumeration of coagulase positive *Staphylococcus aureus* in foods. NMKL No. 66. 2003

Two internal audits of the quality system were carried out during the year in February and October, 2009. Two Management Review Meetings were also held during the year. Staff of the Division who carried out analytical services participated in the Proficiency Testing Scheme organized by Bio Services Ltd. U.K. and performed satisfactorily.

Re-assessment of Quality System

SANAS, the Accreditation Body of the laboratory's accredited quality system carried out an on-site reassessment of the quality system in March 2009. Five major non-conformances were identified and all have been cleared. Four (4) new technical signatories were confirmed after practical examination bringing the total number of technical signatories in the laboratory to six (6).

Mushroom Unit (MU)

Production and sale of mushroom spawns and compost bags

Production and sale of bottled mushroom spawns by MU in 2009 is shown in Table 6.1.

Table 6.1: Production and sale of mushroom spawns by MU in 2009

Month	Number of spawns sold	Amount realised (GH¢)
January	371	410.40
February	729	874.80
March	1136	1,385.40
April	441	619.40
May	466	574.80
June	702	865.50
July	613	731.70
August	412	518.00
September	810	998.80
October	943	1,155.40
November	831	1,044.50
December	656	881.30
Total	8,110	10,060.00

MU sold 8,110 bottles of mushroom spawns to mushroom growers which gave gross revenue of GH¢10,060.00. MU also produced a total of 3,664 compost bags for cultivation of mushrooms (Table 6.2). The Unit sold a total of 3,140 compost bags to clients in addition to a limited quantity of fresh mushrooms and these also gave a gross income of GH¢1,463.20.

Income generation

Gross income generated by FMD is shown in Table 6.2. There was an increase in the gross income generated from analytical services carried out for clients from GH¢119,301.70 in 2008 to GH¢239,421.50 in 2009 representing an increase of 201%. With respect to the Mushroom Unit there was an increase in gross revenue from GH¢8,794.00 in 2008 to GH¢11,523.20 in 2009 representing an increase of 131.5%

Research projects

Research projects during the year include:

- Studies on the use of various cropping techniques for the cultivation of oyster mushrooms (On-going).
- Performance with physical characteristics of three different *Pleurotus* species under Ghanaian conditions (On-going).
- Effect of different agricultural by-products on the growth and yield of the mushroom *Volvariella volvacea* (Completed).
- Standardisation and Modernisation of the *Ga Kenkey* Production Process (Completed)
- Diversity, molecular phylogeny and evolution of tropical African *Thelephorales* (Basidiomycota, Fungi). A three year collaborative research project with Ludwig-Maximilians-Universität München, Germany. (On-going).

Table 6.2: Gross Incomes of Activities of Food Microbiology Division

Activity	2007	2008	2009
Analytical services			
No of samples analyzed	1,225	943	1,493
Gross income for Industrial Services Unit	GHC79,7558.60	GHC119,301.70	GHC239,421.50
Mushroom spawns			
No of bottle sold	2,266	5438	8,110
Compost bags			
No of bags sold	2,941	10,192	3140
Gross income Mushroom Unit	GHC2,500.00	GHC8,794.00	GHC11,523.20

Training programmes by the Food Microbiology Division

- The Mycology Unit organized a training programme in Mushroom Cultivation for 3 participant from 8th -12th June, 2009.

African Conference on Edible and Medicinal Mushrooms (2nd ACEMM) held at the Noguchi Memorial Institute for Medical Research in March 24 -28, 2009.

Conference Organized by the Food Microbiology Division

- Members of FMD helped to organize the 2nd

7.0 FOOD NUTRITION AND SOCIO-ECONOMICS DIVISION

Introduction

The Food Nutrition and Socio-economics Division (FNSED) consists of the Socio-economics and the Nutrition and Food Utilization Units. Studies into consumer demands are conducted under Socio-economics, while community and human nutrition studies are carried out under the Nutrition and Food Utilization Units. The Division also runs a test kitchen which conducts sensory tests on products developed by the CSIR-FRI and industry. The general activities of the Food Nutrition and Socio-economics Division during the year are as follows: nutritional surveys, baby food formulations and supply, consultation services, exhibition of divisional formulated products, recipe development and documentation, and training of clients in product development. Currently, the Division is also investigating the micronutrient and phytochemical contents of indigenous green leafy vegetables. In addition, the Division conducts surveys and feasibility studies into the economic viability and socio-economic impacts of on-going projects in the Institute. Activities implemented in the Division during in 2009 include internship program for students, consultancy services, collaborative work under various projects and exhibitions.

Internship and Supervision of Student Projects

The Division supported the training of the third year students from Kwame Nkrumah University of Science and Technology (KNUST) Food Science and Technology Department who were under internship for two months. The students were trained in the preparation of products from high quality cassava flour (HQCF) and organized sensory evaluation for their acceptability. The Division also supervised students from Cape Coast Polytechnic on their respective project works

Consultancy Services

Advisory services were offered to individuals in the *Moringa* processing industry and the *Moringa* Association of Ghana.

Training

Recipe development to expand products under HQCF usage was carried out under the Cassava: Adding value in Africa (C: AVA) project for which a number of training programmes were conducted for the following:

- selected senior high schools in Volta Region
- 178 domestic bursars from all the regions in Ghana trained in HQCF products
- domestic bursars Association in Volta, Eastern, Western and Central Regions of Ghana

In addition to regular training under C: AVA, the Division conducted monitoring of HQCF uptake and shelf life studies of some composite flour biscuits. There were periodic sampling and evaluation of some biscuits such as *Obama*, *All time*, *Coreen*, and *Bansa* digestive.

Projects

USAID Incubator Project/West Africa Trade Hub

- Initial informal reconstitution levels for dried *garifoto* and dried *jollof* from Ebenut was undertaken. Also there was sensory evaluation of Home Foods Exotic Ghanaian soups.

Peanut Crisp Project

- Trials on peanut cookies, cakes, *kulikuli* etc. were organized during the period under review.

TELFUN Project

- There was socio-economic assessment of cowpea diversity on the Ghanaian Market under Tailoring Food Science and Technology to Endogenous Patterns of Food Supply (TELFUN) Project
- Socio-economic aspects of traditional commercial production and marketing of cocoyam and cocoyam leaf in Fantekwa, Asante Akim (North and South) and Asunafo North Districts was carried out under the

Root and Tubers Improvement and Marketing Program (RTIMP).

