INTERNATIONAL FOUNDATION FOR SCIENCE

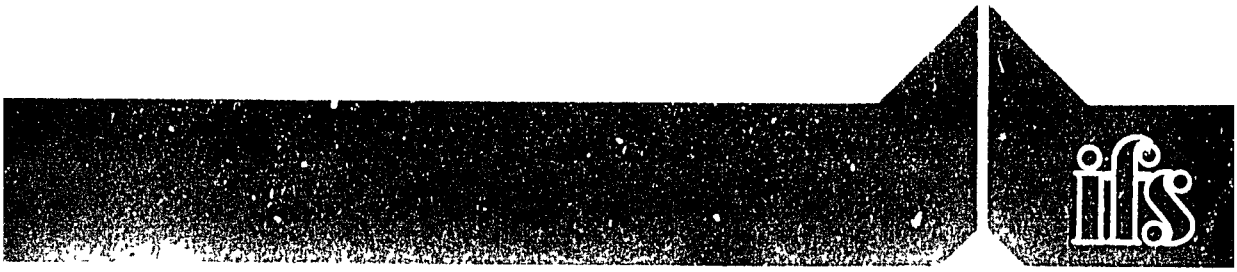
IFS WORK 1974 - 1983

FERMENTATION AND APPLIED MICROBIOLOGY

The International Foundation for Science, a non-governmental, non-profit organization, is established to promote and support in developing regions of the world meritorious research in the fields of the natural and social sciences and in technology.

The Foundation will provide young scientists and technologists of outstanding merit from developing countries with financial and other support in their work.

A condition is that the research activity shall take place in the territory of a developing country.



INTERNATIONAL
FOUNDATION
FOR SCIENCE

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FOREWORD

By 1972, the year the International Foundation for Science was founded, scientists, academics, and policy makers interested in development aid had long recognized the difficult situation faced by young scientists from developing countries. Research opportunities did not exist in their countries, or if they did, they were reserved for senior and well-established researchers.

The need for an organization that could enable young scientists to pursue a career of research in their homelands was clear, and in 1972 Sweden and Canada provided the initial funds to establish such an organization, the IFS. Since then France, the Federal Republic of Germany, the Netherlands, Belgium, Norway, Switzerland, Nigeria, the United States, Australia and UNESCO have joined as donors of the Foundation. Member Organizations--scientific academies, research councils, and royal societies--from 65 countries advise the IFS on policy and promote its activities.

In the past ten years the IFS has awarded grants to nearly 800 scientists in 78 developing countries for research within a granting programme that includes Aquaculture, Animal Production, Food Crops, Afforestation and Mycorrhiza, Fermentation and Applied Microbiology, Natural Products, and Rural Technology. The grantees were selected based on the recommendations of the IFS Scientific Advisers, specialists in the IFS scientific areas who serve the IFS voluntarily and in a personal capacity.

The grants are modest (normally not more than USD 10 000) and can be awarded up to four times per grantee. Since the institute of the grantee provides a salary and facilities, IFS grants are devoted to purchasing the basic tools of research--equipment, expendable supplies, literature. Because grantees often face isolated and difficult conditions, because they are young and inexperienced, the IFS provides more than financial support.

Workshops are arranged on behalf of the grantees and are attended by IFS Scientific Advisers. These advisers provide guidance to grantees on such occasions, as well as by mail and visits to research sites.

The IFS was founded because there was no other organization providing this kind of support to developing countries. Today, ten years later, the IFS is still unique among organizations. This was the conclusion reached by a 1981-82 evaluation of the

FOREWORD

IFS commissioned by the IFS Sponsors and conducted by an external panel headed by Dr Francisco Sagasti of Peru and Prof Geoffrey Oldham of the United Kingdom. The panel also concluded that the IFS had succeeded in reaching the intended target group of young and well-educated scientists and had provided them with research opportunities in their own countries that would not otherwise have been available. The panel was satisfied with the selection of grantees and the quality and relevance of the research done by these scientists.

The panel made a number of recommendations for future activities. The proportion of grants given to scientists in Latin America and Africa should be increased in order to balance the geographic distribution between these continents and Asia. Because of the importance of the IFS Scientific Advisers to the success of the IFS activities, their number should be increased. The Foundation has implemented both of these recommendations.

The most important recommendation was that the IFS increase the scope of its activities. The need for such an increase is reflected by the number of applications received by the Foundation. Today the IFS is able to provide support for only one out of every three applicants. The IFS is making concerted efforts to seek additional funds that such a recommendation, and such a need, imply.

Gordon Butler
President

GUIDE TO IFS WORK

FERMENTATION AND APPLIED MICROBIOLOGY

This report is a chapter of the IFS WORK, which includes chapters of all the scientific areas of the IFS granting programme: A, Aquaculture; B, Animal Production; C, Food Crops; D, Afforestation and Mycorrhiza; E, Fermentation and Applied Microbiology; F, Natural Products; G, Rural Technology. These other chapters have also been printed individually and are available from the IFS Secretariat.

The chapter FERMENTATION AND APPLIED MICROBIOLOGY presents in numerical order the names and institutions of grantees who have received grants in this scientific area during the years 1974 - 1983. The title, a short summary, and subject descriptors (taken from the OECD MACROTHESAURUS; those not found in the OECD publication are preceded by asterisks ***) are included as well as the amount of funding provided by the IFS. These amounts are given in SEK, Swedish Crowns. The funding dates coincide with the year of the award. Completed projects are indicated by a date; when no such date appears, the project is active as of 1983.

A brief introduction of the scientific area was written by the IFS Scientific Secretary Dr Lennart Prage. There are two indexes: one by subject descriptor, the other by country.

The summaries of the projects were written at the IFS Secretariat and submitted to the grantees for their approval.

The information contained in the IFS WORK is part of a database created for sharing project information, the International Development Research Information System (IDRIS). The system, in the pilot project stage, is being hosted by the International Development Research Centre (IDRC) of Canada. The database is stored in the Centre's minicomputer, which uses MINISIS software. MINISIS processors were used to extract the information for the printing of the IFS WORK.

Ms Judith Furberg, Information Secretary, was responsible for the compilation and editing of the IFS WORK 1974 - 1983.

FERMENTATION AND APPLIED MICROBIOLOGY

Bacteria, viruses and some fungi and algae are commonly referred to as microbes or microorganisms. By virtue of their almost unlimited capacity to adapt to and grow under almost any environmental conditions, microbes can be used in a variety of beneficial ways.

Man has known and utilized microbes for thousands of years. Yeasts were cultured for brewing purposes in Mesopotamia around 6 000 B. C. In ancient Greece Hippocrates and his followers prescribed yeasts for a number of ailments. Civilizations in most parts of the world have prepared fermented food from milk and various plant products. During the 20th century bacteria and fungi have provided a number of indispensable antibiotics, such as penicillin. With the introduction of genetic engineering technology in recent years, new potentials to tailor and produce useful products with the help of microbes have become a reality. Besides bacteria and fungi, these sophisticated new techniques also make use of viruses. The diversity and adaptability of microorganisms offer great possibilities for applied microbiology, especially in the tropical countries where the natural resources and the climate often favour microbial growth.

All microbiological techniques take advantage of the ability of microbes to convert organic materials to other, more valuable products--food and feed, medicine and fuel. Microbiological processes are characterized by their limited need for energy and by their capacity to produce high yields of specific substances. Success in the area of applied microbiology is dependent on the proper choice of microorganisms, the development of optimal growth conditions, and on the amounts and quality of the products.

About half of the 80 IFS grantees supported within the research area Fermentation and Applied Microbiology are working on research related to food technology. Most study various aspects of fermentation processes used in the preparation of food. Fermentation is a traditional method to produce and preserve food; at the same time it enhances the nutritive value of the food. Grantees are working on tempeh and other products based on soybeans and also on food prepared by fermentation of rice, corn and various leguminous seeds. Besides improving the nutritive quality and prolonging the shelf-life of the products, attempts are also made to shorten the fermentation time.

FERMENTATION AND APPLIED MICROBIOLOGY

Under humid conditions stored feed and food easily become contaminated with fungi. Such fungi often produce mycotoxins which make the products unsuitable for consumption. Ten percent of the grantees are studying factors affecting mycotoxin formation in various cereals, legume products and oils in order to reduce and prevent mycotoxin contamination.

Within this research area a number of grantees are working on food technology projects not involving microbiology. Some study the effect of cooking and germination on the nutritive value of foods derived from plants. Others investigate new sources for the production of flours, juices and rennet substitutes. One grantee has investigated the effect of irradiation on products derived from underutilized tropical fruits.

