

Council for Scientific & Industrial Research



Food Research Institute

2004 Annual Report



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Council for Scientific and Industrial Research



Food Research Institute



The Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR) is an internationally recognised centre of expertise in research into problems of food processing and preservation, storage, marketing, distribution and utilisation, 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 FRI. The views expressed are solely that of the Institute.

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Members of FRI Management Board

1.	Prof. A. Ayensu Dep. Director-General, INSS/CSIR	-	Chairman
2.	Dr. W. A. Plahar Director, Food Research Institute (FRI)	-	Member
3.	Dr. E. B. Hagan Director, Institute for Industrial Research (IIR)	-	Member
4.	Prof. E. Asibey-Berko Head, Dept. of Nutrition & Food Science, Legon	-	Member
5.	Mrs. Juliana Kwakyewa Dennis Director, WIAD, MoFA	-	Member
6.	Mr. Timothy Osei Oduro, Adiya, Osei & Co. SEDCO House	-	Member
7.	Mr. Nimo Ahenkorah Executive Director, Ghana Standards Board	-	Member
8.	Mr. Kofi Asiamah-Asiedu CEO, Can & Kaa Ltd	-	Member
9.	Dr. Josephine Nketsiah-Tabiri Head, Dept. of Fd. Sci. & Radiation Processing BNARI-GAEC, Kwabenya, Accra	-	Member
10.	Mr. Charles Gunu Production Manager, Fish Cannery GAFCO, Tema	-	Member
11.	Mr. Charles Debrah-Asante Production Manager, Cocoa Processing Company	-	Member
12.	Dr. Wisdom Amoa-Awua Deputy-Director, Food Research Institute (FRI)	-	In Attendance
13.	Mrs. Eugenia Atta-Sonno Head of Administration, FRI	-	Secretary
14.	Robert M. Yawson Scientific Secretary	-	Recorder

Principal Officers

Chairman, Management Board	Prof. A. Ayensu
Director	Dr. Wisdom A. Plahar
Deputy-Director	Dr. Wisdom Amoa-Awua
Heads of Division	
<i>Commercialization and Information Division...</i> ...	Agnes Osei-Yaw (Mrs.)
<i>Food Processing & Engineering Division</i>	Dr. P. N-T Johnson
<i>Nutrition and Socio-Economics Division...</i> ...	Phoebe Lokko (Mrs.)
<i>Food Microbiology Division...</i>	Mary Halm (Ms.)
<i>Food Chemistry Division...</i>	Dr. Kafui Kpodo (Mrs.)
<i>Administration Division...</i>	Eugenia Atta-Sonno (Mrs.)
<i>Accounts Division</i>	Jacob Mintah
Scientific Secretary	Robert M. Yawson

Members of the Internal Management Committee

1. *Dr. W. A. Plahar* - *Director*
2. *Dr. W. A. Amoa-Awua* - *Deputy-Director*
3. *Mrs. Agnes Osei-Yaw* - *Head, Commercialisation & Info. Division*
4. *Mrs. P. Lokko* - *Head, Nutrition & Socio-Econ. Division*
5. *Dr. (Mrs.) K. Kpodo* - *Head, Food Chemistry Division*
6. *Mrs Nana T. Annan* - *Head, ISU - FMD*
7. *Dr. P. N-T. Johnson* - *Head, Food Proc. & Engineering Division*
8. *Dr. P. Adu-Amankwa* - *Head, PPSU-FPED*
9. *Mrs. E. Atta-Sonno* - *Head of Administration*
10. *Mrs. M. Ottah Atikpo* - *Head, ISU-FMD/ President, Local RSA*
11. *Mr. Daniel Blay* - *Head, EU-FPED*
12. *Mr. R. M. Yawson* - *Scientific Secretary*
13. *Mr. J. Mintah Snr.* - *Head, Accounts*
14. *Mr. D. Asiedu* - *Chairman, Staff Welfare*
15. *Mr. Ben Awotwi* - *Chairman, SSA-FRI*
16. *Mr. R. Mawuli* - *Chairman, TUC*

In Attendance

17. *Mr. Frederick Frimpong* - *Administrative Officer*

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EXECUTIVE SUMMARY

The Food Research Institute was established by the Government of Ghana in 1963, and incorporated into the Council for Scientific and Industrial Research (CSIR) as one of thirteen institutes in 1968. FRI has a mandate to conduct applied research into problems of food processing and preservation, storage, marketing, distribution and utilisation in support of the food industry, and also to advise government on its food policy. The Institute's mission focuses on providing scientific and technological support to the growth of the food and agricultural sectors in the national economy in line with government policy objectives.

The Institute is divided into 7 Divisions, 4 of which address technical aspects of food quality and production; food microbiology, food chemistry, food processing & engineering and nutrition & socioeconomics. The remaining 3 Divisions deal with business development, administration and finance.

The year under review saw the appointment of new 12 – Member Management Board for the Institute for a four-year term. Several other appointments were made including an Administrative Officer, Administrative Assistant, Technical Officer, Clerk Grade II and a Security Man. FRI maintained a total of 178 staff during the year under review, of which 41 were scientists and engineers, 56 senior technical and administrative support staff, and 81 junior members of staff in various supporting roles. The Institute maintained its bipartite structure, with the Director managing the 3 non-scientific Divisions (and with overall responsibility for all divisions and reporting to the Management Board), whilst the Deputy Director manages the 4 Scientific Divisions.

The main programmes of the Institute during the year 2004 were centred on R&D activities for the solution of postharvest problems and also to generate income. The Institute measures and manages its performance using the balanced scorecard approach. The short term goal of the FRI under the current measurement framework is: *To be a centre of excellence that conducts market-orientated research and provides accredited technical services to the food industry by 2008*. During the year under review the Institute accomplished several of its Key Performance Indicators. On whole, the Institute performed better than the previous year on all the Scorecard Perspectives.

The Commercialisation process of the Institute continued and the following areas were the major sources of income:

- Consultancies
- Collaborative Research
- Equipment fabrication & Hire of Facilities
- Sale of Research By-Products
- Technical and Analytical Services
- Training

The percentage of Internally Generated Fund (IGF) as percentage of subvention was **4.23%**. Although Collaborative Research does not directly contribute to the calculated IGF it was the mainstay of the Institute and brought the ratio to **29.40 %** of subvention.

The R&D output for the year was quite good with over 50 Publications. Five refereed journal papers, twenty-seven edited research reports, ten conference papers and eleven consultancy reports, manuals etc were published within the year by the scientists of the Institute.

The year under review saw a high number of participation in local and international conferences by staff.

PART 1
GENERAL MATTERS
(Non – Scientific Divisions)

Chapter 1 ADMINISTRATION DIVISION

1.1 *Introduction*

The FRI presently operates under seven Divisions – Food Chemistry, Food Microbiology, Food Processing and Engineering, Nutrition and Socio-Economics, Commercialisation and Information, Administration, and Accounts. The detailed existing organisational structure of FRI is given in Appendix VIII. The Administration Division caters for the secretarial, personnel, establishment, estate and transport matters of the FRI. The Division continued with these support services to the Institute under the constraints of limited staff and lack of some basic office equipment

1.2 *Staff Strength*

The staff strength of the Institute stood at 178 and the breakdown is as follows:

Category of Staff	Number of Females	Number of Males	Total
Research staff	20	21	41
Senior Staff	8	43	56
Junior Staff	16	70	81
Overall Total	43	133	178

1.3 *Appointments*

During the year, six people were given temporary appointments. Please refer to Appendix VI for details. A new Management Board was appointed for the Institute. Please see the preface to this report for details of the Members.

1.4 *Resignations*

Two members of staff resigned from the institute and the Council. They are:

- Mr. Leslie Codjoe, a Senior Admin. Assistant
- Mr. Patrick Feglo, a Research Scientist.

1.5 *Retirements*

Ms. Mary Halm, a Senior Research Scientist, and Mr. Seidu Kanjarga, a Security man proceeded on retirement.

1.6 Promotions

During the year under review, several promotions were announced for both Senior and Junior Staff. The following senior staff were promoted to the following designations:

Name		Designation
1. Mr. Benedict Awotwi	promoted to	Principal Tech. Officer
2. Mr. Samuel Tagoe	-	“
3. Mr. Richard Mawuli	-	“
4. Mr. Benjamin Amoako	-	Chief Technical Officer
5. Mr. Joseph Lamptey	-	Principal Wks. Superintendent
6. Mr. Joseph Akoto	-	Works Superintendent
7. Mr. Emmanuel Allorsey	-	Technical Officer

Nineteen Junior Staff were promoted. Among them were Ms. Joanna Dzikunu and Mr. Ben Adu who were promoted to Administrative Assistant and Traffic Supervisor respectively. All the security men were also among those promoted.

1.7 Upgrading

Two staff were upgraded to the post of Assistant Technologist. The staff are Mr. Appolonius Nyarko and Mr. Kofi Kwegyir Essel.

1.8 Institutional Transfer

Mrs. Mary Glover-Amengor, a Research Scientist was transferred from the Soil Research Institute to the Food Research Institute. She reported for duty on 1st March, 2004.

1.9 Study Leave with Pay

A few staff members were on study leave pursuing courses at various levels in various institutions. Please refer to Appendix IV for details

1.10 Leave without Pay

Mr. David Abusah and Mrs. Angela Addy were on leave without pay.

1.11 Return to Post

Dr. Charles Tortoe, Mr. Peter Addo, Ms. Janet Aggrey-Yawson, Mr. Tutu Aikins etc, resumed duty after their study leave. Please refer to Appendix V for details

1.12 In-Service Training/Courses/Conferences/Workshops/Seminars

Several In-Service Training, Courses, Conferences, Workshops and Seminars were attended by all categories of staff including the Security Personnel and Drivers. Please see Appendix VII for details.

1.12 Attachment Training/National Service Postings

During the year, eleven (11) students from various institutions undertook their attachment training and National Service with the institute. The students came from the universities and polytechnics. They were attached to the various Divisions.

1.13 Institute Visitors

The Institute had a couple of visitors from various institutions. Among them were:

- A field trip to the CPDU, Pokuase by ADRA on 1st September, 2004.
- 50 students from the Science, Technology and Mathematics Education Unit of the Ga District Assembly who visited the pilot plant on 8th September, 2004;
- the Agri-Business club of Wesley Grammar School made a study tour to mushroom production unit on 26th November, 2004
- Several Visiting Scientist mostly from NRI, UK

Chapter – 2 ACCOUNTS DIVISION

2.1 Introduction

The Accounts Division controls expenditure and caters for all financial transactions of the FRI. It prepares the annual estimates, annual accounts and financial statements, and maintains books and documents involved in all these activities. The Division supports all the other Divisions to carry out their financial obligations effectively for the smooth running of the Institute. The Division is made up of two sections, namely, the Main Accounts Section and the Stores Section.

2.2 Staff Strength and Movement

As at the end of the year, the staff strength of the Division stood at ten. The Main Accounts Section had seven members of staff and the Stores section had three. Mr Tutu Aikins, Mr James Cromwell and Mrs Lawrencina Botchie resumed duty after their study leave. Mrs Angela Addy was on leave without pay effective October 2003.

2.3 Major Activities

The Main Accounts Section of the Division undertook the following activities;

- Prepared Financial Statements for the Institute and for collaborative projects;
- Prepared Quarterly Returns which were forwarded to the CSIR Secretariat,
- Prepared of Quarterly Report on the Institute's Internally Generated Funds (IGF);
- Prepared Annual Budget for the institute;
- Prepared Quarterly Reports for collaborative projects

The Stores section continued with its functions of procurement of chemicals and media for the laboratories, procurement of stationery and other needed items, and their proper storage and documentation for effective running of the Institute.

2.4 Statement of Accounts for the year ending 2004

The total income for the year amounted to **¢6,261,321,533.00**. The total recurrent expenditure for the year was **¢6,452,341,155.00** leaving an excess of expenditure over income of negative **¢191,019,622.00** carried forward.

2.5 Constraints

- Funds released to run the Institute in the year 2004 was woefully inadequate.
- Delay in release of Government subventions to meet workers salaries, administrative expenses and research activities.

- The Scala Accounting Software currently in use automatically deletes details of transactions relating to previous years and brings only the outstanding balances such as trade debtors, creditors etc.

2.6 *Accounting System*

The accounting system of the Institute during the year was assessed to be satisfactory for the capturing of financial data in terms of revenue, expenditure, assets and liabilities of the Institute. Segregation of duties was found to be well spelt out with different staff responsible for pay roll, Final Accounts, Cash Receipts, salary Advances etc.

Chapter - 3

COMMERCIALISATION AND INFORMATION DIVISION

3.1 Introduction

The Commercial and Information Division continued its basic task of coordinating the commercial activities of all the other Divisions of the Institute in order to generate income for the Institute. The Division has three Units namely Client Services Unit, Library and Publications Unit and the Cassava Processing Demonstration Unit.

3.2 Staff Strength

The staff strength of the Division stood at 21 at the end of the year. It is made up of a Head of Division who is a Principal Research Scientist, 8 Processors, 7 Senior Tech Staff, 3 Security men, 1 labourer, and 1 Driver.

3.3 Commercialisation Activities

During the year under review the Division continued its work of co-ordination of commercialization activities. The main activities carried out include collection of samples for analysis, transfer of technology, hiring of Institute's facilities, organization of training programs and sale of research by-products.

