

**FOOD RESEARCH INSTITUTE
(C.S.I.R)**

1991 ANNUAL REPORT

Compiled & Produced by the
Scientific Information Division
Food Research Institute
P. O. Box M.20
Accra

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FRI ANNUAL REPORT 1991

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FOOD RESEARCH INSTITUTE

ANNUAL REPORT - 1991

1.0 INTRODUCTION

The Food Research Institute (FRI) conducts applied research into problems of food processing and preservation, storage, marketing, distribution and utilization and gives advice to industry and the general public on food analysis, quality control, product improvement and development, marketing, distribution and utilization. It is one of the thirteen affiliate institutes of the Council for Scientific and Industrial Research (CSIR), Ghana. It was set up in 1963 and incorporated in 1965 to assist the local food industry at all levels of organization to improve and diversify their operations, to boost agricultural productivity in Ghana as well as to advise government in the formulation and implementation of its food policy.

During the year 1991, research and development work was continued on cassava processing demonstrations, production and marketing of cowpea flour, survey of rice-milling in Ghana, storage of staple food crops, the solar energy technology project, and the Ghana-Netherlands Regional Training and Applied Research Project for Artisanal Fish Processing in West Africa.

Work also continued on new development projects such as Utilization of Locally produced Sorghum in Malt and Beer processing, "Studies on Non-Traditional Horticultural Crops, the National Mushroom Development Project (NMDP), "Assessment of Meat Drying in Hot Humid Climates Using Convection-Type Dryers and Investigation of Practicable Meat Drying Parameters", the Extension of Food

Preservation Methods, Quality Assessment of Wheat Flours, etc.

The fourth training programme under the Ghana-Netherlands Regional Training and Applied Research Training Project for Artisanal Fish Processing in West Africa was held at the University of Ghana. Other training programmes under the National Mushroom Development Project (NMDP) and the Cassava Processing Demonstration Unit were held.

The FRI as usual conducted technical and consultancy services for industry and the general public.

2.0 GENERAL

2.1 Physical Developments

A number of equipment supplied under the World Bank Industrial Sector Adjustment Credit (ISAC) were installed. These include a tunnel dryer, a drum dryer, a vacuum sealer and a fill, weigh and seal machine. Other equipment were also installed such as the Fateco Groundnut roaster, the winged bean dehulling plant, a standby electric generator, and an attrition mill. A milling room and an office for the grain legumes project was completed.

Rehabilitation of two laboratories and two offices by Accra Brewery Limited for the project on "Utilization of Locally Produced Sorghum in Malt and Beer Processing" is still in progress.

2.2 Finance

The FRI faced serious financial problems this year 1991. Of an estimated recurrent budget of C192,741,012,

Ø147,400,000.00 was approved but only Ø113,370,967.10 or (76.44%) of the approved budget was released. This was grossly inadequate for the effective running of the institute. No money has yet been received for the capital and development work even though Ø85,000,000.00 was approved under the Public Investment Programme (PIP). Please refer to appendix III for a breakdown of the budget.

2.3 STAFF MATTERS

2.3.1 Staff Strength and Turnover

The staff strength of the FRI is 186, an increase of 12 over last year's number of 175. The breakdown is as follows:

	<u>1990</u>	<u>1991</u>
Research Staff	35	35
Non-Research Senior Staff	35	36
Junior Staff	68	80
Monthly Rated	37	35
	<hr/>	<hr/>
Total	175	186
	<hr/>	<hr/>

(Please see Appendix II for the Senior Staff List)

2.3.2 New Appointments

Dr. John Dei-Tutu, Principal Research Officer, and Head of the FRI Pilot Plant was appointed Deputy Director in June 22 new staff appointments were made during the year (Please see Appendix IV for a full list).

2.3.3 Resignations

Josephine Cleland-Okine (Ms), Technical Asst. Grade I resigned with effect from 8th November 1991, to pursue a degree course at the University of Cape Coast.

Mr. James Otu-Odame has also tendered his resignation to enable him to undertake further studies.

Mr. Richard Apasugbey, Watchman, resigned with effect from 25th November 1991.

2.3.4 Secondment

Dr. J.K.B.A. Ata, Principal Research Officer, is still on secondment to the Ministry of Industries Science and Technology (MIST) as Technical Director.

Mr. Mawuli Mensah, Foreman, is also still on secondment to Zone Seven of the CDR Secretariat.

2.3.5 Promotions

Sixteen Technical Staff promotions were announced this year with retrospective effect from 1 October 1990. (Please see Appendix V for full details).

2.3.6 Obituary

Mr. Wellington Kofi Amoako, Driver Gd.I, died on 6th July 1991.

2.3.7 Training

2.3.7.1 Local

Messrs. E.A. Allotey and D.K. Asiedu, Senior Technical Officers (STO's) are still pursuing a diploma course in Laboratory Science and Technology at the University of Ghana, Legon.

Mr. B. Awotwi (Technical Officer) Food Economics and Utilization Division (FEUD), completed a two-year course in Marketing at the Institute of Management Studies, Accra.

Mr. E.A. Larbi, Works Superintendent, completed the seven-month 19th Senior Technical Supervisory Course at

the Institute of Technical Supervision (ITS), Weija, Accra.

C. Ketsie (Ms) and P. Tetteh (Ms), both Clerks Gd.I, attended a Supervisory and Management course at the Civil Service Training Centre, Accra.

2.3.7.2 African and Overseas Courses

Mr. D.M. Attiogbe, Assistant Research Officer (ARO), Engineering Division, attended a course in Machine Design and Manufacture (Jigs and Fixtures) organised by the African Regional Centre for Engineering Design and Manufacture (ARCEDEM), Ibadan, Nigeria.

Mr. Cletus Gyato, Scientific Officer, also undertook a course in Machine Design and Manufacture at ARCEDEM, Ibadan, Nigeria under a Commonwealth Fund for Technical Co-operation Award.

Mr. P.N.T. Johnson, Research Officer, attended a course on Scientific Methods of Storage and Inspection of Food Grains at the Indian Grain Storage Institute, Hapur, India.

Mr. J.T. Manful (ARO) Processing Division embarked on an Advanced Practical Training in Cereal Processing in Germany.

Mrs. A. Osei-Yaw, Senior Research Officer, (SRO), and Head of the Food Economics and Utilization Division (FEUD) attended a training course in sensory evaluation at the Division for Food Research (TNO), the Netherlands.

M. Streetor (Ms.) Chief Library Assistant attended the 12th Commonwealth Agricultural Bureau International

Course on Agricultural information, Wallingford, Oxfordshire, U.K.

Mr. Kafui Ameh, Chief Technical Officer, Public Relations, attended an eight-week training course in Information Storage and Retrieval Systems at the National Institute of Small Industry Extension Training (NISIET), Hyderabad, India.

M. Halm (Ms), Senior Research Officer, and Head of Analysis, attended a course in connection with the project Capability Building for R&D in Fermented Food Processing in Ghana in Denmark.

P. Lokko (Mrs.), (SRO) attended a training course on Rural Milk Processing in Ethiopia, in November.

N.T. Annang (Mrs) (ARO) continued her M.Sc. Programme in Food Science at the Technical University of Nova Scotia (TUNS), Canada.

A.E. Hayford(Ms) continued her M.Sc. Programme in Biotechnology at Monash University, Australia. (Please see appendix for fuller details).

2.3.8 Conferences/Workshops/Seminars

Mr. K.K. Eyeson, Director, attended the ARCT Africa Regional Centre for Technology (ARCT) Regional "Workshop in the Formulation, Appraisal, and Management of Projects for the Food Processing Industry, Addis Ababa, Ethiopia, 22 - 26 April.

Number of staff led by Mr. B.L. Lartey, Chief Research Officer and Head of Engineering Division attended the First National Workshop on Root and Tuber Crops and Plantain.

The FRI also participated in the Ninth International Symposium of the International Society for Tropical Root Crops (ISTRC) Accra, 20 - 26 October.

Mrs. A. Andah, Principal Research Officer and Head of Processing participated in the Ad-hoc Experts Groups Meeting on Composite Flours, organised by the United Nations Economic Commission for Africa (UNECA), Addis Ababa, Ethiopia, 18 - 28 November.

The Institute attended a number of other important conferences, meetings, workshops, seminars and symposia. Among these were the:

- Fifth FAO Expert Consultation Conference on Fish Technology in Africa, Accra, 22 - 25 October.
- Management Committee Meetings of the Priority Action Programme for West Africa on Improvement of Post harvest Utilization of Artisanal Fish Production, Accra.
- Africa Regional Workshop on the use of micro-computers in Technology Management, Accra.
- Workshop on Teachers/Facilitators on the Fourth Training Programme of the Ghana Netherlands Fish Project, Accra.
- Seminar on Iodine Deficiency Disorders (IDD), GIMPA, Accra.
- Seminar on Vitamin A Supplementation Trials (VAST), Kumasi, Ghana.
- National Preparatory Workshop on the International Nutrition Conference, University of Ghana.
- Workshop on the use of Biotechnology in the Food Industry, Ibadan, Nigeria.
- International seminar on promoting the production of ACP Fresh Fruits and Vegetables for Export to the NRC,

the Netherlands, 2 - 6 December 1991. (Please see Appendix VIII for full details).

2.3.9 Staff Canteen

The canteen operated throughout the year without any major problems.

2.3.10 Board items

Some office equipment mostly typewriters were sold to staff by bid during the year.

2.3.11 Internal Transfer

Mr. B.A. Mensah, (ARO), Food Technologist, of the Engineering Division has joined the FRI Processing Division. He is currently attached to the Cassava Processing and Demonstration Unit, Pokuase.

2.3.12 Leave without pay

L. Opare-Sem (Mrs), (ARO), is on leave without pay effective 13th November 1991 to join her husband in the United States.

2.3.13 Internal Seminars and Publications

15 Internal Seminars were held out of a scheduled 19. The proceedings of these seminars are being compiled and will be produced within the framework of the Institute's Publications Programme.

The Annual Report and the summary for 1990 was produced, and two Quarterly Reports for 1991 prepared.

2.3.14 Meetings

Three Management Board (MB) meetings were held during the year. The Research and Administrative Committee as well

as the Finance Committee met twice during the year.

The Heads of Division held six regular meetings during the year. In August/September the Heads of Division held a series of daily consecutive meetings with project leaders to prepare the development and recurrent estimates for 1992 - 1994.

Three staff durbars were held during the year.

2.3.15 National service

Dzidzo Amoa(Ms) formerly of the University of Science and Technology (UST) continued her National Service at the FRI. Grace Akomaning(Ms) began her service in October 1991.

2.3.16 Visitors to the Institute

The Scientific Information Division bears the responsibility for receiving visitors to the Institute and conducting them round. During the year, the Institute received 130 official visitors. These included students, government officials, home scientists, consultants, journalists, industrialists, farmers, etc. Some of the organizations from which visitors came were; IITA, FAO, UNDP, UNIDO, ARCT, ISODEC, NRI, etc. Some of them came from countries such as Algeria, Austria, Cameroon, Cote d'Ivoire, Senegal, Sri Lanka, Turkey, United Kingdom, USA, Zaire and Zambia. (Please see Appendix X for a full List.

