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ج. ب. ٣٢٤٣

**ORGANISATION DE L'UNITE  
AFRICAINNE**

Secretariat  
B. P. 3243

Addis Ababa : أديس أبابا

ORIGINAL : English

DISTRIBUTION : GENERAL

CM/981 (XXXIII)

COUNCIL OF MINISTERS

Thirty-third Ordinary Session

Monrovia, Liberia, July

REPORT OF THE SECRETARY GENERAL

ON A PROJECT PLAN FOR AN OAU INTER-AFRICAN CENTRE(S)  
FOR TRAINING AND RESEARCH IN FOOD SCIENCE, TECHNOLOGY  
AND NUTRITION



CM/981

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PROJECT PLAN FOR AN OAU INTER-AFRICAN CENTRE(S)  
FOR TRAINING AND RESEARCH IN FOOD SCIENCE, TECHNOLOGY AND NUTRITION

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Food Science & Nutrition Research Department  
National Research Centre  
Dokki.  
CAIRO, Egypt

August 3rd, 1978

The Secretary General,  
Organization of African Unity,  
P.O. Box 3243,  
Addis Ababa  
Ethiopia

Excellency,

Recommendations of the Team of Experts on an Inter-African Centre for  
Training and Research in Food Science, Technology and Nutrition

On the behalf of the Team of Experts consisting of Prof. S.N. Morcos, Egypt (Chairman), Prof. Dr. A. Omololu, Nigeria and Mr. O.H. El Khidir, Sudan, I have the honour to submit the final project - plan for the proposed Inter-African Centre for Training and Research in Food Science, Technology and Nutrition.

To accomplish the task given to us by the OAU, we held two meetings in Addis Ababa and also undertake a fact finding mission to 17 Member States of the OAU. The Team left Addis Ababa on September 2nd, 1973 to Navraba (Kenya) and went on according to their schedule. On October 6th, 1973, the Egyptian-Israeli conflict started and Cairo Airport was closed so Professor Omololu went back home on October 26th after finishing the visit to Freetown, Sierra Leone. Professor Morcos and Mr. El-Khidir continued their visit to North African countries, then arrived to Cairo, Egypt on November 6th, 1973 when Cairo Airport was opened.

On 31st July 1974, Professor Omololu arrived to Cairo where he visited different University Departments, Research Institutes, Food Industries and held some meetings with the official. Professor Morcos and Mr. El-Khidir did such job in November 1973.

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Professor Morcos and Professor Omololu left Cairo to Khartoum on August 16th, 1974 to go on with their study in Sudan with Mr. El-Khidir. From Khartoum they sent a cable to OAU asking permission to proceed to Addis Ababa to write up their final report, but no reply was received.

Due to the commitments of the members of the team, it was decided to meet on January 23rd, 1978. Only Professor Morcos had arrived and started writing up the report. Professor Omololu and Mr. El-Khidir did not come as they did not receive their air tickets.

Another meeting was agreed upon to be held in Addis Ababa on July 23rd 1978 to finish writing up the report. Only Professor Omololu and Professor Morcos did arrive. They finish writing up the report which they have sent to Mr. El-Khidir (Sudan) for comments.

The team wish to express their thanks and gratitude for the help given to them by the countries they visited in the course of their work.

Also on behalf of the Team, I would like to express to you personally and to the Director of the Scientific and Cultural Department and to your Staff for the preparations undertaken to enable us to execute our task.

It is our hope that our proposal will be processed smoothly so that the proposed OAU-Inter-African Centre(s) for training and research in Food Science, Technology and Nutrition will be established.

Finally, on behalf of the Team, may I, through you, express our gratitude to the Scientific Council Of Africa, the Council of Ministers and the Assembly of Heads of State and Government for the confidence they showed in electing us to undertake this task and giving us the chance for working for the benefit of our beloved Continent, AFRICA.

Please accept, Excellency, the assurances of my highest consideration.

Professor Sabry Riad Morcos  
(Chairman)

The team is composed of :

Professor Sabry Riad Morcos  
Professor and Head of Food Science and  
Nutrition Research Department  
National Research Centre  
Dokki, Cairo, (Egypt) Chairman

Mr. Omar Hag El-Khidir  
P.O. Box 4167  
Khartoum (Sudan) Member

Professor Adewale Omololu  
Professor and Head  
Department of Human Nutrition  
University of IBADAN  
Ibadan (Nigeria) Member

+ Professor Edouard Adjenhoun  
University of Dahomey  
Porto-Novo (Benin) Member

+ Professor Adjenhoun did not join the Team.

The Team was requested to draw up a project plan for the proposed Centre or Centres for Food Science, Technology and Nutrition. The Centre (s) should undertake two main functions :

a) provide training for personnel at postgraduate level in the relevant professional scientific skills, as well as the training of research workers at that level; and

b) make provision of facilities for and undertake advanced research and development to complement, support and stimulate the development efforts of individual Member States.

.../...

To these, the Team added a third function : -

c) The provision of technical services and advice in the fields of Food Science, Food Technology and Nutrition to African States including Food Consumption Studies, Nutritional surveillance, Flow Charts and equipment for Food Technology.

2. In view of the diversity of foods and animals produced, processed and eaten on the vast continent of Africa, of the main languages of Arabic, English and French and of the differing nutritional and cultural problems, the Team recommends that at least two Centres should be sited.

One in Rabat, Morocco - teaching in French and Arabic; and the other in Ibadan, Nigeria, to serve the English speaking countries.

3. The Centre should not be affiliated to any University but may later be associated to one or more universities for the granting of postgraduate degrees. Each Centre should offer its own Certificate, Diploma, Associate and Fellowship courses. A Rector should head each Centre.

4. The two Centres should be managed by one common Council appointed by OAU. Each Centre should have a Board of Management made of its Rector, Vice-Rectors, and all Directors; as well as a Board of Studies responsible for Academic matters composed of all teachers in the Centre.

5. Training provided at the Centres will include :

a) varied intensive short term practical and theoretical courses in the different areas of Food Science, Food Technology and Nutrition to train staff for Member States. These may lead to Certificates and Diplomas.

b) Postgraduate specialised training in the various fields of Food Science Food Technology and Nutrition leading to Associateships, Fellowships and post-graduate degrees.

c) Training of Senior and Intermediate grade workers including Technicians and Field Workers in all aspects of Food Science, Food Technology and Nutrition.

.../...

6. Technical services are to be provided by the Centres to Member States and industries on payment of fees. These services in the fields of Food Science, Food Technology will include sensibility studies, advice on processes and equipment, flow-charts, solution of problems. In the field of Nutrition, the services offered will include the running of in-service training in Member States, carrying of Nutrition Surveys, Baseline studies in Nutrition, analysis of foods and solution of nutrition problems. The Computer Unit will provide services on payment as also the Library and Documentation Unit.

7. The staff requirements of each Centre when fully developed will be :

- 1 Rector
- 2 Vice-Rectors
- 5 Directors
- 10 Professors
- 84 Lecturers, Administrative Officers, Technicians and Secretaries of all grades
- 120 Supporting Junior Staff of all grades

8. Building requirements of each Centre consist of :

Administrative Blocks	....	1850 sq. metres
Teaching Blocks	....	5610 sq. metres
Hostel	....	5930 sq. metres
Workshops	....	710 sq. metres
Living accommodation	....	17100 sq. metres
Others	....	900 sq. metres
		<hr/> 32100 sq. metres

Total Building cost is estimated at US \$ 12,840,000 for each Centre.

Equipment cost for each centre :

Total Capital cost is therefore :

This can be phased as follows :

1st phase	....	7,256,000
2nd phase	....	3,284,000
3rd phase	....	1,560,000
4th phase	....	740,000
		<hr/>
TOTAL :		12,840,000

9. The recurrent cost when each Centre is in full operation is estimated at an average of US \$ 2,558,500

.../...

10. The project should be financed by contribution from ~~the~~ Member States, UNDP, International Organizations including A.B. LEAGUE, OPEC, INDUSTRIES, especially Food Industries and Multinational industries.

There should be created a BUILDING FUND and an ENDOWMENT FUND to make for proper planning for research and development in the Centres.

11. The countries in which the Centres are to be sited should make substantial donations to both the Building and Endowment Funds. The contributions from these countries should also include :

- a) Land and Infrastructure
- b) Diplomatic Immunity to Staff of Centre

12. Rabat or Casablanca (Morocco) and Ibadan (Nigeria) are recommended as suitable sites for the two Centres proposed.

2. The facts that there are :

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(a) 3 main languages and areas of the continent to be covered - Arabic, French and English speaking;

(b) great diversity of crops and products to be studied and the differing climate and soils resulted in many : oils - olive, palm oil, groundnut oil, sesame seed, sunflower seed, cotton seed;

crops - cassava, yams, rice, maize, sorghum, wheat, teff, millet, bananas, plantain, cocoyam, potatoes, beans, cowpeas, peas, soya, beans, tomatoes, mangoes, oranges, pineapples, peppers, spices, vegetables, cocoa, animal and dairy products like meat, poultry, fish, - fresh, cured, fermented, salted, milk, cheese, shrimps, crabs and the need to study these in depth, choose and train in the appropriate processes and technology;

(c) differing staple foods, articles of diet, cultural and socio-economic patterns and eating habits in the different areas,

DECIDED the team in recommending the immediate setting up of 2 Centres for Food Science, Food Technology and Nutrition.

3. One Centre should be sited in RABAT, Morocco, teaching in Arabic and French and cover products of the Mediterranean, sub-tropical and desert areas.

The second Centre should be sited at IBADAN, Nigeria, to teach in English and cover the tropical crops.