3.4 Income Generation

The Institute generated a gross income of Seven hundred and twenty-one million, eight hundred and thirty-two thousand eight hundred and twenty cedis (**¢721,832,820.00**) through its commercialisation activities. The net Internally Generated Income (IGF) of the Institute amounted to two hundred and twenty seven million, eight hundred and seventy nine thousand, and nine cedis (**¢227,879,009.00**).

The Institute received an amount of Five billion three hundred and eighty-eight million seven hundred and forty-two thousand, nine hundred and seventy-nine cedis (**¢5,388,742,979.00**) as Government subvention for the year 2004. The IGF as a percentage of total subvention is **4.23%**. However, the Institute attracted a lot of donor funding for its research activities, which could not be borne by Government subvention. The total Donor Direct Inflow to the Institute amounted to approximately **¢1,356,591,279.00** which bring the IGF/Subvention ratio to **29.40%**

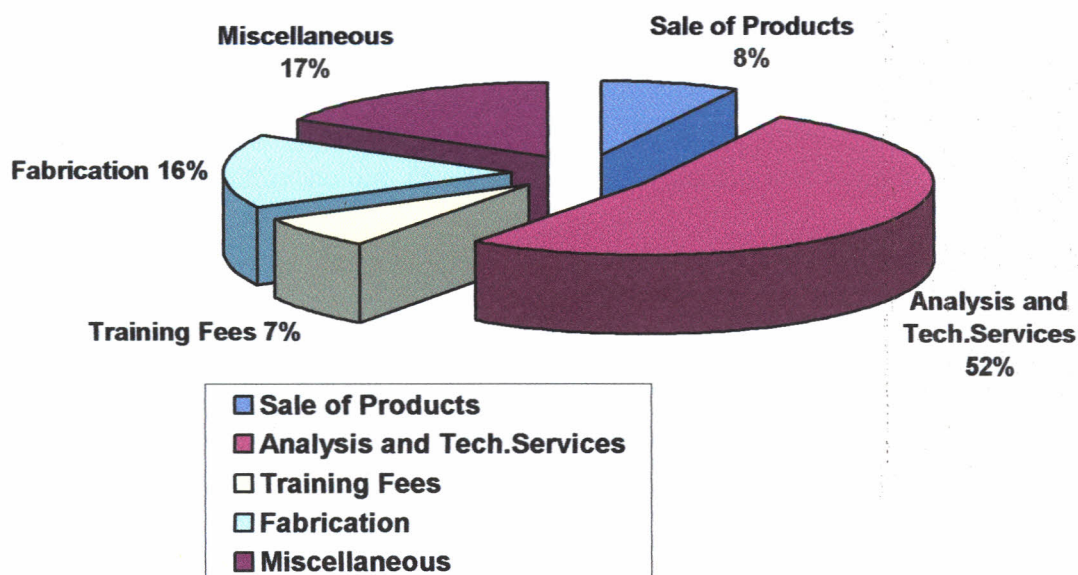
The FRI set **¢534,146,370.00** as target for the year under review. The table below compares the projections with the actual incomes:

ACTIVITY	PROJECTED INCOME (¢)	ACTUAL INCOME (¢)
<i>Sale of Products</i>	86,061,976.00	55,957,000.00
<i>Analysis & Tech. Services</i>	263,723,374.00	376,941,800.00
<i>Training Fees</i>	52,541,060.00	52,955,000.00
<i>Fabrication</i>	29,100,500.00	115,500,000.00
<i>Miscellaneous</i>	102,719,460.00	120,479,020.00
TOTAL INCOME	534,146,370.00	721,832,820.00

Table Showing Projections as Against Actual Incomes for Year 2004

Although the institute far exceeded its targets, it must be noted that all the projections and the actuals are gross amounts. The total net income amounted to two hundred and twenty-seven million, eight hundred and seventy-nine thousand, and nine cedis (¢227,879,009.00) with an Expense Ratio of 68.4% which makes the Expense Ratio exceedingly high. Please see Appendix III for details of Annual Statement of IGF Account

Relative Contribution to IGF - 2004



3.5 *FRI Media Exposure in 2004*

In line with the objective of media exposure through the popularisation of FRI training programmes; a soybean workshop held for entrepreneurs from 4th to 7th May attracted good media exposure. A write up on FRI's training objectives and a photograph of the participants and resource persons at the workshop appeared in the *Daily Graphic*.

In July, a documentary on the production of glucose syrup and high quality cassava flour was launched at a seminar for policy makers and industrialists at the Royale Cresta Hotel in Accra. This activity was broadcast on all the three television networks and the other news media. A workshop to launch 5 Rice Quality Improvement Training Manuals attracted high media coverage

Several articles were also published in the major Ghanaian Newspapers.

PART 11

SCIENTIFIC DIVISIONS

Chapter - 4

NUTRITION AND SOCIO-ECONOMICS DIVISION

4.1 Introduction

The major functions of the Nutrition and Socio-economics Division are to conduct surveys and feasibility studies into the economic viability and socio-economic impacts of projects in the Institute. In addition, the Division also conducts studies into consumer demands and the utilisation of food. The Division consists of two units namely the Socioeconomics Unit and the Nutrition Unit which handles community and human nutrition studies and runs a test Kitchen which conducts sensory tests on products developed by the FRI and Industry. The Division (NSED) continued with its main responsibility of conducting surveys and feasibility studies into the economic viability and socio-economic impacts of projects of the institute, consumer demand and the utilisation of food during the year. The Division also continued with its community nutrition studies.

4.2 Staff Strength

The Division has a total staff strength of ten made up of 6 Research Grade Staff and 4 Technical grade staff. The staff comprises of one Principal Research Scientist, one Research Scientist, four Assistant Research Scientists, one Chief Technical Officer, two Senior Technical Assistants and one Technical Assistant Grade II. Mrs Alice Padi and Ms. Constance Boateng resumed duty in October 2004 after completing a 2-year Hotel and Catering Management Course. Mrs Patience Larweh continued with her study leave in Canada whilst Ms. Anna Kuevi started her MPhil project work in the Division under the supervision of Mrs. Phoebe Lokko. Mr. Eric Akwasi Sarpong from the KNUST was assigned to the Division for his National Service in November 2004.

4.3 Technology Transfer

Staff of the Division organised training sessions for:

- Staff of UNILEVER in sensory attributes and evaluation from 10th to 17th March
- Private Entrepreneurs in soy bean processing
- Production of cassava strips

Other activities involved recipe formulation with cassava flour for Obuasi Continental Goldfields Limited and the fortification of wheat flour with micronutrients as well as the preparation of strong wheat flour products for the Health Services Department at Legon.

4.4 Support of Research Activities

DFID Project on sustainable uptake of cassava as an industrial commodity

Staff of the Division supervised and managed the activities of the cassava processing plants at Dobblo Gonno, Manchi and Blofoyedur.

Root and Tuber Improvement Programme (RTIP)

Some members of the Division conducted Cost Benefit Analysis of cassava processing technologies. In this regard they designed questionnaires and conducted surveys in the Central, Eastern and Volta Regions. Staff also conducted a nutritional and lifestyle study in 20 selected communities in the Central, Upper East and Ashanti regions.

Peanut CRSP Project

Studies were conducted on the effect of peanut consumption on appetite, energy balance and cardiovascular diseases. These studies were conducted with students of the University of Ghana, Legon

Sensory studies and Recipe Development

Sensory evaluation studies were conducted for the following foods and projects:

- Parboiled rice under the DFID/CPHP/FRI Rice project
- Locally grown rice under the AgSSIP project
- Micronutrient fortified banku mix and preparation of Kenkey
- Recipe formulation and trials on parboiled rice.

4.5 Participation in workshops, training, conferences, seminars and exhibitions.

Staff of the Division participated in the celebration of Africa Rice Day held at the International Conference Centre on 28th September 2004 by mounting an exhibition. Staff of the Division also participated in several conferences, seminars and workshops. Please refer to appendix VII for details

Chapter - 5
FOOD CHEMISTRY DIVISION

5.1 Introduction

The Chemistry Division of the Institute comprises two units namely the Food Toxicology Unit and the Industrial Services Unit.

5.2 Staff Strength

The Division has staff strength of 14 as follows:

- 2 Senior Research Scientists
- 1 Research Scientist
- 1 Assistant Research Scientist
- 2 Chief Technical Officer/Senior Technologists
- 3 Principal Technical Officers/Technologists
- 1 Senior Technical Officer/Technologist
- 1 Assistant Technologist
- 1 Technical Officer
- 1 Senior Technical Assistant
- 1 Technical Assistant

During the year, Mr. Kwegir Essel was transferred from the Food Microbiology Division to the Division. Ms. Mercy Fianu is on temporary appointment to the Division after completing her National Service.

5.3 Analytical Services

During the year under review, the Division offered analytical services to several companies, establishments and individuals. A total of 343 samples were received by the Industrial Services unit for analyses. This number represents an increase of a 100 samples over the previous year (2003).

The samples analysed included biscuits, flour, rice, Burger Peanut snacks, Snappy Peanut snacks, maize, beans, honey, animal feed, alcoholic beverages, fruit drinks, edible oils, among several others.

The major clients included Food and Drugs Board, UNHCR, EuroFoods., Cadbury Ghana Ltd., Transpomech, Sitos Ghana Ltd., Morgan Farms, Agricare Ltd., Rals Commodities and Ghana Inspections Ltd., among others. Analysis of the 343 samples generated a gross income of Seventy Five Million, One Hundred and Twenty Thousand

Cedis (¢ 75,120,000). During the year, the Toxicology Unit received a total of 144 samples for aflatoxin analysis as against 142 samples for the year 2003. The samples consisted of groundnut kernels, groundnut paste, maize kernels, Burger peanut snacks, Snappy Peanut snacks, Cocoa cake, Cassava flour (Kokonte) and Copra cake among others. The major clients included Food and Drugs Board, Agricare, Burger Food Industries, West African Mills Company (WAMCO), Krisha Farms, Ghana Nuts Ltd., SGS Ghana Ltd., Ghana Standards Board, FoodTech. Ltd. Ejura Farms and Barbex Technology Ltd. Total charges for the 144 samples amounted to Thirty-Eight Million and Four Hundred Thousand cedis (¢38,400,000). This works out to a total of One Hundred and Thirteen million, five hundred and Twenty thousand Cedis (¢113,520,000) for the two units of the Chemistry Division.

5.4 Practical Training and Attachment

During the year, four students from KNUST (Emmanuel Aboagye, Priscilla Adusu, Benjamin Asmah and Kweku Ayensu) were on Practical Attachment with the Division from 7th June to 30th July 2004. One MPhil. Student (Regina Tefe) from the Botany Department at Legon undertook part of her project work in the Division. Five students from Accra Polytechnic also conducted their project work in the Division.

5.5 National Service Personnel

During the year three National Service personnel were attached to the Division from June to August 2004 to complete their service. Mr. Henry Dorson from KNUST started his National Service with the Division in November 2004.

5.6 Efforts towards Accreditation of Chemistry Laboratories

In preparation towards the Accreditation of five of our chemical methods to ISO 17025 Quality System, two audits were conducted during the year under review. These were held in May and November 2004.

5.7 Training and Attendance at Meetings

Staff of the Division participated in several conferences, seminars and workshops. Please refer to appendix VII for details

5.8 Other Matters

Generally the Division had a good year. The only problems encountered were delays in the supply of chemicals and other consumables for analytical work in the Laboratories.

Chapter -6

FOOD PROCESSING AND ENGINEERING DIVISION

6.1 Introduction

The Food Processing & Engineering Division in line with its mandate conducted applied research into the processing, preservation, packaging and storage of food as well as the development of new products from available raw materials.

6.2 Staff Situation & Movement

The total number of staff in the Division stood at 42.

- a. Study Leave: Two staff members, Mrs Charlotte Oduro-Yeboah and Mr. Elvis Baidoo continued with the studies in MPhil Food Science at the Department of Nutrition and Food Science.
- b. National Service Personnel: Four national service personnel were assigned to the Division.

6.3 The Units and Consultancy Services of the Division

Both the Pilot-Scale Production and the Engineering Units continued to render normal services to the public and the Institute. The Pilot-Scale Production Unit (PSPU) continued to provide its normal services; drying, milling, roasting and assisting clients in product development. Commodities dried include pineapple and pawpaw pieces, grated coconut, fermented maize, coffee, cassava dough etc. It has also been producing FRI food products for the FRI tuck shop. The coffee and groundnut roasting processing area was given a minor facelift.

The year under review saw the unit continuing with its routine maintenance of processing and analytical machines and equipment of all Divisions of the Institute and occasional design and construction of processing machines and equipment for customers.

The unit constructed twelve machines and equipment for three different clients. They are:

- Five cassava graters and five cassava presses for ADRA
- A centrifugal sifter for Centrapac Ltd.
- A centrifugal sifter for Amasa Agro-Processing Company Ltd.