2.4 GENERAL

2.4.1 Divisions of the Institute

The FRI is made up of six scientific divisions - Analysis, Eengineering, Processing, Pilot Plant, Food

Economics and Utilization, Scientific Information as well as the Administration and Accounts Divisions.

The Analysis Division conducts analysis into the chemical and microbial composition of food for their safety. On request it also organises training programmes for laboratory technicians in the food industry in "Basic Techniques in Basic Food Microbiology.

The Engineering Division conducts research into the development modification and testing of suitable machines for food processing.

The functions of the Processing Division are to conduct applied research into the processing, preservation, packaging and storage of food as well as the development of new products from available raw materials.

The functions of the Pilot Plant Division are to conduct pilot scale studies into products developed by the FRI. It also provides service such as dehydration to industry.

The Food Economics and Utilization Division (FEUD) conducts surveys and feasibility studies into the economic operation of plants and projects, from plant/project organization to marketing, distribution, consumer demand and the utilization of food. It runs a test kitchen which conducts sensory tests on products developed by the FRI.

The functions of the Scientific Information Division are the assembly, storage, retrieval of technical and non-technical information of relevance to the institute's work, the maintenance of communications with food industries and contacts with institutions, and organizations of interest to FRI as well as the creation of public awareness of the institutes facilities, programmes and research results.

The Administration Division caters for the secretarial,

personnel, establishment, estate and transport matters of the FRI. 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 on all these activities.

2.4.1.1 DIVISIONAL REPORTS

2.4.1.1.1 SCIENTIFIC INFORMATION DIVISION

2.4.1.1.1.1 Library and Documentation Services

The Library continued to offer a great deal of service to its users. The Institute library which is under high priority consideration under the National Agricultural Research Programme (NARP) for rehabilitation, is going to be expanded and adequately equipped with modern facilities for information documentation and retrieval. The library had 20 new journals listed for subscription by the World Bank Agricultural Project on Information Systems

Exchange of Publications was also established with the following Institutions and bodies:

- a. International Development Research Center (IDRC)
- b. Technical Centre for Agric and Rural Co-operation (TCARC)
- c. Commonwealth Agricultural Bureau International (CABI)
- d. Board on Sciences and Technology for International Development (BOSTID)
- e. Central Food Technology Research Institute (CFTRI)
- f. International Institute of Tropical Agriculture (IITA)
- g. Kansas State University, USA.

A total of 77 non-staff members used the library within

the period. Of, this students accounted for almost 50%. Researchers, lecturers, consultants, former librarians and laboratory technicians formed the other 50% of non-staff library users.

The FRI staff also patronised the library a great deal .

2.4.1.1.1.2 Public Relations Activities

The Scientific Information Division through its Public Relations Unit was as usual very instrumental in boosting the image of the Institute through publicising its activities through the press, radio and television. Some of the activities that presented such opportunity in 1991 were:

- a. Commonwealth Day
- b. Scientific Renaissance Day of Africa
- c. Africa Industrialization Day
- d. Expo '91

The numerous public enquiries and editorial comments about the Institute's activities and contribution to national development is a direct result of this effort.

2.4.1.1.2 FOOD ECONOMICS AND UTILIZATION DIVISION [FEUD]

2.4.1.1.2.1 Data Bank

The Food Economics and Utilization Division {FEUD} collected, compiled and stored up-to-date information on prices and the production of major staples - maize, rice, millet, cassava etc.

2.4.1.1.2.2 Commercial Activities

The technical staff of the Economics section were mainly engaged in commercial activities; processing and distribution of cowpea flour, and helping in the production of dehydrated fermented maize meal, etc.

A total of 30.5 mini bags (1525kg) cowpea grains were dehulled in the year 1990 and 20.5 mini bags (1075 kg) milled into flour. Sale of cowpea flour has gone up as more distribution outlets have been found such as GNTC, Kingsway, Glamour, Multi-Stores and the FRI Commercial Unit Kiosk. Total sale of cowpea flour amounted to about C300,000.00.

2.4.1.1.2.3 Soyabean production and utilization

The Food Economics and Utilization Division worked on the standardisation of soymilk production and recipe development. Using mainly soybeans to promote the use of soymilk, the test kitchen staff started the production and sale of soymilk to staff.

2.4.1.1.2.4 Maize recipe development

The FEUD tested several maize recipes.

2.4.1.1.3 ENGINEERING DIVISION REPORT

Technical staff of the Division have been helping in the installation of machinery and equipment at the Cassava Processing Demonstration Unit at Pokuase as well as pilot plant (Okponglo) and Rangoon sites of the FRI. Repair and Maintenance work were also carried out.

3.0 RESEARCH ACTIVITIES

3.1 ROOT AND TUBER CROP STORAGE AND PROCESSING

3.1.1 ARCT/CSIR Project: Cassava Processing Demonstration Unit (CPDU)

3.1.1.1 Objectives

The project objectives are to set up an integrated pilot scale system for the processing of gari and other

products. The completed integrated project consists of units for processing, solar drying, animal husbandry and biogas plant.

It is an objective of the CPDU to accelerate the use of improved gari making technology and to serve as a demonstration centre for traditional cassava processors and technicians from the West African region. The project is a multi-disciplinary one, with various divisions of the FRI as well as various institutes of the CSIR namely the Animal Research Institute (ARI), Crops Research Institute (CRI), Industrial Research Institute (IRI), participating. The project was sponsored by the Economic Commission for Africa (ECA) and the Africa Regional Centre for Technology (ARCT), Dakar, Senegal.

3.1.1.2 Demonstrations on Cassava Processing

The unit organised a one-day demonstration on cassava processing for womens' group from Ho, Ghana and Cameroon. Participants were taken through the theoretical and practical aspects of improved and mechanised gari production.

3.1.1.3 PRODUCTION FIGURES FOR THE YEAR

PRODUCT	QUANTITY OF CASSAVA PROCESSED (KG)	QUANTITY OF PRODUCT OBTAINED (KG)
Gari	35,478.40	8,000.20
Kokonte	10,151.40	2,762.30
Starch	2,527.00	268.60

3.1.1.4 Evaluation of CPDU

A team of three consultants from the UNDP (under UNDP Project RAF/82/039) undertook an in-depth evaluation of the CPDU from 29 September to 2nd October 1991. The team evaluated the technologies developed and their potential for transfer and commercialization.

3.1.1.5 Installation of New Equipment

3.1.1.5.1 UNIDO Project A/RAF/90/632

A small-scale gari and cassava processing plant for rural areas was installed at the CPDU. The plant which was fabricated by the Federal Institute of Industrial Research, Oshodi (FIIRO), Lagos, Nigerian, consists of a cassava grater, a cassava dough press, cassava cake, sifter, and a roaster, all driven by a single diesel engine. A team from FIIRO organised a training programme for equipment manufacturers and food processors on the fabrication and use of the plant. Participants came from the FRI, IRI, Agricultural Engineers, Engineering Metal and Motor Engineering Co. Ltd. and FATECO.

Similar plants have been installed by FIIRO at Cameroon, Zaire, Togo and Sierra Leone under the project.

3.1.1.4 OTHER CPDU ACTIVITIES

The appointments of 16 temporary staff were confirmed. They see to the routine production of gari, kokonte, starch and fermented cassava meal as well as the demonstration of cassava processing to the general public.

During the year 11 samples of locally milled rice collected from Tamale and other surrounding villages such as Nyankpala, Tolon, Kumbungu and Bontanga irrigation scheme villages was tested for their physical, chemical and organoleptic characteristics.

All samples examined were parboiled. The level of broken grains in the samples were variable ranging from 9.8% - 48.8% showing inconsistency in quality. Moisture levels ranged from 13.1 - 16.1% with a mean of 14.4%. Samples with moisture content of more than 13.5% would be more susceptible to mould infestation during storage (even in the drier conditions of the north).

The study found that in the North, the bulk of milled rice has to be parboiled using traditional methods in order to reduce or eliminate breakage of grains during milling. Rice farms in the north are rain-fed and the need arises to delay harvesting until the land is dry enough to allow the use of manual harvesting or harvesters. This results in the grains becoming over mature, too dry and thus developing cracks before harvesting, resulting in breakages during milling. Taste panel evaluation of samples indicated that samples of parboiled rice produced in the North are more suitable for the preparation of dishes such as 'WAAKYE' a local dish made with boiled rice and cowpeas. Samples were given low ratings when presented as plain boiled rice. The study took the form of interviews with respondents using prepared questionnaires on paddy production, parboiling, milling and marketing. Respondents included farmers, traditional processors, small-scale millers, officials of milling plants, middlemen and women, marketing organisations and officials of irrigation schemes.

A special study was conducted on the women who do traditional parboiling of paddy, an important income-generating activity for the women in the region. Emphasis was placed on the socio-economic status of these women and the level of technologies they employed. The study found that milled rice and paddy marketing from North to other parts of Ghana at both wholesale and retail levels are almost exclusively handled by women. A final report has been prepared.

3.2.1.1 Project Team

Mrs. A. Andah - Leader

Mr. J.T. Manful - Asst. Research Officer, Member

3.2.2 Utilization of Locally Produced Sorghum in Malt and Beer Processing

3.2.2.1 Introduction

This project started in September 1990. It is an integrated agro-industrial programme for the use of locally produced sorghum as a substitute for imported barley in the brewery industry in Ghana. The United Nations Industrial Development Organization (UNIDO) responded favourably to a government of Ghana request, made in August 1987 by the Ministry of Industries, Science and Technology (MIST), for technical aid to assist the brewing industry in gradually substituting imported barley malt for suitable locally cultivated varieties of sorghum. The project, which is expected to last for four years, consists of two phases: a preliminary phase I including a Raw Material Development Programme (RMDP) and an operational phase II involving a Research and Development Programme (R&DP).

This is to be followed later by a Full Scale Industrial Development Programme (FSIDP).

The preliminary phase I comprises the rehabilitation and establishment of modern research laboratories on the premises of the FRI for the project and the RMDP. The RMDP involves the collection of both and local foreign sorghum samples for analysis in the project laboratories and for control analysis in the laboratories of the Malting and Brewing Department of Louvain University, Belgium, to enable the identification and selection of white sorghum varieties which have comparable characteristics to the brewer's barley. The selected varieties are to be tested at on-station trials at the Nyankpala Agricultural Experimental Station (NAES) of the Crops Research Institute (CRI) and on-field trials both under irrigation and under rain-fed conditions at different locations in northern Ghana, where the RMDP is located, to enable the identification and selection of varieties, which agronomically are also suitable for the malting and brewing process. The established parameters for this selection are duration of maturity, size of yield, resistance against pests and disease and as well as genetical sustainability. Varieties which are found to be analytically and agronomically suitable are then put on extension trials for large scale production.

Under the R&DP, pilot malting and brewing plants are to be installed by UNIDO on the premises of the Achimota Brewery Company (ABC) to help the local brewing industry to gradually substitute the desired locally produced varieties of white sorghum malt for imported barley malt.