4. The Centres do not need to compete or be affiliated to Universities. The Centres should be so staffed and equipped to be able to carry out in-depth studies of problems in the three fields, provide answers and train all types of personnel from Member States. No formal undergraduate courses should be planned. Short and long term intensive courses to prepare for specific tasks and teach new processes and technologies should be aimed at. Programmes should be action oriented as also research. Workers - though not graduate - who have had extensive experience in the field should be given training - also graduates should be prepared for and given experience in their chosen fields.

5. Staff for the Centres should be carefully selected and experience and expertise in industry and practice should be as important as theoretical knowledge.

.../...

Recommendations of the Team of Experts on siting of Centre (s) for training  
And research in Food Science, Food Technology and Nutrition

The OAU Team was composed of the following :

Professor Sabry Riad Morcos  
Prof. & Head of Food Science and  
Nutrition Research Department  
Dokki, Cairo, Egypt Chairman

Mr. Omar Hag El-Khidir  
P.O Box 4167  
Khartoum Sudan Member

Professor Adewale Omololu  
Prof. & Head, Department of Human Nutrition  
University of Ibadan  
Ibadan, Nigeria Member

+ Professor Edouard Adjenhoun  
University of Dahomey  
Porto-Novo, Benin Member

+ Professor Adjenhoun did not join the team.

We have the honour to submit the attached report. In further amplification of the report, we will like to make the following comments and recommendations:

1. The present state of nutrition of the continent is far from good. Future prospects for the proper nutrition of our peoples are not rosy due to population increase outpacing good production, high wastage of good produced due to improper harvesting, pests and spoilage, poor storage and processing and a lack of knowledge of factors that control and affect eating habits, choice of goods for eating, nutritional intake and ways of improving nutrition.

The recent drought in the Sahel and other regions of the continent has highlighted these problems - and we have no answers. There is an urgent need for in-depth studies of our foods. The choice of appropriate ways of harvesting, processing and storage to reduce waste and ensure adequate reserves and ensure adequate nutrition for our people. Everywhere the team went, these needs were expressed and stressed. Every effort should be made to study these problems and train staff to solve them.

.../...

6. The Centres should be headed by Africans of proven theoretical and practical experience commanding international reputation. The posts of RECTOR, VICE-RECTORS and DIRECTORS of Departments should be filled by Africans of merit and foresight.

7. The two Centres should be governed by the Governing Council. The Council should be selected immediately and be responsible for the appointment of the RECTOR. The appointment of the Vice- Rector and Directors should be made by the Council on the recommendation of the Rector.

8. Appointment of staff should be phased, depending on availability of funds, speed of building and training programmes. In the first phase, the Rector, Director of Foods, Director of Nutrition and Director of Administration should be appointed. These should start with planning of training and research programmes, funding, building, staff and student selection and building up of supportive services.

9. The Centres proposed are meant in staffing, equipment and running - to be Centres of excellence of which the OAU, Member States and all Africa should be proud. No centre of excellence can be built or run on annual subventions or grants, whether from OAU funds or from the subscription of Member States. A capital fund for building should be set up and an Endowment Fund for the recurrent expenditure. Contributions to both should be sought from the Arab League, OPEC, International Organizations like UNDP, World Bank, Bilateral aid from USAID, SIDA (Swedish), CIDA (Canadian), DANIDA (Dutch), as well as from Member States of the Organization. OAU should take the lead in seeking funds with the help of ECA, UNESCO and other organizations. In view of the great contribution that these Centres would make to the solution of the World Food Problem, donations of equipment, materials, buildings should also be sought from FAO, WHO, UNICEF, and such organizations. The contributions to the buildings Fund and more so to the Endowment Fund will determine how soon and how the Centres will function. It shall be one of the main functions of the Rectors to seek funds.

.../...



Once the Centres become functioning properly, ~~some funds will accrue from the technical services, consultancy services,~~ mission oriented research and work from Member States and industry.

10. It is important that the member countries in which the Centres are sited ~~make substantial contributions - not only of land and infrastructure,~~ but also of money to both the Building and Endowment Funds.

These countries should also give some immunity to the staff and structure of the Centres.

INTRODUCTION

In 1967 and by resolution CM/Res.116 (IX), the Council of Ministers and the Assembly of Heads of State and Government of the OAU, approved in principle, the proposal to establish Inter-African Centres for Training and Research in Africa. At that time only eight disciplines had been selected in Applied Science and Technology (Document ESCHC/25). But in 1968, at the joint OAU/UNESCO Conference on Education and Scientific and Technical Training in relation to Development in Africa, two more disciplines were added, bringing the total to ten Centres (Documents CM/282 Part 8). Thus the hopes which were expressed in the early meetings of the OAU in 1963, 1964, and 1965 relating to the need to expand the infrastructures for training and for research and development in Africa took an implemented form.

The ten selected areas are :

- i) Earth Science (including geology, geophysics, mineralogy etc.);
- ii) Applied Science and Engineering;
- iii) Food Science and Technology;
- iv) Water Resources, Planning and Development
- v) Marine Science and Technology;
- vi) Human Medicine and Pharmacology;
- vii) Veterinary Science;
- viii) Climatology and Meteorology;
- ix) Basic Sciences (Physics, Chemistry, Biology and Mathematics);
- x) Social Science (Documentation, teaching and research).

2. In implementing this resolution the centre on Earth Science was chosen as pilot scheme and a team of experts was appointed.

3. The Scientific Council for Africa in its 4th meeting in Ibadan from 1 to 4 November 1971, advised that the second Centre to be established is the one for Food Sciences and Technology. The Council proposed a Committee of four African experts to the Council of Ministers meeting in its 19th Ordinary Session.

The names of the team of experts for the Centres for Food Science and Technology are :

.../...

1. Professor Dr. Sabry Riad Morcos  
Prof. & Head of Food Science And  
Nutrition Research Department  
National Research Centre  
Dokki, Cairo, Egypt
  2. Mr. Omar Hag El-Khidir  
P.O. Box 4167  
Khartoum - Sudan
  3. Professor Dr. Adewale Omololu  
Professor and Head of Human Nutrition Department  
University of Ibadan  
Ibadan - Nigeria
  4. + Professor Edouard Adjénohoun  
University of Benin  
Porto-Novo - Benin
- + Professor Adjénohoun did not join the team.

#### Election of Chairman

4. At its first meeting held on the 11th of December 1972 in Addis Ababa, the team of experts elected Professor S.R. Morcos as Chairman, and the OAU Secretariat as Rapporteur to the team.

5. A working paper dated 23rd November 1972 prepared by Prof. Morcos contains a preface and some ideas on siting of the Centres, curricula for training and research in Food science and Technology, Technical assistance to Member States, publications, staff and service, finance and questionnaire, was distributed to the team in its first meeting (Appendix 1)

#### 6. Terms of Reference

The terms of reference of the Team were outlined in a note describing the task of the team was presented by the Secretariat of the OAU (Appendix 2).

7. The team accepted the terms of references and suggested the change of the title of the Centre to be "Centre for Food Science, Technology and Nutrition".

.../...

8. The team prepared questionnaires (Appendices 3 and 4) to be sent to the followings :

a) Member States (Ministries and Departments concerned with Food Science, Technology and Nutrition.)

b) ~~Universities, Institutes and Research Institutes dealing with~~ Food Science, Technology and Nutrition.

The information to be received will be analysed and categorized.

9. It was decided that the following Member States shall be visited in September 1973. The suggested 17 countries were : Ethiopia, Kenya, Tanzania, Madagascar, Zambia, Zaire, Central African Empire, Nigeria, Benin, Ghana, Sierra Leone, Senegal, Morocco, Algeria, Tunisia, Egypt and Sudan.

The main task of the team was to study Food production, Food industries, number and activities of Universities and Research Institutes, mainly the Departments of Agriculture, Animal Health, Food Science, Food Technology, Nutrition, Public Health and allied subjects.

10. The team assembled in Addis Ababa, Thursday September 20th, 1973 where they started their visit to Nairobi (Kenya), Sunday Sept. 23rd, 1973. The visit to Nairobi was not successful as everybody there was busy in the meetings of the World Bank.

11. The team proceeded following the schedule prepared by the Secretariat of the OAU till Sierra Leone (Saturday, October 27th, 1973).

12. Due to the Egypt-Israel conflict and the closure of Cairo Airport Prof. Omololu returned back to Nigeria. Mr. El-Khidir and Prof. Morcos continued their visits to Senegal, Morocco, Algeria, Tunisia and Egypt where they arrived Cairo on Thursday 8th October, 1973.

13. On 31st July, 1974, Prof. Omololu arrived to Cairo and together with Professor Morcos made all the visits and studies in Cairo and Alexandria.

.../...

14. But Professor Omololu and Professor Morcos left for Khartoum on Friday 16th of August 1974 where they met Mr. El-Khidir and the team assembled again and made their visit and study in Sudan.

15. From Khartoum the team sent a cable to OAU Secretariat asking permission to proceed to Addis Ababa to write up their final report, but no reply was received. Each member returned back home.

16. Due to the different commitments of the members of the team, it was finally decided to meet in Addis Ababa, January 2nd, 1978. Only Professor Morcos arrived and started writing up the report. Professor Omololu and Mr. El-Khidir did not come as they did not receive their air tickets.

17. Another meeting was agreed upon to be held in Addis Ababa on July 23rd, 1978 to finish writing up the report. Only Professor Omololu and Professor Morcos did arrive. They finished writing up the report. Due to the absence of Mr. El-Khidir they suggested that the Secretariat of OAU has to send the draft to him in Khartoum (Sudan) for comments.

The following is the result of the visits and study made by the Team.