Installation works undertaken included the following:

- Air conditioners at the following offices and laboratories:
 - Microbiology
 - Accountant's office
 - Head, CID office
 - Registry
 - Pilot Plant Chemical Store
 - Store's office
 - Account's office
 - Reception
 - Chemical Laboratory, C4
- Cowpea processing plant at Ohawu were dismantled and installed at the Winged Bean Dehulling Plant's building at the Pilot Plant.
- The unit designed and supervised the major constructional new development especially the wall separating the sorghum malting plant.
- The unit completed the construction of fifteen machines and equipment which were started in 2004 for different clients. They are:
 - Five cassava graters and five cassava presses for ADRA.
 - A cleaning machine, roaster, hammer mill, and a sifter for Bennito Catholic Health Center.
 - A hammer mill cum pneumatic conveyer and cyclone for

6.4 Visits by Project Collaborators

During the period under review, the Division played host to a number of collaborators on a number of foreign funded projects which scientists of the Division were participating. These included Dr. Andrew Graffham for the DFID/NRI/FRI Expanded Markets for Cassava Project and Mr. Keith Tomlins for the DFID/NRI/FRI Street Food Project.

6.5 Use of the Pilot Plant Facilities

A number of organisations including individuals continued to use the facilities in the Pilot plant for different food product development. One of such organisation is the Food Processors Association of Ghana.

6.6 Customised Training in Food Processing

A number of customised training workshops were organized by the Division for a number of clients. The training included fufu production, fruit processing into jam, juices and drinks.

6.7 Divisional Meetings

Two divisional meetings (April and August) were held in the course of the year. One of the main highlights of the meetings was the decision of the Division to improve documentation of commercial activities. In this regard, a number of clients' forms were developed. These were:

- **Processing & Engineering Division Form B1:** Client's Request Form for Construction of New Machine/Equipment
- **Processing & Engineering Division Form B2:** Client's Request Form for Repairs or Servicing of Machine/Equipment
- **Processing & Engineering Division Form B3:** Office Information on Construction of New Machine/Equipment or Repairs/Servicing of Machine/Equipment
- **Processing & Engineering Division Form C1:** Client's Request Form for Use of Pilot-Scale Production Unit (PSPU) Facilities for Contract Services/Product Development
- **Processing & Engineering Division Form C2:** Client's Request Form for Simple Processing Services (I.E. Drying, Milling, Packaging Etc.) at the Pilot Plant
- **Processing & Engineering Division Form C1:** Office Information on Clients Using Facilities At PSPU for Product Development or Contract Services
- **Processing & Engineering Division Form E1:** Client's Request Form for Use of Analytical Equipment

6.8 UNIDO/FRI Sorghum Malt Project

The malting plant has now been fully refurbished and put into operation. A wall to separate the wet processing area from the malting and brewing plants has been constructed. The pilot-scale brewing and bottling plants are expected by the end of May 2005. In addition, the cold rooms to house the fermenting vessels have been refurbished.

Chapter - 7

FOOD MICROBIOLOGY DIVISION

7.1 Introduction

The Food Microbiology Division is made up of the Mycology Unit and the Microbiology Industrial Services Unit; and it is in the process of strengthening its capacity in Food Biotechnology. The Division continued with its task of providing analytical support to both research and industry. The main activities carried out by the Division in the period under review were:

- (i) analytical services to clients,
- (ii) activities in connection with accreditation of eleven microbiological methods
- (iii) rehabilitation of mushroom production activities
- (iv) Research activities carried out under the cocoa project.

7.2 Analytical services to clients

The Division continued with its routine analytical services carried out for clients through the CID.

Period	No of clients	No of analysis
2004:		
1 st Quarter	35	333
2 nd Quarter	30	347
3 rd Quarter	27	146
4 th Quarter	30	152
TOTAL for 2004		978

Most important clients included:

- Cadbury Gh. Ltd.
- Pioneer Food Cannery Ltd.
- Beverage Investment Gh. Ltd.
- GAFCO
- Uniliver
- Food and Drugs Board
- Airways Catering Ltd.
- UNHCR
- Burger Peanut Industry
- West Africa Mills Ltd.
- Prof. Asigbey-Berko
- Dr. P.N-T Johnson

7.2.1 Challenges

The two main problems encountered in the Division with respect to analysis carried out for clients were delays in release of reports to clients and availability of inputs. To help solve the problem of delays in report typing, the Institute kindly purchased a new computer for the division to be used solely for typing reports. A staff of CID was also attached to the Division to type the reports at the Pilot Plant. These measures helped to curtail delays in reporting back to clients and further action is being taken to improve performance. The technologists are being encouraged to type the laboratory reports themselves without first preparing hand written drafts. This is able to cut delays by several days.

The second challenge is that certain facilities have to be in place in the laboratories all the time to ensure efficient microbiological analysis of samples. Apart from the media preparation room none of the windows in any of the laboratories can be left open at anytime as this will result in contamination of the rooms. Thus all the rooms have to be air-conditioned all the time. Unfortunately some of the air conditioners were old and kept breaking down. One new air-conditioner was installed in the media storage room. However the conditioner in one of the inoculation rooms had broken down and it could not be repaired and needed to be replaced. The office of the technologists and technicians was also very hot and needed air-conditioning.

The last challenge was that the louver blade windows in the inoculation rooms needed to be replaced with sliding glass windows. This will prevent dust settling into the inoculation rooms through the louver blades as cars pass behind the laboratories.

7.3 Accreditation of eleven microbiological methods

This activity has been on-going for a while and finally the Institute applied formally to SANAS, the accreditation body of South Africa for evaluation of the quality system for accreditation to ISO 17025. Copies of the Quality Manual and the Technical Manuals including the Microbiology Technical Manual were submitted to SANAS. They have been reviewed and were sent back for corrections. During the course of next year assessors from SANAS are expected to come and evaluate the system on site and hopefully after further corrections the accreditation certificate will be given.

7.4 Revitalisation of Mushroom production

A proposal for revitalising the Mushroom Unit to undertake commercial production of compost bags and spawns was presented to the Director. The proposal was accepted for funding and an amount of 21,343,000 cedis was released to the Mushroom Unit. Commercial production of spawns have taken off and the Unit hopes to produce 5,500 compost bags every month to yield a profit of 2,258, 000 cedis monthly; and also 3,000 bottle of spawns quarterly to yield and additional profit of 3,609,000 cedis every quarter.

7.5 Research activities carried out under the cocoa project

The FRI EU Cocoa project involves evaluation of the microbiological profile of cocoa during fermentation. Since it involves microbiological examination of fermenting cocoa, all the three project team members are in the Microbiology Division, Mrs Margaret Ottah Atikpo, Ms Margaret Owusu and Dr. W. K. Amoa-Awua. Since the volume of work under this project is very huge most of the staff in the Division have at some stage or other been carried out some work on the project. So far a total of 2,700 isolates have been sent to our European partners, the Institute of Hygiene and Toxicology, Karlsruhe, Germany and the Royal Veterinary and Agricultural University.

PART III

RESEARCH ACTIVITIES

SECTION I
FOOD EVALUATION AND PRODUCT DEVELOPMENT PROGRAMME

Chapter 8.0
Agricultural Sub-Sector Improvement Project

8.1. Introduction

Scientists in the National Agricultural Research Systems (NARS) are undertaking the Agro-processing Programme under the research component of the 1st phase of the Agricultural Sub-Sector Improvement Project (AgSSIP). This Agro-processing component is being coordinated by the FRI.

8.2 Goal

To contribute to national efforts at reducing the post-harvest losses at the farm-gates and in the fishing industry, improving food security, improving nutritional security as well as improving the socio-economic status of all Ghanaians and also improve export of non-traditional products to help reduce Ghana's balance of payment.

8.3 Purpose

To reduce post-harvest losses of food staples of Ghana as well as improve the socio-economic development through development and diffusion of appropriate technologies, which will add value to agricultural and fish produce.

8.4 Research Areas

The Agro-processing component had eight main research areas and seven of the research areas were led by scientists of FRI. The research areas were:

- 8.4.1 *Technical and sensory evaluation of rice varieties from various improvement Programmes in Ghana*
- 8.4.2 *Improving the hot-air processing of fish using the Chorkor Smoker*
- 8.4.3 *Studies on the characteristics, development and utilization of food products from groundnuts varieties grown in Ghana*
- 8.4.4 *Improving the post-harvest processing of prawn, shrimps and lobsters to access the export market*
- 8.4.5 *Development of diesel/kerosene operated drying machines for food-grains for small- and medium-scale producers*
- 8.4.6 *Improvements in the preservation and utilization and promotion of some traditional leafy vegetables to access the urban markets*
- 8.4.7 *Varietal screening of soybean, bambara and cowpea for anti-nutritional factors and suitability for specific uses*

SECTION II

FOOD BIOTECHNOLOGY PROGRAMME

Chapter 9

Capability Building for Research into Traditional Fermented Food Processing in West Africa

9.1 Collaborating institutions

- Food Research Institute, P.O. Box M20, Accra, Ghana (FRI).
- Department of Biological Sciences, Faculty of Applied Sciences, University for Development Studies (UDS), P. O. Box 1350, Tamale, Ghana,
- Centre National de la Recherche Scientifique et Technologique, BP 7047 Ouagadougou, Burkina Faso (DTA).
- Department of Nutrition and Food Science, Faculty of Agricultural Sciences, National University of Benin, B.P. 526, Cotonou, Benin (FSA/UNB)
- Department of Dairy and Food Science, The Royal Veterinary and Agricultural University, Denmark (KVL).
- Alfred Jørgensen Laboratories Ltd. Denmark.

9.2 Introduction

This collaborative project, which is being funded by DANIDA, was initiated in July 1991 and completed in July 2004. The project comprised capability building and the establishment of appropriate environments for research into food fermentations to support collaboration between West African countries and provide assistance to local industries at various levels in the production of uniform and safe fermented African foods of defined quality. Four major activities were included for the four African partners.

- Establishment and management of laboratories for analytical work and research.
- Collaborative research activities within the field of food fermentation, food processing and quality management in general.
- Training and exchange of staff between project partners.
- Extension of services to local industries and networking activities in Africa.

Chapter 10

EC INCO Project on Development of biochemical and molecular markers for determining quality assurance in the primary processing of cocoa in West Africa

Introduction

Cocoa is the most important export crop for many West African countries whose economies are currently badly affected by falling world prices. The quality of cocoa largely depends on the processing techniques. However, there is no agreement among the major producers and buyers on quality, due mainly to the absence of objective measures for quality assessment. There is therefore a need for scientifically-based techniques that are acceptable to both producers and buyers and are simple enough for application at the field level in the producing countries.

The general objective of this project is thus to study the primary processing of cocoa (i.e. fermentation, drying, transportation and storage prior to export) in West Africa with respect to the microbiological and biochemical processes involved in order to develop improved processing techniques. The project is also aimed at developing scientifically based methods for quality assessment and quality management that would be suitable for practical application at both laboratory and field levels.

The project is divided into 7 work packages (WPs). In WP1 the processing methods and practices in West Africa will be examined in order to identify the best and most economical fermentation techniques. In WP2 studies will be carried out on the role of dominant microorganisms including yeasts, LAB, acetic acid bacteria and *Bacillus* spp., in each phase of fermentation. Both classical and molecular techniques including novel DNA-based culture independent methods (e.g. DGGE) will be used. WP3 will mostly deal with undesired activity of filamentous fungi causing off-flavours and sometimes formation of mycotoxins.

In WP4, current quality indices (e.g. the cut test) will be evaluated and new ones explored. New objective methods based on the use of fluorescence techniques, will be explored. In WP5 guidelines on good manufacturing practices (GMP) for cocoa fermentation will be defined and in WP6 a quality system based on hazard analysis critical control point (HACCP) will be developed. In WP7, the results of the project will be disseminated through national and international seminars and workshops and publications in international journals.

WP 2.1 Studies of microbial succession during fermentation

Fermentation of cocoa has been evaluated at:

- i. On-farm (heap fermentation)
 - a. Tetteh Quarshie farm at Akuapim Mampong in the Eastern Region of Ghana.
 - b. Tafo

- ii. On-station at Cocoa Research Institute, Tafo
 - a. 2 tray fermentations
 - b. 1 heap fermentation.

Sampling and analysis: During fermentation samples were taken at 6 hourly intervals for the first three days and at 12 hourly intervals for the remaining three days of fermentation. During sundrying samples of cocoa beans were taken on the first third and sixth day of fermentation. For samples taken at Tafo, plating was carried out by the FRI team at Tafo using the facilities of the Cocoa Research Institute. Further analytical work was carried out at FRI including isolations, preliminary tests and tentative identification of some culture.

iii. Storage tests

Dried cocoa beans have been stored in sacks at the Food Research Institute and are sampled weekly for evaluation and isolation of moulds.

WP 2.1.1 Enumeration and identification of yeasts

Yeasts and moulds were enumerated on Malt Extract Agar

WP2.1.2 Enumeration and identification of lactic acid bacteria

Lactic acid bacteria were enumerated on deMan, Rogosa and Sharpe medium (MRS) and determined as Gram positive, catalase negative rods and cocci. Lactococci were enumerated on M17.

WP2.1.3 Enumeration and identification of acetic acid bacteria

Acetic acid bacteria were enumerated on GYC and YPM and counts confirmed after further biochemical tests.

WP2.1.4 Enumeration and identification of Bacillus species

Bacillus species were enumerated on Nutrient Agar as Gram-positive, catalase-positive rods usually bearing phase bright spores.

WP3.1 Enumeration and identification of mould species in primary processing and storage of cocoa beans by macroscopic examination and detection of intercellular and extracellular secondary metabolites

Moulds were enumerated together with yeasts on Malt Extract Agar.

Enterobacteriaceae: Enterobacteriaceae were enumerated on Violet Red Bile Agar.