Moringa Project

- The Division conducted tests to determine the best drying methods for maximum nutrient retention, and shelf-life stability for *moringa* leaf powder production.
- Microbiological quality assessment of

treated *moringa* leaves was undertaken, and

- Sensory analysis was conducted on *moringa* beverage as part of shelf-life studies.

Exhibition

There was processing of root and tubers for an international exhibition under West Africa Agriculture Productivity Project (WAAPP) in Kumasi.

8.0 PROJECTS

8.1 ACCREDITATION; FOOD SAFETY AND QUALITY ASSURANCE

Introduction

The CSIR-Food Research Institute established and has been implementing a quality management system according to ISO/IEC 17025: Standard since August 2001. The main objective is to obtain accreditation for chemical and microbiological methods to ISO/IEC 17025: Standard. This is to ensure that the Food Research Institute's Chemistry and Microbiological laboratories produce technically valid analytical results that can be internationally accepted by customers.

In 2007, the Institute obtained accreditation for 11 microbiological and 4 chemical methods from the South African National Accreditation System (SANAS).

This report covers the activities of the CSIR-FRI Quality Management System implemented in the Chemistry, Mycotoxin and Microbiology laboratories; Customer services Unit of the Commercial and Information Division (CID) and the Stores and Purchasing Units of the Accounts Division., for the year January to December, 2009.

Activities

Internal Audits

According to the CSIR-FRI Quality Management System, a minimum of two internal audits are to be conducted annually in each of the three laboratories i.e. Chemistry, Mycotoxin and Microbiology; the Client Services Unit of the CID and the FRI Stores to verify whether the operations continue to comply with the requirements of CSIR-FRI Quality Management System and the International Standard ISO/IEC 17025 and also whether the defined methods, procedures and instructions as stated in the documents are properly carried out.

Two internal audits were conducted during the year, one in April and the second in November. The audits

were conducted by Drs. P.N.T. Johnson, Charles Tortoe and Mary Halm.

External Audit

The first surveillance visit by the SANAS to access the continuing compliance of the CSIR-FRI Quality Management System, and the technical competence of staff of the Microbiological and Chemical laboratories came on two separate dates:

- Management System and Microbiology Laboratory 20th and 21st July, 2009.
- Chemistry Laboratory 24th & 25th November, 2009.

The assessments were carried out by: Mr. John Peart - Lead Assessor (SANAS) - Management System; D.J. Neethling - Technical Expert, Microbiology (ACTEBIS) - Microbiology Laboratory and Dr. L. Smit - Technical Expert, Chemistry (ARCANPI) - Chemistry Laboratory.

Four additional Technical Signatories for Microbiology Laboratory were also accessed for technical competence and approved bringing the total number of technical signatories for Microbiology Laboratory as six. . The old technical signatories are: David Asiedu (Principal Technologist/Technologist-In-Charge of Microbiology Laboratory) and David Baisel (Senior Technologist). The four additional signatories are Evans Agbemaflle (Assistant Scientific Officer); Mrs Nina Bernice Ackah (Assistant Scientific Officer); Theophilus Annan (Senior Technologist) and Michael Amoo-Gyasi Technologist).

Dr. Lawrence Abbey was assessed and approved as the incoming nominated representative to take over from Dr. Mary Halm who relinquished this position at the end of her contract on December 31st 2009.

Continued accreditation was granted for the eleven microbiological methods and the four chemical methods which were accredited in May 2007 for a period of five years April 2012.

Management Review Meetings

Management review meetings are held twice a year to ensure the continuous suitability and effectiveness of the quality management system and introduce necessary changes and improvements. Two meetings were held on 29th June and 17th December 2009, respectively.

Participation In Proficiency Tests/Inter Laboratory Comparisons

The Microbiology Laboratory participated in General Food and Dairy Microbiology Scheme organized by Bio Services UK Ltd. (formerly known as Senate QA Proficiency Testing Scheme, Great Britain). The Chemistry Laboratories also participated in inter laboratory comparisons organised by the Food Analysis Performance Assessment Scheme (FAPAS) of the Central Science Laboratory of the U.K. The laboratories performed satisfactorily in these tests but when unsatisfactory z-scores were obtained corrective actions were taken as required.

National Metrology Institute of Germany-[Physikalisch-Technische Bundesanstalt(PTB)] Project

The project 'Quality assurance of agricultural products through improved metrological and testing services' is a Technical Cooperation Project between Ghana and Germany initiated in December 2007 by the National Metrology Institute of Germany-(Physikalisch-Technische Bundesanstalt(PTB)).

The aim of the project is to support the establishment of a consolidated and adequate quality infrastructure to guarantee the quality and safety of food and agricultural products in Ghana.

This objective will be achieved through the following:

- Strengthening the competence and capacity of analytical and metrology laboratories
- Supporting and promoting networking activities among laboratories and other relevant organizations and authorities
- Providing policy advice in the quality infrastructure sector for optimal task allocation and cooperation amongst competent authorities
- Providing practical support to Ghana's quality infrastructure institutions on the road to international recognition.

The Political Counterpart for the project is the Plant Protection and Regulatory Services Directorate of the Ministry of Food and Agriculture.

The laboratories involved in the first phase of the project are the Metrology laboratories (Mass, Temperature, Pressure and Volume) and Food Laboratory (Heavy Metals) of Ghana Standards Board; and the Mycotoxin Laboratory of CSIR Food Research Institute.

Selected activities under the project include:

- Consultancy missions by international experts
- Hands on training of technical laboratory staff
- Supply of laboratory equipment
- Participation in inter-laboratory comparisons
- Information and outreach events
- High-level expert round tables and workshops
- Study visits and educational attachments

The project is scheduled to have a total duration of ten years divided over three implementation phases. The first phase is from December 2007 to November 2011 with a budget of 900,000 EUR.

Activities carried out under the project in 2009

1. Workshop on Quality Issues and Infrastructures (QI) in Pineapple Production & Export Hotel Fiesta Royal, Accra. 11th February 2009.