SEE PART II

STRUCTURE AND ORGANIZATION OF THE CENTRES

1. The two Centres should have comparable structures and be under one Governing Council.
2. The Governing Council should be appointed by OAU and consist of the followings :

OAU Member States	9	4 years
Scientific Council of Africa	2	3 years
Association of African Universities	1	3 years
Host Government	1	
Food Industry	2	3 years
Rectors	2	

The 9 representatives of the Member States will be selected immediately. Every 2 years, 4 and then 5 representatives will retire to be replaced by new members to ensure continuity. Member States will be represented at Council meeting by the relevant Minister or Junior Minister. If either of these Ministers are unable to be present, the Senior Technical Officer in the relevant Member state will deputise. This applies also to the representation at Council meeting of the representative of the host government.

The representative recommended by the Scientific Council of Africa will be chosen as individuals with relevant expertise of the subjects.

The 3 representatives of Industry will be chosen to ensure geographical and product cover.

3. The Council should meet not more than once a year, alternately in each Centre. Thus, the meeting in each Centre should be every two years.

The Chairman of the Council should be elected by OAU.

The Council shall be the supreme authority and proprietor of the Centres on behalf of OAU. Budgets for each Centre will be prepared for two years, presented by the Rector of the Centre at the Council meeting held every two years at that Centre. The Council will approve budgets and release money for expenditure. The Council will decide policy, give guidelines and when needed, specific directives to the Rectors.

The Council shall appoint the Rector. Appointments of the Vice-Rector and Directors will also be made by the Council on the recommendation of the Rector.

The Council will establish its own rules of procedure, form committees and present regular reports on the activities and development of the Centres.

#### ORGANIZATION

4. Each Centre will have a Rector, appointed by the Governing Council for a term of 4 years - renewable for another term of 4 years only once - who shall have overall responsibility for the work of the Centre. He shall also be responsible for seeking funds.

He will, on the Centre charges, be assisted by two Vice-Rectors.

a) Vice-Rector - Research, Development and Technical Services

b) Vice-Rector - Training

The appointments of the Vice-Rectors will be made by the Rector on the advice of the Board of management and will last for 2 years - renewable for one more term of 2 years. Normally the choice shall be from among the Directors of the Centre who will return to his directorship at the end of his term.

In the absence of the Rector, the Vice-Rector - Research, Development and Technical Services will act as Rector.

5. Each Centre shall be made up of 3 Divisions, with a Director in charge of each, having departments under Professors, with Associate Professors, Assistant Professors, Research Officers etc.

The Divisions shall include the followings :

a) DIRECTOR OF FOOD DIVISION with

i) Department of Food Science

ii) Department of Food Technology

b) DIRECTOR OF NUTRITION

i) Department of Public Health and Clinical Nutrition

ii) Department of Nutritional Sciences

## c) DIRECTOR OF BASIC SCIENCES

- i) Department of Bio-Chemistry
- ii) Department of Physiology
- iii) Department of Statistics
- iv) Department of Management & Feasibility Studies

## d) DIRECTOR OF ADMINISTRATION AND FINANCE

General Administration, Finance, Financial Control etc.

These Divisions and Departments do not all have to be formed at the inception of the Centre. In the first phase, the Directors of Food Division, Nutrition and Administration will suffice.

6. Service units will also need to be created for each Centre. These will include :

- a) Library and Documentation
- b) Workshop and Instrument Maintenance
- c) Pilot Plants
- d) Nutrition Clinics and Mobile Laboratories
- e) Computer Unit
- f) Animal House
- g) Experimental Farm
- h) Information, Education and Public Relations Unit
- i) Transport and Travel

These will be developed as the Centre grows though the Library will need to be developed as soon its building is ready. The appointment of a Librarian should be done as early as possible.

7. There shall be a BOARD OF MANAGEMENT for each Centre under the chairmanship of the Rector. The Board shall consist of the Rector, the Vice-Rectors, Directors of Divisions and all Professors and Head of Sections. It shall be responsible for the appointment of all Professors, research, teaching, administrative and technical staff and their discipline. It will plan and coordinate the activities of the Centre including teaching, research, admission and discipline of students, preparation of budget, regulations in respect of all academic and technical matters.



8. Each Division should have a BOARD OF STUDIES with the Director of the Division as Chairman. The Board shall comprise the Director, all professors and all teaching and research staff of the Division. It shall be responsible for the preparation of courses and syllabuses, research programmes, selection of students, conduct of examinations and preparation of results for the Board of Management.

9. The board of management and the board of studies may appoint Committees for the accomplishment of their tasks and make regulations and rules to control their activities. Both board may provide for the representation of students and administrative and other staff on their Committees.

#### Relationship with other agencies

10. Each Centre should with proper selection of staff, equipment and building as planned, attain an excellence of its own. There is therefore no need to seek affiliation with any University or other such agency. However, no Centre or training organization can attain and keep excellence in isolation. Excellence is recognised by the caliber of staff, teaching given, research undertaken, problems solved for industry and the worth and attainment of the products of the Centre. Therefore, the Centre should develop relationships with all pertinent agencies and organizations such as universities, international organizations industries and governments without subjugating its independence and sovereignty. There should be free flow of communication between the Centres and universities, organizations and industry. Liaison should be maintained with industries and governments. Students should be allowed to show their worth by taking postgraduate degrees of universities by their research work at the Centres but no formal training for university degrees should be run as such by the Centres. Staff from industries, universities and such agencies should be encouraged to impart their knowledge to students and work with the staff of the Centres. Also, staff from the Centres should gain experience by working in industry, with governments and other agencies to bring new knowledge and expertise to the Centre.

11. The main objectives of the Centre will be to :

a) provide short term practical training in the many fields of Food Science, Food Technology and Nutrition leading to Certificates and Diplomas;

b) provide postgraduate specialised training in these fields leading to Associateships and Fellowships qualifications.

c) provide Technical and Consultancy Services in the Fields of Food Science, Food Technology and Nutrition to governments, industries of Member States and carry out research and development programmes to provide answers to African problems in these fields.

TRAINING FACILITIES TO BE PROVIDED

All candidates admitted to the Centre whether for training of research should be University Graduates from Schools of Agriculture, home economics, science (Chemistry and biology), social science medicine and veterinary medicine.

It is considered best for the centre to concentrate on postgraduate training technical services and research in Food Science, Technology and Nutrition.

In view of the objectives set out for the centre, the complexity of financing it, diversity of the membership of OAU and the variation of educational structure in Africa, it will not be wise to affiliate the Centre to any university. It should award its own diplomas and degrees and control its own academic and technical service programmes. But it should ensure high standard of its work and respect for its degree and diplomas, though the use of external examiners and moderators and by frequent exchanges of staff with African and other Universities and Institutions of high reputation. It should also strive to maintain liaison with African Universities and research institutions.

In all, the reputation of the Centre as a place of learning and research will be achieved by the quality of its graduates, of its research and by the amount and usefulness of the service it is able to give to Member states.

Categories of training to be provided

It is not considered wise to provide full undergraduate courses leading to a first degree. The centre should provide 3 categories of programs.

These programmes are designed to provide applied practical training which is action-oriented to general university graduates, experienced workers in the field with enough basic knowledge, and experience to appreciate the problem in the field of Nutrition and make worth-while contributions.

Each programme is self continued as a short intensive course which can be given in 6-9 months or less. This should lead to a Certificate.

.../...

Candidates for the Associateship of the Centre will be expected to take a combination of two or more of these courses and also carry out a field project. The Associateship training will last 2 years. The formal courses will be examined whilst the candidates will defend his thesis.

The Fellowship course will last at least 3 years. Candidates will follow a combination of courses decided by the Director of the programmes and pass the necessary examination. They will be expected to plan and carry out projects and present thesis which they will successfully defend before the award of the Fellowship.

#### A. Short Term Practical Professional Training

##### NUTRITION

#### 1. Food Consumption Studies 6 - 9 months

- a) Basic Nutrition
- b) Local Foods & their nutrients
- c) Factors affecting nutrient intake
- d) Assessment of Nutritional status
- e) Requirements of Field workers
- f) Collection of data
- g) Collation and analysis of data
- h) Uses of data and reports

#### 2. Nutrition for Health Workers - Nurses, Public Health Inspectors, Dietitians etc...

- a) Basic Nutrition
- b) Local Foods & their nutrients
- c) Factors affecting nutrient intake
- d) Assessment of nutritional status
- e) choice of indicators for assessment & surveillance
- f) Collection of necessary data
- g) Uses of data collected
- h) Planning of Nutriti<sup>on</sup>/ activities in health
- i) Execution of Nutrition activities in health
- j) Evaluation of Nutrition activities

.../...

3. Nutrition Education

- a) Basic nutrition
- b) Present state of nutrition in Africa (each state)
- c) Identification of factors making for malnutrition
- d) Choice of problems amenable to education
- e) Planning of educational programmes
- f) Audio-visual aids - preparations, testing, use
- g) Evaluation of programmes

4. CHILD NUTRITION IN AFRICA

- a) Nutritional needs of the child
- b) Breastfeeding
- c) Artificial Feeding
- d) Weaning Foods
- e) Assessment of nutritional adequacy of intake
- f) Nutrition & Infection
- g) Nutrition Education

5. FEEDING THE SCHOOL CHILD

- a) Nutritional needs of the school child
- b) Traditional feeding of school child
- c) Types of school feeding & meals
- d) Nutrition Education in schools
- e) Assessment of nutritional adequacy of intake
- f) Nutrition & infection

6. INDUSTRIAL FEEDING

- a) Nutritional needs of adults in Africa
- b) Nutrition & infection
- c) Types of industrial feeding
- d) Local foods & their content
- e) Industrial Feeding & management
- f) Evaluation

7. Nutrition and Community Development

- a) Nutrition & Health of the Community
- b) Basic nutrition
- c) Local foods & their nutrients
- d) Needs of different groups in the Community
- e) Factors affecting food intake & utilisation
- f) Use of local foods to meet nutritional needs
- g) nutrition Education - including audio visual aids
- h) Evaluation

Post graduate TrainingShort Term Programmes

- 1. Computer Applications in nutrition
- 2. Nutrition for Teachers of Agriculture
- 3. Nutrition for teachers in Public health
- 4. Nutrition for medical doctors

B. The programmes for a candidate for the fellowship of the Centre of Food Science, Technology and Nutrition (F.S.F.S.T.N.) will consist of three years of study, during which the candidate is expected to carry out an independent project involving considerable practical work in applied nutrition and present a thesis based on his work. The candidate will sit for the relevant examination and attend an oral examination to defend his thesis.