Mr. Nii Otto-Darko, a specialist in Malting, Brewing and Distilling Technology has been appointed as the National

Project Director (NPD) and the FRI has been chosen as the project headquarters. The function of the NPD is to collaborate with the UNIDO Chief Technical Advisor(CTA) in the supervision and co-ordination of all the activities of the project. The FRI is to provide laboratory support services for both the RMDP and the R&DP including the pilot and later the industrial scale trials. These include establishing the technological parameters for malting and brewing technology which will enable the production of acceptable quality, pale, lager beer and defining the analytical methods which will allow accurate investigations to be carried out on the sorghum raw materials itself, the sorghum malt as well as the intermediate and finished products of the beer process. UNIDO has therefore budgeted US \$30,000.00 (thirty thousand dollars) as its contribution towards the purchase of equipment to set up modern research laboratory for the malting and brewing process at the FRI's pilot plant site at Okponglo. The project is being funded by the Ghana and Belgian governments.

The Crops Services Department of the Ministry of Agriculture is directly responsible for the implementation of the RMDP. Other collaborative institutions are the Nyankpala Agricultural Experiment Station (NAES), the Irrigation Company of the Upper Region (ICOUR) Ltd., Tono, the Gessellschaft fur Technische Zusammenarbeit (GTZ), Accra, the Sasakawa Global 2000, the Ministry of Industries, Science and Technology (MIST) as well as the Ministry of Finance and Economic Planning (MFEP).

3.2.2.2 Project Justification

- (i) To reduce the production cost and therefore the consumer price of beer and spirits.

- (ii) Huge foreign exchange, otherwise used for the importation of barley malt can be saved this way for use in other pressing areas in the economy.
- (iii) Production of these cereals and other crops - yam, maize, groundnut, soybean - included in the farmers cropping patterns - will in turn, stimulate more activity on the fields and generate more work and employment, all in conformity with the government drive towards agro-based industrial development and promotion of food-sufficiency.
- (iv) It is expected that the white sorghum development project, located in the northern Ghana, will bring about new farming ventures in the north, improve and increase the farmers equity and income earnings and distribution and reduce labour migration from the already thinly populated savannah north to the urban and densely-populated south.
- (v) When the project is successfully completed, the malthouse will not only serve as a supplier of sorghum malt for beer production but will also supply raw materials for feeder for use in livestock feeding and with little supplementary equipment can also produce malt extract for use in various areas of the food and other industries.

3.2.2.3 Report on Phase I

A Project Performance Evaluation Report (PPER) on Phase I was prepared by the project management team and presented to the steering committee meeting at the Ministry of Industries, Science and Technology (MIST) in August. Copies were sent to the UNDP and to UNIDO for review and assessment.

The project faced a lot of hardships and difficulties during operational Phase I. Funds requested for under the government's Public Investment Programme were not forthcoming and UNIDO inputs and equipment necessary for research and analytical work were delayed. However the project managed to achieve some successes in the Raw Materials Development Programme (RMDP).

3.2.2.4 Review of the Phase II of the Project Proposal

A revision of Phase II of the project proposal was undertaken and completed in late August. This revision became necessary to attempt to rectify the difficulties and hardships faced during operational Phase I. The review revised the budget for all government inputs as well as the UNIDO budgetary estimates. A report has been sent to UNIDO, Vienna Headquarters for review and assessment and to the Belgian government project donor country, for acceptance and clearance.

3.2.2.5 Raw Material Development Programme (RMDP)

3.2.2.5.1 Field Trials Under Irrigation

Under the Raw Material Development Programme (RMDP) the first field trials under irrigation were started at Tono with the planting of seven sorghum bicolor varieties between December 1990 and January 1991. The varieties included one red Framida and six White Sureno, Dorado, NSVI, NSVII, Belko White and Naga White. It was observed, at the Tono project irrigation site that the red Framida is an early maturing variety and was already ready for harvesting in March. Dorado and Sureno, the Texan varieties were next to mature and were harvested in the middle of April. Earlier analytical tests have

shown them to have promising malting and brewing qualities. The local varieties, NSVI, NSVII, Belko White and Naga White were found to be longer maturing varieties which rules them out as suitable for the purposes of the project.

Previous tests on two Ethiopian varieties Gambella 1107 and 76 to 23 have also found them to be analytically very promising for the malting and brewery process. Agronomical suitability tests are yet to be ascertained in later trials.

Three varieties received from the Food and Agriculture Organisation (FAO) in July - Sepon 82, PAN 841 and PAN 884 were sent for field trials under irrigation at the Tono irrigation site during the off-rainy dry period in November.

Results to be obtained in April 1992 will be compared with those obtained from trials of similar samples tested under natural, rain-fed conditions using the parameters of size of yield, duration of maturity, resistance against pests and disease as well as genetic sustainability.

3.2.2.5.2 On-farm trials under Rain-fed Conditions

A focus of major activities was field trials under rain-fed conditions. Planting of different white sorghum varieties on field trials under natural rain-fed conditions were undertaken at Tilli, Manga and Bolga in the Upper East Region (UER) in June and many varieties have reached maturity stage. The seeds included such foreign and local varieties as Dorado (Texas/USA), Sureno (Texas/USA), Gambella 1107 (Ethiopia), Sorghum 76 T.23 (Ethiopia), Frara Fara White (Burkina Faso), Gyibara (Wa/Ghana) Naga

White (Takuri/Ghana), Zambie and Nazie (Ulu/Ghana) and 12 other Ghanaian varieties on seed

Two new Sorghum bicolor varieties CSM 63 and CSM 228 received from Mali were sent to the project agronomist for trials.

Harvesting of the field trials under rainfed conditions took place at the end of November at all the three locations in the Upper East Region. The project agronomist is yet to submit a technical report on the performance of the field trials.

3.2.2.6 Training

Two FRI laboratory technicians, Messrs. P. Addo and A.K. Mensah undertook a three month training in malting and brewing studies at the Accra Brewery Ltd. The two are to assist in the project laboratories when they become fully operational.

3.2.2.7 Rehabilitation of the Project Laboratories

Work on the rehabilitation of the project laboratories started in August. Accra Brewery Limited (ABL) awarded the contract to Obosu Co. Ltd., suppliers of advanced science equipment and laboratory installation. The work involves complete rehabilitation of two laboratories, an office, equipment room, a secretary's office and an office for the project management. Work on the laboratories is progressing steadily. The secretary's office and the office of the project management team have been completed. However laboratory equipment expected from UNIDO, Vienna over a year ago for analytical work has not yet arrived and delaying progress of work.

3.3 STORAGE OF STAPLE FOOD CROPS AND VEGETABLES

Research in the area of storage of staple food crops and vegetables is focussed on the reduction of post-harvest losses of cereals, grain legumes and roots and tubers in Ghana such as maize, rice, sorghum, millet cowpeas and beans, cassava, cocoyam, yam and plantain with particular emphasis being placed on the small scale farmer.

The storage programme is being carried out at three levels, the on-farm and village levels, the market level as well as bulk storage in silos.

Research attention is being paid to the identification solution of such problems as design of stores, construction materials, storage practices, handling of equipment as well as pest control and quality control.

3.3.1 Maize Storage Project

A study was started in 1991 to determine the extent of post harvest losses of maize stored in improved maize cribs at different initial moisture levels.

A member of the FRI maize storage project was appointed a resource person for the National Post-harvest Training Programme organised for agricultural extension officers by the Post-harvest Development Unit of the Ministry of Agriculture and sponsored by the Sasakawa Global 2000 Agricultural Project in Ghana.

3.3.2 Tomato Handling and Storage Project

Work on the "Investigation into the effectiveness of traditional practice of using low concentration of brine

as a cleansing solution of fresh tomatoes was suspended due to the absence of the project leader on study leave.

3.3.3 Mycotoxin Contamination of Food Crops in Ghana

3.3.3.1 Objectives

- (i) To establish a laboratory with analytical capability for mycotoxins.
- (ii) To screen commodities from local markets and various storage structures for their mycotoxin levels.
- (iii) To identify points of contamination by mycotoxin in the production and marketing chains of locally grown agricultural commodities.
- (iv) To utilize the information acquired as a basis for the improvement of farming methods, storage facilities, marketing techniques and the establishment of National Aflatoxin Standards

3.3.3.2 Biochemical Studies on Groundnut Paste

A sub project on the chemical, microbiological and aflatoxin evaluation of groundnut paste on sale in markets in Ghana was started during the year. So far 56 samples from markets in the Ashanti, Brong Ahafo, Central, Northern, Upper and Western Regions have been evaluated.

Results show relatively low aflatoxin levels in samples from the Northern and Upper regions but high levels for Ashanti and Brong Ahafo regions. The highest level of 721 ppb total aflatoxin contamination recorded was from a sample obtained from the Sunyani market in the Brong Ahafo Region.

3.3.3.3 Aflatoxin Studies During Maize Processing

Work was initiated on a new sub-project entitled "Studies on the fate of Aflatoxin during traditional processing of Maize in Ghana".

3.3.3.4 Technical Information on Aflatoxin

Technical advice was offered to several farmers and exporters of agricultural commodities, especially groundnut exporters.

3.4. GRAIN LEGUMES PROCESSING AND UTILIZATION

3.4.1 Joint AAU/UNU/EC African Regional Food and Nutrition Project

3.4.1.1 Background Information

The aim of the African Regional Food and Nutrition Project is to strengthen the scientific and technological capabilities of institutes in the area of food and nutrition in Africa. Participating institutions in the West African network include the Food Research Institute, Department of Nutrition and Food Science of the University of Ghana, Institute de Technologie Alimentaire (Senegal), Federal Institute of Industrial Research (Nigeria), Centre Ivoirien de Recherche Technologique (Cote d'Ivoire) and Centre for Nutrition Planning (Cameroon).

The project is concerned with the development of high protein-energy foods based on local legumes and cereals for the vulnerable groups of the population. The project is being funded by the European Community with assistance from the Association of African University (AAU) and the

United Nations Universities (UNU).

3.4.1.2 Network Activities

A three-day international seminar was held in Accra, Ghana, to discuss issues related to "The Development of High Protein-Energy Foods Based on Grain Legumes". The seminar, organised by the Food Research Institute and the Nutrition and Food Science Department of the University of Ghana, was attended by scientists and researchers from six African countries: Ghana, Benin, Nigeria, Senegal, Cameroon and Tanzania. 23 technical papers were presented on various topics on grain legume processing and utilization. Participants endorsed the view among others that regional co-operation in the development of strategies is essential for solving protein-energy malnutrition in Africa. Five network groups in specific areas were formed to be the basis for future co-operation between the institutions and researchers working in this multi-disciplinary area. Dr. W.A. Plahar of the FRI was nominated to coordinate the network activity on the Dehulling and other Unit operations in Grain Legume Processing.

A meeting of network co-ordinators was held in May in Accra to share ideas on the most effective means of making the network functional among members in the West African sub-region. Major issues discussed focused on funding and the immediate activities of the network. Funding of the network research projects was promised by AAU. Immediate activities to be undertaken for the first year of operation were identified as the review of the state of the art in the topic area of each network group, the establishment of a network newsletter and the promotion of interaction within network groups. The co-ordinators visited the Food Research Institute's Grain

Legume Processing Unit at the Pilot Plant, Okponglo.