This workshop was organized by the GTZ Market-Oriented Agriculture Programme (MOAP). The objectives of the workshop were:

- To present the interventions of Ghana Standards Board (GSB), Food Research Institute (FRI) and Physikalisch Technische Bundesanstalt (PTB);
- To present GSB and FRI and their services offered particularly in the area of measurement and testing;
- To introduce quality infrastructure (QI) issues, disciplines, tools and methods;
- To present farm-gate and post farm-gate quality challenges in the fruit (and vegetable) production and export sector in Ghana;
- To ensure that farmers/exporters of

commodities know about and make use of quality control, calibration and testing facilities in order to improve the quality of the products and to enhance their competitiveness on national and international markets;

- To adapt the services of quality inspection and testing institutions like GSB/FRI to national and international customer requirements;
- To discuss potential interventions and next steps, and to agree on a tentative action plan to address QI challenges in the fruit production and exporting sector, particularly in view of identifying joint PTB/GSB/FRI and MOAP interventions.

Working Mission in February 2009

The Project consultant Dr. Ulrich Nehring of the Institute Nehring Gmb, paid a working visit to FRI Mycotoxins Laboratory on 12th February 2009 to evaluate the progress so far made after the previous visit in February 2008. He had discussions with the Head of Chemistry Division CSIR-FRI on the proposed items list for new equipment and agreed on an amended list to be purchased.

8.2 CASSAVA ADDING VALUE FOR AFRICA (C:AVA) PROJECT

Introduction

The C:AVA project is an initiative supported by the Bill and Melinda Gates Foundation. The CSIR-FRI in collaboration with NRI is leading the Cassava: Adding Value for Africa initiative in Ghana to develop the cassava value chain by exploiting the use of value added cassava products such as High Quality Cassava Flour (HQCF) for the benefit of small farmers, micro and small scale processors.

HQCF has many applications including the industrial production of glucose syrup that can save Ghana a lot of foreign exchange that is used annually for imports. A lot of imported Glucose is currently used in the confectionery business in Ghana. Potential markets for HQCF include adhesives for paperboard products, extenders for plywood glues, starches for textiles, sugar syrups for confectionery industries, industrial alcohol, and alternative flour to wheat

flour in bakery products. Some recipes from High Quality Cassava Flour are bread, cakes, biscuits, sausage rolls, strips, 'bofrot', doughnuts, pancakes and other snacks.

Activities

Stakeholders Meeting in 2009

A two -day meeting attended by about 70 participants from CSIR institutes (FRI, FORIG, and CRI), the Ministry of Food and Agriculture (MOFA), CSIR- FRI, CSIR-FORIG and, non-governmental organizations agencies, and cassava processing enterprises, presented stakeholders' of the Cassava: Adding Value for Africa Project in Ghana (C:AVA-Ghana) a chance to interact, evaluate and mark our the way forward for the project. This meeting was hosted by CSIR-FRI recently.

Dr. W. K. A. Amoa-Awua, Head of Food Microbiology Division of CSIR-FRI welcomed the participants on behalf of the Ag. Director of the Institute. He urged participants to address the problems of cassava waste management and environmental concerns as well as the high cost of processed cassava products. He suggested that stakeholders could take advantage of new processing systems that address these challenges. He expressed belief that the project objectives of the C:AVA could be achieved.

The meeting was also addressed by Dr. Nanam Dziedzoave, Country Manager of the C:AVA-Ghana Pproject, Ghana, Dr. Kwame Vowotor of CSIR-Food Research Institute, Nana Safo Agyeman Derkyi of the CSIR- Forestry Research Institute of Ghana , Dr. Joe Manu-Aduening, a production consultant as well as and representatives of the Volta and Brong Ahafo Regional Directorates of MOFA, non-governmental organizations agencies (NGO's) and cassava processing enterprisesors . Mr. Victor Antwi, the Business Development Advisor for the C:AVA, - Ghana Project facilitated the deliberations. Dr. Kola Adebayo, Project Manager Director for Africa Region of the C: AVA Pproject, also addressed the meeting.

Non-Governmental Organisations NGO's such as the Association of African Women in Development (AAWID), Social Development and Improvement Agency (SODIA), the Christian Rural Action Network

(CRAN), Associates for Sustainable Rural Development (ASRuD), Christ Apostolic Agency for Relief and Development (CAARD) and Progressive Youth and Community Development (PROYCOD) reported on their activities. Presentations were also made heard by from the Managing Directors of cassava processing businesses such as Caltech Ventures, Bredi Agricultural Enterprise, Cassacoxa Ltd., Majestic Agribusiness Center, Mabert Enterprise, God's Way Enterprise, 1st Door Farms, Amasa Agro-Processing Co. and Afrimart Global Enterprises.

Stakeholders unanimously agreed that good progress has been made and the way forward for the project is to concentrate on: strengthening linkages between the current collaborating value chain actors, mobilizing more small-medium-large scale processors, developing new linkages to potential end-users and improving competitiveness in the business activities of farmers and processors (through yield improvements and reduction in drying costs), whilst Strengthening in particular the cash flow situation of processors, who all stakeholders consider as key to effective delivery on the project's vision of success.

A major development at the meeting was the initiation of the formation of a C:AVA-Ghana Cassava Processors Association as a nuclear group for the formation of a national association and the possible consequent formation of a 'National Cassava Products Marketing Association Company'.

Dr. Nanam Dziedzoave, the C:AVA-Ghana Country Manager, told stakeholders that they would better understand their dual and interdependent roles and deliver more effectively on their outputs if they visualized the C:AVA Project as a 'Big Limited Liability Company' whose Directors are the Farmers, Processors and End-Users; the Project Management Office being the Manager and Financial Controller; the NGOs being the Purchasing, Marketing and Business Development Officers: whilst FRI, MOFA, FORIG and CRI serve as Quality Control and Customer Relationship Officers of the company. Consequently, as responsible 'employees' of the 'company called C:AVA', stakeholders' dedication to serving the

interests of the 'company's' shareholders - represented by the 'Directors': the Farmers, Processors and End-users - should culminate in a compelling desire to create value for the shareholders as a means of maximizing stakeholder benefits. This concept should drive their efforts, sharpen their focus, and direct their vision.

Achievement

Within the one year period of its inception, the C:AVA-Ghana Project Management Team and its implementation partners have mobilized over 4,000 cassava farmers, 1,000 microprocessors, 15 small, medium and large scale cassava processors and over 15 well-sensitized and dedicated end-users of HQCF in the food and non-food sectors of the Ghanaian economy. Through the collaborative and concerted efforts of all these cassava value chain actors more than 1,000 tons of fresh cassava have been supplied by farmers, processed into over 200 tons of HQCF and sold into various viable markets in Ghana.