Programme of studySECTION I - BASIC PRINCIPLES OF FOOD AND NUTRITION SCIENCES

.../

### 1. Food Chemistry

- a) Carbohydrates, proteins, fats, vitamins, macro and trace nutrient elements and water as constituents of food : composition, properties stability.
- b) Chemical food analysis
- c) Composition of foods and the use of food tables.
- d) Food additives
- e) Toxic components : alcohol, stimulants, naturally occurring toxic elements, naturally occurring organic toxic substances, residues of pesticides and hormones, residues from processing.
- f) Food legalisation : principles and examples. Food control laboratories. Consumer organizations.

### 2. Physiology and Biochemistry of Nutrition.

- a) Development of knowledge of nutrition. The concept of optimal nutrition.
- b) Digestion, absorption, storage, metabolism, excretion, physiology of appetite.
- c) Food as source of energy.
- d) Functions of water, proteins and essential amino acids, essential fatty acids, vitamins, minerals and trace elements.
- e) Nutrition in relation to body composition, growth and mental development.
- f) Nutrition requirements in relation to age, activities, climate, pregnancy, lactation, etc,...
- g) Recommended dietary allowance for nutrients.
- h) Common sense about nutrition.

### 3. Biostatistics :

- a) Statistical methods
- b) Vital statistics.

#### 4. Food Microbiology

- a) General microbiology
- b) Prevention of Food born diseases of microbial origin.
- c) Food preservation
- d) Microbial food production
- e) Microbiological quality control

#### 5. Food Technology

Production contents and stability of nutrients, processing, storage, packaging, and marketing of :

- a) Meat, fish, poultry, eggs.
- b) Milk and dairy products.
- c) New protein sources
- d) Fats
- e) Cereals and tubers.
- f) Pulses
- g) Vegetables and fruits
- h) Water, beverages

#### 6. Demonstration, Exercises, Visits

- Visits to institutes, factories and laboratories
- Demonstration of chemical methods for food analysis
- Demonstration of microbiological control of foods
- Calculation of nutrients, e.g. on protein evaluation
- Nutrition and dietary surveys
- Visit to nutrition clinics
- Training in Nutrition Education
- Importance and practical value of the subjects and their presentation.

.../ ..



## SECTION II - NUTRITIONAL DISORDERS

- a) Features, causes epidemiology and prevention of important nutritional deficiency diseases.  
     Caloric deficiency  
     Protein - caloric malnutrition  
     Nutritional anaemia  
     Vitamin deficiencies  
     Other disorders
- b) Over-nutrition
- c) Assessment of the nutritional status of a population group
- d) Growth and development
- e) Nutrition and infection
- f) Relation between nutrition of man and his productivity.

## SECTION III - MAIN HUMAN FACTORS AFFECTING THE NUTRITIONAL SITUATION

- a) Ecological factors (among others regional differentiations, foods consumption surveys.
- b) The economy of foods
- c) Cultural factors affecting food consumption.

## SECTION IV - RESEARCH ACTIVITIES

After the course participants who pass the examination, are asked to prepare a thesis for 9 - 12 months in one of the topics which is related to their country problems. The thesis may be either in Food Technology, chemical nutrition, biochemical nutrition food microbiology and Food Hygiene.

## SECTION V - Thesis research work in the area of either

- 1) Food Science
  - 2) Nutrition
- for 9 - 12 months.

### C. Specialized training in applied nutrition leading to associateship

#### Qualification ;

This is designed to provide practical training to University graduates to allow them to become useful in the field of nutrition if given such training. The programme for a candidate for the associateship of the Centre of Food Science, Technology and Nutrition (A.C.F.S.T.N.) will consist of two years study, attending a course of 10 months, 4 months for field surveys and 6 months thesis work.

#### PROGRAMME OF STUDY

##### 1. Physiology and Biochemistry of Nutrition

The composition of the body, energy, nutrients, biological synthesis and cellular metabolism, water and electrolytes, adaptive mechanisms, physiological requirements and recommended allowances.

##### 2. State of Nutrition and Pathology of Malnutrition

Assessment of state of nutrition, growth and development, subnutrition and starvation obesity, kwashiorkor, rickets, scurvy, pellagra, nutrition and infection, nutrition and dental caries, nutrition of the eye.

##### 3. Applied Nutrition

- Prevention and treatment of malnutrition
- Feeding of young children and vulnerable groups
- School feeding programme
- Feeding of industrial workers
- Nutrition survey

##### 4. Food Consumption

- Composition of foods and the use of food tables
- Food hygiene
- Food microbiology
- Food analysis
- Food preservation

D. Specialized training in Food Science, and Food Technology  
Leading to Associateship qualification

This is designed to provide practical training to University graduates to allow them to become useful in the field of food science and food technology if given such training.

The programme for a candidate for the associateship of the Centre of Food Science, Technology and Nutrition (A.C.F.S.T.N.) will consist of two years study, attending a course of 10 months, 4 months training in four different food industry factories and 6 months for thesis work.

PROGRAMME OF STUDY:

1. Physiology and Biochemistry of Nutrition

The composition of the body, energy, nutrients, biological synthesis and cellular metabolism, water and electrolytes, adaptive mechanisms, physiological requirements and recommended allowances.

2. Food Science

Fluid flow, heat transfer, evaporation, drying, extraction, distillation, crystallization, filtration, mixing, handling. Raw materials used, post harvest changes.

3. Food Theoretical and practical studies on Food and their chemistry.

Chemical and biological evaluation of food constituents. The use of Food composition tables. Some food commodities. Cereals, meat including fish and poultry, eggs, milk and dairy products.

Special foods, weaning foods, emergency foods, breakfast cereal products.

...

4. Food Preservation

- Food spoilage, important methods of food preservation (canning, freezing, drying, refrigeration, food preservations, fermentation and radiation)
- Technological basis of food p reservation. Machinery and equipments used.
- Quality control
- Factors influencing fish and meat quality and consumer acceptance
- Use of bying products.

5. Food microbiology and Food hygiene

- 1- Bakery
- 2- Fish preservation
- 3- Oil industry
- 4- Sugar industry

STAFF REQUIREMENT

1. If the OAU wants the best for these Centres of Excellence, then it must get the best African staff to run, teach and control the destinies of the Centres. Africans must hold the posts of Rector, Vice-Rector, Directors. The OAU must be ready to pay for and induce the staff to join the centre and stay there. There is a shortage of staff of the right caliber all over the world. Industry is always ready to induce the type of staff needed for the centres. As such, it is not only the salary that is paid but also the general condition of service that will attract the best staff. These conditions include housing, infrastructure, schooling for children, medical facilities, stability of the country in which the centres are situated, working conditions, especially equipment and other staff.

If the countries in which the centres are sited offer some form of diplomatic immunity by making salaries tax-free and offer facilities to staff to import foods, import duty free, these attractions will help retain staff.

2. Staff should be recruited from all over the world, on the basis of theoretical and practical knowledge, work experience, not only teaching - should be highly valued.

3. Salary scale should be as stated and appointments should be as much as possible on contract for 3 or 4 years to allow for gaining of wide experience by staff.

ACADEMIC STAFF.DIVISION OF FOOD - 1 Director1) Department of Food Science

1 Professor

7 others of varying grades

2) Department of Food Technology

1 Professor

6 Others of varying grades

.../

DIVISION OF NUTRITION - 1 Director1) Department of Medical Nutrition

1 Professor

5 Others

2) Department of Nutritional Sciences

1 Professor

5 others

DIVISION OF BASIC STUDIES - 1 Director

2 Professors

8 others

This division will include Biochemistry, Physiology, Statistics, Management and and such courses basic to Food Science, Food Technology & Nutrition. Some of these posts may be filled on short - term basis or part-time from industry.

SUPPORTIVE STAFFLIBRARY & DOCUMENTATION

1 Librarian (Professional level)

2 Assistant Librarians

1 Audio-visual Adviser

1 Translator

3 Others

Workshop + Instrument Unit

1 mechanical Engineer

1 Electronic Engineer

1 Workshop Superintendent

1 Machinist

4 others

Pilot Plant

3 Technologists

Animal House

1 animal Curator

3 Technologists

Computer Unit (Under control of Statistics)

3 Technologists

.../

Nutrition Clinics and Mobile Laboratories

3 Senior Nurses  
1 Demonstrator  
2 Technologists

Experimental Farm

1 Agricultural Officer  
4 Technologists

Information And Public Relations

1 Public Relation Officer  
2 others

Transport

1 Automobile Engineer  
2 others

ADMINISTRATION

Director  
Finance Officer  
Medical Officer  
Catering office  
8 Administration & Finance grade

I

Intermediate & Junior Staff

100 others - including stenographers, laboratory assistants, clerks, drivers, cleaners, labourers

BUILDINGS

page 35

ADMINISTRATIVE BLOCK

4 Layc Offices : Secretary's rooms for Rector, Vice-Rectors, Directors of administration.

30 Standard Offices for finance, administration, etc...

1 Board Room (to hold 40) with two committee Rooms

1 Library - reading rooms, museum, stores, vinding section, Xerox Room, microfilm room

1 large office for librarian - Secretary's room

12 Standard offices for Staff

TEACHING BLOCKS

10 Lecture + tutorial rooms

6 Research laboratories with stores + washing up

1 Research kitchen auxilliary rooms - cold store, preparation room, stores, cleaning up room

6 Teaching Laboratories with preparations rooms, cleaning up room etc...

1 Pilot Plant house with auxilliary

2 Departments workshops : Food Science, Food technology

4 Directors offices and rooms & secretary's room + committee rooms

7 Professörial rooms

40 offices for other staff

1 Animal house

1 Audio-visual rooms with equipment - dark rooms drawing room, demonstration room hand press, projectors overhead + cine + still

1 lecture incatre to seat 500 with projection facilities, lectures, conferences

1 Hostel Block - for 300 students in self-contained single rooms with kitchen facilities, dining lounge, recreation rooms, ... rooms, bath facilities and 10 bedrooms for visitings experts + teachers on short stay.