3.4.1.3 Development of High Protein-Energy Foods base on Local Legumes

Some laboratory equipment were supplied under the AAU/UNU/EC African Regional Food and Nutrition Project in March 1991. The equipment will help upgrade the quality of analytical work undertaken by the Grain Legumes Research Team.

The main research activities within the period was on the development and quality evaluation of weaning foods. Formulations, trials processing and evaluation of various blends were undertaken with the aim of achieving an ideal weaning food based on cereals and local legumes. A project was initiated to evaluate mixed legume blends from soybeans and cowpeas for their physicochemical, nutritional, sensory and functional characteristics as protein base for fortification of cereal foods in Ghana. Process characteristics for the effective destruction of anti-nutritional factors, especially in soybeans, are also being studied. This project is being funded by a grant approved by the AAU.

3.4.2 Grain Legume Processing Unit

The construction of a milling shed and the installation of the wingedbean dehulling machines were completed during the year. The dehulling machines consist of a grader, conditioner, storage bins, dehuller and a separator. The machines were tested and commissioned. A disc attrition mill was also acquired and installed to complement the facilities at the Unit to facilitate a complete dehulling and milling process.

Tests are being run to standardize the machines for each of the major legumes produced locally.

3.4.3 Soybean Oil Extraction and Quality Evaluation

The FRI has been assisting the Ghana Food Distribution Corporation (GFDC) with standardization of soybean oil extraction process using the expeller system for maximum extraction and high quality oil and cake by-product. Protein dispersibility index was used to assess the degree of heat treatment for the destruction of anti-nutritional factors present. The exercise is aimed at opening a viable avenue for the effective utilization of soybeans in Ghana to obtain local substitutes for the currently imported cooking oils and the animal feed cake and to provide adequate support for the livestock industry in Ghana.

In addition to routine analysis of soybean cake samples from expeller systems, a project was initiated with the GFDC to develop standard procedures for soybean oil extraction using locally manufactured screw press. The screw press at the FRI pilot plant is therefore being rehabilitated for the purpose. The development of such standard procedure will facilitate small-scale processing of soybeans for good quality cooking oil and animal feed cake in many soybean farming communities.

3.4.4 National Soybean Production and Utilization Committee Activities

The Food Research Institute continued to play an active role in the promotion of soybean production and utilization in Ghana through the activities of Dr. W.A. Plahar who served on the National Soybean Production and

Utilization Committee. The committee met every two months during the year to discuss issues and implement decisions for the development of effective strategies towards the promotion of soybean production and utilization in Ghana.

In June 1991, the Utilization sub-committee, led by Dr. Plahar of FRI embarked on a project to identify processing facilities in the country for soybeans. The sub-committee is to report on the available facilities and prospects for soybean utilization in the country.

3.5 EXTENSION OF IMPROVED FISH PROCESSING TECHNOLOGY

3.5.1 Ghana-Netherlands Regional Training and Applied Research Project for Artisanal Fish Processing in West Africa

3.5.1.1 Activities

1. Recruitment of course participants for the fourth Annual Training programme, 1991.
2. Selection of two pilot villages for the field work during the course.
3. Follow-up of previous course participants
4. Supervision and following of six pilot villages of the project.
5. Preparation of course lecture handouts.
6. Execution of the fourth Regional Training Programme.

12 August - 20 September 1991. There were a total of 19 participants from Gambia, Ghana, Kenya, Nigeria, Sierra Leone and Tanzania.

3.5.1.2 Reports 1991

1. 1990 Course Evaluation Report.
2. Progress Report October 1990 to March 1991.
3. Progress Report April - September 1991

3.5.1.3 Research

3.5.1.3.1 Effects of Marketing Practices on the Quality of Fresh Fish in Ghana

Work continued studies on earlier. Fresh fish obtained from four species of fish sea bream (pagrus uegrus), jack mackerel (caran hypes), barracuda (sphyraena spp.) and round sardines (sardinella aunte) were analysed.

Preliminary findings of the study reveal that fish bought from distant landing sites undergo deterioration in quality as shown by changes in odour, loss of scales, colour of the skin, gills and eyes due to improper handling before and during sale, long delays without adequate cold storage facilities coupled with direct displays of fish in the sun greatly affect the quantity of fresh fish.

Further research work is needed to elucidate the spoilage pattern of the species being worked on and to identify the correlation between physical quality of fish and chemical composition in order to develop indices for quality assessment.

A report on the study is in preparation. This work is in

continuance of work done during the year by evaluating the physical evaluation of fresh fish obtained from Tema, Salaga, La and Kaneshie Markets.

3.5.1.3.2 Studies on Traditional Storage

Work began late in the year on the studies on traditional storage of smoked anchovies in Ghana.

Research Team

Dr. W.A. Plahar - Leader

Mrs. G. Nerquaye-Tetteh

Mrs. Kafui Kpodo

Mrs. Hodari-Okae

3.5.1.3.3 Improvement of Chorkor Smoking Kiln

Work is in progress on this sub-project which is part of the research component of the Ghana Netherlands Applied Research and Training Programme for Artisanal Fish Processing in West Africa. Draught control unite have been designed by the FRI Pilot Plant Division for smoking trials.

Research Team

Mrs. Nerquaye-Tetteh - Leader

Mr. Daniel Blay

3.6 STUDIES AND IMPROVEMENT OF TRADITIONAL MEAT PRESERVATION METHODS

3.6.1 Assessment of Meat Drying in Hot-Humid Climate using Convection-type Solar Dryers and Investigation of Practicable Meat Drying Parameters

Research at the FRI has established that it is possible to dry meat in the hot-humid climates provided the meat is cut in strips not more than two centimetres thick. Work on assessment of meat drying in hot-humid climates using natural convection-type solar dryers and investigation of practicable meat drying parameters, which began in January, was completed and a report has been submitted to the Food and Agriculture Organization (FAO) of the United Nations (UN). The work was a collaborative one involving the Natural Resources Institute (NRI) of the United Kingdom, which provided solar-measuring equipment, and the FAO which funded the project at a cost of USD 10,000.00 (ten thousand dollars).

3.6.2 Objectives

The objectives of the project were to establish the most appropriate procedures for preparing meat for solar drying in the hot-humid sub-region of Ghana and to evaluate the performance of closed-type natural convection solar dryers for the purpose of drying meat; to determine the quality of dried meat immediately after preparation and after prolonged storage through chemical, microbiological and sensory analysis and to compare this with traditional open-air sun-drying practices, where appropriate; and to make recommendations regarding the design, costs and application of simple closed-type natural convection solar dryers for meat drying in the hot-humid sub-region of Ghana.

3.6.3 Findings

The study found that

- Solar drying of meat strips in the hot-humid zone of

Ghana is possible, if the meat strips are not more than two centimeters thick.

- Brining of meat strips prior to drying adversely affected moisture removal, irrespective of whether the meat was sun or solar dried and irrespective of thickness (either 1 or 2 thick) of the meat, and this had adverse consequential effects during storage.
- Initial drying rates of meat strips were faster at ambient temperature than within the solar Tent and Cabinet solar dryers used in the experiment, indicating the importance of air flow during the initial process; during the latter stages of drying, the Tent and Cabinet dryers recorded faster drying rates, indicating the importance of temperature during the latter stages of drying.
- Hot smoke or gelatine treatment of dried meat strips prior to packaging and storage offered improved shelf stability for solar dried meat strips in the hot humid zone. Gelatine coating of meat strips and hot wood smoking gave the dried meat strips a shelf stability of about 24 weeks when stored aerobically in heat sealed plain polythene bags.
- With regards to stability and ease of construction and commercial application the tent solar dryers has advantages over the cabinet dryer.

Further investigation is recommended.

3.6.4 Project Team

3.6.4.1 FRI Team

Mr. E.C-T. Tettey, Meat Technologist
(Research Officer) FRI Leader

Mr. B.L. Lartey, Food Technologist
(Chief Research Officer) - FRI Member

Mrs. A. Osei-Yaw, Sensory Analyst, Senior Research

Officer, - FRI Member

Mrs. M. Hodari-Okoe, Microbiologist, Research Officer,
FRI Member

Miss D. Amoa, Biochemist, National Service Personnel,
FRI.

3.6.4.2 Collaborating Team Members

D.K. Silverside Livestock Section

M. Jones National Resources Institute (NRI),
Ghatham, London, U.K

3.7. STUDIES ON NON-TRADITIONAL EXPORTABLE HORTICULTURAL CROPS

3.7.1 Background

Ghana derives a significant proportion of her foreign exchange through exportation of few traditional crops such as cocoa, timber and coffee.

With the introduction of the Economic Recovery Programme (ERP), the government has diversified the export base to prevent the risk posed by a mono-crop economy based essentially on cocoa.

Pineapples, mangoes, citrus, etc. have been identified as possible foreign exchange earners within the non-traditional exportables.

Unlike the traditional crops which have well established research support facilities the horticultural crops have not. It is necessary to support facilities that will enable these crops meet the various international standards.

Within the post-harvest system, there is the need to establish a sound quality control laboratory with dependable facilities to monitor the quality from the field through harvest, transportation and storage until they leave the ports of Ghana for overseas markets.

A survey was conducted to find out the farmers' cultivation and farm management practices. Four months was concentrated on advising the pineapple producers/exporters in on the choice of land, preparation of land, health and grading of plant material.

Methods of effective weed control to avoid competition with the crop, flower induction, degreening, harvesting and postharvest handling were always discussed.

Pineapple samples for export were purchased and analysed in the laboratory for the quality parameters of appearance, texture, soluble solids and acidity. Sensory evaluation using trained personnel was also carried out. The Ghanaian panelists rated the samples poor even though the chemical analysis indicated that total acidity and soluble solids conformed to standards of importing countries. Further work will be done using personnel from the various missions and embassies.

3.7.2 Collaborative Work with the Ministry of Agriculture(MOA)

Work continued on the fertilization programme of pineapples with the Ministry of Agriculture (MOA). Two pineapple varieties smooth cayenne and sugar loaf have been planted on a one hectare farm at Agomeda. Fertilization has been done in different compounding of Nitrogen, Phosphorus and Potassium (NPK).

No flower induction was done. The sugar loaf variety planted six months before the smooth cayenne variety will be ready for harvesting at the beginning of the year.

3.7.3 National Agricultural Research Project (NARP)

Food Research Institute is in collaboration with Crops Research Institute (CRI). Unit Ghana in the execution of the NARP. The post-harvest team is involved with pineapples and plantain.

3.7.3.1 National Agricultural Research Programme (NARP)

Pineapple Development Programme

Pineapples were identified as one of the three commodities in the recent World Bank agricultural appraisal exercise for priority research under the National Agricultural Research Programme (NARP).

The programme seeks to develop technologies that farmers can adopt to enable them increase their production base and produce good quality fruits for the fresh fruits export market and also for the local canning industries.

The majority of the work will be carried out directly with the producers on their farms. The on-station field research programme will be limited to the smooth cayenne cultivar in the evaluation of rapid propagation methods and the screening of agro-chemicals.