8.3 Millennium Development Authority (MiDA) Project

Introduction

CSIR-FRI participated as a Technical Training Service Provider for the Millennium Challenge Account (MCA). The MCA which is also known as the Ghana Compact is an agreement between the Government of the United States of America and the Government of Ghana. The agreement spells out how U.S. development assistance fund (\$540,000,000) must be used to achieve poverty reduction and economic growth.

The MCA Ghana Program

- The Program seeks to achieve poverty reduction and economic growth through rural transformation led by farmer based organizations (FBOs) in three target intervention zones:
 - Afram Basin Zone
 - Southern Horticultural Zone, and
 - Northern Zone.
- The Ghana Compact is managed by the Millennium Development Authority (MiDA) through three projects
 - Agriculture Project
 - Transportation Infrastructure Project
 - Rural Services Development Project.

The CSIR-FRI participated in the Agriculture Project in the West Mamprusi and Savelugu Nanton Districts of the Northern Region in the Northern Zone.

MiDA Agriculture Project

The Agriculture Project seeks to enhance competitiveness in local, regional and international markets through increases in production and productivity. This will be achieved through the training and empowering of 1200 FBOs consisting of 50 members in 19 districts nation-wide.

1. The Agriculture Project consists of six components:
 - Farmer and Enterprise Training in Commercial Agriculture
 - Irrigation Development
 - Improvement of Post Harvest and Value Chain Service Activity
 - Land Tenure Facilitation
 - Improvement of Credit Services for On-Farm and Value Chain Investments Activity
 - Rehabilitation of Feeder Roads

CSIR-FRI carried out a two-stage training program in Commercial Agriculture for the FBOs as follows:

Stage 1. Training: Business Capacity Development (6 weeks)

Modules

1. The MCA Ghana Program and Course Objectives

2. FBOs, Rural Development and Commercialization
3. Value Chain Thinking
4. Business Vision through a Value Chain Lens
5. Leadership, Governance and Management
6. Developing Business Expansion Strategies
7. Developing the Action Agenda
8. Driving Organization Change
9. Completing the Draft Action Business Plan

Stage 2. Technical Training (Crop Productivity) (3 weeks)

Modules

1. Farm Management
2. Crop Production Practices
3. Integrated Crop Management Practices
4. Irrigation
5. Harvesting, Post-Harvest Management and Quality Control
6. Safe Handling and Storage of Plant Protection Products
7. Agricultural Marketing and Distribution
8. Market Standards
9. Processing
10. Environmental and Social Impact
11. Field Demonstrations

APPENDIX I

FRI Senior Staff List

Directorate

1.	Dr. P. N. T. Johnson	-	Acting Director
2.	R. M. Yawson	-	Senior Scientific Secretary
3.	S. Nketia	-	Scientific Secretary
4.	F. Mante (Mrs.)	-	Prin. Admin Assistant
5.	E. K. Ofori	-	Prin. Admin. Assistant

Administration Division

1.	J. Aggrey–Yawson (Ms.)	-	Asst. Admin Officer.
2.	J.F. Asigbey	-	Chief Admin. Asst.
3.	E. A. Larbi	-	Chief Works Supt.
4.	G. Aklieh	-	Prin. Works Supt.
5.	C. Ketsie (Ms.)	-	Senior Admin Asst.
7.	Victoria A. Asunka (Mrs.)	-	Senior Admin. Assistant
8.	Beullah Adadevoh-Sallah (Mrs.)	-	Senior Admin. Assistant

Accounts Division

1	C. Aikins Tutu	-	Chief. Accounting Asst.
2.	J. Mintah Nakotey	-	Chief Stores Supt.
3.	C. Aikins Tutu	-	Chief. Accounting Asst.
4.	K. K. Aidoo	-	Chief Accounting Asst.
5.	C. Amega	-	Prin. Accounting Asst.
7.	G. O. Gyamfi	-	Prin. Stores Supt.
8.	J. K. Larbi	-	Accounting Asst.

Commercialization & Information Division

1.	Dr. P. Adu-Amankwa (Mrs.)	-	Head of Divison (Senior Research Scientist)
2.	K.A. Bugyei	-	Asst. Scientific Info. Officer
3.	A. Andoh	-	Chief Tech. Officer
4.	B. Awotwi	-	Chief Tech. Officer
5.	R. Kavi	-	Jnr. Asst Librarian
6.	B. P. Osae	-	Principal Technical Officer
7.	P.O. Baidoo	-	Technical Officer
8.	Joana B. Dzikunu	-	Snr. Admin. Assistant
9.	Mary Assimah	-	Admin. Assist.

Food Processing & Engineering Division

1.	Dr. N. T. Dziedzoave	-	Ag. Head of Division (Senior Research Scientist)
2.	Dr. K. A. Vowotor	-	Senior Research Scientist
3.	Dr. J. T. Manful	-	Senior Research Scientist
4.	D. Blay	-	Senior Research Scientist
5.	E. C. Tettey	-	Research Scientist
6.	Dr. L. D. Abbey	-	Research Scientist

7.	C. K. Gyato	-	Research Scientist
8.	B.A. Mensah	-	Research Scientist
9.	J. Gayin	-	Research Scientist
9.	Dr. C. Tortoe	-	Research Scientist
10.	G. A. Komlaga	-	Research Scientist
11.	C. Oduro-Yeboah (Mrs.)	-	Research Scientist
12.	E. A. Baidoo	-	Asst. Res. Scientist
13.	S. A. Sampare	-	Chief Tech. Officer
14.	J. R. Addo	-	Snr. Tech. Officer
15.	E. Ablorh	-	Tech. Officer
16.	J. A. Asafu-Adjei	-	Chief Works Supt
17.	R. Y. Anthonio	-	Prin. Works Supt.
18.	R. M. Mawuli	-	Prin. Works Supt.