Mushrooms, fungi, and algae can be cultivated on various agricultural waste products to improve the digestibility of these materials. The mushrooms produce edible fruiting bodies whereas the microbial fungi and algae can be grown to produce single-cell proteins. Grantees study the possibilities of growing mushrooms, fungi, and algae on a variety of starchy materials such as cassava, potato wastes, reject bananas, rice straw, coconut husks, and saw dust.

Microbes can also convert a wide range of organic waste products into biogas, containing 50 - 70% combustible methane gas. Biogas is produced in relatively cheap and simple digesters which are suitable for rural areas and can provide small-scale energy for room lighting, hot water heating, and cooking. The technology for biogas production has been used extensively in Asia, particularly in China and India. The IFS has supported 6 grantees who are studying the fermentation process in order to produce biogas. These studies utilize various waste products such as coffee pulp juice, sugar industry wastes, straws, etc. In addition, 2 grantees are supported with the area of Rural Technology to develop biodigester technology.

Among the more recent grantees a few have worked on modern biotechnological techniques. Genetic engineering has been employed to increase the production of antibiotics in bacteria and improve soy sauce production by fungi.

The research area Fermentation and Applied Microbiology is open to applications on most aspects of applied microbiology and food

technology. It is expected, however, that in the future more grantees will be working with newly developed techniques to manipulate microbes to produce much needed products. It is believed that biotechnological methods require sophisticated facilities that are inappropriate for developing countries. Many techniques, however, have been developed and modified to the extent that the need for sophisticated and expensive equipment has been drastically reduced. What with the abundance of natural resources in developing countries, properly introduced and utilized biotechnological methods could be of great impportance to these countries.

Some aspects of microbiology are also supported in other areas of the IFS granting programme. Soil microbiology, including nitrogen fixation and mycorrhiza, is included in the areas Food Crops and Afforestation and Mycorrhiza. Biological control of plant pathogens with the help of microorganisms is also dealt with in the area Food Crops.

More than 60% of the IFS grantees supported within the area Fermentation and Applied Microbiology come from Asia, a percentage that reflects the traditional interest for microbiological techniques. Some 20% come from Latin America and the remainder from Africa. There is a growing interest for the practical uses of fermentation techniques in Latin America and Africa that in the future may well result in a higher proportion of grantees from these parts of the world.

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E008: Dr Susono Saono, Laboratorium Treub, Lembaga Biologi Nasional, P O Box 110, BOGOR, Indonesia

"Preserving microbiological cultures"

IFS funding: 11250 SEK 1974 Completed 1977

Dr Saono will improve techniques to preserve cultures of non-pathogenic microorganisms and to establish a collection of different strains. Many of the microorganisms found in traditionally fermented foods in Indonesia and other parts of Southeast Asia are still unknown or poorly defined.

/microorganisms/

Grantee E009: Dr Florentinus Winarno, Food Technology Development Center, Institut Pertanian Bogor, (IPB), P O Box 61, BOGOR, Indonesia

"Microbial fermentation of tauco"

IFS funding: 38250 SEK 1974 35200 SEK 1975
48000 SEK 1977 38700 SEK 1979

"Tauco", a fermented soybean paste, is traditionally consumed by many Indonesians, particularly by low income families. Production is still carried out in small-scale industry, using very simple methods. The use of single or mixed cultures under various conditions at different steps of the fermentation process will be studied.

/food technology/ /fermentation/ /soybeans/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E010: Dr Ho Coy Choke, Department of Genetics and Cellular Biology, Universiti Malaya, Lembah Pantai, KUALA LUMPUR, Malaysia

"Development of cheap high protein foods and a microbial enzyme industry in Malaysia"

IFS funding: 22500 SEK 1974

The study includes analysis of ontjom fermentation for protein content, carbohydrates, lipids and nucleic acids for evaluation of nutritive value. The possibilities of isolating and selecting mutants of the active bacteria in the ontjom fermentation (Neurospora intermedia) for improved protein content and quality will also be examined.

/food technology/ /fermentation/ /nutritive value/

Grantee E034: Dr Indrawati Gandjar, Nutrition Research Institute, Semboja Unit, Jalan Semboja, BOGOR, Indonesia, Indonesia

"Tempe benguk fermentation and fermentation of Psophocarpus tetragonolobus seeds"

IFS funding: 21100 SEK 1974 26400 SEK 1976
Completed 1979

Tempe benguk is an Indonesian fermented food from the leguminous seeds of Mucuna pruriens. The seeds provide protein at low cost, and the fermented product is very popular. Dr Gandjar has studied the nutritional aspects of the utilization of M. pruriens, and will continue to study the same aspects of Psophocarpus tetragonolobus (winged beans). The young green pods of P. tetragonolobus are commonly-used as vegetables in Java and sometimes the mature seeds are roasted or cooked. The most important objective in this study is to investigate whether the mature seeds of P. tetragonolobus can be utilized for tempe production, by inoculation of the commonly-used bacteria strains for tempe preparation. The results will tell if this kind of tempe should be recommended as a new protein source beside tempe from soybeans, especially in areas where these seeds are produced in large quantities.

/food technology/ /fermentation/ /leguminosae/ /nutritive value/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E036: Dr D Purushothaman, Department of Biology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, COIMBATORE 641 003, India

"Idli and dosai fermentation"

IFS funding: 7600 SEK 1975

Dr Purushothamin will investigate the isolation and characterization of microorganisms involved in fermentation of idli and dosai, which are important in South India as breakfast dishes. The fermentation is based on rice blended with various pulse grains. Nutritional and other qualities, like taste and texture, will be studied in order to improve recipes for idli and dosai preparations.

/food technology/ /fermentation/ /rice/ /nutritive value/

Grantee E056: Ms Zelmira Reynoso de L, Departamento de Tecnologia de Alimentos y Productos Agropecuarios, Universidad Nacional Agraria, Apartado 456, La Molina, LIMA, Peru

"Utilization of native products as wheat substitutes"

IFS funding: 31600 SEK 1975 47000 SEK 1978

An increased demand for bread, noodles, crackers, biscuits, etc., has made Peru highly dependent on wheat imports. The project involves studies on the preparation of flour from different Peruvian plants which might replace part of the wheat flour. Ms Reynoso de L will try raw materials from some locally-grown tubers and root crops (Colocasia esculenta, Oxalis crenata, Ulucus tuberosus, Tropaedum tuberosum), as well as some cereals (Chenopodium pallidicaule) and leguminous crops (Lupinus mutabilis, Vigna sinensis). Some of these plants are grown with good results at altitudes of more than 3 000 m.

/food technology/ /bakery products/ /cereals/ /leguminosae/ /root crops/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E058: Dr Sientong Nutalaya, Agricultural Products Development Division, TISTR, 196 Phahonyothin Road, Bangkhen, BANGKOK 9, Thailand

"Button mushroom cultivation"

IFS funding: 20935 SEK 1975 Completed 1979

Dr Sientong Nutalaya will investigate the possibilities of producing button mushrooms for domestic market demands and canning factories. The study is promising, since plenty of material for compost preparation is available in the country, and cultivation can be carried out at low labour costs, providing an important income especially for farmers in the upland regions of Thailand. Particular attempts will be made to accelerate the production and improve the quality of button mushrooms.

/fungi/ /cultivation systems/ /agricultural wastes/

Grantee E060: Dr Wang Chee Woon, Department of Biochemistry, Faculty of Medicine, Universiti Malaya, Lembah Pantai, KUALA LUMPUR, Malaysia

"Utilization of celluloses of higher tropical basidiomycetes in waste recovery"

IFS funding: 15800 SEK 1975 44000 SEK 1977

Intensive poultry and pig farming is important in Malaysia to provide animal protein for human consumption. However, the costs of animal feed are increasing. Fungi cultures on substrates of waste products will be used to produce animal feed. Dr Wang will study some properties of fast-growing species of tropical basidiomycetes, which may be grown on cellulosic materials.

/fungi/ /feed production/ /agricultural wastes/ /cellulose/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E070: Dr P. Pushpamma, College of Home Science, Andhra Pradesh Agricultural University, Khairtabad, HYDERABAD 500 004, India

"Loss of certain nutrients by different methods of cooking in common Indian recipes of pulses, vegetables and fruits"

IFS funding: 17600 SEK 1975 19200 SEK 1977
30000 SEK 1981

Chemical studies in India have often shown mineral and vitamin deficiencies. Dr Pushpamma will gather information about common methods and durations of cooking, and popular combinations of foods. A diet survey will be conducted in one city and five villages in three different regions of Andhra Pradesh. Mineral and vitamin losses at various stages of preparation and cooking in different recipes will be estimated. The College of Home Science, where the research will be done, collaborates with the Department of the State. It offers training programmes to village workers, and the results from the proposed research can in this way be passed on.