LIVING ACCOMODATION

1 Rector's house - 4 bedroom with guest chalet or rooms

12 Bungalows - 3 bedrooms + study for Directors & Librarian

25 Duplex - Semi-detached houses - 3 bedrooms for staff

7 Blocks of 6 flats each for staff.



1. HEALTH CENTRE

Workshops blocks for : Machine + mechanical  
 Electronic + machines  
 Computers electrical  
 Vehicule workshop + garages  
 Generator house  
 1 Computer house

DETAILS OF BUILDINGSADMINISTRATIVE BLOCK

Rectors Office	40 sq. meters
3 Offices for vice-rectors + Director of Adm.	120 sq. "
30 Standard offices of finance & Administration	600 sq. "
Board Room	60 sq. "
2 Committee rooms (40 sq. meters each)	80 sq. "
Library	400 sq. "
Office of Librarian	40 sq. "
12 Standard office space for library staff work	240 sq. "
1 Museum/Exhibition room	100 sq. "
	<hr/>
	1.680 sq. meters
Corridors, toilets etc...	170 sq. "
	<hr/>
	1.850 sq. meters

TEACHING BLOCK (OR BLOCKS)

10 Lecture/Tutorial rooms (60 sq. meters each)	600 sq. meters
6 Research Labs (80 sq. meters each)	480 sq. "
6 Teaching Labs (120 sq. meters each)	720 sq. "
1 Research kitchen + auxilliary	140 sq. "
2 Departmental workshops (240 sq. meters each)	480 sq. "
1 Pilot plant house	200 sq. "
4 Director's office (40 sq. meters each)	160 sq. "
7 Professorial offices at 30 sq. meters each	210 sq. meters
2 common rooms (60 sq. m. each)	120 sq. "
40 Offices for other staff (20 sq. each)	800 sq. meters
1 Audio-visual set up	200 sq. "
1 Animal house	400 sq. "
1 Lecture Teacher	600 sq. "
	<hr/>
	5.110 sq. "
Corridors and toilets etc...	510 sq. "
	<hr/>
	5.620 sq. "

DETAILS OF HOSTEL BLOCK

300 rooms (15 sq. metres each)	4,500 sq. metres
10 bedrooms guest flat (30 sq. metres each)	300 "
Kitchen, cold store, service rooms	200 "
Dining room	150 "
Recreation room + Lounge (120 sq.m. each)	240 "
	<hr/> 5,390 "
Corridors, toilets ...	540 "
	<hr/> 5,930 sq. metres

WORKSHOPS: Machine workshop

Electronic + electrical

Vehicle workshop + repairs

Computers + others

Generator house

Corridors, toilets etc.

120 "
160 "
200 "
80 "
100 "
<hr/> 640 sq. metres
70 "
<hr/> 710 sq. metres

OTHER BUILDINGS

Health Centre

Computer House + Complex

500 sq. metres
400 "
<hr/> 900 sq. metres

LIVING QUARTERS

Rectors' Residence

12 Bungalows of 3 bedrooms &amp; Study

(250 sq.m. each)

25 Semi-detached houses (300 sq.m. each)

7 Blocks of 6 Flats (150 sq.m. each flat)

300 sq. metres
3,000 "
7,500 "
6,300 "
<hr/> 17,100 sq. metres

STUDENTS AND ADMISSION POLICYCategories of students

Three main categories of students are envisaged for the Centres:

- a) Post-graduate students undergoing short practical courses leading to certificates and diplomas or longer courses leading to the higher qualifications of the Centre;
- b) Research workers working on particular research projects or being trained for a specific project in Member States;
- c) Candidates - though not graduates - who have had extensive experience in the fields of Food Science, Food Technology and Nutrition in the Member States who are sponsored for Certificate courses by their States.

Number of Students

It is planned that each Centre should cater for a maximum of 300 students made up of the above categories. The number in each category will depend on the demand of Member States.

COST-OF-PROJECTCAPITAL COST

a) LAND - The cost of land required will vary from one country to another. It is hoped, however, that it will be a condition of siting the Centre in a country that land should be provided by the country.

The land needed will be at least 2 sq. kilometres to include the experimental farm;

b) BUILDINGS - Details of buildings are already given. The summary is given below, showing the total floor space requirement of 32,100 sq. metres.

SUMMARY OF BUILDINGS

Teaching Blocks	5,610 sq. metres
Hostel Blocks	5,930 "
Workshops	710 "
Administrative Block	1,850 "
Residential Quarters	17,100 "
Others - Health & Computer Centres	900 "
	<hr/>
	32,100 sq. metres

Average cost of building per square metre for the country can be used to calculate the actual cost of each Centre. Cost of building will vary between workshops and laboratories with heavy floors and a lot of plumbing and residential buildings and animal house.

An average cost of US \$400 per square metre is applied making an estimated cost of building and fitting at US \$12,840,000.00.

NUTRITION DIVISION: PUBLIC HEALTH AND CLINICAL NUTRITION  
NUTRITIONAL SCIENCES

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
<u>A. Laboratory Equipment</u>			
1	1	Refrigerated Centrifuge	10,000
2	1	Liquid scintillation counter	20,000
3	1	Gas-Liquid chromatography	10,000
4	1	Amino-acid autoanalyser	35,000
5	1	Recording Spectrophotometer	30,000
6	1	Atomic absorption Spectrophotometer	25,000
7	1	Ultracentrifuge	25,000
8	1	Fraction collector	2,000
9	4	Laboratory centrifuges	4,000
10	6	Table centrifuges	1,500
11	7	Photoelectric colorimeter	2,500
12	1	Ultrathermostat	4,000
13	2	Vacuum ovens	5,000
14	1	Automatic recording titrator	3,000
15	1	Shaking incubator	6,000
16	2	Incubators	3,000
17	2	Drying ovens	4,000
18	1	Automatic distilling apparatus	1,200
19	4	pH meters	2,000
20	1	Thin layer chromatography	800
21	2	Microkjeldahl, 12 units	3,000
22	4	Regulated thermostat	2,400
23	2	Oil pump, vacuum	1,600
24	4	Hot plates	1,600

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
25	1	Microzone electrophoretic unit with immuno accessories	7,000
26	1	Warburg apparatus	6,000
27	1	Deep Freeze, 20 cu.ft.	1,000
28	2	Water deionizer	2,000
29	1	Gallenkamp, Ballistic Bomb calorimeter	5,500
30	1	Flame photometer	5,000
31	2	Mobile X-Ray Unit	5,000
32	1	Recording fluorometer	20,000
33	1	Baby balance	200
34	1	Human balance	500
35	1	Apparatus for measuring B.M.R.	2,000
36	1	Catering and kitchen utensils	2,000
37	6	Calculating machines	600
38	1	Freeze dryer	2,000
39	1	Spray dryer	6,000
40	6	Refrigerators 0.30 cu.ft.	1,000
41	2	Stage Air compressor (50 hz)	1,000

B. Animal House

1	1	Air compressor	1,000
2	100	Metabolic cages	6,000
3	200	Rat cages	4,000
4	24	Batteries for rats, each for 60	24,000
5	2	Batteries for hens, each 60	4,000
6	2	Batteries for chick Starters, each battery 6 cages, each cage for 10 chicks	3,000
7	4	Air conditionning Units	4,000
8	2	Deep Freeze capacity 20 cu.ft.	2,000
9	4	Blenders	600

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
10	2	Hammer mill	3,000
11	1	Rotation washing machine	5,000
12	4	Sets of standard sieves, 6 each	1,000
13	1	Universal mill	4,000
14		Food mixers capacity:	
	1	50 kg.	
	2	10 kg.	
	2	5 kg.	
	2	2 kg.	
	4	1 kg.	10,000
15	1	Incinerator electric	10,000

C. Nutrition Clinic

1	1	Anthropometric measurement set	1,000
2	1	Metabolic ward, 10 beds	30,000
3	1	EEG Apparatus, portable	6,000
4	1	ECG Apparatus portable	3,500
5	2	First aid sets	2,000
6	2	Typewriters, portable	200
7	1	Copy machine	3,000
8	2	Mobile laboratory cars	50,000
9	2	Land Rover	10,000
10	2	9 passengers microbus	25,000
11	2	Economy car	5,000
12	2	Binocular microscopes	800
13	2	Projector	500
14	2	Camera	400
15	1	Cine-camera	800
16	4	Hand centrifuges	200
17	4	Sets of dissecting instruments	800

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Total 487,200

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FOOD DIVISION: FOOD SCIENCE AND FOOD TECHNOLOGY

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
1	1	Reverse osmosis, lab type with membranes and suitable pressure pump	2,000
2	12	Chromatographic columns for gel filtration, ion exchange, and high pressure chromatography. Different sizes with standard accessories	1,000
3	200m	Teflon tubings, inside diameter 1, 2 & 3mm	100
4	2	Peristaltic pump	1,200
5	2	Fractional collector for time, drop and volumetric capabilities	5,000
6	1	Continuous flow UV absorpimenter at 280mm	1,000
7	1	Recorder with 50 chart rolls	1,500
8	1	Microzone electrophoretic apparatus for protein separation on cellulose acetate complete with all accessories	7,000
9	1	Deionizer, cap 60L/h	500
10	1	High voltage paper electrophoresis complete with accessories	1,500
11	1	Preparative ultracentrifuge, up to 100,000g. different heads with 10-50 ml tubes	8,000
12	1	Amino acid analyzer, 6-12 samples/day with integrator, and complete with packing material, ninhydrin, buffer salts and charts	55,000
13	2	Electric balance, cap. 200g, 0,0001g	1,000
14	1	PH meter, digital, expanded scale 0.01 unit with different electrodes	500
15	2	UV visible spectrophotometer range 200-1,000mm model DB digital	28,000
16	1	Technicon milk analyzer, for fat, protein lactose determination	4,000