Food Microbiology Division

1.	Dr. W.A. Amoa -Awua	-	Head of Division (Chief Research Scientist)
2.	Dr. M. A. Ottah Atikpo (Mrs.)	-	Research Scientist
3.	Dr. M. Obodai (Mrs.)	-	Research Scientist
4.	M. Owusu (Ms.)	-	Research Scientist
5.	Peter Adoquaye Addo	-	Research Scientist
6.	Bernice Kudjawu	-	Asst. Research Scientist
7.	Matilda Dzomeku (Mrs.)	-	Asst. Research Scientist
8.	Amy Atter (Mrs.)	-	Asst. Scientific Officer
9.	Deborah L. Narh	-	Asst. Research Scientist
10.	Nina Bernice Ackah (Mrs.)	-	Asst. Scientific Officer
11.	Evans Agbamafle	-	Asst. Scientific Officer
12.	D. K. Asiedu	-	Prin. Technologist
13.	D.K. Baisel	-	Senior Technologist
14.	R. Takli	-	Asst. Technologist
15.	M. Amoo-Gyasi	-	Senior Technologist
16.	Theophilus Annan	-	Technologist
17.	Angela Adams	-	Technologist

Food Chemistry Division

1.	Dr. (Mrs.) K. Kpodo	-	Head of Division (Senior Research Scientist)
2.	G. A. A. Anyebuno	-	Research Scientist
3.	C. Diako	-	Asst. Res. Scientist
4.	F.Y. Mensah	-	Asst. Scientific Officer
5.	W. K. Amevor	-	Prin. Technologist
6.	P. Mensah Toku	-	Prin. Technologist
7.	D. N. A. Ankrah	-	Senior Technologist
8.	N.Y. Amey	-	Senior Technologist
9.	Kofi K. Essel	-	Technologist
10.	Jeremiah Lartey- Brown	-	Senior Technical Officer
11.	Mercy Fianu	-	Senior Technical Officer
12.	Emefa Gblende	-	Technical Officer
13.	Derick K. Ashley	-	Technical Officer

- | | | |
|--------------------------|---|-------------------|
| 14. Vida Awidi | - | Technical Officer |
| 15. Belinda Quaye (Mrs.) | - | Technical Officer |
| 16. Dorothy Narh (Mrs.) | - | Technical Officer |
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Food Nutrition & Socio-Economics Division

- | | | |
|-----------------------------|---|------------------------------|
| 1. W. Quaye (Mrs.) | - | Research Scientist |
| 2. M. Glover Amengor (Mrs.) | - | Research Scientist |
| 3. I. Yawson (Mrs.) | - | Assistant Research Scientist |
| 4. L. Hagan (Mrs.) | - | Assistant Research Scientist |
| 5. E. S. Buckman (Mrs.) | - | Assistant Research Scientist |
| 6. I. A. Tamakloe (Mrs.) | - | Chief Tech. Officer |
| 7. Alice Padi (Mrs.) | - | Senior Technical Officer |
| 8. Constance Boateng | - | Senior Technical Officer |
| 9. Joyce Nortey | - | Technical Assistant |
-

APPENDIX II
CSIR-FRI Staff Promotions

No.	Name	Grade Promoted To	Effective Date
1	George Gyamfi	Chief Stores Supt.	01/01/09
2	Jacob Kuwornu	Prin. Works Supt.	"
3	Patrick Mintah	Prin. Technical Officer	"
4	Christiana Ketsie	Snr. Admin. Asst.	"
5	Greta Akpokli	Snr. Admin. Asst.	"
6	Isaac Hammah	Snr. Works Supt.	"
7	Godwin Armah	Snr. Tech. Officer	"
8	Constance Boateng	Snr. Tech. Officer	"
9	Alice Padi	Snr. Tech. Officer	"
10	Mercy Fianu	Snr. Tech. Officer	"
11	Makafui Torgbor	Technical Officer	"
12	Samuel Odjao	Traffic Supervisor	"
13	Reuben Tetteh	Traffic Supervisor	"
14	Gariba Alimiyaw	Traffic Supervisor	"
15	Anthony Sevor	Traffic Supervisor	"
16	Samuel Asiedu	Technical Officer	"
17	Diana Kuwornu	Principal Telephonist	"

APPENDIX III

CSIR-FRI Staff Who Completed Training

CSIR-FRI Staff Who Completed Training

No	Name	Programme	Institution
1.	Mr. Eric Ofori	Bachelor of Business Admin,	Institute Professional Studies
2.	Mr. Charles Diako	MPhil, Food Science	University of Ghana
3.	Mrs. Linda Hagan	MPhil, Home Science	University of Ghana
4.	Ms. Matilda Dzomeku	MPhil. Biological Science	Kwame Nkrumah University of Science and Technology
5.	Ms. Bernice Kudjauw	MSc. Food Science	Purdue University/University of Ghana
6.	Ivy Yawson	MSc. Food Science	University of Minnesota

CSIR-FRI Staff Under Training

No	Name	Programme	Institution
1	Robert M. Yawson	MSc/PhD Science, Technology and Environmental Policy	University of Minnesota
2.	Ms. Margaret Owusu	PhD Food Science	University of Denmark
3.	Mr. Kofi Kwegyir Essel	BSc Applied Applied Chemistry	University for Development Studies
4.	Ms. Joana Dzikunu	Bachelor of Business Admin	Institute of Professional Studies
5.	Mr. Apolonius Nyarko	BSc. Lab. Technology	University of Cape Coast
6.	Mr. Emmanuel Alorsey	BSc. Food Science & Tech.	Kwame Nkrumah University of Science and Technology
7.	Ms. Mercy Fianu	BSc. Lab. Technology	University of Cape Coast
8.	May Boham-Darko	BSc. Lab. Technology	University of Cape Coast
9.	Helene Ama Van-Ess	BSc. Lab. Technology	University of Cape Coast
10.	Justina Thompson	BSc. Marketing	University of Cape Coast
11.	Angela Addy	BSc. Accounting	Institute of Professional Studies