/food technology/ /food preparation/ /nutritive value/

Grantee E071: Dr Lim Wah Ching, School of Biological Sciences, Universiti Sains Malaysia, MINDEN, Penang, Malaysia

"Improvement of the yield and quality of paddy straw mushroom, Volvariella volvacea"

IFS funding: 26400 SEK 1975 17280 SEK 1977
50000 SEK 1981

Mushrooms are widely consumed and appreciated in South East Asia and provides farmers with income. This project deals with the possibilities of utilizing rice straw for mushroom farming. Until now, rice planters have usually burnt the rice straw in the fields. Dr Lim will try to find out the best type of growth medium for preparation of mushroom spawn and the best morphology of straw beds for maximum yield of mushrooms. The environmental conditions which affect the growth of mycelia in the straw bed and the production of muchrooms will be determined. Improved strains of mushrooms will be selected for quality and yield.

/fungi/ /cultivation systems/ /agricultural wastes/ /rice/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E087: Dr Somasiri Widanapathirana, Department of Botany, University of Kelaniya, Vidyalankara Campus, KELANIYA, Sri Lanka

"Studies on the biology of fermentation of phloem sap (toddy) of coconut (Cocos nucifera)"

IFS funding: 13288 SEK 1975

Toddy, a fermented beverage similar to cider, has been a national drink in Sri Lanka for many centuries. The phloem sap obtained from the coconut palm is traditionally fermented in open vessels on the tree itself. Dr Widanapathirana will study the microbiology of toddy, and the chemical transformations of the raw materials. In a second phase isolated organisms will be tested for different fermentation characteristics. The ultimate objective is to produce a high-quality toddy by means of pure fermentation cultures.

/food technology/ /fermentation/ /alcoholic beverages/ /coconut palms/

Grantee E088: Dr Ahmed Y Gibriel, Food Science Department, Faculty of Agriculture, Ain Shams University, Shobra-Khaima, CAIRO, Egypt

"Production of single-cell proteins from food industry wastes"

IFS funding: 30800 SEK 1975 25850 SEK 1978
32250 SEK 1979

Industrial food processing leaves a large amount of wastes from fruits, vegetables, sugar cane and rice. These wastes may be suitable for controlled microbial growth, following chemical analysis and selection of rapidly growing microorganisms. Suitable combinations of wastes and particular strains of microorganisms may be used for economical production of protein for fodder.

/microbiology/ /feed production/ /agricultural wastes/ /proteins/ /single-cell proteins/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E089: Dr Soetarjo Brotonegoro, Laboratorium Treub, Lembaga Biologi Nasional, P O Box 110, BOGOR, Indonesia

"The decomposition of organic town wastes under tropical conditions"

IFS funding: 25652 SEK 1975

Organic wastes from cities may, after decomposition, be a valuable complement to inorganic fertilizers in agriculture. Dr Brotonegoro will attempt to accelerate the formation of compost from available town refuse, taking into account the composition of the waste, its water content, and the kinds and amounts of inoculum to be added to the original material.

/microbiology/ /wastes/ /fertilizers/

Grantee E090: Dr Cherrappathanathu John, Rubber Research Institute of Malaysia, (RRIM), P O Box 150, KUALA LUMPUR 0102, Malaysia

"Utilization of wastes from natural rubber processing factories"

IFS funding: 30800 SEK 1975

Effluents from natural rubber processing factories consist of various components, such as proteins, amino acids, sugars, lipids, carotinoids and other inorganic or organic material. If untreated, such effluents are an environmental menace. Dr John will study large scale utilization of the effluents, paying particular attention to five lines of research: (1.) Production of food and feed yeasts, such as Candida utilis and Saccharomyces cerevisiae; (2.) production of commercially important algae, particularly Chlorella sp. for food and feed; (3.) large-scale propagation of rhizobia for the inoculation of clover and grain legume seeds; (4.) production of mushrooms such as Volvariella volvacea, Agaricus bisporus, and an unidentified Australian edible mushroom; (5.) cultivation of freshwater fish in the partially treated effluent containing green algae.

/microbiology/ /industrial wastes/ /rubber/ /algae/ /yeast/ /fungi/ /single-cell proteins/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E134: Dr Chaufah Thongthai, Department of Microbiology, Faculty of Science, Mahidol University, Rama VI Road, BANGKOK 4, Thailand

"Role of microorganisms in the fermentation of fish sauce in Thailand"

IFS funding: 44000 SEK 1976 36400 SEK 1977
44000 SEK 1979 67200 SEK 1981

Fish sauce is a good condiment widely produced and consumed in Southeast Asia, often used as the only complement to rice. It is rich in lysine, vitamin B12 and minerals, which are of importance especially in rural areas where malnutrition is common. Little is known about the microbial process of the fermentation. Dr Chaufah Thongthai will investigate the microbial succession throughout the fermentation period and improve the nutritional quality through selection of superior microbial strains. In this way the project aims at improving methods and at establishing methods of controlling the nutritional value of the final product.

/food technology/ /fermentation/ /fish/ /nutritive value/

Grantee E136: Ms Lindajati Tanuwidjaja, National Institute for Chemistry, Jalan Cisitu Sangkuriang, BANDUNG, Indonesia

"Improvement of kecap manufacturing techniques"

IFS funding: 11000 SEK 1976 24200 SEK 1979

Kecap is an Indonesian soy sauce which is traditionally manufactured by fermentation on a home industry scale. Ms Tanuwidjaja will try to standardize the fermentation techniques by selecting the best strain producing a good and stable quality of kecap. The fermentation conditions will be controlled, and the growth of undesirable organisms will be prevented. She will also make an attempt to shorten the fermentation period and improve the nutritional value of kecap.

/food technology/ /fermentation/ /soybeans/ /nutritive value/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E163: Dr Emerita Sevilla-Mendoza, College of Home Economics, Central Luzon State University, Munoz, NUEVA ECIJA 2320, Philippines

"Fermentation, processing and storage studies of pickled green mangoes"

IFS funding: 13050 SEK 1976 6880 SEK 1979
Completed 1983

Production of mango pickles involves fermentation of the dry salted or brined, immature or mature green mangoes. The effect of several factors on the microbial, physical and chemical changes during fermentation will be investigated, as well as processing conditions and storage stability of the product. The factors to be studied are initial salt concentration, temperature of fermentation, blanching prior to fermentation, sugar, firming agents, and chemical preservatives. Results of studies on processing conditions of storage stability will help to determine the optimum time and temperature of heat processing of the pickled green mango, without damaging the quality and the storage life of the product.

/food technology/ /fermentation/ /fruits/

Grantee E164: Dr Wasito Mas Loegito, Department of Biology, Universitas Brawijaya, Jalan Mayor Jendral Haryono 169, MALANG, Indonesia

"Studies on aflatoxin concentration of tempe menjes and tempe kapuk - fermented food made from agricultural wastes in Malang"

IFS funding: 15225 SEK 1976 13200 SEK 1979
18750 SEK 1981

Tempe menjes and tempe kapuk are made from waste materials such as coconut residues or crushed bean debris, and are widely consumed as a low-cost food in East Java. Dr Mas will investigate the possible carcinogenic effect of the aflatoxin produced by fungi used in the production of such foods. The occurrence of aflatoxin producing fungi and aflatoxin concentration will be determined.

/food technology/ /agricultural wastes/ /toxic substances/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E165: Ms Phang Siew Moi, Department of Botany, Universiti Malaya, Lembah Pantai, KUALA LUMPUR, Malaysia

"Aspects of the culture of algae in rubber effluent and the utilization of the algae as animal feed"

IFS funding: 21750 SEK 1976 35690 SEK 1979

The rubber industry is one of the major sources of industrial pollution in Malaysia. The waste effluent consists mainly of non-rubber solids. If left untreated, it is a highly noxious pollutant. The oxidation pond system offers a promising means by which the effluent may be converted into protein-rich organisms. Initially, Ms Phang will study the heterotrophic growth of algae isolated from the rubber effluent. The bacterial components of the effluent will be investigated, and growth studies on the algae-bacterial symbiosis in the oxidation pond will be carried out. Optimum addition of nutrients will be determined to obtain maximum algae biomass production. The algae may be utilized as animal feed for fish, prawns and chickens.

