



CSIR-FOOD RESEARCH TECHNOLOGIES AT A GLANCE



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INTRODUCTION

Food Research Institute (FRI) was established by the Government of Ghana on 1st October, 1963 and incorporated by Legislative Instrument No. 438 of 19th March, 1965. CSIR-FRI was later incorporated into the CSIR as one of the Institutes by a revocation of LI 438 when NLC Decree 293 established the CSIR in October 1968. Operations of CSIR-FRI started in 1965 with assistance from the United Nations Development Programme (UNDP) while the Food and Agriculture Organization (FAO) acted as the executing agency. The phase of UNDP/FAO project assistance lasted for five years, from October 1965 to September 1970. CSIR-FRI has since blossomed into a full-fledged Research Institute with great impact on the national economy.

The CSIR-FRI is mandated to conduct applied market oriented research into problems of food processing and preservation, food safety, storage, marketing, distribution and utilization, and national food and nutritional security in support of the food industry and also to advise government on its food policy.

Projects ran by the Institute are generally classified under four (4) programs. These are the Roots and Tuber products; Cereals, grains and Legume products; Meat, Fish and Dairy products and Fruits, Vegetables and spices products. Over the past sixty (60) years, CSIR-FRI has collaborated with local and foreign organizations on projects to address food safety, food security, nutrition and socio-economic challenges.

Expertise and services include Collaborative Research, Consultancy services, Trainings, Technology transfer, Technical and Analytical services, Sale of products of Research outputs, Equipment fabrication and Contract productions.

The CSIR-FRI has 2 main sites; Okponglo South Legon, Accra (Main office, laboratories, incubation centers, processing and fabrication) and Pokuasi Amasaman District (Root and Tuber processing plant, Flash drying facility, Starch, Ethanol and Glucose syrup production plant (Agri-Business incubation center).

SOME R&D ACHIEVEMENTS

A. Marketable technologies

i. Food Products

Technologies available for the production of:

1. Fufu flours (yam, water yam, sweet potato, cocoyam and plantain)



2. High Protein Infant Weaning Foods



3. Banku mix



4. Fermented maize meal



5. Weaning food blend from cashew apple



6. Dried fruits



7. Prawn crackers with anchovies



8. Tiger nut composite flour and products

9. Instant cashew drink

10. Instant *koose* mix

11. Mushroom blend cereal mix

12. Mushroom soup

13. Mushroom noodles

14. High Quality Cassava Flour (HQCF)

15. Dehydrated Fermented Maize Meal

16. Protein and Mineral Fortified Recipes

17. Products from low grade broken rice fractions

18. High Quality Legume Flours

19. Fermented cassava flour (agbelima)

20. Porridges (yam, water yam)

21. Fruit juices/Concertrates

22. Marmelades

ii. Industrial Products

Technologies available for the production of:

1. Mushroom Cultivation



2. Glucose syrup from cassava



3. Industrial Grade Cassava Flour (IGCF)

4. Industrial alcohol (ethanol) from cassava

iii. Food Processing Equipment

Technologies available for the fabrication of:

1. Rice Par-boilers



2. Fish Smoking Ovens



3. Solar House dryer



4. Y-Cone



5. Disintegrated dough



6. Hot air cabinet dryer



7. Hammer Mills



8. Wooden-gas cabinet dryer for fruit drying



8. Cassava Graters

9. Cassava Presses

10. Industrial Pressure Cookers

11. *Gari* Grading / Sifting Machine

12. Flash dryer

13. High performance hot air dryer

14. Flour sifter etc.

B. Development of industrial solving technologies

CSIR-FRI uses its expertise in solving technical challenges in various agro-processing industries.

Some examples are as follows:

1. Development of various composite flours from cassava, yam, cocoyam, potato, water yam, cowpea etc, for bakers, matrons and caterers. This would help in reducing wheat flour importation.
2. Improvement of quality and stability of meat (eg. Snails, pork) through alternative processing methods.
3. Improvement of children's meals in schools by increasing micronutrients through the use of underutilized fish species.
4. Process improvement to control and enhance safety, nutritional and sensory qualities of *kenkey*. (Transferred to *kenkey* producers)
5. Reduction of the strong pungent aroma of dawadawa. (Transferred to dawadawa processors)
6. Over 10,000 tons of fresh cassava has been moved through the cassava value chain for the production of high quality cassava grits, high quality flours (cassava), kokonte and gari to various end-users.