Enterococci: Enterococci were enumerated on Kanamycin-esculin-azide agar

Results

Results of the enumeration and identification of some of the microbial species are not shown in this report. Tentative identification of acetic acid bacteria, yeasts and moulds using morphological and biochemical tests including carbohydrate fermentation/utilization patterns for yeasts were carried out and the results are not shown in this report. Some of this work has been carried out as part of an MPhil programme of a student registered at the University of Ghana.

Isolates sent to European partners

Isolates numbering 280 were sent to Federal Research Centre for Nutrition, Institute of Hygiene and Toxicology, Germany and 80 yeast isolates to The Royal Veterinary and Agricultural University, Denmark. Isolates sent to BFE included moulds, acetic acid bacteria, lactic acid bacteria, lactococci and enterobacteriaceae. The list of cultures is attached

Future work

- Currently more isolations are being made and purified cultures will be sent to the European partners for identification by molecular methods. The isolates will also be tentatively identified by phenotypic methods in our laboratory. A member of the project team will also proceed to the Institute of Hygiene and Toxicology to take part in the identification of isolates using genotypic methods.
- The FRI team will develop and implement an HACCP system and GMP for primary processing of cocoa.
- Cocoa fermentation will be evaluated in a different agro-ecological zone of the country i.e. in Kumasi using facilities at the Forestry Products Research Institute or the Kwame Nkrumah University of Science of Technology.
- DGGE method will be transferred to FRI.

SECTION III
PILOT STUDIES AND TRANSFER OF PROCESSING TECHNOLOGIES PROGRAMME

Chapter 11

DFID-funded project on 'sustainable uptake of cassava as an industrial commodity'

11.1 Introduction

'Sustainable Uptake of Cassava as an Industrial Commodity' is a DFID Project Coordinated by FRI between 9 Institutions. The institutions are:

- Afrimart Global Enterprises
- Amasa Agro-Processing Co. Ltd
- Feed and Flour Gh. Ltd.
- Food Research Institute
- Forestry Research Institute of Ghana
- MOFA, Brong Ahafo Directorate
- NBSSI
- NRI, UK
- University of Ghana, Nutrition and Food Science Dept.

11.2 Activities

Transfer of the technology on the production of glucose syrup from cassava starch to Afrimart Global Enterprise was based on the coalition partnership arrangement governing the execution of the DFID/CPHP project under which the technology was developed and is being transferred. Afrimart is the commercial partner on the project. Currently, Afrimart is producing at a very low capacity of about 200 kg/week or about 10 tonnes a year as against the import level of 500 tonnes. The major obstacle is the capital input for the purchase of boilers, vacuum evaporators, storage tanks and filtration equipment. It is for this same reason that the FRI is unable to upgrade its processing facilities for the commercial production of the glucose syrup now. However, other commercial enterprises have started expressing interest in the production of the syrup after an awareness creation seminar was held in July for policy makers and industrialists, at which a documentary on the technology was launched

Chapter 12
CFC/UNIDO project on industrial development of sorghum malt and its utilization in food industries

Project summary

- Project Executing Agency: United Nations Industrial Development Organization
- Location: Ghana and Nigeria
- Starting Date: 7 August 2003
- Completion Date: 31 August 2007
- Financing:
 - Total Project Cost: US\$ 2,238,600
 - of which:
 - CFC Financing: US\$ 1,494,600
 - Co-financing (UNIDO) US\$ 200,000
 - Counterpart contribution: US\$ 544,000 in kind

Status of project implementation

Review the work done on the evaluation of new sorghum varieties and the related malting and brewing tests as well as the new technological development in the sorghum utilization for malt and beer production: This activity is still ongoing.

The steering committee held its second meeting in Accra on 4-5 December 2004. In this meeting, the steering committee, after it had taken note of the project progress and the difficulties encountered in its implementation, established a technical committee, which was assigned the specific tasks and made the following recommendations:

- Adoption of the emergency work plan of the Technical Committee to be implemented systematically to catch up on the implementation of the project;
- Preparation of a business plan for the pilot malting and brewing plant by an expert to address the sustainability of the project and the location of the plant;
- Recognition of the need to improve communication on a regular basis;
- Prototype installations should not be provided free of charge but at the cost of production;
- Project manager to send a proposal for discussion by the Steering Committee on the revision of the budget;
- Monthly briefs to be sent to members of the Steering Committee;

- Members should be committed to their responsibilities stated in the MOU and implement them;
- Ghana Breweries Ltd. and the Ministry of Food and Agriculture were formally admitted as Steering Committee members;
- The next Steering Committee meeting was scheduled for June 2005 in Accra.

Pilot Malting Plant operating and malting trials still ongoing: Two malting trials were carried out in November 2004. The Technical Committee will meet in February 2005 and will review and analyse available information on trials that have been carried out to identify further trials required and the trial methodologies.

Data collection on Pito brewing: Three brews of Frafara Pito and one brew of Dagarti Pito were brewed for process data collection at the project site by women brewing in pito bars.

Data collection on sorghum varieties: In December 2004 the National Project Manager and the representative of FRI visited SARI at Nyankpala, the Ghana Seed Inspection Unit at Tamale, sorghum malt production houses and the market at Zebilla in the Upper East Region. The objectives of the visit were to follow-up on the supply of sorghum, collect information on agricultural practices, current production and farming settings for the production of Kaapala for use in beer brewing, and to collect information required for the design of the prototype malting installation (Output 2.2 of the Project)

Discussions were held with the SARI representative on the supply of sorghum for malting trials and on the inputs from SARI for the production of Kaapala for Guinness. The SARI representative assured that SARI is in a position to continue supplying the Project with the required sorghum varieties in specified quantities without any difficulty. He also informed that SARI would be releasing 12 new sorghum varieties to be tested for their suitability for malting and brewing. Field trials of some of those varieties are being carried out in the Brong Ahafo Region.

According to the SARI representative the lack of high outputs of Kaapala for Guinness Ghana Ltd. is due to organizational deficiencies rather than unsatisfactory technical inputs from SARI. He explained that SARI produces foundation seeds and supplies them to the Ghana Seed Inspection

Unit for distribution. The Ghana Seed Inspection Unit tests and certifies the seeds for adequate viability before releasing them to farmers. He noted that SARI produces much more high viability Kapaala foundation seeds than required by the farmers to meet the grain requirements for Guinness Ghana Ltd. For this reason, there is no need to bring in the seeds from Nigeria as being contemplated. The representative of the Ghana Seed Inspection Unit confirmed the above statement.

Information required for the design of the prototype malting and Pito brewing installations:

Two sorghum malt production houses, a 'Pito factory' and the malt market in Zebilla were visited. The production processes of the sorghum malt at these places was monitored, information on the difficulties experienced with the processing was collected and improvements and innovations that could help facilitate their work, were discussed. Information was also collected on production unit capacities, physical dimensions of equipment and on the supply chain of materials. Details of the information will be presented to the technical committee for the preparation of the initial draft of the installation. The team will make a second visit to discuss and collect comments on the design of the installation for preparation of the final version.

Data collection on Pito brewing in Nigeria: As recommended during the last steering committee meeting, a visit was made to Northern Nigeria to get information on the production technology for pito brewing, evaluate the unit operations in terms of efficiency, spot out constraints and difficulties in the production process and identify areas of technical intervention to improve efficiency of production. The following findings of the visit will contribute to the design and fabrication of appropriate pito prototypes:

- Each unit operation is labor intensive and time consuming;
- Malting process is inefficient and characterized by a lack of evaluation methods and criteria for quality control of produced malt;
- Green malt drying is done in open air, which leads to malt contaminations;
- Boiling process is hazardous, and energy (fuel and/or fire wood) consuming;
- Mash filtration is very slow and inefficient;
- Deficient products packaging and short product shelf-life;
- The whole production process is cumbersome and the influence of the drums and pots used may be hazardous for consumer's health.

Project laboratory: The challenges facing the project are: (1) removing any health risk of the finished drinks and foods that may be related to aflatoxin, (2) speeding up the implementation of the project, and (3) ensuring its sustainability. The proposal for equipping the project laboratory will be completed after the visit of the International Consultant in February 2005. The existing Spectrophotometer, Malt analyser and pH meter are defective and under repair. An arrangement is being worked out with FRI concerning the issue of aflatoxin analysis raised during the last steering committee meeting

Project operational budget: Based on the recommendations of the last steering committee meeting to facilitate local project operation, a revised budget of project running costs for the year 2005 has been prepared and funds released to the field

Data Base on sorghum malt brewing: Preparations for the establishment and administration of a web-based central database on the use of sorghum in the food industry are ongoing.

Purchase of the brewing plant: First batch of brewing equipment ready for dispatch to Accra. Second part is expected to be ready as scheduled in the subcontract. The brewing plant is expected to be operational by June 2005.

Project site: Space has been allocated for the installation of the brewing plant next to the malting plant. FRI has completed the fitting including the cold room to house the fermenting vessels. A wall has been constructed to separate the pilot malting and brewing plants from the other areas of the processing hall. The main electrical power supply switch for the Malting Plant has been relocated to the inner side of the wall near to the control panel. Two rooms have been made available by FRI to be used as an additional office and a documentation centre.

The personnel working at the project site have been furnished with protective wear. A fire extinguisher has also been installed at the site.

Planned activities	Targets set	Present Status	Remarks
General activities (preparatory work)			
1. Meeting of the BSC and the NSCs	Meeting to take place in November or December.	Meeting took place on 4-5 November 2004.	See recommendations above
2. Review the work done on the evaluation of the new sorghum varieties and the related malting and brewing tests as well as the new technological development in sorghum utilization for malt and beer production. Pito brewing trials have started.	Basic information gathered and data collected	Basic information about to be completed (see table above)	This will be a continuing process with a view to establishing a data base on sorghum beer production
Output 1-1: Operational pilot brewing facility established at FRI Ghana*			
1. International biddings for the design, purchase and installation of the pilot plant	Sub-contract awarded by mid July	Offers received and analyzed	Committee on contracts met and took decision to award sub-contract.
3. Mission of the subcontractor to prepare engineering part with FRI	Engineering part carried out	Premises to host the brewing plant made available and fitting work for the visit of the subcontractor completed.	Visit of subcontractor took place end July-beginning August
4. Pilot plant delivery and installation at FRI, test run and training	Pilot brewing plant is operational	Expected for June 2005	Delayed due to limited number of suppliers of micro-breweries

* For more convenience, the engineering work, the purchase and the installation of the brewing pilot plant have been grouped under a single sub-contract. As a consequence of that the sequence of the activities of output 1-1 have been redesigned as shown in the above table.

IV. Resources utilization

Category	Budget for year 2004 (US\$)		Actual first six months		Actual second six months		Balance (US\$)	
	CFC	UNIDO	CFC	UNIDO	CFC	UNIDO	CFC	UNIDO
I	15,000	0	7,538	1,970	782	-25	6,680	-1,945
II	612,000	39,500	371,055	0	0	0	240,945	39,500
IV	28,820	0	17,281	0	11,518	0	21	0
V	90,000	14,250	15,050	0	6,900	28,500	68,050	-14,250
VI	14,500	0	1,300	1,008	3,688	-59	9,512	-949
VII	18,000	0	0	0	0	0	18,000	0
VIII	0	36,625	0	6,776	0	2,864	0	26,985
Total	778,320	90,375	*412,224	9,754	22,888	31,280	343,208	**49,341

* Obligation operations of US\$ 200,000 started in the last quarter of 2004 but will be completed only in February 2005.

** With the plant delivery the UNIDO contribution will be used to a very high level in 2005.

V. **PEA's Assessment of Project Progress**

1. **Assessment of Technical Progress**

Though not as expected, the project implementation progressed well during the second semester of 2004. The sorghum malting plant has been put into operation and malting trials have successfully been carried out. The premises to host the brewing facility have been prepared. The visit of the sub-contractor was carried out and the plant engineering design was prepared. First batch of brewing equipment is ready for dispatch to Accra and the second batch is foreseen as scheduled in the sub-contract. The plant delivery and installation as well as operation and training are foreseen for June 2005.

2. **Assessment of Resources Utilization**

If we take into account the obligation operations that started in 2004 for beginning 2005, the percentage of the financial resources utilization for the year 2004 is very good (expenditures represent about 80% of the funds phased for 2004).

Planned activities	Targets set	Present Status	Remarks
General activities (preparatory work)			
1. Meeting of the BSC and the NSCs	Meeting to take place in November or December.	Meeting took place on 4-5 November 2004.	See recommendations above
2. Review the work done on the evaluation of the new sorghum varieties and the related malting and brewing tests as well as the new technological development in sorghum utilization for malt and beer production. Pito brewing trials have started.	Basic information gathered and data collected	Basic information about to be completed (see table above)	This will be a continuing process with a view to establishing a data base on sorghum beer production
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4. Pilot plant delivery and installation at FRI, test run and training	Pilot brewing plant is operational	Expected for June 2005	Delayed due to limited number of suppliers of micro-breweries

* For more convenience, the engineering work, the purchase and the installation of the brewing pilot plant have been grouped under a single sub-contract. As a consequence of that the sequence of the activities of output 1-1 have been redesigned as shown in the above table.