This is a multi-disciplinary and collaborative programme involving scientists from the Food Research and Crops Research Institutes (FRI & CRI) of the Council for Scientific and Industrial Research Institute (CSIR) the Universities of Ghana (UG) and Science and Technology

(UST), and the Grains Development Board.

The Food Research Institute has been charged with the responsibility for the quality control within the postharvest systems of pineapple fruits for export.

The FRI will establish guidelines and disseminate information and criteria for the establishment of quality assurance systems within the production and marketing system. Baseline information from research will be made readily available to commercial users in postharvest technology including harvest maturity, handling, storage, postharvest treatment, and infrastructure requirements.

The principal technical problems now constraining yields and attainment of high quality fruits have been identified to include the use of the proper plant materials and the lack of propagation techniques; plant protection and diseases; proper cultivation practices which include plant spacing, weed control, soil water conservation measures; flowering control by application of hormones; and good quality control within the post-harvest systems of the fruits.

Pineapple exports contribute about 4-6% of the total foreign exchange earnings within the non-traditional export sector.

3.7.3.2 Plantain Development Programme - (NARP)

Plantain is also one of the three priority commodities of the National Agricultural Research Project (NARP).

The main objective in the postharvest programme of plantain is to improve the postharvest handling, based on

established banana technologies to reduce postharvest losses while satisfying defined consumer needs, with special emphasis on field-to-market handling and on delay or promotion of ripening using simple techniques.

The project seeks to improve assurance of food security through the development of appropriate technology for crop and land management in the various production areas. The field trials by the University of Ghana at Kade will be duplicated by the Crops Research Institute (CRI) at Fumesua with on-farm experimental programme based at seven different production zones.

Testing of selected postharvest techniques will be done at research laboratories, field trials, on farmer's field and at village as well as urban markets.

A code of practice for production, harvesting, handling, storage and transportation will be established, thus strengthen plantain research.

The research programme will be planned and executed by the Food and Crops Research Institutes (FRI & CRI) of the CSIR, as well as the University of Ghana with the direct involvement of the Ministry of Agriculture (MOA) and farmers in the development of technologies.

The FRI also has been charged with the responsibility of the post-harvest systems in plantains.

Plantains are grown extensively throughout the forest zones of Ghana. The commodity forms a staple food in Brong Ahafo, Ashanti, Central, Eastern and Western regions and the rapidly growing urban markets.

The development of the postharvest systems of plantain and the reduction of postharvest losses is hindered by a lack of knowledge among farmers of good handling, storage and processing techniques.

In the market economy there are urban consumers who suffer deficits of local staples, which are partly overcome through food imports. Facilitating a link up between rural producers and urban consumers, thus fulfilling demand in urban areas depend strongly upon an efficient postharvest system.

3.8 DEVELOPMENT AND EXTENSION OF MUSHROOM CULTIVATION FOR LOCAL AND EXTERNAL MARKETS

3.8.1 National Mushroom Development Project (NMDP)

The NMDP was initiated by the Ghana Export Promotion Council (GEPC) under the International Trade Centre (ITC)/UNDP Project (GHA/87/004) in collaboration with the FRI. Activity commenced in June 1990 with the invitation of Professor Anon Auetragul, a UNDP expert on tropical mushrooms, to set up the National Mycelium Bank and the Central Mother Unit (CMU) which are located at the FRI Pilot Plant. The initial provision of laboratory equipment amounting to USD 15,475 was supplied by UNDP. Pure spawn was obtained from Thailand, Sri Lanka, Hong Kong and Mauritius. Isolates have since been cultured from local mushrooms collected from the wild.

3.8.1.1 Objectives

The objectives of the NMDP are:

1. To conduct breeding and screening trials to identify high yielding mushroom varieties

2. To improve methods of mushroom cultivation using locally available materials
3. To determine the composting period of wawa sawdust needed for maximum yield of the Pleurotus species of mushrooms.

3.8.1.2 Activities 1991 - NMDP Research

Applied research which was started in 1990 continued during the year in the following areas:

- (i) Utilization of local agricultural and industrial by-products or wastes in the cultivation of edible tropical mushroom and commercial production of mushroom spawn.
- (ii) Sawdust compost formulation for oyster and Jews Ear mushroom culture.
- (iii) Collection and isolation of local and exotic mushroom varieties for the National Mycelium Bank.
- (iv) Characterization and selection of mushroom for commercial production in Ghana.

3.8.1.3 Pilot Production

Production of mushroom compost bags (average 200 bags/month) mushroom spawn (45 bottles/month) and fresh oyster mushroom (av. 30 bags/month), for sale continues throughout the year using the limited facilities available.

Production figures are given below:

	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
No. of compost bags produced	5232	4917	9266	6354
Weight of fresh fresh mushroom produced (kg)	157.1	105.3	61.8	39.2
Oil palm mushroom spawn produced	*n.a	83	167	152

n.a - not available

3.8.1.4 Extension Activities

3.8.1.4.1 Training Workshop

A total of 234 participants were trained in five two-day introductory course within the year as against 211 in 1990. Out of this number only five attended the three-week intensive on-the-job training at various times.

3.8.1.4.2 Lectures and Desmonstrations

Lectures and demonstrations were given to several institutions on request. These includes:

1. Ministry of Agriculture, Extension Services Division
- Akim Tafo District (Tafo) - 27 Extension Officers trained.

- Ga Rural District (Amasaman) - 26 Extension Officers trained.
- 2. Ghana Congress on Evangelization Women's Ministry at Breman-Asikuma (Central Region) - 63 participants.
- 3. Association of Small Scale Industries (Greater Accra Branch) at Trade Fair Centre - 10 participants.
- 4. Institute of Adult Education, Non-formal Education Division at Pokuase - 110 adult learners, 20 facilitators from 15 communities including Pokuase, Legon, Mayera, Djanman, Katapor, Ofankor, etc.
- 5. Air Force Station, Burma Camp - 30 officers and airmen.
- 6. St. Francis Teacher Training, Hohoe - 30 final year Agriculture Students.
- 7. Garrison Primary and Junior Secondary School, Burma Camp, Over 100 pupils and teachers.

3.8.1.4.3 Publications

- 1. Pamphlet on Mushroom Growing Courses
- 2. Guidelines on Growing Mushroom for Home Consumption.

3.8.1.4.4 Exhibition:

Exhibitions attended include;

- GIFEX '91, Trade Fair Centre
- National Farmers Show, Juapong
- National Expo ;91, Trade Fair Centre.

3.8.1.4.5 Radio and TV Programmes

- Adult Education in Ga (GBC TV)
- Adult Education in Ewe (GBC TV)
- Women's Digest programme - twice (GBC TV)
- Interviews on GBC 2 and Radio France International.

3.8.1.4.6 Farm Visits

Farm visits were limited to the Greater Accra Region - to growers on cultural techniques, pest control, etc.

3.8.1.5 Project Team

- | | | |
|---------------------|---|---------------------------|
| 1. Leslie Sawyerr | - | Research Officer (Leader) |
| 2. Mary Obodai(Mrs) | - | Asst. Research Officer |
| 3. Richard Takli | - | Technical Asst. |
| 4. K.E. Essel | - | " |
| 5. Godson Agbeley | - | Labourer. |

3.8.2 Development

Due to limited office and laboratory space at the present premises of the FRI Pilot Plant, Okponglo and the resultant high contamination rate of mushroom cultures the following developments are under way:-

Space has been allotted at the FRI construction of a separate mushroom laboratory adjacent to the Winged Bean Mill.

- A new site has been located for the construction of the commercial wing of the central Mother Unit to step up production of compost bags to 20,000 per month. The foundation has been laid and the structure should be completed by the end of February, 1992. This development is being funded by Ghana Export Promotion Council.

3.8.3 Factors Limiting Progress

1. limited Laboratory and office space
2. Lack of laboratory facilities and other equipment to increase production
3. No vehicle for collection of raw materials for production, mushroom samples for Mycelium bank and to carry out extension services.

3.9 APPLICATION OF SOLAR ENERGY TO FOOD PRESERVATION

3.9.1 Objectives

The objectives of this project are aimed at designing and developing a variety of equipment and devices to effectively harness this energy source, in various applications primarily for the improvement of life in the rural and village communities. The solar energy technology developed will be transferred to the requisite areas under a strategy which will include:

- (i) integration with effective on-going projects in farming and fishing communities especially those involving reduction in post-harvest losses;
- (ii) establishment of demonstration sites for the technology of selected rural and village centres in collaboration with the Ministries of Agriculture, Rural Development and Co-operatives, and National Council on Women and Development

(NCWD) with full participation of inhabitants of the respective communities;

- (iii) organisation of workshops to introduce the technology in collaboration with both government and non-government organisation;
- (iv) production of information manuals on the technology.

3.9.2 Activities

During the year technical assistance and collaboration was provided for the project on FAO/FRI solar meat drying project entitled "Assessment of Meat Drying in Hot Humid Climates using convection-type Solar Dryers and Investigation of Practicable Meat Drying Parameters". Though many requests were made by the public for the construction of dryers these requests could not be fulfilled due to lack of funds.

3.10 OTHER RESEARCH ACTIVITIES

3.10.1 Extension of Food Preservation Methods Project

The FRI Scientific Information Division has initiated a project on the Extension of Food Preservation Methods for the benefit of food processors and the general public. The project has been designed to assemble the equipment, materials and information necessary for effective and active extension of food preservation methods and with these prepare simple language publications based on FRI and other relevant technical reports for specified target groups. A computer acquired by the Institute under this project has arrived in the country and will be installed at the Institute early next year.

3.10.2. Project Team

Dr. W.A. Plahar (Prin. Res. Officer)	-	Project Leader
Mr. S.K. Noamesi (Sci. Secretary)	-	Member
Mr. K. Ameh (Chief Tec. Officer) Public Relations	-	"
Mr. A. Andoh (Tech. Officer) Public Relations	-	"
Mr. R.K. Adjei (Asst. Res. Officer)	-	"

3.11 TECHNICAL SERVICES

The FRI provides technical consultancy and advisory services on request, food samples are analysed for their composition, and assess for their safety, chemically, microbiologically and organoleptically. Clients for FRI technical and advisory service included the University of Cape Coast, Ghana National Procurement Agency (GNPA), Ghana Food Distribution Corporation (GFPC), Pee Cola Ltd. Customs, Excise and Preventive Services (CEPS), Ghana Standards Board (GSB), Golden Spoon Flour Mills, Tringo Ltd., Tropical Starch Products, Export and Import Ltd., Tema Food Complex Corporation, Multi-stores, Highway Authority Sterling Products Ltd., Cadbury (Gh) Ltd., National Catholic Secretariat, Forestry Department, World Food Programme, Cocoa Processing Company Ltd., and SGS (Gh) Ltd., Koranco Farms.

3.11.1 Chemical Analysis

64 food samples were analysed for their chemical characteristics. The samples consisted of fish meal, pork, soyabean cake, soyabean oil, yellow maize, dessicated coconut, baby foods, palm oil, gari, wheat flour, cocoa powder, beef samples and maize grit.