<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
17	1	Gas chromatographic apparatus, with flame ionization detector, temperature programming and different exchangeable packed columns, provided with hydrogen gas generator and integrator	10,000
18	1	Laboratory fermentor, with variable adjustment for pH oxygen and temperature, capacity 1 L	3,000
19	2	Electric drying oven	2,000
20	2	Electric muffle furnace	3,000
21	1	Elameless digestion apparatus	1,000
22	1	Saccherometer	500
23	1	Farinograph	2,000
24	1	Alveograph	2,000
25	1	Extensograph	2,000
26	1	Spreader for TLC	1,000
27	4	Calculators, scientific	1,000
28	1	A-M total copy system	17,000
29	4	Hamilton syringe, 10, 50 ul	100
30	12	Micropipette 2 ul	50
31	12	Micropipette 5 ul	50
32	12	Micropipette 10 ul	50
33	12	Micropipette 25 ul	50
34	12	Micropipette 50 ul	50
35	2	Hollow fibre dialyzer	100
36		Laboratory chemicals	10,000
37	1	Freeze Drying Unit	16,000
38	1	Immuno electrophase and Immuno diffusion unit	1,000
39	1	Flying Denistometer (TLD 100)	
40	1	Cooling Centrifuge	10,000

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
41	1	Wrist action shaker	1,000
42	1	Dickens Mill	1,500
43	1	Hammer Mill	1,500
44	1	High speed blender explosion proof	700
45	1	Tube shaking machine	800
46	1	TLC apparatus	800
Total			187,550

## BASIC SCIENCES DIVISION : BIOCHEMISTRY

PHYSIOLOGY

STATISTICS

MANAGEMENT AND FEASIBILITY STUDIES

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
1	1	Beckman-Spinco model E Analytical Ultracentrifuge	15,000
2	1	E.C. Vertical Electrophoresis Equipment	5,000
3	1	Automated Kjeldahl Auto Analyzer, Technicon Instruments Corp., Chauncey, N.Y.	2,000
4	1	Laboratory Centrifuge (up to 9000 g) with replaceable heads	-
5	1	Basket centrifuge (or bowl for item 4)	-
6	1	Beckman-Spinco Model Amino acid analyzer	30,000
7	1	Laboratory Air Classifier	6,000
8	1	Beckman DU Spectrophotometer (or) Unicam SP-400 Spectrophotometer	8,000
9	1	Perkin Elmer Infracord	8,000
10	1	Serval Omnimixer	1,000
11	1	Liquid-Solid Syphon (50 mm and 10 mm)	1,500
12	1	Atomic Absorption Spectrophotometer	6,000
13	1	Hydrogenation Autoclave	5,000
14	1	Thin Layer Equipment (Desaga)	800
15	1	Preparative Fraction Collector	2,000
16	1	Laboratory Fractional Distillator	1,500
17	1	Molecular Distillation Apparatus	2,500
18	1	Abe Refractometer	2,000
19	1	Electronic Polarimeter	2,000
20	1	Viscometer, recording Apparatus	2,000
21	1	Ultra thermostat	2,000
22	1	Moisture tester Automatic	1,200

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
23	1	Mobile High Vacuum Unit	1,800
24	1	Digital pH-meter	1,500
25	1	Ultraturrax Stirrer	2,000
26	1	Beckman Universal liquid column chromatograph, Multichrom B.Amino acid analyzer Peptide analyzer-Nucleotide analyzer with accessories	50,000
27	6	Sphygmomanometer	340
28	6	Haemocytometer	350
29	6	Haemometer, Sahli	90
30	3	Blood sedimentation apparatus	300
31	12	Haematocrit tubes acc. to Vann Alln	84
32	12	Blood diluting pipettes for r.b.cs. tested and certified acc. to Thomas 1:100, length 105 to 120 mm	72
33	12	Blood diluting pipettes for w.b.cs. tested and certified acc. to Thomas 1:10	72
34	6	Albumin tubes, Jena glass acc. to KAFA	36
35	1	Blood pipette shaking vibrator	55
36	6	Blood sugar tubes acc. to Fllin-Wu, diameter 18-19 mm, length 220 ml with marks at 4/12.5/25 ml, Jena glass	18
37	6	Sugar pipettes, officially tested, ca. 0,1 ml, graduated in 0.001	36
38	6	Ureometer, Doremus	36
39	6	Albumenometer, Esbach	12
40	2	Tuberculin syringe with lever lock mount ca. 10 ml	12
41	1	Sterilizer, electric, horizontal, inside dimensions 208 x 420 mm, max. working pressure 2.2 atg. = 134 C, fully automatic	1,550
42	1	Sterilizer, electrical vertical, double wall, volume 210 litres, max. working pressure 2.2 atg. = 134 C, inside dimensions 50x70 cm	4,000

<u>Number</u>	<u>Quantity</u>	<u>Item</u>	<u>Approximate price in \$</u>
43	1	Bacteria colony counter with stereo- microscope for petri dishes 10 mm dran	900
44	2	Hand Tally counters with finger ring, with 4 digits, 4,5 mm high	32
45	2	Drum Kymograph, research model with build in contact clock and synchroncus motor with 20-step gear box including seamless-drawn aluminium drum 160mm in diameter, 260mm high	4,000
46	1	Continuous infusion apparatus Unito II with 12 speeds	1,250
47		Visual aids	1,000
48	12	Portable calculating machines	300
49	6	Drawing instruments, sets	150
50	1	Copy machine	3,000
51	4	Electric typewriters	2,000
Total			178,495
			=====

Total cost of building and Equipment

	<u>US \$</u>
a) Land	Nil
b) Buildings	12,840,000
c) Equipment	<u>853,245</u>
Total	<u>13,693,245</u> =====

Recurrent Expenditure at full operationEmolument:

	<u>US \$</u>	
a) <u>Senior Staff</u>		
1 Rector	30,000	
4 Directors (25,000 each)	100,000	
8 Professors (22,500 each)	180,000	
88 others average 10,000 each	880,000	
Allowances & superannuation 30%	<u>357,000</u>	
	1,547,000	1,547,000
b) <u>Other Staff</u>		
100 average US \$3,000	300,000	
Allowances & superannuation 30%	<u>90,000</u>	
	390,000	<u>390,000</u>
Total Emoluments		<u>1,937,000</u> =====

US \$

Laboratory and Teaching Materials	100,000
Stationery	10,000
Transport and Travelling (leave & motor repairs)	60,000
Maintenance of building and Equipment	20,000
Health Services	20,000
Utilities and Capital replacement	100,000
Cables, stamps and postage	5,000
Insurance	100,000
Books and Journals	50,000
Computer Hiring	100,000
Exigency - 10%	<u>56,500</u>
	<u>621,500</u>
	=====

Total Annual Recurrent Cost:  $1,937,000 + 621,500 = 2,558,500$  US \$  
 =====

PHASING

1st phase - Teaching block	5,610
Hostel	5,930
Living	<u>6,600</u>
	18,140 sq.metres
Cost: US \$ 7,256,000	=====
2nd phase - Workshops	710
Living quarters	<u>7,500</u>
	8,210 sq.metres
Cost: US \$ 3,284,000	=====
3rd phase - Computer & Health	900
Bungalows	<u>3,000</u>
	3,900 sq.metres
Cost: US \$ 1,560,000	=====
4th phase - Administration	1,850 sq.metres
Cost: US \$ 740,000	=====

SOURCE OF FUND

1. The Centres may obtain funds from the following sources:

- i) Contributions by Member States of OAU;
- ii) Grants from Governments of the host country in which the Centre is sited;
- iii) UNDP contribution;
- iv) International Organizations including: a) Arab League  
b) OPEC
- v) Industries especially Food industries and Multinational Industries.

2. CONTRIBUTION BY MEMBER STATES

It is hoped that OAU will be the Proprietor of the Centres and give them enough support to be independent of outside control and influence, and to enable them to run effectively. The total capital cost as well as the recurrent expenditure are to be regarded as the responsibility of OAU. That responsibility is diminished only to the extent of what can be found from other sources listed above.

3. It is desirable that the total recurrent expenditure be provided by OAU as part of its annual budget. In addition, OAU should provide the required capital cost for the first year of development amounting to 7,256,000 dollars, so the Centre may open without undue delay. Of this amount, it is hoped that the host country will provide 2,50 million dollars. This contribution should be made a condition for siting the Centre in that country.

4. UNDP CONTRIBUTION

As soon as this report is accepted, the support for the rest of capital cost should be sought. An application should be submitted early enough to allow capital development in the second year to start on schedule and be followed immediately by the third and fourth phases of capital development.



5. Assistance from Non-African Governments

There is a strong possibility that assistance in the form of cash and more likely equipment, will come from some Non-African Governments which are friendly to Africa. Second the Staff from such countries may also reduce recurrent commitment of the OAU.

6. Fees

It is hoped that catering and boarding facilities will balance their own accounts and require no subsidy. The Board of the Centre will fix the appropriate fees for tuitions, board and room. Consultation fees charged for services rendered to Member States will be the actual cost of the service. (Salary and allowances of consultants and supporting staff during the actual period of the service plus cost of travelling and materials ... etc.).