3. Assessment of Project Co-ordination and Management

Project co-ordination and management performs as expected. The UNIDO office in Accra, supported by competent staff (national and international experts) is managing the project in close cooperation with FRI and other stakeholders. A new budget for project running costs in 2005, has been prepared and funds released. Measures have been taken to solve, in cooperation with the counterpart, the communication problems that are encountered. The linkage FRI-FIIRO and Breweries in Ghana and Nigeria has been strengthened.

4. Social and Environmental Effects of Project Implementation

The project continues to raise strong interest among the breweries and PITO producers. In addition the third brewery GBL (Ghana Brewery Ltd) has been admitted to join the project. Its merge with GGL (Guinness Ghana Ltd) is now effective. Several PITO producers particularly women have been involved, hoping to increase the quality and the quantity of their production. The PITO business is expected to grow. The Government of Ghana has now included the development of the industrial use of sorghum in the Presidential Initiatives and substantial government efforts are put on the sorghum production.

5. Planning of Project Implementation for the next reporting period

Output 1.1

Award of subcontract amendment: February 2005

Pilot plant delivery and installation at FRI: March-April 2005

Test run and training: May-June 2005

Output 1.2

Exchange between FRI and FIIRO of information on technology for "white" beer production and plan for six months scholarship for two Nigerians in malting operation at FRI: Exchange of experience and know-how is ongoing and will continue. Frequent visits (at least one per quarter) of FIIRO (Nigeria) staff to FRI (Ghana) are foreseen within the work of the technical committee.

Output 1.3

Plan for the scholarship of 42 months of two Nigerians in sorghum malt/beer production: Most of the training is expected to take place in the second and third quarter of 2005.

Output 1.4

Evaluation of the malt ability of the newly imported varieties by FRI/FIIRO: The work started and will continue during 2005

Output 2.1

Technical parameters established and tests carried out: foreseen for 2005.

Output 2.2

Study tour on traditional beer production for Nigerians in Ghana (scheduled for 2006).

VI. Conclusions and Recommendations

The decisions and recommendations of the last steering committee meeting have boosted project implementation.

To ensure project sustainability, assistance to the farmers for the production of appropriate sorghum varieties is badly needed. Urgent follow-up of this issue by both CFC and UNIDO is required.

It is observed that a closer cooperation between Technoserve, SARI and Guinness Ghana Ltd is needed for the organization of the farming activities and the implementation of the proper agricultural practices for the production of Kaapala in the quantities needed by Guinness Ghana Ltd.

3. Assessment of Project Co-ordination and Management

Project co-ordination and management performs as expected. The UNIDO office in Accra, supported by competent staff (national and international experts) is managing the project in close cooperation with FRI and other stakeholders. A new budget for project running costs in 2005, has been prepared and funds released. Measures have been taken to solve, in cooperation with the counterpart, the communication problems that are encountered. The linkage FRI-FIIRO and Breweries in Ghana and Nigeria has been strengthened.

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Output 1.3

Plan for the scholarship of 42 months of two Nigerians in sorghum malt/beer production: Most of the training is expected to take place in the second and third quarter of 2005.

Chapter 13

DFID - project on the dissemination of improved rice post-production and marketing technologies, through coalition arrangement, to enhance rural livelihoods in Northern Ghana

Purpose:

Enhance rural livelihoods in selected communities in Northern Ghana through promotion of rice post-production technologies and marketing systems

Contribution of project to purpose:

The northern sector of Ghana produces about 60% of the national output of paddy rice. Almost this entire paddy produced in northern Ghana is parboiled and the parboiling is carried out exclusively by women in 40kg batches using rudimentary traditional technologies. The result is a product of very variable quality that commands a low price and is unable to compete with imported rice on the local market. The project outputs have produced 5 “Rice Quality Training Manuals” that have helped in training extension staff and rice farmers, parboilers, mill operators and marketers on the importance of improved product quality as well as a “Rice Recipe Album” that created awareness among consumers on a variety of new preparations from locally produced rice.

Key activities

The key project activities were as follows:

- Existing socio-economic baseline data was validated.
- Forty 40 agricultural extension agents and 50 beneficiaries were trained in improved rice post production handling techniques in a “training of trainer’s programme.
- Four existing rice mills were adapted and fitted with aspirators to improve milling efficiency.
- Seven new mills were installed in selected communities to enhance improved milling capability.
- Cost-benefit analyses as well as constraints faced in adopting improved technologies were assessed.
- Price sensitivity of consumers to improved quality parboiled rice was assessed.
- Over 18,000 seedlings distributed to parboilers to be planted and harvested for fuel wood

Dissemination highlights

- Five “Rice Quality Training Manuals” were produced.
- A “Rice Recipe Album” was produced to popularise new ways of utilising parboiled rice.
- The French Cooperation in Ghana requested for 20 parboiling vessels to be introduced in their rice development project area.
- The Minister of Food and Agriculture requested for the coalition to work more closely with the Ministry in further disseminating the technologies developed after the termination of the project.

The project fell under the “focused” category of poverty reduction. The project addressed issues relating to adding value to locally produced parboiled rice which is exclusively a rural occupation in northern Ghana and is carried out by the poor. The higher quality product subsequently sold for a premium price on the local market. The project set up “best practice sites” where Good Agricultural Practice and Good Manufacturing Practice were adhered to. The designated best practice sites were located in rural, poor communities. The target beneficiaries were farmers, parboilers, rice mill operators and rice marketers as well as agricultural extension workers of the Ministry of Food and Agriculture and agricultural oriented NGOs. Farmers were encouraged to harvest at the optimum time and to thresh on tarpaulins to eliminate stones and other impurities in the paddy. Parboilers were trained and encouraged to use the prototype rice parboiler which reduced fuel and water consumption and produced a better quality product. The level of production was kept at 100kg per batch for artisanal processors. Rice mill operators were encouraged to fit aspirators to their mill to produce cleaner rice on milling and were also trained in the adjusted of the motors and belts to reduce power consumption and increase profit margins.

Some women parboilers in the Upper East Region were linked to a MOFA – IFAD project that provided micro-credit to help them keep control of their processing operations.

Chapter 14

DFID - Project on Dissemination of improved bambara processing technologies through a new coalition arrangement to enhance rural livelihoods in Northern Ghana

1. Project Purpose:

The purpose of the project was to promote bambara processing and utilization for improved food security of poor households through the effective dissemination of improved processing technologies, using the coalition partnership approach.

2. Outputs:

All planned outputs of the project have been achieved with targets exceeded in most cases. Significant results are summarized as follows:

- Socio-economic surveys were conducted in four target districts (Tamale municipality, Tolon Kubungu, Gushiegu-Karaga and Savelugu-Nanton districts) in northern Ghana, and a situational analysis report prepared, highlighting on the level of key performance indicators for impact tracking on the high quality bambara flour (HQBF) production technology disseminated.
- A total of 25 retail outlets for high quality bambara flour (HQBF) have been identified in Ghana, and marketing margins along the bambara supply chain established using the commodity systems approach.
- The high quality bambara flour production technology was re-packaged for both commercial production and for household preparation, and a total of four extension brochures for training of trainers were developed and produced in English and the local language, Dagbani.
- To facilitate accelerated dissemination of the technology, 18 extension staff from WIAD and five NGOs operating in four northern districts were trained as trainers.
- A total of 219 women food processors have been trained in four project districts in northern Ghana on the micro-scale production and use of the high quality bambara flour (HQBF).

- The HQBF technology has been successfully transferred to two commercial entrepreneurs who were trained and equipped with mainly locally fabricated machines to produce the flour for sale.
- Ten community-based demonstrations have also been conducted in the four districts in northern Ghana for 370 participants on household use of the HQBF.
- In the area of public awareness creation, a total of 13 recordings on bambara processing and utilization have been produced and two local radio stations in Tamale (Radio Savannah and Radio Justice), made a total of 20 broadcasts.
- Eleven existing recipes for the preparation of traditional bambara foods have been identified and standardized, and their nutritional quality determined and documented. In addition, twenty-one new home-based/restaurant type recipes were developed and the nutritive value determined. A two-day training of master trainers' workshop was conducted on the recipes developed.
- Eight regular quarterly meetings of coalition partners, one inception workshop, one mid-term review workshop and a final stakeholders workshop were held during project duration as a means to enhance Agricultural Knowledge Information System (AKIS) and strengthen Institutional linkages to ensure efficient collaboration between co-operating organizations, leading to sustainable mechanisms for future activities and actions.
- Adoption and impact surveys conducted on targeted beneficiaries indicated level of HQBF utilization at 68%. Improvement in product quality in terms of taste, texture and nutritional value was a key positive impact. Consumer demand for bambara-based products increased by 12.5% within the project duration as a result of HQBF adoption.

3. Contribution of Outputs to Project Goal:

The outputs of the project have all been achieved and these can contribute significantly to the project goal of "National and international crop-post harvest innovation systems responding more effectively to the needs of the poor". The use of the coalition partnership approach in the dissemination of the bambara processing and utilization technologies has empowered poor

Chapter 14

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3. Contribution of Outputs to Project Goal:

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households in northern Ghana to have access to knowledge of these technologies, the application of which will enhance bambara utilization and increase demand for the crop to help address livelihood constraints emanating from the decline in production as a result of lack of processing methods. The commercial production of the HQBF, and the recipes developed will help create jobs and increase income of poor households in northern Ghana. Several report outputs of this project will strengthen the scientific knowledge base on legumes processing and utilization to enhance the nutritional status of children in the developing world in general, and the African Region in particular.

SECTION IV
FOOD SAFETY AND QUALITY ASSURANCE PROGRAMMES

Chapter 17

DFID/NRI Developing food safety strategies and procedures through reduction of food hazards in street-vended foods to improve security for consumers, street food vendors and input suppliers

The project, through an enabling process, sought to improve the livelihoods of vendors and health of consumers. This was achieved through a successful coalition partnership approach comprising street food vendor NGO's, local authorities, food standards authorities, research institutions and food laboratories. They explored the wider framework in which the policies, institutional linkages and food laws associated with street vending were carried out and by determining the sources and extent of food safety hazards that could jeopardise livelihoods and consumer health. The coalition approach began during an earlier CPHP project (R7493) and was successfully formalised during this project; new partners joined the coalition and some stakeholders/agencies substantially enhanced this project. It is anticipated that the coalition will sustainably address future food safety issues in Ghana.

However, at the inception of this project, there were uncertainties by the CPHP over the role of international organisations such as NRI (and manager of the earlier project) and were initially excluded from the project until this was successfully resolved. The CPHP also appointed a coalition partner to provide strategic research into heavy metals. While the organisation played a constructive role in the coalition, equipment failure led to substantial delays and by using an incorrect approach the results could have potentially had serious implications for the livelihoods of those in the street food sector. A UK backstopping laboratory successfully complemented this organisation to overcome these concerns. The research partnership developed strategies that could be used to control identified food safety hazards in an economical and socially-acceptable manner. A food safety baseline study indicated variations between markets and vendors selling different food types.

Microbiological studies indicated that *fufu* was more at risk than others. Analysis of heavy metal residues indicated that concentrations of the heavy metal lead in street foods were generally low. However, cooking pots produced by informal manufacturers contained high concentrations (419mg/kg) that could leach into foods at levels slightly above the maximum permitted level (WHO/FAO). Promotion materials on food safety to educate both consumers and vendors were

developed. These included four TV documentaries and billboards by the FDB (with UNIDO funding), four posters and training manuals for Environmental Health Officers and street vendor NGOs. Nearly 300 vendors were trained but falls substantially short of the estimated 60000 vendors in Accra. A survey of 265 street food vendors highlighted that many had limited understanding of their business finances and this hindered the benefits of training. A survey of 530 consumers indicated that most consumers did not associate unsafe food with food borne illnesses. New male dominated street food vending businesses, known as 'check-check food vendors' have recently arisen but the food safety issues are similar and need to be addressed.

The project successfully contributed to developing new knowledge on food safety issues, how information is managed and issues relating to how street vendors take up this new knowledge. It has also illustrated new challenges if this new knowledge is to be adapted successfully and in a sustainable way to improve livelihoods of the vendors and the health of consumers.

SECTION V

GOG Institutional Renewal/CSIR Restructuring Programme

Chapter 21

CSIR/NRI – Performance Management Programme

21.1 Introduction

The FRI is involved in a project set out to develop and institutionalize performance management systems that enhance the impact orientation of research organizations. As part of the project a diagnostic assessment of organizational context and capacity, followed by the initial steps of developing a performance management approach was conducted. The FRI has been able to manage assessment results to the benefit of the Institute, and is now using BSC methodology as a guide in accomplishing the strategic goals of the Institute. The use of the BSC as a Management tool has made the FRI to re-examine the philosophy and core principles of how research programmes are designed. It is no longer acceptable within the Institute for Project Managers, for example, to plan programmes for applied research without the participation of direct and indirect users. During the year under review the Institute prepared a strategic plan, based on the Performance Management approach.

21.2 Purpose of the Plan

FRI's strategic plan is a mechanism to assist and inform staff and management in directing and managing the Institute over the period covered by the plan. The plan incorporates mechanisms for review and reorientation to take account of shifts in the context or circumstances of FRI's work. The operational plan is a more detailed annual plan, which specifies in greater depth how the strategic plan will be implemented in any given year. The strategic plan is part of the overall Performance Management Framework of the Institute

21.3 Methods of Planning

FRI will conduct its planning and evaluation processes both internally, using its own staff and board resources, and will also periodically employ external assistance where appropriate. Planning and evaluation is perceived as an ongoing process, and one in which the input of the entire staff team and board is incorporated. The FRI has adopted the Balanced Scorecard approach to its performance management.