/algae/ /industrial wastes/ /rubber/ /feed/ /pollution control/

Grantee E204: Dr Tan Kok Kheng, Department of Biochemistry, National University of Singapore, College Road, SINGAPORE 0316, Singapore

"Cultivation of mushrooms, a protein- and vitamin-rich food"

IFS funding: 22000 SEK 1977 20250 SEK 1978
Completed 1982

Mushrooms are rich in proteins and vitamins and grow rapidly on cellulosic waste material such as straw, corn cobs and wood waste that are usually disposed of by burning, or left to decay. Dr Tan will make a survey of mushroom species that can be grown under tropical conditions. Locally-available cellulosic substrates will be tested for growth of selected suitable species. The physiology and biochemistry of the fruiting will be investigated as well as the effect of light.

/fungi/ /cultivation systems/ /agricultural wastes/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E210: Dr Luis Herrera M, Centro Nacional de Investigaciones Cientificas, (CNIC), Apartado 6990, HABANA, Cuba

"Genetical improvement of Candida utilis"

IFS funding: 22000 SEK 1977 31500 SEK 1978
41500 SEK 1980

Dr Herrera will work on the improvement of some nutritional and industrial properties of the yeast Candida utilis to obtain an adequate source of single-cell protein for animal feeding. Lack of methionine is often a limiting factor for weight gain. Thorough genetic studies will be carried out to obtain methionine hyper-producing strains. The intracellular metabolism in the hyper-producing mutants will be determined by chromatographic and isotopic methods, and the content of nucleic acids, proteins and amino acids will be assessed. The enzyme and intermediate reactions in the methionine biosynthesis and degradation will be investigated, and methionine transport will be determined by using isotopic methods. Mutants unable to use methionine as a nitrogen source will be selected, and subsequent fermentation studies will make it possible to calculate the requirements for increasing single-cell protein production to an industrial level.

/yeast/ /genetic improvement/ /feed/ /nutritive value/ /single-cell proteins/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E211: Dr Reinaldo Lopez P, Centro Nacional de Investigaciones Cientificas, (CNIC), Apartado 6990, HABANA, Cuba

"Fermentation of chemical hydrolysates from bagasse by normal yeast strains for protein production"

IFS funding: 40656 SEK 1977 Completed 1979

The supply of protein-rich animal feed does not meet the demand in Cuba, and animal feed is therefore imported. It is possible to obtain protein from fermentable sugars by using proper yeast strains. However, the yeast strains in general have a strong cell wall and high nucleic acid contents, which make the protein less accessible. Hydrolysates obtained from bagasse and pith will be fermented with different strains of yeast, one of them enriched in methionine (Candida utilis). The contents of nucleic acids in the biomass will be reduced by thermal shocks and endogenous enzymatic hydrolysis. The cell disruption will be optimized by biochemical tests of the protein, amino acid and nucleic acid residual contents. The project is expected to yield results on how to improve single-cell protein technology, which is making fast progress in Cuba.

/yeast/ /fermentation/ /agricultural wastes/ /sugar/ /single-cell proteins/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E214: Ms Elisabeth de Porres, Instituto Centroamericano de Investigación y Tecnología Industrial, (ICAITI), Apartado Postal 1552, GUATEMALA, Guatemala

"Anaerobic fermentation of coffee pulp juice"

IFS funding:	22000 SEK 1977	22000 SEK 1979
	28600 SEK 1981	Completed 1982

Coffee pulp is the major by-product from coffee processing. It may be used as an agricultural mulch and soil conditioner, but often it creates storage problems and pollution. A controlled anaerobic fermentation to produce methane and a more stable residue will be carried out. The residual solids could be used as organic fertilizer and/or as animal feed. Ms de Porres will quantify the biogas produced from fresh coffee pulp, containing some 75% moisture, and from liquid from fresh pulp. Different types of digesters will be used, such as batch, continuously stirred tank type and upward flow tubular type, empty or packed. Gas composition will be determined by gas chromatography. The nutritive value of the dry residual solids will be assessed and feeding trials will be carried out. It is expected that toxic factors originally present in the pulp will disappear in the process.

/fermentation/ /agricultural wastes/ /coffee/ /biogas/ /fertilizers/ /feed/ /pollution control/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E253: Dr Mohamed Salleh Ismail, Department of Food Science and Technology, Universiti Pertanian Malaysia, (UPM), SERDANG, Selangor, Malaysia

"Study of fermented products from Tilapia"

IFS funding: 19200 SEK 1977

Fermented fish products are important as condiments and also as a source of animal protein. Tilapia is readily-available in fresh waters in Malaysia, and has no commercial value there. Dr Ismail will start by preliminary studies of chemical and microbial characteristics of the tilapia, such as amino acid profiles and mineral and vitamin analyses. Fish sauce and paste will initially be produced from tilapia by conventional methods such as acid hydrolysis and enzymatic hydrolysis using locally-available proteases such as papain and bromelin. Fish sauce will also be produced with fungal enzymes from Aspergillus oryzae at different temperatures. The content of total nitrogen, soluble and volatile nitrogen and amines, and also the soluble and total solids, reduced sugar will be analyzed. The microbial flora will be studied and presence of food poisoning microorganisms will be investigated. The final product will be compared to the best brands available on the market. Attempts will be made to develop an economical village-scale plant.

/food technology/ /fermentation/ /fish/ /toxic substances/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E258: Mr Paiboon Thammarutwasik, Department of Agro-Industry, Faculty of Natural Resources, Prince of Songkla University, HAAD YAI, Thailand

"Development of cashew apple products in Thailand"

IFS funding: 12700 SEK 1978 17500 SEK 1981

Cashew trees are widely cultivated in arid areas in Thailand, and are important for nut crops, particularly in the southern part of the country. The cashew apple, which is a small fruit from which the nut grows, is mostly discarded. It has so far been little utilized in Thailand. Mr Paiboon Thammarutwasik will investigate means to process the cashew apple to finished products, such as juice, wine, vinegar and candies. The product quality will be studied by analyses of chemical and physical properties, and by panel testing. Product properties will be investigated to develop storage methods.

/food technology/ /fruits/ /agricultural wastes/

Grantee E277: Ms Verma Cayabyab, Natural Science Research Center, University of the Philippines, (UP), Diliman, QUEZON CITY 3004, Philippines

"Microbial protein production from wastes; slurry fermentation"

IFS funding: 28200 SEK 1978 44000 SEK 1979
41500 SEK 1980 40000 SEK 1981

The supply of meat in the Philippines is not adequate and prices are high. Ms Cayabyab will study the utilization of selected strains of fungi and yeasts which can convert agricultural wastes into protein-rich feeds for poultry and swine. Large quantities of the banana crop do not meet export standards; such rejects will be used to produce singe-cell protein. Isolates of fungi (Aspergillus niger, A. foetidus) and yeast (Endomycopsis fibuligera) will be grown in banana slurry. The carbohydrate conversion efficiency and increase of digestibility will be determined under different temperatures, pH and substrate concentration. Protein analyses and feeding tests will be conducted; the conversion efficiency of the different species, as well as their protein content will determine whether they are suitable for single-cell protein production.

/fermentation/ /agricultural wastes/ /bananas/ /feed production/ /single-cell proteins/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E278: Dr Faustino Sineriz, Planta Piloto de Procesos, Industriales Microbiológicos, (PROIMI), Av Belgrano y Pasaje Caseros, 4000 SAN MIGUEL DE TUCUMAN, Argentina

"Production of methane and single-cell protein from bagasse and related agricultural wastes"

IFS funding: 32900 SEK 1978 25800 SEK 1979

In the region of Tucumán about 600 000 tons of sugar are produced per year. Some 15 sugar mills in the region process the whole crop, and bagasse and other sugar industry wastes are abundantly available. Dr Sineriz aims at etablishing a stable process, using the simplest possible technique for the production of methane and single-cell proteins by fermentation of sugar cane wastes. Bagasse would first be anaerobically fermented with cellulolytic and methanogenic bacteria to obtain methane, which can be used as fuel in industries. The soluble products from this fermentation will be used as carbon sources for the production of single-cell proteins. The minimum medium needed will be determined, as well as the conditions for stability, influence of pH, temperature, etc. The single-cell proteins will be tested for toxicity and nutritional value on rate, poultry and dairy cattle.

/fermentation/ /agricultural wastes/ /sugar/ /biogas/ /feed/ /single-cell proteins/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E279: Dr Mouhoussine Nacro, Département de Chimie, Institut Supérieur Polytechnique, Université de Ouagadougou, B P 7021, OUAGADOUGOU, Upper Volta

"Production of enriched compost and of energy in rural areas"

IFS funding: 23500 SEK 1978

Severe soil degradation and a shortage of fuel are common problems for the Sahel countries. The high cost of fertilizers and oil make these problems even worse. Dr Nacro aims at establishing a simple and economic method to produce methane as fuel in households and small industries. Cellulosic wastes will be anaerobically fermented to produce methane; the remaining substrate will be used for compost enrichment. When a suitable construction technique for a plant has been developed, Dr Nacro will try out the best method for rapid gas production. The composition of the gas will be analyzed and transportation and utilization problems studied. The remaining substrate and enriched compost will be chemically and biochemically analysed, and bacteriological studies will be carried out. Agronomical field trials will be made to determine the best use of the compost.