Money from this source will be to some extent lighten the OAU commitment in respect of the recurrent cost. The extent of this relief cannot however be estimated at present.

SITING OF THE CENTRES

In selecting sites for the Centres the following criteria were considered:

A - (1) The Organisation of African Unity encompasses a vast continent with a large variety of geographic and climatic conditions. Their obvious effects on food production differ from one region to another. The inhabitants have different cultures and different food habits.

(2) Accessibility - The Centres must be sited in a country with good communication and accessibility to most if not all Member States. There must also be good communication to the rest of the world.

(3) Food and Agriculture Production - The varying climate and soils in the continent make for vast differences in the types of foods grown and animals produced. It was felt that countries with wide variation of produce - both plant and animal - to cover the products of the region should be chosen.

(4) Presence of Food Industries or Rudiments - Food Science and Food Technology training cannot exist without some Food Industries. It was however thought that a lot of highly sophisticated food industries would not allow for new technology and research.

(5) Infrastructure and support - The Centres, students and staff need some stability for proper development studies and research. There must be some political stability in the country; schools for the children of staff, medical facilities, nearness or being part of an intellectual community to stimulate research.

(6) Languages - The three main languages of the Continent, Arabic, English and French must be covered.

(7) Contributions of Host country - It should be a condition of selection of host countries that these countries must:

- i) give free land in convenient and accessible locations;
- ii) make substantial contributions to both the Building and Endowment Funds;
- iii) arrange for Diplomatic Immunity for the Centre and Staff.

B - Using these criteria, there was no Member State that satisfied all. A very special case was ARAB REPUBLIC OF EGYPT. This country can teach in Arabic and English and if need be in French. It has 13 Universities distributed all over the country, many technical schools. It has also the National Research Centre, a multidisciplinary research Institute with its 14 big divisions. There is also the Nutrition Institute. Food Industry and Technology are highly developed. In Egypt there is a well qualified staff for teaching, training and research.

The well developed food industry is already making a lot of contribution to the training and research in the continent. A lot of students from other African or Arab countries are being trained in Egypt.

The team felt that siting the Centre in Egypt would not be in the host interest of the rest of Africa which still has a lot of developing to do. Egypt is on the northern extreme of the continent, but not too difficult to get to. However, it was felt that Egypt - as a big brother - should give other countries the opportunity.

For the North and North-West of Africa and to serve the needs of Arabic and French speaking countries CASABLANCA in Morocco is recommended.

To serve the rest of Africa and the English speaking areas, the team recommends IBADAN in Nigeria.

Both sites are easily accessible to the areas they will serve. If these countries cannot justify the criteria (7) showed above as refuse OAU's offer, the team recommends the following in order:

- 1) Khartoum (Sudan)
- 2) Cairo or Alexandria (Egypt)
- 3) Lusaka (Zambia)
- 4) Dakar (Senegal)

Khartoum can teach in Arabic and English; Cairo can teach in Arabic, English and French; Lusaka can teach only in English and Dakar can teach in French only.

POST SCRIPT

The above report and recommendations were made on the visits and data collected in 1973/74. Since then a lot of changes have occurred on the continent of Africa in the fields of Food Nutrition; it will be unwise of us to ignore these.

The most important is the decision of ECA, OAU and other International Organisations to found an "Advanced Centre for Technology" in Africa. This Centre is meant to work out, modify and teach all types of technology for Africa. Such technology must include foods. The decision to found this Centre has been taken and in a few months time the site will be chosen and staff recruited. The search for funds has also started. As the OAU is also involved in giving and seeking funds for this Advanced Centre, perhaps, it would be better to either delay a decision on the Centre for Food Science and Food Technology or merge these into the Advanced Centre for Technology by strengthening this aspect.

On the question of Nutrition, the need for a Centre of Excellence for Training, Research and Development is still urgent.

PART II

- f
- A) REPORT ON THE VISITS OF THE TEAM OF EXPERTS TO  
SOME AFRICAN COUNTRIES
  - B) REPORT EXTRACTED FROM QUESTIONNAIRES SENT EITHER TO  
MEMBER STATES OR UNIVERSITIES AND INSTITUTES

PART IIA) REPORT ON THE VISITS OF THE TEAM OF EXPERTS TO SOME  
AFRICAN COUNTRIES

TANZANIA (Number of Population : 14,000,000)

The team met and made discussions with the following officials :

1. Mr. G.A. Samiti,  
Director,  
Manpower Development,  
Ministry of Agriculture
2. Dr. Abdel Tawab El-Mohandes,  
Senior Food Technologist,  
Industrial Studies and Development Centre (UNEDO)
3. Prof. Kreysler,  
Senior Research Officer,  
Ministry of Agriculture.
4. Mr. Mudoga,  
Coordinator of proposed Tanzania and Nutrition Centre.
5. Dr. Maletulema,  
Nutrition Specialist,  
Ministry of Health.
6. Mr. Awenda,  
Commissioner of Finance,  
Ministry of Treasury.
7. Assistant Dean of Medical Faculty.

As a result of the discussions and interviews, the following is given :

A. FOOD PRODUCTION AND FOOD INDUSTRIES

- (1) Principal food, millet gradually being replaced by maize
- (2) Fish crop is 100,000 tons/year; 20% from salt water and 80% fresh water
- (3) There are flour mills for wheat and maize with a combined capacity of 200,000 tons/year.

- (4) Sugar production and refinery capacity : 110,000 tons, sugar comes from sugar cane (main cash crop).
- (5) Oil mills capacity of 25,000 tons/year. Oil seeds are : cotton seed, ground nut, sunflower and coconut oil. The country export oil.
- (6) Cattle : total population - about 10 million head every year; besides meat packing and preservation industry, excess meat is exported (120,000 head of cattle).
- (7) Pig and poultry are possible to exist, but no estimate provided.
- (8) Fruit industry exist, preservation of mango and of citrus fruits.
- (9) Wine industry exist, but they have small amount of grapes. "Dodoma wine" is locally produced.
- (10) Protein intake (24-40 gr. reference protein per head per day, energy intake (7-10 joules). Most protein intake is of vegetable origin.
- (11) The food production does not keep pace with the rate of increase in the number of population, about 2-7% per annum.

#### B. NUTRITIONEL PROBLEMS

- (1) Protein energy deficiency diseases occur among infants and children (incidence 7%). Rate of mortality high; it is 400 per thousand among children up to school age (1-6 years).
- (2) Vitamin A and Vitamin C do exist because fresh vegetables and fresh fruits are seasonal. Production depend on rain fall and sometimes there is no rain.
- (3) Vitamin B fairly adequate, very occasionally pellagra, little rickets, goitre are seen.
- (4) Anemia exists, aggravated by intestinal parasites iron intake 12 mg. per day. Various intestinal parasites. Fluorosis prevalent due to excess fluorine in water.
- (5) Among the parasites existing there are malaria, bilharzia and intestinal worms.

#### UNIVERSITIES AND RESEARCH INSTITUTES ACTIVITIES

- (1) There is no department for nutrition either in the School of Medicine or of agriculture. Teaching of nutrition is integrated with physiology, biochemistry, medicine, paediatrics and pathology.



(2) Research in nutrition per se, but some is carried on in the paediatric section. Food analysis is carried on in the Biochemistry Department and at the Ilongi Agricultural Section. Height and weight of school boys is carried on in the Physiology Department. Nutrient requirements are also studied in the same Department.

(3) There is a nutrition unit affiliated to the Ministry of Health. With the help of the UNICEF the Unit started dietary surveys in MCH Centres. They also give training courses to nurses (20 - 30 nurses every year), who will work in the nutrition and dietary surveys. There is also a laboratory for food analysis. There is only one medical nutritionist.

(4) Both the Ministries of Health and Agriculture, in collaboration with the Ministry of Labour, are responsible for raising nutrition state of the people.

(5) There is a Food and Nutrition Centre established mainly for education and training.

(6) Among the committees of the National Scientific Research Council of Tanzania there is a committee for nutrition.

(7) The number of nutritionists in the country is few. Six University graduates were trained in Ibadan. There are two food scientists, one having B. Sc. in Home Economics from USA. There are 10 Food technologists (foreigners) working in the factories. There is only one medical nutritionist, 140 assistants including nurses attended courses in nutrition at the Nutrition Unit of the Ministry of Health.

N. B. Reply for questionnaires either not received or unavailable.

(The number of population 7,000,000, rate of increase 3%).

The team made discussions with the following officials :

- (1) The director of nutrition
- (2) The director of rural population
- (3) The Head of Population and Rural Department,  
Ministry of Health (Dr. Tiantraza)
- (4) The Director, Statistical Department,  
Ministry of Rural Development (Mr. Razafindrakota)
- (5) The President  
The University of Madagascar
- (6) Dean  
Faculty of Agronomy  
The University of Madagascar.

#### Food Production and Food industries

- (1) Main occupation of people 85% is in agriculture
- (2) They grow rice, coffee, vanilla, tobacco, cloves, cotton and sugar cane. Most fruits including pine apples are grown.
- (3) Although they cultivate rice which is the staple food, the crop is not enough. They eat rice three times a day. They import from 500,000-700,000 tons a year.  
  
The local rice is of a very good quality, they export it.  
The rice crop is 1,000,000 tons a year and the per caput intake is 154 kg/year. As it will be a shortage of rice in the future all over the world they are trying to replace it with beans or cassava.
- (4) They started cultivation of wheat. They import wheat and wheat flour. They know macaroni in the city only.  
  
There are four factories for cane sugar.
- (5) They raise cattle, the number being 6,200,000 including pigs. They export cattle, frozen fish, shrimps and lobsters.
- (6) There is small food canning industry for fruits, vegetables and meat. Canned foods are either exported or locally consumed.