APPENDIX IV

Commercial Accounts For The Year Ending 31st December 2009

	DIVISION/UNIT	ACTUAL INCOME FOR THE YEAR	ACTUAL EXPENSES FOR THE YEAR	NET INCOME FOR THE YEAR	BALANCE AS AT 1/1/2009	BALANCE AS AT 31/1/2009
A	MICROBIOLOGY					
	LAB. ANALYSIS MUSHROOM UNIT	206,686.85 14,712.40	47,069.32 20,383.02	159,617.53 (5,670.62)	137,523.31 2,626.74	297,140.84 (3,043.88)
	SUB TOTAL	221,399.25	67,452.34	153,946.91	140,150.05	294,096.96
	RATE OF SUB TOTAL TO TOTAL	58%	26%	130%		
B	CHEMISTRY					
	GEN. CHEMISTRY AFLATOXIN	43,641.45 30,878.16	53,464.93	(9,823.48) 30,878.16	9,814.94 24,494.60	(8.54) 55,372.76
	SUB TOTAL	74,519.61	53,464.93	21,054.68	34,309.54	55,364.22
	RATE OF SUB TOTAL TO TOTAL	20%	20%	18%		
C	PROCESSING & ENGINEERING					
	PILOT SCALE PRODUCTION UNIT	23,581.40	16,334.20	7,247.20	9,972.12	17,219.32
	ENGINEERING UNIT	44,690.00	31,600.00	13,090.00	12,740.46	25,830.46
	ROOT & TUBER PROD. & DEV. UNIT	4,639.60	30,376.60	(25,737.00)	9,121.00	(16,616.00)
	SUB TOTAL	72,911.00	78,307.80	(5,399.80)	31,833.58	26,433.78

D	RATE OF SUB TOTAL TO TOTAL	19%	30%	(5%)		
	OTHERS	11,052.50	10,172.10	880.40	(2,187.91)	(1,307.51)
	FOOD & SOCIO-ECONOMICS	710.50	0.00	710.50	2,017.97	2,728.47
	INFORMATION & FRI SHOP	0.00	0.00	0.00	(2,082.40)	(2082.40)
	MORINGA TRAINING	0.00	52,328.96	(52,328.96)	(59,021.35)	(111,350.31)
	OTHERS INSTITUTIONAL ACTIVITIES					
	SUB TOTAL	11,869.06	62,500.96	(50,738.06)	(61,273.69)	(112,011.74)
	RATE OF SUB TOTAL TO TOTAL	3%	0.36	(43%)		
	GRAND TOTAL RATE OF NET INCOME TO GRAND INCOME	380,589.76	261,729.13	118,863.73 Summary of Activities	145,021.48	263,883.22
	TOTAL REVENUE		Year ending 2008	Year ending 2009	% Increase	
	TOTAL EXPENSES		282,517.95	380,592.86	35	
	NET INCOME		205,712.42	261,729.13	27	
			76,805.53	118,863.73	55	

APPENDIX V

Scientific Reports and Publications

Edited Research Report

(1). **Tortoe, C. (2009)**. Report on training and training related activities for Suguru Vaala Farmers Group in West Mamprusi District in the Northern Region from 16th March to 31 March 2009. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 38. CSIR-FRI/RE/TC/2009/001

(2). **Tortoe, C. (2009)**. Report on training and training related activities for Tiwalsi Nya Farmers Group in West Mamprusi District in the Northern Region from 16th March to 31 March 2009. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 37. CSIR-FRI/RE/RC/2009/002

(3). **Tortoe, C. and B. Mensah, (2009)**. Report on training and training related activities for Anye Nua Farmers Group in West Mamprusi District in the Northern Region from 14th March to 1st April 2009. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 37. CSIR-FRI/RE/TC/2009/003

(4). **Tortoe, C. (2009)**. Training Needs Assessment for Bomanga Farmers Group, Tuvuu Behigu Farmers Group and N-Ningbani Felia Maize farmers Group in the West Mamprusi District of the Northern Region. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 48. CSIR-FRI/RE/TC/2009/004

(5). **Amoa-Awua, W. K., K. Kpodo, K. A. Vowotor, M. Ottah-Atikpo, C. Gyato, J. Gayin, C. Tortoe, G. Anjeburo, C. Oduro-Yeboah, and E. Baido, (2009)**. FBO Training Needs Assessment for beneficiary FBO's in the Northern Intervention Zone (West Mamprusi and Savelugu Nanton Districts). MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp.311. CSIR-FRI/RE/A-AWK/2009/005

(6). **Amoa-Awua, W. K., K. Kpodo, K. A. Vowotor, M. Ottah-Atikpo, C. Gyato, J. Gayin, C. Tortoe, G. Anjeburo, C. Oduro-Yeboah, and E. Baido, (2009)**. Stage One Training of Farmer Based Organization in the West Mamprusi and Savelugu-Nanton Districts: First Bi-weekly Report. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp.98. CSIR-FRI/RE/A-AWK/2009/006

(7). **Amo-Awua, W. K., K. Kpodo, K. A. Vowotor, M. Ottah-Atikpo, C. Gyato, J. Gayin, C. Tortoe, G. Anjeburo, C. Oduro-Yeboah, and E. Baido, (2009)**. Stage One Training of Farmer Based Organization in the West Mamprusi and Savelugu-Nanton Districts: Second Bi-weekly Report. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp.87. CSIR-FRI/RE/A-AWK/2009/007

(8). **Amoa-Awua, W. K., K. Kpodo, K. A. Vowotor, M. Ottah-Atikpo, C. Gyato, J. Gayin, C. Tortoe, G. Anjeburo, C. Oduro-Yeboah, and E. Baido, (2009)**. Stage One Training of Farmer Based Organization in the West Mamprusi and Savelugu-Nanton Districts: Third Bi-weekly Report. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp.77. CSIR-FRI/RE/A-AWK/2009/008

(9). **Tortoe, C., C. Gyato, and C. Oduro-Yeboah, (2009)**. Training Needs Assessment of the medium to large scale cassava processors in the Volta, Brong Ahafo and Greater Accra Regions in Ghana. UoG/NRI/C:AVA/CSIR-FRI Project, Accra, Ghana. pp. 24. CSIR-FRI/RE/TC/2009/009

(10). **Tortoe, C., C. Gyato, and C. Oduro-Yeboah, (2009)**. Initial Technical Training on HQCF Production in the Volta, Brong Ahafo and Greater Accra Regions in Ghana. UoG/NRI/C:AVA/CSIR-FRI Project, Accra, Ghana. pp. 20. CSIR-FRI/RE/TC/2009/010

(11). **Tortoe, C., C. Oduro-Yeboah, E. Baido, L. D. Abbey, and R. Adiepena, (2009)**. Report on Fruits and Vegetables Processing Training Workshop for Agricultural Extension Agents of MoFA/WIAD. CSIR-FRI, Accra, Ghana. pp.46. CSIR-FRI/RE/TC/2009/011

(12). **Oduro-Yeboah C (2009)** Kpansim Manga Fbo in the Northern Intervention Zone (West Mamprusi) Fbo Training Needs Assessment CSIR-Food Research Institute (West Mamprusi). pp.23. CSIR-FRI/RE/O-**YC/2009/012**

Refereed Journals Papers

(1). **Gayin, J., T. J. Manful and Johnson, P-N.T. (2009)**. Rheological and sensory properties of rice varieties from Improvement Programmes in Ghana.