/fermentation/ /agricultural wastes/ /biogas/ /fertilizers/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E315: Dr Mearle Barrett, Jamaican Bureau of Standards, 6 Winchester Road, KINGSTON 10, Jamaica

"Toxicological evaluation of hypoglycin in ackee"

IFS funding: 13500 SEK 1978 8800 SEK 1981

Canned ackee fruits, Blighia sapia, were formerly an important export product in Jamaica. Lack of sufficient data on the toxicological components and their removal has reduced the exportation. Dr Barrett will make toxicological studies of the ackee, and develop a reliable method for quantitative determination of the occurrence of hypoglycin in the arilli and brine of the canned fruit. A processing technique for ackee, to obtain a hypoglycin-free product for export, will also be developed.

/food technology/ /canned food/ /fruits/ /toxic substances/

Grantee E323: Mr Moussa Souane, Institut de Technologie Alimentaire, B P 2765, Hann-DAKAR, Senegal

"Production of nététou, a vegetable cheese"

IFS funding: 22000 SEK 1979

Food preparation by fermentation is not common in West Africa. Nététou is a vegetable cheese produced by an uncontrolled fermentation process of leguminous seeds and is, in spite of its bad smell, one of the few fermented products that is commonly consumed. Mr Souane will try to improve the nététou by isolating the active microorganisms and make comparative studies on different leguminous seeds to select the best substrate. When the fermentation process can be controlled, attempts will be made to improve the smell of the product. A suitable technique for small-scale industry will also be developed.

/food technology/ /fermentation/ /leguminosae/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E349: Dr Linda Mabesa, Institute of Food Science and Technology, College of Agriculture, University of the Philippines at Los Banos, (UPLB), College, LAGUNA 3720, Philippines

"Improvement of the nutritive value of legumes by germination"

IFS funding: 35200 SEK 1979 40000 SEK 1981
37410 SEK 1982 Completed 1983

Dr Mabesa will try to improve the nutritive value of different legumes through germination. The relative nutritive value will be microbiologically evaluated before and after germination by using Tetrahymena pyriformis. The amino acid composition will similarly be evaluated by using Streptococcus faecalis and Pediococcus cerevisiae. The vitamin content will also be investigated. Product development from the flour prepared from each kind of germinated legumes and from their mixtures will be conducted to prepare nutritious products. Community feeding programmes will be conducted to evaluate their effects on, for instance, weight gain.

/food technology/ /leguminosae/ /nutritive value/

Grantee E350: Dr J. Ayo Odunfa, Department of Botany, University of Ibadan, IBADAN, Nigeria

"Development of starter cultures for the production of indigenous fermented food condiments"

IFS funding: 44000 SEK 1979 35200 SEK 1980
36400 SEK 1981

Fermented foods are common in the Nigerian diet. Their preparation is made in the home according to traditional methods. Dr Odunfa will try to develop simple modernized preparation techniques, based on the traditional processes for the fermentation of water melon (Citrullus vulgaris), castor oil seed (Ricinus communis), and African locust bean (Parkia spp.). To develop effective starter cultures, the microorganisms involved in the fermentation will be isolated, and the promising strains will be selected and tested. The optimum conditions for fermentation will be studied as well as the growth physiology of the microorganisms. These fermented foods can then be produced in a shorter time with a more consistent and superior quality.

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E351: Ms Endang Suprapto, National Institute for Chemistry, Jalan Cisitu Sangkuriang, BANDUNG, Indonesia

"The effect of Rhizopus oligosporus on aflatoxin B1 reduction in fermented peanut pressed cake"

IFS funding: 8800 SEK 1979 22400 SEK 1981

Tempe bungkil is a relatively cheap source of protein and fat, made of fermented peanut pressed cake, and consumed in place of meat. Ms Suprapto will carry out the fermentation process by using different amounts of spores of Rhizopus oligosporus, and analyze the contents of aflatoxin B1 at different stages of the process. A number of other factors, such as moisture content, total protein content, pH, etc., will also be investigated. The optimum fermentation conditions and amount of spores to obtain maximum reduction effect on aflatoxin B1 content will then be determined. The result will enable the production of a more hygienic and safe fermented product.

/food technology/ /fermentation/ /toxic substances/ /groundnuts/

Grantee E352: Mr Kwaku Nyako, Department of Biological Sciences, University of Science and Technology, KUMASI, Ghana

"Corn dough fermentation to produce kenkey, porridge and other Ghanaian dishes"

IFS funding: 22000 SEK 1979

Fermented corn dough is common food in Ghana. Improper fermentation gives acidic or tasteless products, and undesirable microorganisms may have harmful effects on the product. Mr Nyako will isolate the microorganisms involved in the fermentation process, and study their biochemical characteristics and mode of preservation. Pure cultures will be inoculated on corn dough, as well as combinations, to determine suitable inoculum composition and amount to obtain a product of superior quality.

/food technology/ /fermentation/ /maize/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E394: Dr Tricita Quimio, Department of Plant Pathology, College of Agriculture, University of the Philippines at Los Banos, (UPLB), College, LAGUNA 3720, Philippines

"Cultivation of some tropical mushrooms on agricultural wastes"

IFS funding: 28000 SEK 1980 31500 SEK 1981
29000 SEK 1982

In the Philippines only a few mushroom species out of at least 50 known edible ones are being cultivated. Dr Quimio will try to develop techniques to cultivate some selected edible species. Laboratory experiments will be carried out with Oudemansiella canarii, Collybia reinakeana, Calvatia lilaciana, and Lentinus sajor caju grown on both solid and liquid media, and on agricultural wastes, such as sawdust, rice hulls, rice straw, and coconut husks. Ipil-ipil (Leucaena leucocephala) and winged beans (Psophocarpus tetragonolobus) will also be tested as substrates. The environmental requirements for fruiting will be studied, and recommendations for bulk cultivation formulated.

/fungi/ /cultivation systems/ /agricultural wastes/

Grantee E395: Dr Clara Davide, Dairy Training and Research Institute, University of the Philippines at Los Banos, (UPLB), College, LAGUNA 3720, Philippines

"Preparation and characterization of a potential calf rennet substitute from adult goats, carabaos and cattle."

IFS funding: 38808 SEK 1979 49500 SEK 1981
29000 SEK 1982

The commonest commercial rennet for the manufacture of cheese is obtained from the abomasum of unweaned calves. In order to increase the meat supply, calves are slaughtered less often than before, and calf rennet is in short supply. Dr Davide will investigate alternative sources of rennet extract. Abomasum from adult carabaos, goats and cattle will be subjected to different methods of preparation prior to extraction. Characterization and screening of the dfferent rennet extracts with regard to, e.g., milk clotting activity, colour, odour, storage stability and microbiological qualities will be made. Panel tests will be carried out to evaluate the cheese products.

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E428: Dr Reynaldo Mabesa, Institute of Food Science and Technology, College of Agriculture, University of the Philippines at Los Banos, (UPLB), College, LAGUNA 3720, Philippines

"Studies on the fermentation of fish sauce"

IFS funding: 26975 SEK 1980 42000 SEK 1981
46890 SEK 1983

The traditional process of producing fish sauce usually takes between eight months and one year. Under unfavourable conditions the time required may be longer. Attempts will be made in this project to standardize and shorten the fermentation procedure so that there will be quicker turn-over, resulting in more economical manufacture of fish sauce. The microflora of the fermenting medium will be monitored and effects of temperature and salt purity investigated.

/food Technology/ /fermentation/ /fish/

Grantee E429: Dr Babu Siradhana, Agricultural Research Station, University of Udaipur, Durgapura, JAIPUR 302 004, India

"Mycotoxin formation on maize"

IFS funding: 20750 SEK 1980

Storage of grain is often very poor in rural India. Climatic conditions are conducive to mould infection and mycotoxin production. Dr Siradhana will study mycotoxin production on mould-infected maize grains and its variation during the year. The project will also involve studies on the ability of different mould isolates to produce mycotoxins on maize grain and the effect of environmental factors on mycotoxin formation.