21.4 Strategic Focus

This Strategic Research Plan recognizes that research will continue to be done by individuals in areas other than those identified in the Strategic Plan, but identifies eight areas of strategic focus that capitalize on existing strengths of the FRI and the unique socio-economic and industrial developmental needs, and cultural setting of the country:

- i. Pilot Studies and Transfer of Processing Technologies Programme
- ii. Technical and Analytical Services Programme
- iii. Food Biotechnology/ Molecular Biology Programme
- iv. Food Evaluation and Product Development Programme
- v. Training Programme
- vi. Food Safety and Quality Assurance Programme
- vii. Community Outreach Programme
- viii. Knowledge Management (encompassing Information/Performance/Change Management)

The plan is to expand the level of our research and training of our staff in these and other areas of fundamental research to achieve international prominence. Our Strategic Research Plan is a crucial element in determining how we allocate our resources and it is shaping an institute that is both a leader in and an integral part of its surrounding environment. We are actively pursuing partnerships that will increase our ability to support research excellence, enhance our technological and technology commercialisation capacity, and further our contributions to national economic development. Successful measurement of our performance will be based on the balanced scorecard approach.

Chapter 22 Establishment of Local Area Network/Intranet Connectivity

22.1 Introduction

FRINet Technical Committee was set up to develop proposals for the establishment of a Local Area Network within the Food Research Institute. The membership of the Committee is as follows:

Mr. Nanam Dziedzoave	-	Chairman
Dr. L. D. Abbey	-	Member
Robert M. Yawson	-	Secretary

The Committee submitted its report in January, 2005 and it was accepted. Implementation of the report began in February this year.

22.2 Status Report

The establishment of the FRI Local Area Network/Intranet and Internet connectivity was divided into three phases:

Phase 1: Networking of the Okponglo Site

Phase 2: Networking of the Broz Tito Site

Phase 3: Establishment of FRI Website

Phase 1: Networking of the Okponglo Site

Networking of the Okponglo Site is completed. A Wireless LAN is in place. Technonet Ghana Ltd was contracted to provide the WLAN infrastructure.

Intercom Data Network (Ghana) is the Internet Service Provider (ISP). The FRI opted for a dedicated Internet Bandwidth of 4kbps Uplink – 10kbps Downlink Burstable to 32kbps. IDN has installed Sava Series wireless router at FRI and interconnected to IDN office in Accra utilizing Cisco routers at both FRI and IDN office in New York.

The FRI has registered a domain name: www.frighana.com. A webmail has also been created and it would be functional by 15th February 2005.

Phase 2: Networking of the Broz Tito Site

Networking of the Broz Tito Site has not started. It has been put on hold due to the following reasons:

1. To wait for the complete test running of the Networking of the Okponglo Site to make sure the system is robust and working properly.
2. Wait to get a clear time table for the relocation of the entire staff to Okponglo
3. Financial Constraints

Phase 3: Establishment of FRI Website

With the domain name registered, the establishment of the FRI website is to begin. Preparatory work has started and it is hoped that the website would be functional by the end of June.

Project Financing

The project is being financed through FRI's own resources. The Director of Finance released the funds from FRI foreign accounts, and that amount was used to finance project phase 1.

The recurrent expenditure and the cost of completing Phase 2 & 3 are being financed through IGF, Projects and LUTTA. It has been agreed by all Research Staff that an amount of \$60 per annum should be deducted from each member's LUTTA to help meet the recurrent expenditure. This amount was deducted accordingly from last year's LUTTA and the same is expected to be deducted this year. Project leaders also agreed to contribute \$300 per project per year. Specific Projects are contributing far in excess of the minimum rate of \$300 per project.

APPENDIX I
FRI SENIOR STAFF LIST (2004)

Directorate

- | | | |
|--|---|---|
| 1. W. A. Plahar
BSc (Gen.), BSc (Hons) MSc Fd. Sci. (Ghana)
PhD (Washington) | - | Director
(Chief Research Scientist) |
| 2. W. K. Amoa-Awua
BSc (Ghana) MSc. App. Sci. (New South Wales)
PhD (Ghana) | - | Deputy Director
(Principal Research Scientist) |
| 3. R. M. Yawson
BSc. (Hons) M. Phil. (Biochem) Ghana
Post Grad. Cert. Fd. Mgt. (Jerusalem) | - | Scientific Secretary
(Research Scientist) |
| 4. J. Aggrey –Yawson (Ms.) | - | Snr Admin Assistant. |
| 5. F. Mante (Mrs.) | - | Admin Assistant |

Food Microbiology Division

- | | | |
|--|---|---|
| 1. M. Halm (Ms)
BSc (Gen.) BSc (Hons), MSc Botany (Ghana)
Post Grad. Dip. Rural Fd. Tech (Netherlands) | - | Senior Research Scientist
(Head of Division) |
| 2. M. Ottah-Atikpo (Mrs.)
BSc Microbiology, MSc Fisheries (ABU, Zaria) | - | Research Scientist |
| 3. M. Obodai (Mrs.)
BSc (Hons), MPhil. Botany (Ghana) | - | Research Scientist |
| 4. Dr. C. Tortoe
BSc (Hons), MPhil. Botany (Ghana) | - | Research Scientist |
| 5. P. K. Feglo
BSc (Hons), Zoology (Ghana)
MSc, Clinical Microbiology (UST) | - | Research Scientist |
| 6. M. Owusu (Ms.)
BSc (Hons), MPhil. Botany (Ghana) | - | Research Scientist |
| 7. I. Soyiri
BSc (Hons), MPhil. Fd. Sci. (Ghana) | - | Research Scientist
(Temporary) |
| 8. Matilda Dzomeku (Mrs.)
BSc Biological Sciences (UST) | - | Asst. Res. Scientist |
| 9. D. K. Asiedu | - | Snr. Technologist |
| 10. J. Anlobe | - | Snr. Technologist |
| 11. B. Amoako | - | Snr. Technologist |
| 12. Peter Addo | - | Prin. Tech. Officer |
| 13. D.K. Baisel | - | Technologist |
| 14. R. Takli | - | Asst. Technologist |
| 15. M. Amoo-Gyasi | - | Asst. Technologist |
| 16. Theophillus Annan | - | Technical Officer |

Food Chemistry Division

1. Dr. (Mrs.) K. Kpodo - Senior Research Scientist
BSc (Gen.) BSc (Hons) Ghana
MPhil (West Indies) PhD (Ghana)
2. N. T. Annan (Mrs.) - Senior Research Scientist
BSc (Hons) Fd. Sci. (Ghana),
MSc Fd. Sci. (Nova Scotia)
3. G. A. A. Anyebuno - Research Scientist
BSc (Hons), MPhil. Botany (Ghana)
4. C. Diako - Asst. Res. Scientist (Temp.)
BSc (Hons), Fd. Sci & Nut. (Ghana)
5. E. A. Allotey - Snr. Technologist
6. S. Antonio - Snr. Technologist
7. W. K. Aमेvor - Snr. Technologist
8. Mensah Toku - Snr. Technologist
9. D. N. A. Ankrah - Technologist
10. N.Y. Amey - Technologist

Nutrition & Socio-Economics Division

1. P. Lokko (Mrs.) - Principal Research Scientist
B.Sc. (Gen.) BSc (Hons) MSc Biochem (Ghana)
Dip. Fd. Sci. & Nut. (The Netherlands)
(Head of Division)
2. W. Quaye (Mrs.) - Research Scientist
BSc (Hons) MPhil Agric. Econs (Ghana)
3. P. Larweh (Mrs.) - Assistant Research Scientist
BSc (Hons) Home Sci. (Ghana)
4. I. Johnson-Kanda (Ms.) - Assistant Research Scientist
BSc (Hons) Fd. Sci & Nut. (Ghana)
5. L. Larweh (Ms.) - Assistant Research Scientist
BSc (Hons) Home Sci. (Ghana)
(Temporary Staff)
6. B. Kudjawu (Ms.) - Assistant Research Scientist
BSc (Hons) Home Sci. (Ghana)
(Temporary Staff)
7. I. A. Tamakloe (Mrs.) - Chief Tech. Officer

Commercialization & Information Division

1. A. Osei-Yaw (Mrs.) - Principal Research Scientist
BSc (Gen.), Ghana,
MSc. Fd. Sci. & Nut. (Washington)
(Head of Division)
2. A. Andoh - Chief Tech. Officer
3. B. Awotwi - Prin. Tech. Officer
4. R. Kavi - Prin. Lib. Assistant
5. B. P. Osae - Technical Officer
6. P.O. Baidoo - Technical Officer

Food Processing & Engineering Division

- | | | | |
|-----|---|---|---|
| 1. | Dr. P. N. T. Johnson
BSc (Hons), Biochem. (UST)
MSc. Agric. Eng. Tech. (Cranfield)
PhD Food Tech. (Reading) | - | Senior Research Scientist
(Head of Division) |
| 2. | Dr. P. Adu-Amankwa (Mrs.)
BSc (Hons) Biochem (UST)
MSc. Fd. & Mgt. Sci.,
PhD Post-Harvest Physiology (Lond.) | - | Senior Research Scientist |
| 3. | Dr. N. T. Dziedzoave
BSc (Hons), Biochem. (UST)
Post Grad. Dip. in Fd. Sci. & Nut., (Gent, Belgium)
MSc Fd. Sci. & Tech. (UST) | - | Senior Research Scientist |
| 4. | D. Blay
MSc Chem. Eng. (Moscow) | - | Research Scientist |
| 5. | E. C. Tettey
BSc (Hons) Agric (UST)
Post-Grad. Dip. Fd. Tech.,
MPhil, (Humberside, UK) | - | Research Scientist |
| 6. | Dr. L. D. Abbey
BSc (Hons), Biochem. (UST)
MSc. App. Sci. (Fd. Tech.) New South Wales
PhD (Ghana) | - | Research Scientist |
| 7. | C. K. Gyato
Nat. Dip. in Agric. Mech. (Ghana)
MSc Agric. Eng. (Bulgaria) | - | Research Scientist |
| 8. | J. T. Manful
BSc (Agric), Dip. Ed. (Cape Coast)
MPhil Biochem. (UST) | - | Research Scientist |
| 9. | Dr. K. A. Vowotor
B.Sc. Zoology Dip. Ed. (Cape Coast)
M. Phil. PhD Crop Science (Ghana) | - | Research Scientist |
| 10. | B.A. Mensah
MSc. Fd. Press. Tech. (Kransnodar, USSR) | - | Research Scientist |
| 11. | S. K. Noamesi
BSc (Agric) MSc Fd. Sc. (Ghana) | - | Research Scientist |
| 12. | J. Gayin
BSc (Hons) Biochem (UST)
MSc Fd. Tech. (Gent) | - | Research Scientist |
| 13. | G. A. Komlaga
BSc (Hons) Biochem (Ghana)
MSc Fd. Sc. & Tech. (UST) | - | Research Scientist |

14. D. Abusah BSc (Hons) Chem., MSc Chem. Eng. (UST)	-	Research Scientist
15. C. Oduro-Yeboah (Mrs.) BSc (Hons) Biochem (Ghana)	-	Assistant Research Scientist
16. E. A. Baidoo BSc (Hons) Biochem (UST)	-	Asst. Res. Scientist
17. J. F. Asigbey	-	Chief Admin. Asst.
18. S. A. Sampare	-	Chief Tech. Officer
19. K. Opoku-Acheampong (Mrs.)	-	Chief. Tech. Off.
20. J. R. Addo	-	Snr. Tech. Off.
21. E. Ablorh	-	Snr. Tech. Off.
22. S. A. Tagoe	-	Snr. Technical Officer
23. J. A. Asafu-Adjei	-	Prin. Works Supt
24. R. Y. Anthonio	-	Prin. Works Supt.
25. C. T. Yeboah	-	Works Supt.
26. G. K. Akleih	-	Works Supt.
27. R. M. Mawuli	-	Works Supt.
28. J. L. Lamptey	-	Works Supt.

Accounts Division

1. J. Mintah	-	Prin. Accounting Asst. (Head of Accounts)
2. J. Mintah Nakotey	-	Chief Stores Supt.
3. C. Aikins Tutu	-	Snr. Accounting Asst.
4. S. O. T. Oddoye	-	Snr. Stores Supt.
5. G. O. Gyamfi	-	Stores Supt.