C. Trainings

1. Mushroom cultivation and production
2. Food safety and quality control
3. Fruits and Vegetables processing
4. Cereals, Legumes and Grains products processing (rice noodles, soy milk, drinks, etc.)
5. Roots and Tuber products processing (glucose syrup, high quality cassava flour, vacuum packed yam etc.)
6. Part-Semester Internship programs for food and nutrition related programs from Tertiary Institutions

D. Community Developments

1. Community nutrition interventions (eg. Flour fortification programme for 12 rural communities in Northern and Upper regions)
2. Formulation of recipes and development of recipe manuals for diversified uses of sweet potatoes, cassava, soybeans, cowpea and maize for bakers and matrons on different communities.

3. Development, promotion and transfer of Bambara processing technologies in Northern Ghana. (Technology has been transferred to 219 women in micro-scale Bambara processing and over 370 women beneficiaries).
4. Food safety awareness creation (eg. Awareness of safety of street foods)
5. Establishment of cassava processing plants in Rural Communities (eg. Mantsi, Doblo-Gonno, Brofoyeduro, Beposo Nkran, Amanase, Suhum, Mampong etc.)
6. Contribution to development of improved crop varieties.
7. Development and promotion of improved storage cribs.

Flagship research projects

FOOD SECURITY AND POVERTY REDUCTION

CASSAVA: ADDING VALUE FOR AFRICA (C: AVA II) PROJECT-GHANA



In collaboration with rural developmental agencies and associations, Dr. Nanam Tay Dzedzoave, a Principal Research Scientist, (specialist in Post-harvest Technology- Roots and Tubers development) is running a Bill and Melinda Gates Foundation funded project titled “*Cassava: Adding Value for Africa*”. He is assisted by Mrs. Marian Tandoh- Wordey and Mrs. Beullah Sallah. The project commenced in January, 2014; with activities extending to the Greater Accra, Brong Ahafo, Volta, Eastern, Central and Ashanti Regions of the country.

The main objective of the project is to increase the incomes of smallholder farmers and community processors through participation in profitable and sustainable value-added cassava chains. This project aids in bridging gaps within the cassava value chain, therefore, increasing profitability of all actors in the value chain.

The project has produced and distributed over 2000 copies of four (4) different training manuals. A documentary titled ‘High Quality Cassava Flour- The hidden treasure in cassava’ was produced. Over 10,000 tons of fresh cassava has moved through the value chain for the production of High Quality Cassava Flour (HQCF), High Quality Cassava Grits (HQCG), improved *kokonte* and *gari*. A GPS tracking was installed for all beneficiary farmer groups, farmer processors and processors.

Through activities of C:AVA project, over 100 farmer-processor groups and medium/large scale cassava processors in cassava growing regions in Ghana have the knowledge and technical know-how in processing High Quality Cassava Flour. Trained kitchen staff of SHS and commercial bakers now substitute portions of wheat flour for HQCF in bread making, therefore, reducing cost and dependence on imported wheat flour. The introduction of HQCF, has recorded a boost in the relationship between stakeholders in the cassava value-chain. HQCF has significantly impacted the baking and plywood industry to a great extent, therefore, if fully adopted and implemented by law, the nation’s economy will experience a significant reduction in wheat importation. There has also been a significant reduction in the cost of bread and plywood production by stakeholders. HQCF/Grits has been used as poultry and pig feed substitute. Market linkages have been created between C:AVA and SMEs and between beneficiaries to funding agencies.

Beneficiaries have testified on the cost benefits in using composite HQCF flour for baking. HQCF composite products have been readily accepted by consumers. Market linkages created by C:AVA have impacted growth of businesses of beneficiaries. Investors and beneficiaries have also benefitted from awareness and sensitization fora, business development, feasibility studies and ultimately, increase in investment.



Field trip to assess yields of improved varieties introduced to farmers



Establishing a High Quality Cassava Flour processing plant



Discussions at a stakeholders' forum



Follow up visit to a plywood factory to assess the impact of Industrial Grade Cassava Flour on productions

DEVELOPMENT OF EDIBLE AND MEDICINAL MUSHROOMS AS FUNCTIONAL FOODS IN GHANA



With sponsorship from Partnerships for Enhanced Engagement in Research, Prof. Mrs. Mary Obodai, a Chief Research Scientist, (specialization in Food Microbiology-Mushroom Biotechnology) in collaboration with the Ohio State University commenced the “*Development of edible and medicinal mushrooms as functional foods in Ghana*” in August, 2013. Participating scientists included, Dr. Steven Schwartz, Dr. Robin Raltson, Ms. Matilda Dzomeku, Mrs. Deborah Narh Mensah and Mrs. Linda Hagan.