/food technology/ /toxic substances/ /fungi/ /maize/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E430: Dr Li Zu-yi, Shanghai Institute of Organic Chemistry, Academia Sinica, 345 Linglin Lu, SHANGHAI, China

"Production of yeast protein from n-alkanes for animal feed"

IFS funding: 28000 SEK 1982

Strains of yeasts from n-alkanes and suitable for single-cell production will be selected and isolated. A series of screening procedures will be performed to determine the nutritional and conditional growth requirements, growth rate and ability of the isolates to adapt to high temperature. Chemical analyses will be carried out to determine the protein content and amino acid composition of the yeasts, as well as their contents of condensed ring aromatic compounds. The aim is to select a non-toxic strain that will grow rapidly, give a high yield of protein, have a high conversion rate of n-alkanes, and possess high nutritive value.

/proteins/ /yeast/ /industrial wastes/ /feed production/ /single-cell proteins/

Grantee E431: Prof Sundara Rajaguru, Department of Animal Science, University of Peradeniya, PERADENIYA, Sri Lanka

"Integration of dairy, biogas and fish production"

IFS funding: 33200 SEK 1980 33600 SEK 1981

Sri Lanka has experienced a severe energy crisis and there is a great potential for introduction of biogas technology. Data on details of the potential of biogas production are, however, scarce. Prof Rajaguru will study the dung output of local cattle, buffaloes and swine and determine their potential for biogas production. The biogas yielding potential of local, under-utilized grasses will also be evaluated. Biogas production efficiency of Indian and Chinese systems will be compared. Finally, optimum possibility of using fermented slurry as pond fertilizer and feed for mono-gastric animals will be studied.

/fermentation/ /agricultural wastes/ /biogas/ /fertilizers/ /feed/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E432: Dr Jayasuriya Bandara, Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, PERADENIYA, Sri Lanka

"Aflatoxin and other postharvest disease problems in Sri Lanka"

IFS funding: 38740 SEK 1980

There is no information on postharvest crop losses in Sri Lanka. Dr Bandara will survey postharvest diseases in different production zones. The etiology of postharvest diseases will be studied and various chemical treatments for prevention of such diseases will be evaluated. The occurrence of aflatoxin and other mycotoxins in grain, rice, coconut oil and sesame oil will be monitored. In addition, the different storage practices in Sri Lanka will be evaluated in order to suggest methods to minimize aflatoxin contamination. In this investigation efforts will be made to determine whether there is a correlation between aflatoxin contamination with liver cancer and cirrosis in Sri Lanka.

/food technology/ /fungi/ /toxic substances/ /food crops/

*** /postharvest losses/

Grantee E433: Mr Gannoruwa Upawansa, Postgraduate Institute of Agriculture, University of Peradeniya, Old Galaha Road, PERADENIYA, Sri Lanka

"Evaluation of crop residues and water plants for biogas production"

IFS funding: 33200 SEK 1980

One constraint for the development of biogas in rural areas is the short supply of animal dung and urine. Theoretically, biogas can easily be produced from straw, grass and water plants, but it has been more difficult to devise practical methods. If adequate techniques can be developed to produce biogas from these materials, the potential for biogas production in Sri Lanka would increase considerably. Mr Upawansa will optimize the conditions for biogas production from fiber with minimum amounts of dung or substitutes for dung. Experiments will be done with nitrogen sources such as urea, Azolla and leguminous plants.

/fermentation/ /agricultural wastes/ /biogas/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E436: Dr Chen Yu-mei, Institute of Microbiology, Academia Sinica, BEIJING, China

"Genetics of ergot organisms"

IFS funding: 32000 SEK 1980 40000 SEK 1981
75000 SEK 1982

Ergot alkaloids such as ergometrine are important drugs in obstetrics. The alkaloids can now be produced through fermentation by means of Clariceps purpurea, but strain improvement is needed to obtain a higher yield and shorten the fermentation cycle. Dr Chen will investigate the genetic regulation of ergot alkaloid biosynthesis. The project also involves genetic manipulation at cellular and molecular levels.

/fermentation/ /drugs/ /genetic improvement/

Grantee E480: Dr Isworo Kuntjoro, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia, Jalan Salemba Raya 4, JAKARTA, Indonesia

"A study on the residue of "brem bali" as a potential source for human food"

IFS funding: 35200 SEK 1980 44800 SEK 1981

"Brem bali" is a traditional fermented drink made out of glutinous rice. The residue left after the fermentation process consists mainly of soft rice grains and microorganisms, and is given to cattle or poultry as feed. Dr Kuntjoro will determine the nutrient contents of the residues from the "brem bali" preparation, and investigate the possibility of utilizing it for human food. The physiological and biochemical characteristics of the inoculum will be studied, as well as the fermentation process of the solid substrate. Simple recipes will be tried out to utilize the residue as snacks or as side dishes. Storage methods for the residue will also be studied.

/food technology/ /fermentation/ /alcoholic beverages/ /rice/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E527: Ms Ninfa Pelea, College of Fisheries, Bicol University, TABACO, Albay, Philippines

"The utilization of sea urchin gonads for food"

IFS funding: 47250 SEK 1981

The Philippines has vast fishery resources, but the demand for fish is still barely met. The utilization of minor resources, like sea urchins, would increase the supply of marine products. Ms Pelea will try to make a tasty and marketable product from sea urchin eggs for human consumption. A suitable formula for a fermented product will be developed, and the conditions for storage and marketing investigated. Processing methods to prepare dried sea urchin egg powder will also be devised. Pre-drying conditions will be investigated, as well as appropriate methods of storing and marketing the product.

/food technology/ /fermentation/ /molluscs/

Grantee E568: Ms Erinma Akpala, Department of Microbiology, University of Nigeria, NSUKKA, Nigeria

"Lactic acid bacteria in cassava fermentation for garri production"

IFS funding: 26000 SEK 1981

Garri is an important food in Nigeria and throughout West Africa. It is produced by fermentation of cassava. Several researchers have tried to characterize the microorganisms responsible for this fermentation and they have had various results. Ms Akpala will try to make a conclusive characterization of the microorganisms responsible for the texture and flavour of garri, using standardized methods. Seed cultures of the proper organisms will be made available to local producers which might then be able to reduce the production time of garri.

/food technology/ /fermentation/ /cassava/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E569: Dr Amaret Bhumiratana, Department of Microbiology, Faculty of Science, Mahidol University, Rama VI Road, BANGKOK 4, Thailand

"Genetic manipulation of a natural Thai koji mold for improved soy sauce production"

IFS funding: 56000 SEK 1981 67500 SEK 1983

Soy sauces play a major role in the diet of Thailand and throughout Southeast Asia. Their popularity depends on the flavour as well as the colour, which vary among the different brands. Traditionally, soy sauce in Thailand is produced in small-scale factories. Starting with selected mutants of Aspergillus flavus var columnaris, Dr Amaret Bhumiratana will use genetic recombination techniques to produce strains which have high activities of protease and amylase and also have light spore colour. These strains will improve the soy sauce quality and they will be made available to local producers. In addition, the project will serve as an initial step in developing genetic engineering methodology relevant to Thailand.

/food technology/ /fermentation/ /soybeans/

Grantee E570: Dr P Geervani, College of Home Science, Andhra Pradesh Agricultural University, HYDERABAD 500 004, India

"Nutritive value of legume vegetables"

IFS funding: 28210 SEK 1981

A number of legume vegetables are grown in backyards of rural parts of Andhra Pradesh. They are available throughout the year and constitute an important source of nutrients at a low cost, but some of the legumes contain anti-nutritional factors like oxalates and phytates. Dr Geervani will study the nutritive value of regional legume vegetables at various stages of processing, i.e., before, at and after the harvesting, during storage and after home processing. She will also determine the levels of oxalate and phytate at these stages. The digestability of proteins and carbohydrates in the legume vegetables will be determined.

/food technology/ /leguminosae/ /nutritive value/ /toxic substances/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E571: Mr Crisanto Lopez Junior, Natural Science Research Center, University of the Philippines, (UP), Diliman, QUEZON CITY 3004, Philippines

"Microbial ensilation of trash fish for animal feeds"

IFS funding: 42950 SEK 1981 69280 SEK 1983

The Philippines depend on imported animal feed supplemented with protein such as fish meal. The reason for this is that fish meal processing is capital-intensive and requires adequate skills and facilities which are seldom available in the Philippines. Microbial ensilation of trash fish is a process based on simple technology and low capital input. Mr Lopez will develop such a process for microbial fermentation of trash fish. Local starch materials from cassava and coconut wastes will be mixed with the ensilage to improve its animal feed potential and facilitate storage and transportation.