3.11.2 Microbiological Analysis

459 food items were evaluated for their safety and suitability for human consumption. The samples consisted of drinking chocolate, mackerel in soya-bean oil, sardines in tomato sauce, milk of magnesia, cheese, sugar, salted beef, ice cream, fish meal, rice, milk chocolate.

3.11.3 Sensory Analysis

Sensory analysis were conducted on pineapples and dried beef.

APPENDICES

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APPENDIX I

MEMBERSHIP OF FRI MANAGEMENT BOARD (1991)

1. Dr. A.A. Owusu (Chairman)
Managing Director
Astek Industries
P.O. Box 4710
Accra.
2. Mr. J.K. Asare
P.O. Box 5096
Accra.
3. Mrs. A. Amoako-Mensah
Director
Industrial Research Institute
Accra.
4. Mrs. Alice Menkah
Min. of Indus., Sci. & Tech.
P.O. Box M.39
Accra.
5. Mrs. Beatrice Dovlo
Min. of Finance & Econ. Planning
Accra.
6. Prof. E.H. Amonoo-Neizer
Dept. of Chemistry
UST, Kumasi
7. Mrs. Rosetta Tetebo
Women Farmers Extension Division
Agric. Extension Services Dept.
Accra.
8. Dr. E.K. Marfo
Director
Ghana Standards Board
P.O. Box M.245
Accra.
9. Mr. Ata-Krah
Ag. Managing Director
Ghana Food Distribution Corp.
Accra.

10. Mr. K.K. Eyeson
Director
Food Research Institute
Accra.
11. Mrs. Abigail Andah
Deputy Director
Food Research Institute
Accra.
12. Mr. B.L. Lartey
Chief Res. Officer
F.R.I.
Accra.
13. Ms. Mary Halm
Snr. Research Officer
F.R.I.
Accra.
14. Mr. J.F. Asigbey
Prin. Admin. Asst.
Food Res. Inst.
Accra
15. Mr. Solomon Antonio
Snr. Tech. Officer
F.R.I.
Accra.
16. Mr. J. Tete-Marmon
Chief Tech. Officer
F.R.I.
Accra.
17. Dr. J. Dei-Tutu
Prin. Res. Officer
F.R.I.
Accra.

APPENDIX II

FRI SENIOR STAFF LIST (1991)

K.K. Eyeson BSc Biological Science (Lond.) Dip. Nut. (Lond) Dip. Fd. Quality Control (Nat. Coll of Fd. Tech. (Lond.) MRSH AIRST	-	Director
J. Dei-Tutu BSc. Agric (Univ. of Ghana) Dip. Fd. Sci. MSc. New South Wales, Australia Ph.D. (Mysore, India).	-	Deputy Director
<u>ANALYSIS DIVISION</u>		
M. Halm (Ms) BSc (Gen.) (Univ. of Ghana) BSc (Hons) Botany (Univ. of Ghana) MSc Botany (Univ. of Ghana) Dip. Rural Fd. Tech (Netherlands)	-	Senior Res. Officer
E.K. Ankrah BSc. (Gen) (Univ. of Ghana) MSc Fd. Quality Control (Reading)	-	Prin. Res. Officer
W.A. Plahar BSc. (Gen) (Univ. of Ghana) BSc. (Hons) (Univ. of Ghana) MSc. Fd. Sci. (Univ. of Ghana) Ph.D. (Washington State Univ.)	-	Prin. Res. Officer
K. Kpodo (Mrs.) BSc. (Gen) (Univ. of Ghana) BSc. (Hons) (Univ. of Ghana) M..Phil. (West Indies)	-	Research Officer
P.N.T. Johnson BSc. (Hons) Biochemistry (UST, Ghana) MSc. Agric. Eng. Tech. (Silsoe Coll) Cranfield Inst. of Tech., UK.	-	Research Officer
L.C.B. Sawyerr BSc (Hons) Biology (UST, Ghana) MSc Biological Sci. (UST, Ghana)	-	Research Officer

M. Hodari-Okae (Mrs) BSc Microbiology (ABU, Zaria) MSc. Fisheries (ABU, Zaria)	-	Research Officer
A.E. Hayford (Ms) BSc (Hons) Biological Sci. (UST, Ghana)	-	Asst. Res. Officer
K.A. Vowotor BSc. Zoology (UCC, Ghana) Dip. Educ. (UCC, Ghana)	-	Asst. Res. Officer
N.T. Annan (Mrs) BSc. (Hons) Fd. Sci. (Univ. of Ghana)	-	Asst. Res. Officer
L. Opere-Sem (Mrs) BSc. (Hons) Biological Sci. (UST, Ghana)	-	Asst. Res. Officer
M. Obodai (Mrs) Temp. BSc (Hons) Botany (Univ. of Ghana) M.Phil. (Univ. of Ghana)	-	Asst. Res. Officer
J. Tete-Marmon AIMLT Cert. in Fd. Microbiology Tech. (TPI) London	-	Chief Tech. Officer
N.A. Asare 2nd M.B. Charles Univ. Prague Czechoslovakia	-	Prin. Tech. Officer
E.A. Allotey GCE 'A' Level SLT (Part I) City and Guilds	-	Senior Tech. Officer
B. Amoako GCE 'A' Level Lab. Tech. Cert. SLT (Part I) City and Guilds	-	Senior Tech. Officer
S. Antonio GCE 'O' Level 6 months Course in Chemical Pathology, UGMS	-	Senior Tech. Officer
Mensah Toku GCE 'A' Level SLT (Part I) City and Guilds Adv. Prof. Training (Fd. Stuffs Tech. CDG, FRG	-	Senior Tech. Officer

D.K. Asiedu WASC: SLT (Part I) City and Guilds GCE 'A' Levels	-	Senior Tech. Officer
W.K. Amevor GCE 'O' Level Cert. Sugar Tech., City and Guilds (Part I)	-	Technical Officer
D.K. Baisel GCE 'O' Level SLT (Part I) City and Guilds	-	Technical Officer
D.N.A. Ankrah GCE 'O' Level	-	Technical Officer

PROCESSING DIVISION

A. Andah (Mrs) BSc. (Gen); BSc. (Hons) M. Phil. (Leeds) Dip. Rural Fd. Tech. (The Netherlands)	-	Prin. Res. Officer (Head of Division)
J.K.B.A. Ata (Dr) BSc (Gen) (Univ. of Ghana) BSc (Hons) (Univ. of Ghana) MSc Fd. Quality Control (Reading, UK) Ph.D. Fd. Sci. (Univ. of Ghana) On Secondment to the MIST	-	Prin. Res. Officer
G. Nerquaye-Tetteh (Mrs.) BSc (Gen) (Univ. of Ghana)	-	Snr. Res. Officer
W.K. Amoa-Awua BSc. (Univ. of Ghana) MSc. App. Sci. (New South Wales, Australia)	-	Snr. Res. Officer
P. Adu-Amankwa (Mrs) BSc (Hons) Biochemistry (UST, Ghana) MSc. Fd. & Management Sci. (Lond.) Ph.D Post-Harvest Physiology (Lond.)	-	Snr, Res. Officer
E.C. Tettey Bsc. (Hons) Agric (UST, Ghana) Post-Grad. Dip. Fd. Tech. (Humberside Coll of Tech., UK)	-	Research Officer

- N.T. Dzedzoave - Asst. Res. Officer
 BSc (Hons) Biochemistry
 (UST, Ghana)
 Post. Grad. Dip. in Food Sci.
 and Nut.
 State Univ. of Gent, Belgium
- L.D. Abbey - Asst. Res. Officer
 BSc. (Hons) Biochemistry
 (UST, Ghana)
 MSc. App. Sci. (Fd. Tech.)
 (New South Wales, Australia)
- J.T. Manful - Asst. Res. Officer
 BSc. (Agric) (UCC, Ghana)
 Dip. Educ. (UCC, Ghana)
- K. Opoku-Acheampong (Mrs) - Prin. Tech. Officer
 GCE 'A' Levels
 Lab. Tech. Cert.
 MDPI Cert. Practice of Supervision
- J.M.Y. Anlobe - Snr. Tech. Officer
 GCE 'O' Levels
 SLT Cert.
 MDPI Cert. Practice of Supervision
- J.R. Addo - Tech. Officer
 GCE 'O' Levels
 City and Guilds (Gen) Eng.
 City and Guilds (MET) II

FOOD ECONOMICS AND UTILIZATION DIVISION

- A. Osei-Yaw (Mrs) - Snr. Res. Officer
 BSc. (Gen) (Univ. of Ghana)
 MSc. Fd. Sci. & Nut.
 (The Netherlands)
 (Head of Division)
- P. Lokko (Mrs) - Snr. Res. Officer
 BSc (Gen) (Univ. of Ghana)
 BSc (Hons) Biochemistry
 (Univ. of Ghana)
 MSc Biochemistry (Univ. of Ghana)
 Dip. Fd. Sci. and Nut.
 (The Netherlands)
- C.K. Quartey - Asst. Res. Officer
 BSc (Econs) (Univ. of Ghana)

R.K. Adjei BSc. (Hons) Agric. Econs (Univ. of Ghana) Post-Grad. Dip. Population Studies (Univ. of Ghana)	-	Asst. Res. Officer
S. Nyarko GCE 'O' Level RSA Adv. Cert. (Adv. Stage) Dip. Journalism Cert. Data Management (GIMPA)	-	Chief Tech. Officer
F.B. Dake (Mrs) WASC; Agric Training Cert. Cert. Fd. Sci. and App. Nut. (Univ. of Ibadan) Dip. Home Sci. II (Univ. of Ghana)	-	Chief Tech. Officer
I.A. Tamakloe (Mrs) GCE 'O' Levels City and Guilds Cert. - MDPI Cert. Hotel and Catering Management Cert. in Production of Pastries and Bakery Products	-	Snr. Tech. Officer
B. Awotwi GCE 'O' Levels Cert. Introduction to Marketing	-	Technical Officer
V. Christian Dip. Inst. Management (Accra Poly)	-	Technical Officer
<u>ENGINEERING DIVISION</u>		
B.L. Lartey BSc Agric. Eng. (McGill Univ. of Canada) Dip. Fd. Tech. (Nat. Coll of Fd. Tech) AIFST; MGHIE	-	Chief Res. Officer (Head of Division)
D. Blay MSc Chemical Eng. (Moscow Inst. of Chemical Eng.)	-	Research Officer
C.K. Gyato Nat. Dip. in Agric. Mech (Univ. of Ghana) MSc. Agric. Eng. (Bulgaria)	-	Sci. Officer
B.A. Mensah	-	Asst. Res. Officer

MSc. Fd. Pres. Tech.
(Krasnodar, USSR)

Victor Antwi
BSc. Chemical Eng. (UST, Ghana)

D.M. Attiogbe
BSc. Mech. Eng. (UST, Ghana)

A.K.G. Amoah
Full Tech. Cert. Mech. Eng.
(City & Guilds, London, UK)

J.K. Magbo
SLT, Pre-Tech. Cert.;
City & Guilds Cert. (Final)
Refrigeration Practice

S.A. Sampare
Mech. Eng. Technicians Certs.
(Part I, II, III) City & Guilds
Full Tech. Cert. (Plant Eng.)
City and Guilds

J.A. Asafu-Adjei
ATTC Cert. in Welding
Cert. Inst. of Tech. Supervision
(Parts I, II, III)
Adv. Electrical Tech. - City and
Guilds (Parts I, II, III)

B.K. Abosi
Adv. Electrical Tech. City and
Guilds (Parts I, II, III)
Full Tech. Cert. (Electrical)

S.A. Kankam
Electrical Eng. Technicians Cert.
(Parts I, II, III)
Cert. in Practical Proficiency
Electrical Eng. Technicians
(Kumasi Poly)

PILOT PLANT

J. Dei-Tutu
BSc. Agric. (Univ. of Ghana)
Dip. Fd. Sci.
MSc. (New South Wales, Australia)
Ph.D. (Mysore, India)

- Asst. Res. Officer

- Asst. Res. Officer

- Chief Tech. Officer

- Prin. Tech. Officer

- Snr. Tech. Officer

- Works Supt.