Administration Division

1. E. Atta-Sonno BA Hons. (Cape Coast) Specialist Teachers Cert. in English Qualifying Cert. in Law Cert. of Enrolment to the Roll of Lawyers	-	Snr. Admin. Off. (Head of Division)
2. F. Frimpong BA (Hons) Theatre Arts, MPA (Ghana)	-	Admin. Officer
3. E. A. Larbi	-	Prin. Works Supt.
4. C. Ketsie (Ms.)	-	Admin Asst.
5. Eric Ofori	-	Admin Asst

APPENDIX II

SCIENTIFIC REPORTS AND PUBLICATIONS

Refereed Journal Publications

1. Sefa-Dedeh, S., Cornelius, B., **Amoa-Awua, W. K.**, Sakyi-Dawson, E., Afoakwa, E.O. (2004). The microflora of nixtamalized corn. *International Journal of Food Microbiology*, 96, 97-102.
2. Obilie, E.M., Tano-Debrah, K., **Amoa-Awua, W. K.** (2004) Souring and reduction of cyanogenic glycosides during the processing of cassava into akyeke in Ghana. *International Journal of Food Microbiology*. 93, 115-121.
3. **Halm, M.**, Hornbaek, T., Arneborg, N., Sefa-Dedeh, S., Jespersen, L. 2004. Lactic acid tolerance by measuring of intracellular pH of single cells of *Candida krusei* and *Saccharomyces cerevisiae* isolated from fermented maize dough. *Int. J. Food Microbiol.* 94, 97-103.
4. **Lokko P.**, Kirkmeyer S. and Mattes R. D. (2004). A cross cultural comparison of appetitive and dietary responses to food challenges. *Food Quality and Preference* 15. 129-136
5. Ouaba, L. I. I., Diawara, I., **Amoa-Awua, W. K. A.**, Traore, A.S., Moller, P.L. 2004. Genotyping of starter cultures of *Bacillus subtilis* and *Bacillus pumilus* for fermentation of African locust bean (*Parkia biglobosa*) to produce soumbala. *International Journal of Food Microbiology*, 90, 197-205.

Edited Research Reports

1. **Annan, N. T., Plahar, W. A.** and Nti, C.A. (2004). Mid-Term review workshop report. A report on the mid-term review workshop on the DFID/CPHP/FRI project on Dissemination of improved bambara processing technologies through a new coalition arrangement to enhance rural livelihoods in northern Ghana, held from 25th – 27th February at the MoFA conference room, Tamale. **CSIR-FRI/RE/ANT/2004/001**
2. **Annan, N. T.** (2004). Processing of soybeans into selected soy products. Report on the soybean training workshop held from 3rd to 7th May 2004, at the Fisheries Resource Centre of the Food Research Institute, Accra. Food Research Institute, Accra, Ghana. **CSIR-FRI/RE/ANT/2004/002**
3. Ameleke, G., **Dziedzoave, N. T.**, Krampah, L. and **Komlaga, G.** (2004) Impact Assessment – A Preliminary Assessment of the Impact of Introducing High Quality Cassava Flour and Other Novel Cassava-Based Products in the Atebubu and Sene Districts of the Brong Ahafo Region of Ghana. DFID Crop Post-Harvest Programme, Final Report (2) on Project Output 3.7, Project R8268. Food Research Institute, Accra. **CSIR-FRI/RE/AG/2004/003**
4. **Komlaga, G. Abusah, D., Gyato, C.** and **Dziedzoave N. T.** (2004). Factory Visits and Participatory Trials on the Production of High Quality Cassava Flour (HQCF), Rice Malts and Glucose Syrups. DFID Crop Post-Harvest Programme Final Report on Project Output 1.61 and 3.42. Project R8268. Food Research Institute. Accra. **CSIR-FRI/RE/KGA/2004/004**
5. **Dziedzoave, N. T.**, Graffham, A.J., Krampah, L., Asare-Bediako, B., Oware, K., Sekyere, D., Ayernor, G., Pessey, D. and Boateng, E.O. (2004). Market Linkages – Development and Implementation of a System of Market Linkages between Producers, Processors and End-Users of Cassava and Cassava-Based Products. DFID Crop Post-Harvest Programme. Final Report on Project Output 3.1. Project R8268. Food Research Institute, Accra. **CSIR-FRI/RE/DNT/2004/005**
6. **Dziedzoave, N. T.** and **Komlaga, G.** (2004). Monitoring and Evaluation of Project Progress – Monitoring Visits to Coalition Partners and the Development and Implementation of an Internal Evaluation System to Monitor Institutional and Coalition Performance. DFID Crop Post-Harvest Programme. Final Report on Project Output 5.6. Project R8268. Food Research Institute, Accra. **CSIR-FRI/RE/DNT/2004/006**

7. Tomlins, K. I., **Manful, J. T., Gayin, J., and Kudjawu B. D (2004)** Report on price sensitivity and consumer acceptability of rice in Ghana. FRI/NRI Rice Quality Improvement Project Report. **CSIR-FRI/RE/TKI/2004/007**
8. **Kudjawu B. D and Lokko P. (2004)** Sensory Attributes and Sensory Evaluation Methods of some Locally Consumed Foods. *An FRI Technical Report*. Food Research Institute, Accra. **CSIR-FRI/RE/KBD/2004/008**
9. **Diako C., (2004)** Volatile Compounds in Selected Spices Commonly Used in Ghana. *An FRI Technical Report*. Food Research Institute, Accra **CSIR-FRI/RE/DC/2004/009**
10. **Diako C., (2004)** Iron Content of Twenty-Five Indigenous Green Leafy Vegetables. *An FRI Technical Report*. Food Research Institute, Accra **CSIR-FRI/RE/DC/2004/010**
11. **Quaye, W., and Johnson-Kanda, I., (2004)** Bambara Marketing Margins Analysis. DFID/CPHP/FRI Bambara Project Report Food Research Institute. Accra, Ghana. 41pp. **CSIR-FRI/RE/QW/2004/011**
12. **Quaye, W., Yawson, I. and Plahar, W. A. (2004)** Adoption and impact studies on high quality bambara flour (HQBF) technology transfer in Northern Ghana. DFID/CPHP/FRI Bambara Project Report. Food Research Institute (FRI), Accra, Ghana. 28 pp. **CSIR-FRI/RE/QW/2004/012**
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14. **Yawson, I., Quaye, W., and Plahar, W. A. (2004)** Market Outlet Identification for High Quality Bambara Flour. DFID/CPHP/FRI Bambara Project Report Food Research Institute. **CSIR-FRI/RE/YI/2004/014**
15. **Manful J. T. and Yawson R. M.,(2004)** Enhancing Rural Livelihoods in Selected Communities in Northern Ghana through Promotion of Improved Rice Post-Production Technologies and Marketing Systems. Report of the Workshop for the Launching of Rice Quality Training Manuals. A DFID/CPHP/FRI Project Output. **CSIR-FRI/RE/MJT/2004/016**
16. Kwadzo, G.T-M., Egyir, I. S., **Amoa-Awua, W. K. (2004)**. Cassava supply lines. Root and Tuber Improvement programme, Ghana, report.
17. **Lokko P., and Tamakloe, I (2004)**. Improved old ways and new ways of peanut utilisation. A peanut recipe booklet. Food Research Institute. Council for Scientific and Industrial Research
18. **Lokko P; Kpodo K., Ottah Atikpo M, and Adams F. (2004)**, Chemical, microbiological and sensory qualities of five varieties of groundnuts. FRI/AgSSIP technical report
19. **Lokko P, Tamakloe I, and Kudjawu B (2004)** Sensory, studies of some groundnut products from five varieties of groundnuts AgSSIP technical reports. Food Research Institute.
20. Nti, C.A., **Plahar, W. A., Quaye, W. and Dzomeku, M. (2004)**. Lifestyle Nutritional Survey Report on Krachi, Sekyere East, West Gonja and Yendi districts of Ghana. A project report submitted to the MoFA/AfDB Food Crops Development Project. Ministry of Food and Agriculture, Accra, Ghana.
21. **Plahar, W. A. (2004)** Dissemination of improved bambara processing technologies through a new coalition arrangement to enhance rural livelihoods in northern Ghana. DFID Crop Post Harvest Programme, Project Final Report, Project R8261. Food Research Institute, Accra, Ghana 78 pp
22. **Annan, N. T. and Plahar, W. A. (2004)**. Seed quality characteristics of eight soybean and six groundnut varieties. A Project Report on the varietal characterization of soybean and groundnut cultivars from CSIR-Crops Research Institute. Food Research Institute, Accra, Ghana.

23. **Diako, C. and Plahar, W. A.** (2004). Physical, chemical and functional characteristics of six cultivars of cowpea (*Vigna unguiculata*). Project Report on cowpea varieties submitted by the CSIR-Crops Research Institute under the AgSSIP. Food Research Institute, Accra Ghana.
24. **Quaye, W. and Plahar, W. A.** (2004). Cost and benefit analysis of alternative approaches to cassava processing. A project Report submitted under the Root and Tuber Improvement Programme of MoFA. Food Research Institute, Accra, Ghana.
25. **Plahar W. A. and Yawson R. M.,** (2004) A Report on the End-of-Project Stakeholders' Workshop. An Output of the DFID/CPHP/FRI Project (ZB0332/R8261) on the Dissemination of Improved Bambara Processing Technologies through a New Coalition Arrangement to Enhance Rural Livelihoods in Northern Ghana. December 2, 2004 Gilbt Conference Room, Tamale, Ghana **CSIR-FRI/RE/PWA/2004/015**
26. **Johnson, P-N. T, Ottah Atikpo, M. and Tomlins K. I** (2004) Instituting elements of good manufacturing and good hygienic practices for street food vendors in Ghana. DFID/CPHP Street Food Project. NR International. UK
27. Tomlins, K. I & **Johnson, P-N. T.** (2004) Developing food safety strategies and procedures through reduction of food hazards in street-vended food to improve food security for consumers, street food vendors and input suppliers. Final Technical Report. DFID/CPHP Street Food Project, NR International. UK

Edited Conference Papers

1. **Kpodo K. A.,** Ayernor, G. S., Shephard, G. and Jakobsen, M. (2004) "Exposure to fumonisins through *Kenkey* – A Ghanaian fermented maize product" A poster Presentation at the XI IUPAC Symposium on Mycotoxins and Phycotoxins at the Natcher Conference Center, Bethesda, Maryland, USA, May 2004 **CSIR-FRI/CE/KKA/2004/002**
2. **Yawson R. M.,** (2004) Management of Technology in Ghana – Problems & Prospects. In: Proceedings of the IAMOT 2004 Conference. <http://arago.cprost.sfu.ca/~smith/conference/viewpaper.php?id=493&cf=4> Presented by the International Association for Management of Technology, April 3 – 7, 2004 Washington, DC, USA **CSIR-FRI/CE/YRM/2004/003**
3. **Yawson, R. M.,** Sutherland, A. J., and Amoa-Awua W. K. Eds. (2004) "Broadening Monitoring and Evaluation within Reforming National Agricultural Systems" Proceedings of the Policy Dialogue Forum on Performance Management. CSIR, Accra, Ghana **CSIR-FRI/CE/YRM/2004/004**
4. **Yawson R. M.,** Amoa-Awua W. K., Sutherland A. J., Smith D. R. and Noamesi S. K. (2004) Initial Experiences in Developing a Performance Measurement Framework for the Food Research Institute – a case study for institutionalizing impact orientation: building a performance management approach that enhances the impact orientation of research organizations. A paper accepted for presentation at "Managing people and managing R&D2004" R&D Management Conference Sesimbra, Portugal, 7-9 July 2004 (Co-organization ISPA & RADMA) <http://www.radma.org> **CSIR-FRI/CE/YRM/2004/005**

Conference Abstracts

1. **Yawson R. M.,** Amoa-Awua W. K., Sutherland A. J., Smith D. R. and Noamesi S. K. (2004) Initial Experiences in Developing a Performance Measurement framework for the Food Research Institute – A case study for Institutionalizing Impact Orientation: Building a performance management approach that enhances the impact orientation of research organizations. In: "Managing People in R&D" RADMA 2004 Conference Abstracts <http://www.radma.org/Abstracts> **CSIR-FRI/CA/YRM/2004/001**
2. **Kpodo K. A.,** Ayernor, G. S., Shephard, G. and Jakobsen, M. (2004) "Exposure to fumonisins through *Kenkey* – A Ghanaian fermented maize product" In: Mycotoxins and Phycotoxins – Abstracts of XI IUPAC Symposium on Mycotoxins and Phycotoxins. Pg. 75 B.35 **CSIR-FRI/CA/KKA/2004/002**

Unedited Conference Papers

1. **Annan, N. T., Plahar, W. A. and Nti, C.A.** (2004). Mid-Term review workshop report. A report on the mid-term review workshop on the DFID/CPHP/FRI project on Dissemination of improved bambara processing technologies through a new coalition arrangement to enhance rural livelihoods in northern Ghana, held from 25th – 27th February at the MoFA conference room, Tamale. **CSIR-FRI/CU/ANT/2004/001**
2. **Annan, N. T., Plahar, W. A. and Nti, C.A.** (2003). Project Inception report. A report on the project monitoring and evaluation workshop on the DFID/CPHP/FRI project on Dissemination of improved bambara processing technologies through a new coalition arrangement to enhance rural livelihoods in northern Ghana held on 21st May at the Miklin Hotel, Accra. **CSIR-FRI/CU/ANT/2004/002**
3. **Annan, N. T., Plahar, W. A. and Nti, C.A.** (2003). Training of trainers' workshop report. A report on the Training of trainers workshop on the DFID/CPHP/FRI project on Dissemination of improved bambara processing technologies through a new coalition arrangement to enhance rural livelihoods in northern Ghana, held for extension staff of MoFA and various NGOs from 23rd – 25th February at the MoFA-WIAD training laboratory, Tamale. **CSIR-FRI/CU/ANT/2004/003**
4. **Kpodo, K. A.** (2004) "Mycotoxins in Ghanaian Foods – The Way Forward" A Country Paper Presented at the XI IUPAC Symposium on Mycotoxins and Phycotoxins at the Natcher Conference Center, Bethesda, Maryland, USA, May 2004 **CSIR-FRI/CU/KKA/2004/004**