/fermentation/ /feed production/ /agricultural wastes/ /fish/

Grantee E572: Ms Elisabeth Que, Natural Science Research Center, University of the Philippines, (UP), Diliman, QUEZON CITY 3004, Philippines

"Utilization of microbial protein - enriched pineapple and mango wastes for animal feed"

IFS funding: 56000 SEK 1981 80000 SEK 1983

Pineapple and mango wastes constitute a major and bulky pollution problem in the Philippines. These wastes, however, can be fermented to provide low-cost feed for animals. Since the cost of commercial feed is steadily rising, the benefits of low-cost feed to all animal raisers are obvious. Ms Que will develop a low technology process to ferment wastes from pineapples and mangoes. The resulting product, enriched with protein, will be tested for its nutritive value in livestock and poultry.

/fermentation/ /agricultural wastes/ /fruits/ /feed production/ /pollution control/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E581: Prof Kanagasabai Theivendirarajah, Department of Botany, University of Jaffna, Thirunelvely, JAFFNA, Sri Lanka

"Studies on the microbial fermentation of Borrassus flabellifer (Palmyrah palm) sap"

IFS funding: 22400 SEK 1981

The phloem sap from the Palmyrah palm is used to produce alcoholic beverages which are commonly used in Sri Lanka. Very little is known about the microorganisms involved in these fermentation processes. Prof Theivendirarajah intends to characterize the yeasts and bacteria responsible for the fermentation of the palm sap. He will also select strains which could be used for vinegar production from the palm sap. The collection of the Palmyrah palm phloem sap is presently a difficult and time-consuming operation. Prof Theivendirarajah will also try to design better methods for the sap collection.

/food Technology/ /fermentation/ /alcoholic beverages/ /coconut palms/

Grantee E606: Ms Zhu Ying fang, Institute of Microbiology, Academia Sinica, BEIJING, China

"Molecular genetics and genetic engineering of Streptomyces"

IFS funding: 58000 SEK 1982 75000 SEK 1983

Streptomyces are important sources of antibiotics. Further improvement of strains for getting higher yields and shorter fermentation cycles is needed. Ms Zhu will develop techniques to isolate plasmid DNA's which will then be mapped with endonucleases. Methods to clone the genes responsible for the biosynthesis of antibiotics will be developed in order to establish a DNA recombination system for Streptomyces. These experiments are expected to result in improved strains with better yields of antibiotics as well as valuable information on the selection of plasmid genetic properties for antibiotic synthesis in Streptomyces.

/microbiology/ /antibiotics/ /genetic improvement/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E607: Ms Vicenta Gacutan, Division of Biological Sciences, University of the Philippines in the Visayas, ILOILO CITY, Philippines

"Production of marine fungal proteins and possible feed for fish and crustaceans"

IFS funding: 60320 SEK 1982

With the increasing importance of aquaculture, there is a need for low-cost sources of protein for use as fish feed. Marine fungi will be screened for their capacity to grow on bagasse and rice straw. The growth kinetics and the efficiency of degrading the agricultural wastes will be investigated. Ms Gacutan will use the results from these studies to design a low-cost feed for fish and crustaceans.

/fungi/ /agricultural wastes/ /feed production/ /fish/ /shellfish/

Grantee E608: Dr Lee Hyong Joo, Department of Food Science and Technology, Seoul National University, SUWON, Republic of Korea

"Coprecipitation of whey and soybean proteins to make soy-cheese"

IFS funding: 40020 SEK 1982

Soybean products are an important source of protein in East Asia. It meets requirements for energy and total amount of protein but it lacks some essential amino acids. In order to supplement soybean products with additional nutrients, Dr Lee will investigate the possibility of mixing soy-milk and whey to produce soy-cheese. The conditions of optimum coprecipitation will be studied following variables such as temperature, pH, salt concentration and heating time. In this way the valuable whey proteins will be utilized as food instead of being wasted.

/food technology/ /soybeans/ /nutritive value/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E609: Mr Festus Numfor, Centre de Recherches Agronomiques, Institut de la Recherche Agronomique, (IRA), B P 13, NYOMBE, United Republic of Cameroon

"Postharvest technology of root and tuber crops: cassava fermentation"

IFS funding: 46400 SEK 1982

Products made from fermented cassava flour are eaten daily in Western and Central Africa. The processing of fermented cassava flour is carried out by old traditional methods which could be improved in many ways. Mr Numfor will investigate possibilities of improving the fermentation of cassava by reducing the fermentation time. He will also develop better drying and milling techniques and attempt to prolong the storage. He will also study the microorganisms involved in fermentation to develop better inocula.

/food technology/ /fermentation/ /cassava/

Grantee E610: Ms Maria del Carmen de Arriola, Instituto Centroamericano de Investigacion y Tecnologia Industrial, (ICAITI), Apartado Postal 1552, GUATEMALA, Guatemala

"Rheological studies of banana puree according to different ripening processes"

IFS funding: 40600 SEK 1982

A substantial part of the banana crop in Guatemala is discarded because it is overripe or, if ripe, does not otherwise fulfil adequate characteristics. Ms de Arriola will study the rheological, chemical and physical properties of banana puree from ripe bananas using different methods of ripening.

/food technology/ /agricultural wastes/ /bananas/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E611: Dr Vithaya Meevootisom, Department of Microbiology, Faculty of Science, Mahidol University, Rama VI Road, BANGKOK 4, Thailand

"Antibiotic and antibiotic enhancing substances produced by new actinomycetes from Thai soils"

IFS funding: 49300 SEK 1981

Competence in biotechnology is necessary to provide a base for the development of an antibiotic production industry. Thailand is heavily dependent on importation of antibiotics and lacks the basic technology for adequate research and development for its own production of antibiotics. Dr Meevootisom will isolate actinomycetes from various localities in Thailand and prepare stock cultures of these. The isolates will be screened for antibiotic activities. The results of the project will be a valuable resource for other researchers and could help in the creation of an antibiotic production capability in Thailand.

/microbiology/ /antibiotics/

Grantee E613: Mr Nguyen Ngoc Thao, Institute for Experimental Biology, 1 Mac Dinh Chi Street, HO CHI MINH CITY, Viet Nam

"Upgrading the protein quality of sweet potato and cassava by fermentation with a mutant of Aspergillus niger"

IFS funding: 80000 SEK 1983

After rice, sweet potatoes and cassava are the two most important staple crops in Viet Nam. The nutritive value of these is however low. Mr Nguyen will upgrade the nutritive value of sweet potatoes and cassava by fungal growth using a mutant of Aspergillus niger. His study will include research on the growth conditions of the fungus and on the nutritional composition of the resulting products, which will be used for food and feed purposes.

/sweet potatoes/ /cassava/ /nutritive value/ /fungi/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E647: Dr S Alfred Traore, Institut Supérieur Polytechnique, Université de Ouagadougou, B P 7021, OUAGADOUGOU, Upper Volta

"Investigation of the energy value of latex-containing plants and straw wastes in biogas production"

IFS funding: 22500 SEK 1982

The development of alternative sources of energy is especially important for Upper Volta, which depends heavily on oil imports. There is an abundance of latex-containing plants and straw wastes, neither of which can be used for other purposes. Dr Traore will investigate the possibility of using these plant materials for biogas production. He will try to find the optimal conditions for methane production by varying the composition of the substrate, pH, temperature and the character of the microbial inoculum.

/fermentation/ /agricultural wastes/ /biogas/

Grantee E648: Dr Carlos Pascual, Centro Nacional de Investigaciones Científicas, (CNIC), Apartado 6990, HABANA, Cuba

"Production of L-lysine in Candida utilis"

IFS funding: 75000 SEK 1982

Most plant proteins are deficient in lysine, which is an essential amino acid. During the past years an industry based on yeast production has been developed in Cuba. This industry can provide the basis for lysine production if appropriate yeast strains can be found. Dr Pascual will study the pathways of lysine biosynthesis in Candida utilis. He will then try to induce mutants with high lysine production, optimal growth conditions and stability. These selected mutants will be used for pilot plant studies.

/yeast/ /amino acids/ /genetic improvement/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E649: Ms Felixtina Jonsyn, Njala University College, University of Sierra Leone, Private Mail Bag, FREETOWN, Sierra Leone

"Studies on fungal contamination of ogiri (fermented sesame seed) and possible mycotoxin production"

IFS funding: 75000 SEK 1982

Ogiri is a common and popular fermented food in Sierra Leone. It is produced by fermentation of sesame seeds. Ms Jonsyn will identify the mycoflora of sesame seeds before and after fermentation. She will also study the toxin production of the isolated fungi. The results of these studies will permit a better control of the ogiri production in order to avoid health risks associated with the toxins.