- Technical Officer

- Technical Officer

- Prin. Res. Officer
Deputy Director
(Head of Division)

SCIENTIFIC INFORMATION DIVISION

W.A. Plahar (Dr.) BSc (Gen) BSc (Hons) (Univ. of Ghana) MSc Fd. Sci. (Univ. of Ghana) Ph.D (Washington State Univ.)	-	Prin. Res. Officer (Head of Division)
S.K. Noamesi BSc. (Hons) (Univ. of Ghana) MSc. Fd. Sci. (Univ. of Ghana)	-	Sci. Secretary
M. Streetor (Ms) A.L.A.	-	Chief Lib. Asst.
R. Kavi Cert. (Librarianship) (Univ. of Ghana)	-	Library Assistant
K. Ameh Dip. Journalism (GIJ, Ghana) Cert. Public Relations (MDPI) Cert. ISRS (NISIET, India)	-	Chief Tech. Officer (Public Relations)
A. Andoh GCE 'A' Level Dip. Journalism (GIJ, Ghana)	-	Technical Officer (Public Relations)

ADMINISTRATION DIVISION

J.E. Musey BSc. Econs. (London)	-	Prin. Adm. Officer (Head of Division)
B.K. Jiagge Dip. Pub. Adm. MDPI Cert. in Personnel Management Practice (On secondment to the Inst. of Aquatic Biology)	-	Chief Admin. Asst.
J.F. Asigbey GCE 'A' Levels Cert. in Marketing Cert. Stenography; Cert. Personnel Management; Cert. Management Practice	-	Chief Admin. Asst.
C.J. Buckman Dip. Auto Eng. Dip. in Tech. Supervision (F) Dip. in Tech. Supervision (S)	-	Prin. Asst. Transp. Officer

B.A. Sarbah - Prin. Admin. Asst.
 MSLC; Cert. Inst. of Commerce
 (Lond);
 Dip. Takoradi Secretarial Inst.
 GCE 'O' Level

E.A. Larbi - Works Supt.
 Cert. General Source in Const.
 Construction Tech. Cert. Parts I
 and II

ACCOUNTS DIVISION

A. Amporful - Prin. Acct. Asst.
 Dip. Business Educ. (Accounting
 Option) (UCC, Ghana)
 CA (Ghana Part II)

C. Aikins Tutu - Accounting Asst.
 GCE 'O' & 'A' Levels
 Chartered Inst. of Management
 Accountants
 CIMA (Stage I)

S.Y. Nkansah - Prin. Stores Supt.
 RSA I & II: MFEP Cert. in Basic
 Stores Supply & Stores Management,
 MDPI Cert. Purchasing and Stores
 Control

S.O.T. Oddoye - Snr. Stores Supt.
 GCE 'O' Levels
 MFEP Cert. in Basic Supply and
 Stores Management;
 MDPI Cert. Purchasing and Stores
 Control

J. Mintah Nakotey - Stores Supt.
 GCE 'O' Levels
 Cert. Inst. of Purchasing & Supply
 (Prof. Parts I & II)
 MFEP Cert. in Basic Supply & Stores
 Management Practice; MDPI Cert. in
 Stores Management; Dip. Sales and
 Management and Marketing

G.O. Gyamfi	-	Stores Supt.
RSA Stage II		
Cert. in Book Keeping		
LCC Cert. Stage II		
GCE 'O' Levels		
Cert. Basic Supply & Stores Management		
M.E.K. Amenu	-	Accounting Asst.
GCE 'O' Levels		
RSA (Inter) Stage II		
RSA Stage III;		
LCC Stage III		

APPENDIX III

FINANCE

RECURRENT EXPENDITURE

C113,370,967.10 was released for recurrent expenditure.
The breakdown is as follows;

Item I	-	Personnel Emolument	113,370,967.00
Item II	-	Travelling & Transport	
Item III	-	Gen. Admin. Exp.	
Item IV	-	Repair/Renewals/ Maintenance	
Item V	-	Other Recurrent Expenditure	4,763,700.00
			<u>113,370,867.00</u>

CAPITAL AND DEVELOPMENT BUDGET

Approved	45,000,000.00
Received	

APPENDIX IV

NEW APPOINTMENTS

NAME	DESIGNATION	DATE OF APPOINTMENT
1. M. Obodai (Mrs)	Asst. Res. Officer	3/11/ 91
2. Richard K. Kavi	Library Assistant	3/6/91
3. D.N.A. Ankrah	Tech. Officer	3/6/91.
4. R.A. Mawuena	Accts. Clerk Gd.I	
5. Godson K. Agbaley	Labourer	7/3/91
6. Nuri A. Abdulai	Labourer	1/1/91
7. E.A. Ablorh	Supervisor	"
8. Peter Adalebor	Electrician	"
9. Gladys V. Seshie (Ms)	Skilled Labourer	"
10. Ernestina Armah (Ms)	"	"
11. John A. Adamah	"	"
12. Forsta K. Akplaga	"	"
13. Matilda Adjartey	"	"
14. Soshie Adjasey	"	"
15. Rose A. Doryoh (Ms)	"	"
16. Doris Mienuye	"	"
17. Elizabeth A. Koso	"	"
18. Daniel Nuertey	Watchman	"
19. Emmanuel K. Agunyoh	"	"
20. D.M. Mustapha	"	1/5/91
21. I. Ayitey	Supervisor Gd.	3/7/91
22. M. Torgbui	Supervisor Gd.III	30/7/91

APPENDIX V

PROMOTIONS/UPGRADINGS 1991

NAME	PROMOTED TO (With Effect from 1/10/90)
F. Dake (Mrs.)	Chief Technical Officer
J.F. Asigbey	Chief Admin. Asst.
S.Y. Nkansah	Prin. Stores Supt.
J.K. Magbo	Prin. Tech. Officer
D.K. Asiedu	Snr. Technical Officer
S.O.T. Oddoye	Snr. Stores Supt.
D.K. Baisel	Technical Officer
M.Y. Amekuedi	Senior Tech. Assistant
P. Tetteh	Senior Clerk
M.K. Aryee	Senior Accounts Clerk
S.K.G. Akleih	Foreman
R.O. Okine	Junior Foreman
E.T. Angmortey	Driver Inspector
A.S. Garbrah	Junior Lab. Asst. Gd.II
J. Cromwell	Tech. Asst. Gd.II
G. Armah	Tech. Asst. Gd.I

NAME	UPGRADED TO
N.T. Dzedzoave	Research Officer (with effect from 29/5/91)}
V. Alambire (Ms)	Typist Gd.I (with effect from 23/7/91)}
N.K. Amey	Tech. Asst. Gd.I (with effect from 30/7/91)}
M.H. Myers	Typist Gd.II (with effect from 30/7/91)}
C.A. Boateng	Catering Asst. (with effect from 1/10/90)}
A. Sarbah	Catering Asst. (with effect from 1/10/90)}
E.A. Adjei	Tradesman Apprentice (with effect from 30/7/91)}
F.B. Addo	Tech. Asst. Gd.II (with effect from 30/7/91)

T R A I N I N G - 1991

LOCAL

	NAME	COURSE	ORGANIZERS	SPONSORS	DURATION
1.	E.A. Allotey Snr. Tech. Off.	Higher Diploma in Chemical Techniques	University of Ghana	FRI	1989-992
2.	D.K. Asiedu Snr. Tech. Off.	Higher Diploma in Microbiological Techniques	University of Ghana	FRI	1989-1992
3.	E.A. Larbi Works Supt.	19th Senior Technical Supervisory Course	Institute of Technical Supervision	FRI	22/4-16/11/91
4.	C. Ketsie(Ms) Clerk Gd. I	Supervisory and Management Course	Civil Service Training Centre	FRI	1-25Oct. 1991
5.	P. Tetteh Clerk Gd. I	"	"	"	"

AFRICA AND OVERSEAS

	NAME	COURSE	ORGANIZERS	SPONSORS	DURATION
1.	J.T. Manful Asst. Res. Off.	Advanced Practical Training in Cereal Processing.	Carl Duisberg Gesellschaft e.v.	German Government	January 1991 - March 1992
2.	D.M. Attiogbe Asst. Res. Off.	Machine Design and Manufacture (Jigs and Fixtures)	Africa Regional Centre for Engineering Design and Manufacture (ARCEDEM) Ibadan; Nigeria	Commonwealth Fund for Tech- nical co- operation(CFTC)	7 January - 28 March 1991
3.	P.N.T. Johnson Res. Officer	Scientific Methods of Storage and Inspec- tion of Foodgrains	Indian Grain Storage Institute, Hapur, India	Special Common- wealth African Asst. Programme (SCAAP)	8 April - 7 June 1991
4.	A. Osei-Yaw Snr. Res. Off.	Sensory Evaluation	Department of Food Research (TNO) the Netherlands	Ghana-Netherlands Regional Training and Applied Research Project for Artisanal	19 July - 24 August 1991
5.	M. Streeter Chief Lib. Asst.	12th International Course on Agricultural Information	Commonwealth Agric. Bureau, International (CABI) Wallingford Oxfordshire, U.K.	Commonwealth Fund for Technical Co-operation	9-20/9/91
6.	K. Ameh Chief TEch. Off. Public Relations	Information Storage and Retrieval Systems	National Institute of Small Industry and Extension Training (NISLET), Hyderabad India	Special Common- wealth African Asst. Programme (SCAAP)	4 September - 26 October, 1991

APPENDIX VII

FRI TECHNICAL REPORTS AND PUBLICATIONS 1991

1. Adu-Amankwa, P.A. (Post-harvest Loss Reduction of Perishable Crops FRI Seminar Paper)
2. Adu-Amankwa, P.A. Post harvest Handling of Yam (*Dioscorea Spp*) for Export to the United States (A Technical Report written Tropical Crops Export Ltd.
3. Andah, A. Report on Small-scale Legon Salt production in West Africa with special reference to the Shanger region, Sierra Leone (Mission report for the Fishing Industrial Division FAO).
4. Antwi, V. (1990) Report of the 17th Brienl Conference of the Ghana Science Association(GSA) Kumasi, 4-8 August, 1991.
5. Dziedzoave , N.T. Evaluation of the Sasakawa Compact Gari Processor with respect to product recovery efficiency and product quality (consultancy report)
6. Halm, M. and Johnson, P.N.T. Guidelines on the use of the improved maize with the small scale farmer in Ghana, (FRI) Technical Report.
7. Kpodo, K.A. and Plahar, W.A. 1991. Effects of extrusion variables and starch modification on the puffing characteristics of yam (*Dioscorea alata*) flour. Submitted to Food Control.
8. Lu, J.Y., Pace, R.D. and Plahar, W.A. 1991. Storage conditions and microbial quality of smoked dry herring in Ghana. J. Food Protection 54: 1.
9. Noamesi, S.K. Report on the African Regional Workshop on the use of micro-computers in Technology Management, Ghana Institute of Management and Public Administration (GIMPA) 22-27 July 1991.
10. Plahar, W.A. and Abotsi, S.K. 1991. Pre-gelatinized instant weaning foods based on cereals and legumes. FRI/UG/ Project Report No. FRI/UG/GLP/91/01. Food Research Institute, Accra, Ghana.
11. Plahar, W.A. and Afram, W.A. 1991. Development and quality evaluation of fish for fortification of cereal weaning foods. FRI/UG Project Report No. FRI/UG/GLP/91/02. Food Research Institute, Accra, Ghana.
12. Plahar, W.A. and Ameyaw, E.K. 1991. Concentration and distribution of condensed tannins in selected cereals and legumes. FRI/UG Project Report No. FRI/UG/GLP/03. Food Research Institute, Accra. Ghana.