The project was aimed to cultivate four different species of edible mushrooms, *Pleurotus sajor-caju* strain PScW, *P. tuber-regium* strain PTRW, *Ganoderma sp.* and *Termitomyces sp.* as well as, to develop a new mushroom-based food for infants (2-5years) and to assess consumer acceptability of the new mushroom-based products.

The project has set up mushroom growing demonstration centers in the Eastern, Volta and Greater Accra Regions. Mushroom based cereal blends, mushroom soup mix, mushroom noodles and orange fleshed sweet potato mushroom mash were produced.

This scientific study benefited mushroom farmers, unemployed youth and mothers with infants (2-5years). Through this project twenty seven *Ganoderma* species were characterized using molecular methods and their relationship was established by using a dendogram. A new species of *Ganoderma* mushrooms was identified from Ayum and named as *Ganoderma mbrekobenum* sp. nov. Personia. Two researchers from CSIR-FRI were impacted with research experiences from Ohio State University, USA. Training programmes were carried out for sixty (60) care givers on growing and harvesting mushrooms using agricultural wastes. Beneficiaries were also trained on formulation of mushroom based cereal blend (baby food).



Pleurotus ostreatus strain EM1



Pleurotus sajor caju strain PScW

Some Mushrooms used for cereal blends



Mushroom based cereal blend ready to be served



A mother feeding her baby with mushroom based cereal mix



Focus group discussion in Somanya in the Eastern Region

SCIENCE AND PEOPLE



Dr. Charles Tortoe, in collaboration with Women in Agriculture Development ran a World Bank funded project, titled the ‘ ‘ *West Africa Agricultural Productivity Programme*’ ’ (WAAP2A). His specialization and background is Post-harvest Technology, in the areas of Fruits and Vegetables; Cereals and Grains as well as Roots and Tubers. He worked in collaboration with a team of researchers, Mr. Gregory Komlaga, Mr. Peter Addo, Mrs. Lynda Hagan, Mr. Paa Toah Akonor, Mrs. Evelyn Buckman, Mr. Jonathan Ampah, and Mr. Hayford Ofori.

Through this project, cassava presses, cassava graters, sets of bakery equipment (mixers, rollers, ovens, etc) were given to beneficiaries. Processing centres were constructed for beneficiary groups. A business incubation plant for the processing of ethanol and high glucose corn syrup has also been constructed

The project’s was started in January, 2013 with the objectives: to develop technology for processing intermediate products of cassava, transferred and adopted by 2500 primary out-growers and out-processors; to develop technology for developing composite flour of yam, cocoyam and sweet potato and successfully transferred and adopted by flour and bakery enterprises; to develop cassava and cereal flour and integrate into bread making and other pastry products for scaling-up of the developed technologies and to develop an agribusiness incubation centre for the production of ethanol and glucose syrup. Manuals and journal publications were published.

Through this project Dr. Tortoe’s skills in the production of high quality cassava flour and composite flours such as, sweet potatoes, yam, cocoyam, water yam, cowpea, millet, maize, rice and sorghum composite flours has improved. Through activities of the project, he is well vexed in product development, technology development and transfer as well as capacity building through trainings. Over 2000 individuals in the Ashanti, Brong Ahafo, Eastern, Upper East, Western and Greater Accra regions benefitted from this project. An agribusiness incubation centre has been built for the production of glucose syrup and ethanol for pharmaceutical and confectionary industries.

WAAPP2A has trained 1,561 cassava processors on how to process raw cassava into High Quality Cassava Flour (HQCF). A total of 1,729 bakers and caterers were also trained on processing and utilization of composite flour processing. The project has also formed bakery and pastry groups in parts of the three Northern regions of Ghana, Brong Ahafo and Ashanti regions. Bakery equipment (such as mixers, ovens, rollers etc.) were distributed to beneficiaries

Equipment beneficiaries were grateful to WAAPP2A for equipment received. Beneficiaries were also grateful for the trainings on HQCF, composite flour and its products.



Training of matrons and caterers on composite products



Agribusiness incubation centre at Pokuase, Accra



Some equipment distributed to beneficiaries