/food technology/ /fermentation/ /fungi/ /oilseeds/ /toxic substances/

Grantee E650: Dr R Perez-Garcia, National Crop Protection Center, (NCPC), UPLB, College of Agriculture, College, LAGUNA 3720, Philippines

"Storage fungi associated with rice and corn in the Philippines"

IFS funding: 37500 SEK 1982

Rice and corn are, respectively, the first and second most important food crops in the Philippines. They are also important sources of feed. Fungi are the major causes of spoilage during storage and a more thorough knowledge of the fungal flora is needed in order to formulate effective control measures. Dr Perez-Garcia will isolate and identify storage fungi from samples taken from various market places. The frequency of the different species will be investigated as well as the level of mycotoxin production from the various isolates. The results will be used to formulate control measures specifically designed for different local circumstances.

/food technology/ /fungi/ /cereals/ /toxic substances/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E651: Ms Marlene Roeckel von Bennewitz, Facultad de Ingenieria, Universidad de Concepción, Casilla 53-C, CONCEPCION, Chile

"Ethanol production by yeasts from amilaceous agricultural wastes in the Arauco province"

IFS funding: 115000 SEK 1982

The province of Arauco is one of the poorest in Chile. It produces about 85 000 tons of potatoes per year, 25 per cent of which is lost because of spoilage, inappropriate storage facilities, dehydration, price policies and inaccessibility. Ms Rceckel von Bennewitz will characterize the potato waste materials and their possible use in ethanol-producing microbial processes. She will also investigate the availability and geographic distribution of these wastes.

/yeast/ /agricultural wastes/ /alcohol/

Grantee E652: Dr Morenike Sanni, Biology Department, The Polytechnic, IBADAN, Nigeria

"Microbial flora of stored food: gari and yam flour"

IFS funding: 52500 SEK 1982

Gari is a fermented food obtained from the root tuber of cassava (Manihot esculenta), and yam flour is obtained from the stem tuber of yam (Dioscorea sp.). Both products are the staple food for millions of people in Western Africa. Spoilage of these food items is common and products containing an unhealthy microbial load are placed on the market. Dr Sanni intends to find out the physical properties of fresh and stored products. The microbial flora of gari and yam flour will be investigated in order to formulate a standard of quality which could be used in controlling the quality of these products in the future.

/food technology/ /fermentation/ /agricultural wastes/ /root crops/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E686: Dr Elias Escueta, Institute of Food Science and Technology, College of Agriculture, University of the Philippines at Los Banos, (UPLB), College, LAGUNA 3720, Philippines

"Development of meat substitutes and extenders from local legumes by the tempeh fermentation process"

IFS funding: 71250 SEK 1983

Tempeh is produced in Indonesia from soybean products inoculated with a fungi to provide meat-like texture. Tempeh is accepted as a meat substitute. In the Philippines there is a need to complement the carbohydrate-rich diet with proteins, and it is believed that a tempeh-like product could serve this purpose. Dr Escueta will investigate the possibility to utilize local legumes in the tempeh process to produce meat substitutes and extenders of comminuted meat products. He will also study the acceptability of these products in the Philippines.

/food technology/ /leguminosae/

Grantee E687: Dr Alberto Herrera G, Facultad de Biologia, Universidad de la Habana, San Lazaro y L, Vedado, HABANA 4, Cuba

"Microbial biomass and ethanol production from cellulosic wastes of sugar cane"

IFS funding: 56250 SEK 1983

Huge amounts of waste products are generated in the processing of sugar cane, which is the main crop of Cuba. Most of these waste products are cellulosic and need pretreatment before being subjected to microbial processing. Dr Herrera G will attempt to utilize bagasse, pith and leaves from sugar cane as substrates for microbial conversion into biomass and ethanol. The cellulosic materials will be degraded by cellulolytic microorganisms in order to provide better substrates for bacteria and fungi which produce biomass for food and feed, and ethanol for energy purposes.

/alcohol/ /fermentation/ /biomass/ /sugar cane/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E688: Mr Salad Farah Gutale, Faculty of Medicine, Somali National University, P O Box 1664, MOGADISHU, Somalia

"Domestication and nutritional value of the yeheb nut, Cordeauxia edulis"

IFS funding: 75000 SEK 1983

The yeheb nut, Cordeauxia edulis, is a plant which survives in very arid regions. The seeds of the plant are used as human food, while leaves and branches are browsed by camels and goats even during the driest season. Mr Gutale will perform feeding trials with the nut in order to determine the nutritional and anti-nutritional characteristics of the seeds. It is hoped that the results of the project will allow the nut to be officially recommended as an important part of the diet for the population in the arid regions.

/food technology/ /nutritive value/

*** /yeheb nut/

Grantee E689: Mr Edgar Uzcategui, Escuela Politécnica Nacional, P O Box 2759, QUITO, Ecuador

"Protection and conservation of food by ionizing radiation"

IFS funding: 75000 SEK 1983

Between 20% and 40% of food is lost in Ecuador due to spoilage. The conventional systems of food preservation (freezing, drying, heat treatment) require a lot of energy and are therefore expensive. It is believed that preservation by irradiation can be an adequate alternative for Ecuador. Mr Uzcategui will study the organoleptic and biochemical characteristics introduced by irradiation of cereals and tropical fruits (mango, guava, maracuya, durian, naranjilla).

/food preservation/ /food irradiation/ /cereals/ /fruits/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E690: Ms Nguyen Thi Hui, Institute of Applied Microbiology, University of Hanoi, HANOI, Viet Nam

"Isolation and selection of microorganism strains suitable for biomass production from waste water of alcohol factories"

IFS funding: 30375 SEK 1983

The waste water from alcohol factories contain sugar and should, with proper supplementation, be a possible substrate for microbial growth. The grantee will isolate and select yeast strains which are capaple of growth in the waste water, i.e., they should be adapted to low pH and high temperatures. The objective of the project is to reduce the pollution and at the same time produce feed for animals.

/fermentation/ /biomass/ /waste waters/ /pollution control/

Grantee E732: Dr Kasipathy Kailasapathy, Department of Agriculture and Chemistry, University of Peradeniya, PERADENIYA, Sri Lanka

"Development of nutritional gardens and nutritional evaluation of food preparation in homesteads of selected areas in Sri Lanka"

IFS funding: 61600 SEK 1983

Rice is the staple food in Sri Lanka, which is almost self-sufficient in rice production. The rice, however, needs to be supplemented with other nutrients in order to obtain a satisfactory and balanced diet. Dr Kailasapathy will develop recommendations to utilize the backyards for cultivation of plants which can produce a year-round supply of nutrients to complement rice. His research will include chemical analysis to determine the nutritive value and contents of locally-grown vegetables, fruits and tubers. He will also study the cooking procedures to prevent nutritive losses in the preparation of food.

/food technology/ /gardening/ /food crops/ /nutritive value/

FERMENTATION AND APPLIED MICROBIOLOGY

Grantee E733: Dr A Tantaoui-Elaraki, Département de Microbiologie Alimentaire et Biotechnologie, Institut Agronomique et Vétérinaire Hassan II, B P 6202, RABAT-INSTITUTS, Morocco

"Moulds producing mycotoxins and other toxins in Moroccan food and feed"

IFS funding: 70400 SEK 1983

Considerable losses of food and feed are caused by fungal growth, especially in the hot and humid climate of tropical countries. Many of these fungi produce toxins affecting man as well as livestock. Dr Tantaoui-Elaraki will do a survey of fungal flora of various food and feed products to get an idea of the frequency of various species. He will therefore study the toxin production of the most abundant fungi and also investigate the toxicity of the respective toxins. The result will provide the basis for recommendations on storage procedures as well as health risks regarding agricultural products in Morocco.

/food technology/ /toxic substances/ /food contamination/ /fungi/

Grantee E734: Mr Manuel Raices Perez C, Deparamento de Microbiologia Industrial, Av 25 y 158, Municipio Playa, HABANA, Cuba

"Lignin biodegradation for pulp and paper production by the fungi Sporotrichum pulverulentum"

IFS funding: 80000 SEK 1983

In Cuba bagasse, derived from sugar cane, is utilized as a raw material in pulp and paper production. Bagasse contains lignin, which is degraded by physiochemical methods, and results in noxious waste materials. Mr Raices Perez C intends to isolate fungi which can degrade lignin without breaking down the cellulose. The various parameters for lignin biodegradation will be studied in order to optimize an industrial process for treatment of bagasse. The aim is to reduce costs and pollutants in the present processing of bagasse for production of pulp and paper.

/biodegradation/ /agricultural wastes/ /sugar cane/ /pollution control/

INDEX BY SUBJECT DESCRIPTORS

This index is comprised of the subject descriptors used at the end of each grantee's research summary. Most of the terms are taken from the OECD MACROTHESAURUS. Asterisks *** indicate that they are not from this source.

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