13. Plahar, W.A. and Anti, P.A. 1991. Processing and quality characteristics of soy-gari. FRI/UG Project Report No. FRI/UG/GLP/91/04. Food Research Institute, Accra, Ghana.
14. Plahar, W.A. and Hoyle, N.T. 1991. Estimated quality of weaning blends from legumes and cereals. Proceedings, AAU/UNU Workshop on the Development of High Protein-Energy Foods based on Legumes, held at GIMPA, Green Hill, Accra, Ghana February 1991.
15. Plahar, W.A., Nerquaye-Tetteh, G.A., Kpodo, K.A. and Hodari-Okae, M.A. 1991. Preliminary quality evaluation of traditional stored smoked anchovies (*Anchoa guineensis*) at Tema Manhean. FRI Project Report. Food Research Institute, Accra, Ghana.
16. Tettey et al: Assessment of Meat Drying in hot, humid climates using convection type solar dryers and investigation of practiceable Meat Drying Parameters.

FOOD RESEARCH INSTITUTE SEMINARS

DATE	SEMINAR TOPIC	SPEAKER	CHAIRPERSON
29/1/91	Problems Ancient and Modern	Mr. K.K. Eyeson	Mrs. A. Andah
12/2/91	How to improve project design and Formulation and research implementation.	Dr. W.A. Plahar	Mr. K.K. Eyeson
21/2/91	How to improve effective reporting, dissemination and utilization of research results.	Dr. W.A. Plahar	Mr. K.K. Eyeson
21/3/91	Post-harvest Loss Reduction of Perishable crops (Report on Workshop in the USA)	Mrs. P. Adu-Amankwa	Dr. J. Tutu
18/4/91	Maize Storage Project	Ms. M. Halm and Mr. P.N.T. Johnson	Dr. W.A. Plahar
8/5/91	Improvement of Human Resources in the Fisheries Sector - The contribution of the Ghana/Netherlands Regional Training and Applied Research Project for Artisanal Fish Processing in West Africa.	Mrs. G. Nerquaye-Tetteh	Mr. K.K. Eyeson
23/5/91	Aflatoxin Analysis and Mycotoxins	Mrs. K. Kpodo	Ms. M. Halm
25/7/91	Studies on the Handling, Distribution and Marketing of Fresh-landed fish in Ghana.	Mrs. M. Hodari-Okae	Mrs. Nerquaye-Tetteh
8/8/91	Rice Milling in Ghana	Mrs. A. Andah	Dr. W.A. Plahar
22/8/91	Rapid Rural Appraisal (RRA Methodology)	Mr. W.K. Amoa-Awua	Mrs. A. Andah
19/9/91	Short-term post-doctoral study programme in the USA	Dr. W.A. Plahar	Ms. Halm
17/10/91	Progress in Equipment Installation at the FRI Pilot Plant.	D. Blay	Dr. Dei Tutu
7/11/91	Baseline Studies on some Fishing Communities in the Great Accra Region of Ghana	Mrs. P. Lokko	Mrs. Nerquaye-
13/11/91	Refrigeration & Freezing of perishable Food Produce	B.A. Mensah	B.L. Lartey
20/12/91	Annual Review Seminar	Heads of Division/ Project Leaders	Mr. K.K. Eyeson

APPENDIX IX1991 CONFERENCES/SEMINARS/MEETINGS/WORKSHOPS

NAME	ACTIVITY ATTENDED	VENUE	DATE/DURATION	ORGANIZERS/SPONSORS
K.K. Eyeson Director	Regional Workshop on Formulation, Appraisal and Management of Projects for the Food Processing Industry	Addis Ababa Ethiopia	22-26 April, 1991	Africa Regional Centre for Technology (ARCT)
A. Osei-Yaw (Mrs) P. Lokko (Mrs) Snr Res Officers	Seminar on Iodine Deficiency D. Sorders (IDD)	GIMPA	16 May, 1991	Ministry of Health Nutrition Division
K.K. Eyeson Adu-Amankwa (Mrs) M. Hodari-Okae Res. Officers S.K. Noamesi Sci. Sec. A. Andoh Tech. Off.	Seminar on Food Additives	National Commission on Democracy		Ghana Institute of Nutrition and Food Technology (GIFNT)
K.K. Eyeson	Workshop on Train-the-Trainer in Basic Consulting Skills	GIMPA	17-28 June, 1991	UNDP
Adu-Amankwa (Mrs) Res. Officer	Workshop on Train-the-Trainer in Basic Consulting Skills	GIMPA	7-20 July, 1991	UNDP
G. Nerquaye Tetteh (Mrs) Snr. Res. Off.	Improvement of Post-Harvest Utilization of Artisanal Fish Products: Management Committee Meeting of the Priority Action Programme for West Africa.	Hotel Shangrilla Accra	15-18 July, 1991	Ghana/ Netherlands Regional Training & Applied Research Project for Artisanal Fish Processing in West Africa.

APPENDIX X

CONSULTANCY SERVICES

CLIENT

ASSISTANCE PROVIDED

World Food Programme/
PAMSCAD Project
Ministry of Finance
& Economic Planning.

Assessment of quality and quantity of
wheat flour in storage

S G S (Gh) Ltd.

Assessment of quality of samples of
imported rice.

National Mobilisation Project

Choice of Technology for Shea-
butter Extraction and for bread-
making.

Ministry of Agriculture,
Fisheries Department

Information on fish post-harvest
losses.

Mr. Y. Asamrah,
private equipment
manufacturer

Evaluation of product quality and
recovery efficiency of the Sasakawa
compact Gari Processor.

Tropical Crops Export Ltd.

Post-harvest handling of yams for
export

Ministry of Agriculture,
Agriculture Policy
Coordinating Committee

Preparation of Memorandum on
Post-harvest Measures to Salvage
surpluses of Food Crops on the
Local Market.

Numerous individuals

Information on various aspects of
food processing and technology

Classic Industries

Evaluation of ice cream for
acceptability.

For Processing Div. FRI.

Difference Testing Acceptability
Test of Rice Substitutes.

APPENDIX XI

FRI VISITORS 1991

A.A. Owusu	ASTEK P.O. Box 4710 Accra.
Gunter Heins	FAO, Rome.
Amogavie Kobla	Programme Regional Afrique de l'Ousat 17 BP. 56 Abidjan 17.
Elizabeth O. Adams	P.O. Box 0933, Osu.
Angeline Quartey(Mrs)	School Dental Clinic, Adabraka.
Abraham Bearat	UN University Tokyo Japan.
Sean Conlin	World Bank Washington DC. USA.
Joe Lovis	Westernfried Chicken P.O. Box 0575, Osu.
Emma Wartemberg	Westernfried Chicken
Jos Sijm	Sajetplein 26 1091 D5 Amsterdam, Netherlands
I.T. Agboka	ADRA, Ghana
Jonathan Coulten	Natural Resources Institute (NRI) UK.
Sheiagh Johnson	N R I UK.
Sona Ouattara	c/o FAO Office P.O. Box 4388, Lome.
Patrick Hindryebn	"
Robertrain Ottendykk	"
Mr. Y. Convaths	GTZ

Edmund Annan	Nestle Ghana Ltd. P.O. Box 1739, Accra.
Dider Hog's	Afrireco Ltd. Abidjan (RCI)
Dr. Joseph Hulse	
Dr. David Alonge	University of Ibadan Nigeria.
Bernard E. Chishya	NCSR P.O. Box 310158 Lusaka.
Prof. A.E.A	Dept. of Crop Science, Obapmi Awolowo Univ. Ibadan.
Mrs. Bensaada Rafika	Centre de Development des Technique NUCleaire Haut Commissarot a La Recherche, Algeria.
Musaka Tshisand	Nuclear Centre of Kenshashe (Zaire) BP 868 KINXI
Dr. Mainuddei Ahmed	FAO/IAEA Joint Div. Vienna, Austria
Mr. Legare D'dier	Centre Technique Forrestier Tropical 08 BP 33 Abidjan 08 Cote D'Ivoire
Kouadio Konman	CIRT, 08 ¹ HP 881 Abidjan 08 Cote D'Ivoire
Mohie El Foule	National Centre for Radiation Research and Technology Nasr City, Cairo, Egypt
Valerie Stahe	Association for Studies and Research Irradiation in Alsace, Strashourg, France
Victoria Appiah	Ghana Atomic Energy Commission (GAEC), Kwabenya
Stella A. Nkansah	"
Charles Gbedemah	"
J. Tabiri	"
Gerald Theys	Theys and Associates 01 BP 5888 Abidjan, 01 Ivory Coast.

K.O. Nyarko	Dept. of Biological Sciences, UST, Kumasi.
12 Final Year Students	"
Dr. Camara Sobuipah	Ministere de l'Agriculture et des ressources Animales, Guinee Conakey.
Dr. Malo Nianya	Laboratoire des Composes Naturels de Daonka (KaCOWA) BP 561, Conakry
Attache Consulaire	Embassy of Guinea Accra.
Kudolo Kossivi	Guinea Embassy, Accra.
Nalt Ug tten daele	ec Cualuation Missiai, (Post Harvest Fish) % Sunrise Hotel Accra.
Olar Jull Sarenu	Denmark
Kwesi Kyei Darkwah	Ghana Broadcasting Corporation (GBC), Accra.
Roberta Gardinar	Radio Training School, GBC, Accra.
E.K.A. Hagan	"
Clara Pieteron	"
Susan Osam (Mrs)	NCWD P.O. Box M.53, Accra.
Elizabeth Asante (Mrs)	"
Lutz Llorn	GTZ Hamburg
Ho Mirik	"
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