International Food Research Journal, 16: 167-174 (2009)

CSIR-FRI/JP/GJ/2009/001

(2). **Wuxin, Z., J. Gayin, F. Chatel, K. Dewettinck, and P. Van der Meeren (2009)**. Influence of Electrolytes on the Heat-Induced Swelling of Aqueous Dispersions of Native Wheat Starch Granules. **(Accepted for publication in Food Hydrocolloids)** CSIR-FRI/JP/WZ/2009/002

(3). **Ammonsou, E. O., F. K. Saalia, E. Sakyi-Dawson, S. Sefa-Dedeh, and L. D. Abbey (2009)**. Viscoelastic characteristics of Kpejigaou: a griddled cowpea food. By Journal of Food Process Engineering (2009) CSIR-FRI/JP/AEO/2009/003

(4). **Obodai, E. A., L. D. Abbey, and C. MacCarthy (2009)** Biochemical composition of some marine fish species in Ghana. By Int. Journal of Biol. Chem. Sci. vol. 3(2), 2009, pp.406-409 CSIR-FRI/JP/OEA/2009/004

(5). **Quaye, W., O. Gyasi, P. Larweh, P-N.T Johnson and P. Obeng-Aseidu (2009)** The Extent of Marketability and Consumer Preference for Traditional leafy vegetables-A case study at selected markets in Ghana. *International Journal of Consumer Studies*, 33(2009)244- 249. Published by blackwell publishing Ltd. CSIR-FRI/JP/QW/2009/005

(6). **Quaye, W., G. Frimpong, J. Jongerden and G. Ruivenkamp (2009)** Exploring Possibilities to Enhance Food Sovereignty within the Cowpea Production-Consumption Network in Northern Ghana. *Journal of Human Ecology*. 28(2):83-92 CSIR-FRI/JP/QW/2009/006

(7). **Quaye, W., K Adofo, Y Madode and A Abizari (2009)** Exploratory and multidisciplinary survey of the cowpea network in the Tolon-Kumbugu district of Ghana: A food sovereignty perspective. *African Journal of Agricultural Research* , Vol. 4 (4), pp. 311-320, April, 2009 CSIR-FRI/JP/QW/2009/007

(8). **Quaye, W., I. Yawson, R.M. Yawson and I. Entsi Williams (2009)** Acceptance of biotechnology and social-cultural implications in Ghana. *African Journal of Biotechnology* Vol.8(9), pp. 1997-2003, 4 May, 2009 CSIR-FRI/JP/QW/2009/008

(9). **Quaye W., I Yawson, J. Gayin and W.A. Plahar (2009)**. Economic Comparison of cassava processing methods in some selected districts of Ghana, Africa. *Journal of Root Crops*. 35(2):211-318 CSIR-FRI/JP/QW/2009/009

(10). **Pennise, D, S. Brant, S.M. Agbeve, Quaye W., F. Mengesha, W. Tadele and T. Wofchuck (2009)**. Indoor air quality impacts of an improved woodstove in Ghana and an ethanol stove in Ethiopia. *Science Direct, Energy for Sustainable Development* 13(2009)71-76 CSIR-FRI/JP/PD/2009/010

(11). **Quaye W. (2009)** Local Engagement key to bringing biotech to Africa. Science and development Network, 19 August 2009 Issue. CSIR-FRI/JP/QW/2009/011

(12). **Tortoe, C., J. Orchard, A. Beezer (2009)** Effect of agitation and antagonism between sucrose and sodium chloride on mass transfer during osmo-dehydration in plant materials. *International Food Research Journal*.(In press) CSIR-FRI/JP/TC/2009/012

(13). **Tortoe, C. and Clerk, G. C. (2009)** Pathogenicity of *Sclerotium rolfsii* on cocoyam varieties in Ghana. *Ghana Journal of Agriculture Science*. (In press) CSIR-FRI/JP/TC/2009/013

Tortoe, C. and G. C. Clerk (2009) Isolation, purification and characteristics of strains of *Sclerotium rolfsii* in Ghana. *Journal of Ghana Science Association*. (In press) CSIR-FRI/JP/TC/2009/014

(14). **Adamafio, N. A., M. Obodai, and B. Brimpong (2009)** Solid state fermentation of maize (*Zea mays*) cob by *Pleurotus ostreatus* strain EM-1: Biopolymer profiles and cellulose degradability *International Journal of Biological and Chemical Sciences* 3(6) 1459-1466. CSIR-FRI/JP/ANA/2009/015

(15). **Obodai, M., W. K. Amoa-Awua and G. T. Odamtten (2009)** Physical, chemical and fungal phenology associated with the composting of 'wawa' sawdust (*Triplochiton scleroxylon*) used in the cultivation of oyster mushrooms in Ghana. *International Food Research Journal* (accepted) CSIR-FRI/JP/OM/2009/016

Conference Paper

(1). **Obodai, M. and M. M. Apetorgbor, (2009).** An ethnobotanical study of mushroom germplasm and its uses in the Bia Biosphere reserve of Ghana. In: *Proceedings of the 2nd African Conference on Edible and Medicinal Mushrooms.* Noguchi Memorial Institute for Medical Research, Accra, Ghana. 24th-28th March, 2009 CSIR-FRI/CP/OM/2009/001

Narh, D. L. and **M. Obodai, (2009)** Comparative utilization of rice straw on the growth and yield of three *Pleurotus* species. In: *Proceedings of the 2nd African Conference on Edible and Medicinal Mushrooms.* Noguchi Memorial Institute for Medical Research, Accra, Ghana. 24th-28th March, 2009 CSIR-FRI/CP/NDL/2009/002

(2). Achio, S., **M. Obodai,** and S. Mortu, **(2009)** Effect of storage temperature and packaging on the keeping qualities of fresh oyster mushroom (*Pleurotus ostreatus*). In: *Proceedings of the 2nd African Conference on Edible and Medicinal Mushrooms.* Noguchi Memorial Institute for Medical Research, Accra, Ghana. 24th-28th March, 2009 CSIR-FRI/CP/AS/2009/003