Other Publications (Consultancy, Training Manuals etc)

1. **Hagan L. L. and Lokko P.**, (2004) Salt Iodisation Training Manual. A Project Report. Food Research Institute, Accra, Ghana **CSIR-FRI/MA/HLL/2004/006**
2. **Manful J. T.** (Ed.) (2004) What is Good Quality Rice? DFID/CPHP/FRI/ADRA/MoFA/UG Training Manual on Improving the Quality of Ghanaian Parboiled Rice. Food Research Institute, Accra **CSIR-FRI/MA/MJT/2004/001**
3. **Manful J. T.** (Ed.) (2004) The Role of Farmers. DFID/CPHP/FRI/ADRA/MoFA/UG Training Manual on Improving the Quality of Ghanaian Parboiled Rice. Food Research Institute, Accra **CSIR-FRI/MA/MJT/2004/002**
4. **Manful J. T.** (Ed.) (2004) The Role of Parboilers DFID/CPHP/FRI/ADRA/MoFA/UG Training Manual on Improving the Quality of Ghanaian Parboiled Rice. Food Research Institute, Accra **CSIR-FRI/MA/MJT/2004/003**
5. **Manful J. T.** (Ed.) (2004) The Role of Millers DFID/CPHP/FRI/ADRA/MoFA/UG Training Manual on Improving the Quality of Ghanaian Parboiled Rice. Food Research Institute, Accra **CSIR-FRI/MA/MJT/2004/004**
6. **Manful J. T.** (Ed.) (2004) The Role of Marketers DFID/CPHP/FRI/ADRA/MoFA/UG Training Manual on Improving the Quality of Ghanaian Parboiled Rice. Food Research Institute, Accra **CSIR-FRI/MA/MJT/2004/005**
7. **Tamakloe I., Osei-Yaw A. and Manful J. T.** (2004) Rice Recipe Album. An Output of DFID/CPHP/FRI Improving the Quality of Ghanaian Parboiled Rice Project. **Manful J. T. and Yawson R. M.**, (Eds.) Food Research Institute, Accra **CSIR-FRI/MA/TI/2004/007**
8. **Manful J. T. and Gayin J.** (2004) Technical Assessment of Rice Mills in some Selected Locations. A Consultancy Report for the French Embassy/Food Security and Rice Producers Organisation Project. Food Research Institute, Accra **CSIR-FRI/CR/MJT/2004/003**
9. **Lokko P. and Osei-Yaw A.** (2004) Training manual on sensory evaluation of foods. Food Research Institute Report. CSIR.

9. **Dziedzoave, N., Abbey, L. D., and Yawson, R. M.** (2004) Report on FRI Local Area Network and Intranet Connectivity. An Advisory Report submitted to the Director, Food Research Institute. **CSIR-FRI/CR/DNT/2004/001**
10. **Ayensu, A., Amoa-Awua, W. K. A., and Yawson, R. M.,** (2004) Performance Measurement & Management Framework – A Proposal for Institutionalizing Performance Measurement & Management Systems within CSIR Institutes **CSIR-FRI/CR/AA/2004/002**
11. **Johnson, P-N. T, Amegashie, D & Agbesi, Y.** (2004) Attitudes of small-scale food manufacturers to quality and safety issues. A consultancy paper. Food & Agricultural Organization of the United Nations, Rome.

APPENDIX III
INTERNALLY GENERATED FUNDS (IGF)

ANNUAL STATEMENT

**STATEMENT OF ACCOUNTS FOR THE
YEAR ENDED 31ST DECEMBER, 2004.**

INCOME	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	TOTAL
Sale of Products	11,494,000.00	15,420,000.00	18,932,000.00	10,111,000.00	55,957,000.00
Analysis and Tech.Services	114,522,600.00	122,905,000.00	92,159,200.00	47,355,000.00	376,941,800.00
Training Fees	5,000,000.00	38,955,000.00	1,800,000.00	7,200,000.00	52,955,000.00
Fabrication	-	51,650,000.00	43,650,000.00	20,200,000.00	115,500,000.00
Miscellaneous	41,604,000.00	14,247,680.00	32,447,340.00	32,180,000.00	120,479,020.00
TOTAL INCOME (a)	172,620,600.00	243,177,680.00	188,988,540.00	117,046,000.00	721,832,820.00
LESS : DIRECT COST					
Production - Raw Materials	31,185,360.00	4,780,000.00	9,501,000.00	20,025,000.00	65,491,360.00
Chemicals	44,529,118.00	60,312,774.00	55,775,762.00	28,000,000.00	188,617,654.00
Fabrication Expenses	-	19,900,000.00	72,720,000.00	13,142,984.00	105,762,984.00
Training Workshop Expenses	7,076,000.00	16,521,600.00	7,460,770.00	6,594,000.00	37,652,370.00
Operational Expenses	24,180,711.00	35,346,375.00	14,908,500.00	21,993,857.00	96,429,443.00
TOTAL DIRECT EXPENSES (b)	106,971,189.00	136,860,749.00	160,366,032.00	89,755,841.00	493,953,811.00
NET INCOME (a-b)	65,649,411.00	106,316,931.00	28,622,508.00	27,290,159.00	<u>227,879,009.00</u>

DISTRIBUTION OF NET INCOME

NET INCOME		<u>227,879,009.00</u>
15% - CSIR	34,181,851.35	
85% - FRI	<u>193,697,157.65</u>	
		<u>227,879,009.00</u>

APPENDIX IV
FRI STAFF TRAINING - 2004

	NAME OF STAFF	DESIGNATION	COURSE	INSTITUTION OF STUDY
1.	M. Ottah-Atikpo (Mrs.)	RS	PhD (Food Microbiology)	University of Ghana
2.	E. C. T. Tettey	RS	PhD (Fd. Sci)	Univ. of Ghana,
3.	M. Obodai (Mrs.)	RS	PhD (Food Microbiology)	Univ. of Nottingham. UK
4.	C. Oduro-Yeboah (Mrs.)	ARS	MPhil (Fd. Sci)	Univ. of Ghana, Legon
5.	P. M. Larweh (Mrs.)	ARS	MSc (Fd. Sci)	Dalhousie Univ. Hallifax, Canada
6.	E. A. Baidoo	ARS	MPhil (Fd. Sci)	Univ. of Ghana, Legon
7.	E. Allorsey	Snr. Tech. Asst.	HND Biochemical Lab. Tech.	Univ. of Ghana, Legon
8.	R. Kavi	Prin. Lib. Asst.	BSc (Info. Studies)	Univ. of Ghana, Legon
9.	K.K. Essel	Tech. Asst.	HND Biochemical Lab. Tech.	Univ. of Ghana, Legon
10.	A. I..Nyarko.	Tech Asst. Gd. I	HND Biochemical Lab. Tech.	Univ. of Ghana, Legon

APPENDIX V
FRI STAFF TRAINING COMPLETION - 2004

	NAME OF STAFF	DESIGNATION	COURSE	INSTITUTION OF STUDY
1.	N. T. Annan (Mrs.)	SRS	PhD (Fd. Sc.)	UG / KVL, Denmark
2.	N. T. Dziedzoave	SRS	PhD (Fd. Sci. & Tech.)	NRI
3.	C. Tortoe	RS	PhD (Fd. Sci. & Tech.)	NRI, Univ. Of Greenwich
4.	E. Allorsey	Snr. Tech. Asst.	HND Biochemical Lab. Tech.	Univ. of Ghana, Legon
5.	A. Padi (Mrs.)		Dip. in Catering & Hotel Mgt	Graduate School of Management, Accra
6.	C. Boateng (Ms)		Dip. in Catering & Hotel Mgt	Graduate School of Management, Accra
7.	K.K. Essel	Tech. Asst.	HND Biochemical Lab. Tech.	Univ. of Ghana, Legon
8.	A. Andoh	Chief Tech. Officer	Post Grad Dip. In Marketing	GIMPA
9.	A. I. Nyarko.	Tech Asst. Gd. I	HND Biochemical Lab. Tech.	Univ. of Ghana, Legon
10.	L. Botchie (Mrs)	Snr. Accts. Clerk	BSc (Admin) Acct. Option)	Univ. of Ghana, Legon

APPENDIX VI
APPOINTMENTS

Name	Grade	Date of Appointment	Division
Mr. Frederick Frimpong	Administrative Officer	9 th March, 2004	Administration
Mr. Eric Ofori	Administrative Assistant	15 th March, 2004	Administration
Ms. Mary Boham-Darko	Technical Officer	11 th March, 2004	Food Microbiology
Mr. Harold Aforyinkpo		16 th January, 04	Food Processing & Engineering
Mr. Samuel Quaye	Security man	3 rd April, 2004	Administration
Ms. Mary Assimah	Clerk Gd. 2	1 st June, 2004.	Commercialisation & Information

APPENDIX VII
CONFERENCES, COURSES, WORKSHOPS AND SEMINARS ATTENDED BY FRI STAFF IN 2004

Conferences/ Courses/ Workshops/Seminars	Participants	Designation	Venue	Date/Duration	Organizers
Computer training course-Intermediary Level	Mrs. E. Atta-Sonno Mr. John F Asigbey.	SAO CAA	CSIR HR Center	26-30 th April, 2004	CSIR HR Directorate
XI IUPAC Symposium on Mycotoxins and Phycotoxins	Dr. K. A. Kpodo	SRS	Bethesda, Maryland, USA	May 17 – 21, 2004	US FDA and NIH
5-day course for License Drivers	Mr. Reuben Tetteh, Samuel Odjao, Gariba Alimiyao Anthony Sevor	Drivers	Intercity STC	24 th -28 th May and 21 st -25 June, 2004	Intercity STC
Training Workshop on Database Management Using MS Access	Mr. R. M. Yawson Mr. F. Frimpong Mr. C. Amegah	SS AO A/C Clerk	INSTI, Accra	June 14 – 19, 2004	Institute for Scientific And Technological Information,
African Agricultural Technology Foundation (AATF) Meeting of Experts in Mycotoxins	Dr. K. A. Kpodo	SRS	Nairobi, Kenya	June 22 – 24, 2004	AATF
GM Crops: Detection, Regulation & Monitoring Training Course	Mr. S. K. Noamesi Mr. J. T. Manful	RS	Leeds, UK	July 5-16th 2004	Centre for Plant Science, University of Leeds
Training on quantitative methods with SPSS	Mrs. L. L. Hagan Ms. Bernice Kudjawu	ARS ARS	INSTI, Accra	August 9 - 12, 2004	Institute for Scientific And Technological Information,
Seminar on Information Products and Services for Female Scientists	Dr. K. A. Kpodo Ms. M. Owusu Mrs. I. Yawson	SRS RS ARS	INSTI, Accra	August 18, 2004	INSTI/GAINS/CTA
5-day training course for CSIR Security staff	Mr. Eric Appiah Mr. Daniel Nuetey Mr. John K.A. Abalansah Mr. Peter Abanamikum Mr. Francis Yin	Security Men	CSIR HR Center	23 rd -27 th August 2004	CSIR HR Directorate
Training Course on Electronic Information Resources Management	Dr. K. A. Kpodo Ms. M. Owusu Mrs. I. Yawson	SRS RS ARS	INSTI, Accra	Sept 14 - 15, 2004	Institute for Scientific And Technological Information,
Risk Analysis and Modelling And Sanitary/Phytosanitary (SPS) Capacity Building in Sub-Sahara Africa Train the Trainer Workshop	M. Glover-Amengor (Mrs.)	RS	Addis Ababa, Ethiopia.	Sept 20 - 24, 2004	Tuskegee University in conjunction with USDA, and sponsored by USAID
Workshop on Basic Information, Communication and Technology Skills	Mrs. I. Yawson Ms. M. Dzomeku	ARS ARS	INSTI, Accra	Sept. 27 – 29, 2004	INSTI/GAINS/IICD

Training and Retraining of salt producers	Mrs. P. Lokko Mrs. L. L. Hagan Ms. B. D. Kudjawu	PRS ARS	Apesiwaa Conference Room, FRI, Accra	Sept. 28 – 29, 2004	FRI/UNICEF
Pan African Conference on Risk Analysis and Modelling and Sanitary / Phytosanitary (SPS) Capacity Building in Sub-Sahara Africa	M. Glover-Amengor (Mrs.)	RS	Addis Ababa, Ethiopia.	Sept 27 –Oct 1, 2004	Tuskegee University in conjunction with USDA, and sponsored by USAID
Workshop for the Launching of five Training Manuals on Rice Quality Improvement,	Dr. W. A. Plahar Dr. P. A. Adu-Amankwa Dr. J. T. Manful, Mr. R. M. Yawson Mr. J. Gayin Mr. A. Andoh Mrs. I. Tamakloe	Director SRS RS SS RS CTO PTO	Miklin Hotel, Accra	1 st October, 2004	FRI/CPHP/DFID
Seminar on ICT in Agriculture and Rural Developments in Ghana	Mr. R. M. Yawson	SS	INSTI, Accra	October 27, 2004	INSTI/IAALD/FAO/ GINKS/INASP
Final Stakeholders' Workshop on Bambara	Dr. W. A. Plahar Mr. R. M. Yawson Mrs. M. Quaye	Director SS RS	Gilbt Conference Room, Tamale	December 2, 2004	FRI/CPHP/DFID

**APPENDIX VIII
ORGANOGRAM**