(3). Sarpong, N.S., N.A. Adamafo and **M. Obodai, (2009).** Stability of *Pleurotus ostreatus* strain EM-1 laccase: Determination of optimum concentrations of glycerol and metal ions. In: *Proceedings of the 2nd African Conference on Edible and Medicinal Mushrooms.* Noguchi Memorial Institute for Medical Research, Accra, Ghana. 24th-28th March, 2009 (Poster presentation) CSIR-FRI/CP/SNS/2009/004

Manual

(1). **Tortoe, C., C. Gyato and C. Oduro-Yeboah, (2009).** Training manual for the production, quality control and sanitation management of high quality cassava flour. UoG/NRI/C:AVA/CSIR-FRI Project,

Accra, Ghana. pp. 32. CSIR-FRI/MA/TC/2009/001

Approved Consultancy Reports

(1). **Amoa-Awua, W. K, P. A Adu-Amankwa, K. Vowotor, B. Mensah, C. Gyato J. Gayin, C. Tortoe, G Anyebuno, and A. Sampare, (2009)** Report on Training & Training Related Activities for Designated FBOs in West Mamprusi District in the Northern Region of Ghana. *A consultancy report submitted to Millennium Development Authority (MiDA) Agricultural Project.* CSIR-FRI/CR/AAW/2009/001

(2). **Tortoe, C. (2009).** Action Business Plan for Bomanga Farmers Group at Loagri No. 2 in West Mamprusi District in the Northern Region of Ghana. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 42. CSIR-FRI/CR/TC/2009/002

(3). **Tortoe, C. (2009).** Action Business Plan for N-Ningbani Felia Maize Farmers Group at Wumtubri in West Mamprusi District in the Northern Region of Ghana. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 43. CSIR-FRI/CR/TC/2009/003

(4). **Tortoe, C. (2009).** Action Business Plan for Tuvuu Behigu Farmers Group at Tuvuu in West Mamprusi District in the Northern Region of Ghana. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. pp. 42. CSIR-FRI/CR/TC/2009/004

(5). **Oduro-Yeboah, C (2009)** Action Business Plan Kpansim Manga Farmers Association Goriba C/O MoFA District Directorate, West Mamprusi District, Walewale, District in the Northern Region of Ghana. MiDA Agriculture Project /CSIR-FRI, Accra, Ghana. through Bangmarigu community Bank Ltd. Pp.36 CSIR-FRI/CR/O-YC/2009/005

APPENDIX VI

Conferences, Courses, Workshops and Seminars attended by FRI Staff in 2009

Date of Conference/ Seminar	Type of Conference/Seminar	Organizers	Venue	Participants
23/2/09	FAO regional workshop on applying risk analysis framework to address problems of mycotoxins	National codex committee	AICC	Dr. W. A. Plahar
3/3/09	Nutrition & Food Science Students Society week celebration	NFSSS	Dept. Fd. Sci., UG	Dr. P-N. T. Johnson
23 – 27 /3 /09	3rd Session of the Codex Committee on Contaminants in Foods	(FAO/WHO)	Beurs World Trade Centre in Rotterdam, The Netherlands	Dr Kafui Kpodo
24-27/2/09	18 th session of the FAO/WHO Coordinating Committee for Africa (CCAFRICA)	National Codex Committee	AICC	Dr. K. Kpodo
27/4/09	Go-Global Conference	FDB	Alisa Hotel	Dr. W. A. Plahar
23-4/8/09	4th Global Women Entrepreneurs trade fair and investment forum			Dr. P. A. Adu Amankwah Dr. M. Halm
28/4/09	Training in analysis of veterinary drug residue	FDB	TC Corquaye Conf. Hall	Mr. G. Ayebeunu
8-10/7/09	The HINARY-AGORA-OARE-TEEAL TOT Workshop	ITOCA & CSIR-INSTI	Confernece Hall of INSTI	Mr. R. Kavi
14/7/09	GAPP Seminar and IAALD Conference	INSTI	INSTI	Mr. S. Nketia Mr. R. Kavi
4-8 /8/09	26th Biennial Conference of the Ghana He presented a Paper titled "Consumer perceptions, knowledge and preferences for aromatic rice types in Ghana".	Science Association	held at the University of Cape Coast	Mr Charles Diako
2/9/09	National Chemical Management Profile and Capacity Assessment Workshop	Environmental Protection Agency	Airport View Hotel, Accra	Dr Kafui Kpodo
7-8/10/09	National Housing Conference	Min. of Water Resources & Housing, BRRI, GIA	STEPRI Conf. Hall	Dr. P-N. T. Johnson
20-22/10/09	Seminar on commercialisation	CSIR	CSIR conf. Hall	Mr. B. Awotwi Mr. P. Baidoo
7-8/10/09	Invitation to participate in the WAITRO Networking session	BNARI GAEC	College of Physicians & Surgeons Conference Hall	Dr. P-N. T. Johnson Dr. M. Ottah-Attikpo Dr. K. Kpodo Dr. W. K. Amoa Awua

Appendix VI cont.

Date of Conference/ Seminar	Type of Conference/Seminar	Organizers	Venue	Participants
8/10/09	Stakeholder consultation review meeting	GAINS	Crystal Palm Hotel	Mr. S. Nketia Mr. R. Kavi
17-20/11/09	UNIDO program on Internal Auditing	UNIDO/GSB	GSB	Mr. G. Ayebunu Mr. E. Baidoo
24/11/09	Stakeholders workshop for initiating the implementation of National Rice Development Strategy	MoFA	Marina Hotel, Dodowa	Mr. J. Gayin
18/11/09	AKTP Business forum	British Council	British Council Auditorium	Dr. P. N-T. Johnson
25-27/11/09	Research output review seminar	IIR	IIR	Dr. P. N-T. Johnson
15 th – 21 st /11/09	Technical/Research Paper Writing Workshop	Biosciences Eastern and Central Africa Hub (ILRI)	Addis Ababa, Ethiopia	Mr Charles Diako
7/12/09	Symposium on complementary feeding and lunching of a project to develop nutritionally improved and fortified food products	Centre for Africa Wetlands		Mrs. M. Glover-Amengor
10/12/09	Invitation to join partners for community-based solar technology (PAC-Solar-Tech)			Dr. M. Obodai

ORGANOGRAM