- (7) Protein sources are : Meat, fish, milk and cheese.
- (8) Vegetables grown are : cabbage, marrow, potatoes, sweet potatoes, peas, haricot beans, lettuce, tomato, cassava and leafy vegetables.
- (9) The Island is underpopulated, its area is 600,000 Km<sup>2</sup>. Soil is volcanic, easily cultivable by rain. They cultivate only according to their needs. Man power is limited, 15% of the population is less than 20 years old.
- (10) Street cars sell rice and beans (*Phaseolus* sp.), also grilled minced meat.
- (11) Shops in streets sell black tea in which they soak dry bread and oat.

Nutritional problems :

- 1) They have same hard food habits such as giving rice water for children when mothers milk is not enough.
- 2) 25% of children attending child centres have marasmus or kwashiorkor.
- 3) School children do not show much nutritional diseases but they have dental caries.
- 4) When asked about protein and calorie intake, they did not have an answer.
- 5) When asked about nutrition problems whether due to socio-economic situation or food being inadequate they replied that it is associated with way of life.

Universities and Research Institutes

1. There is one University, 16 years old. All its projects are directed towards development of the island. The University includes schools of : Law, Science, arts, agronomy, medicine and Polytechnics. There is no veterenary school, but, there is cattle breeding school teaching veterenary medicine. School of Pharmacy and Dental surgery is under establishment.

The number of students attending the University are 7,000. The main problem they face is the shortage in teaching staff.

2. The school of Agronomy composed of four Departments :  
Agriculture, Botany, Agricultural economy and Animal production. There is no Department for either food technology and Dairy production. Students study biochemistry and metabolism. There are researches on tropical plants and animals. The number of graduates from the school of Agronomy were 27 in 1973. They will be 29 in 1974 and 40 in 1975. Every year 3 - 4 students make their study in agriculture and 1 - 2 in Veterinary medicine outside the country.

In Madagascar they train a large number of assistants. They send missions to France, among them 5 are going to study Nutrition.

On 1973 there was only 20 students in the final preparing for their M.B., B.Sc. since the school was established on 1968.

N.B. Reply for Questionnaires either not received or unavailable.

Z A M B I A

(Number of population 4,300,000, rate of increase 2.9%)

The team met and made discussions with the following officials :

1. Dr. Kelley  
Director of Medical Services  
Ministry of Health
2. Dr. D.H. Luzongo  
Director of Agriculture
3. Mr. Kowani  
Director of Rural Planning
4. Dr. A.P. Vamoer  
Executive Secretary  
The National Food and Nutrition Commission
5. Pro. Vice Chancellor  
The University of Lusaka  
Zambia
6. The Assistant, Secretary General  
National Scientific Council for Research.

Food Production and Food Industries

1. The land is 3,900,000 square miles, 75% of which is cultivable, only 20 million acres are cultivated.
2. Maize is the staple food, there is always a reserve sufficient for 24 months. They built special stores for maize to be all the time self dependant.
3. They do not cultivate much wheat, the average crop is 2 tons/Hectar. They import wheat.
4. They cultivate rice in the north. They started a combined project for cultivating rice in areas in the north where water is plenty. The average consumption of rice is 12,000 tons imported from Tanzania and Malawy.
5. They cultivate millets, only for local brewing industry and for making stiff porridge.
6. The Government is forced to buy all cereals that farmers produce. These are : Maize, millet and rice. In the same time, the Government is helping the farmers by giving them fertilizers and instruments used for agriculture.

7. Very little fruits are grown including oranges, banana, pine apple and peaches. They are doing experiments for growing vine (grapes). They can produce cashed nuts. They also grow lemon trees and avocado fruits.

8. They cultivate the following vegetables : tomato, potatoes, onions, cabbages, sweet and hot pepper, carrots and cauliflower. They are able to cultivate all vegetable but this depends on the needs for the local market.

9. There is a small factory for canning of tomato and of pine apple.

10. They can produce groundnut but it will be costly for them so they prefer importation. They import groundnut for oil production. There is a project for growing sunflower. They do not grow soya beans. The most important thing to them is : consumer's interest/Producer's interest and the government is in between.

11. Sugar : 75% of the local market needs come from sugar cane; average sugar consumption is 70,000 tons/year, they produce 50,000 tons but they are now self dependant for sugar. The main problem they face is that more production of sugar means such consumption.

12. Number of cattle are 1 1/4 million heads raised in central, west and south of Zambia. The problem they face is that of tse-tse fly. They have a good number of pigs, sheep and goat are very few. 70 - 80% of their needs of meat comes from home produce cattle. They import the rest from different places (Kenya, Tanzania, Botswana and Madagascar).

13. They are self sufficient in poultry including eggs.

14. They have plenty of fish.

15. Dairy industry is limited, milk production is low. 75% of milk consumed is from reconstituted milk.

16. The main agricultural policy is directed towards food crops than cash crops as food is more important and they put more emphasis on the health and nutrition of people.

17. The Government is in its way to set up a new act for food and drugs.

#### Nutritional Diseases

1. Malnutrition is in every village, kwashiorkor and marasmus are prevalent.

2. The caloric intake 1,300 - 1,800 Cal., protein intake 45 gr. (Reference protein) i. e. more deficiency in calories than in proteins.

3. There is vitamin deficiency (Vitamin A and B), vitamin C still short but no survey.
4. There is no Calcium deficiency.
5. Infant mortality is 160 per thousand births.
6. The Ministry of Health is starting establishing a food laboratory. They carried some dietary surveys and collected some foods to be analysed.
7. There is no school feeding programs, but some school masters urge the fathers to pay extra fees for offering a meal for their children. A school feeding programme will be set up for the next year.
8. There is no nutritionists in the proper sense, but there are medical officers working in child health and also nurses. All of them look after the nutrition of the child.
9. There is no training in nutrition.
10. The number of medical professionals are 500.

#### Universities and Research Institutes

##### 1. The National Council for Scientific Research

It was established according to act No.55 of 1967 received Presidential assent on 8th August, 1967. The act defines the general function of the Council as being "To co-ordinate and promote scientific research in Zambia with a view to ensuring that the requirements of the country's development plans are properly supported by scientific research and that the maximum use is made of the results from such research in the carrying out of those development plans".

The Council established 5 permanent Research Committees namely, the industrial committee, the Engineering and Construction Committee, the Medical Committee, the Agriculture and Natural Resources Committee and the Manpower Committee. These Research Committees are to assess and advise the Council on the adequacy of scientific and technological research and development in their fields, to recommend the priorities of the research programmes required, to determine their needs and to follow up the implementation of their results.

The Council's activities in research comprises not only the work done by the Council's research units but also the research work carried out in other laboratories on projects which are being supported by the Council either through the provision of staff or laboratory equipment and supplies.

In 1971 the Council had 7 research units, among them there is an Animal Productivity Research Unit, Tse-Tse Research Unit, Water Resources Research Unit and Food Science Research Unit.

In addition to the research projects carried out by the seven research units, the Council also supported projects on : Thyroid-Goitre research, Neuropathics research, Medicinal plants research, Research on insulin response to intrajejunal glucose and Ground nut "pops" research.

In the animal productivity research, the programme was designed to accumulate information about the normal pattern of reproduction in the local breeds of cattle.

The Food Research Unit concentrated on the investigation of vegetable oils from various plant materials such as ground nuts, sunflower seeds, cotton seed and other fruits.

Studies on the canning of mangoes and the preparation of mango juice, mango squash and mango pulp are also going on.

The Council is co-operating with the Ministry of Health and FAO in the establishment of the Food and Drug Control Laboratory.

The number of staff holding Ph.D. in the Council were 12 in 1973.

## 2. The University of Zambia

It includes three schools : School of Agriculture, School of Medicine and School of Natural Sciences. There are neither schools for veterinary medicine nor home economics. There are also School of Arts and School for Human Sciences.

The School of Agriculture has no farm but it is intended to have one for training students. Only 14 students had been graduated from the school of agriculture up to the year 1973. Among the staff of the school there is a Professor of Animal Nutrition.

13 students were the first group graduated from the school of Medicine in 1973.



Z A I R E(Number of population 22,000,000)

The team interviewed and made discussions with the following officials :

1. Dr. Tshilmalma wa Ilunga Kabengelo  
Director General  
Department of Public Health  
Kinshasa
2. Dr. Ng. Wete  
Director General  
National Office of Research  
and Development

Food Production and Food Industries :

1. Staple food depends on the region but mainly cassava. They eat cassava with meat, fish, and cassava leaves.
2. They grow tomatoes, potatoes, aubergine and mushrooms.
3. The common dish consists of maize and cassava (1 : 1), sometimes soybeans are added then boiled for 15 minutes. Sause made from vegetables and melon seeds are added. According to economic situation fish or meat are added to the sause.
4. Fresh, dried or smoked fish, are consumed, also legumes.
5. They grow vegetables and fruits.
6. There is some canning of tomato, mango and pine apple. Canned foods are for export.
7. The protein intake is 45 and the caloric intake 2,000 Cal.
8. Oil uses is either of groundnut or palm oil.
9. Most of the drinks consumed are bottled in the Country.
10. The main occupation is agriculture.
11. The last dietary survey was conducted 1965 - 1966 and there is a study which started 1971 on food consumption among citizens of Kinshasa.

State of nutrition

1. Mortality rate among children is high (no figure was given). Causes are multifactorial among which are gastro-intestinal diseases, and bronchitis.
2. Very few causes of Kwashiorkor and marasmus.
3. Although mortality rate is high, but nutrition is not the main cause as they follow some preventive measures.

Universities and Institutions

1. A pilot experimental Centre for public health which includes a section for nutrition

Some medical professionals are working in this centre. Five of them are working in the field of nutrition. They are either from UN agencies or from Zaire. They teach mothers how to prepare food using local facilities.

There is a laboratory for meat and milk analysis.

2. Department of Medical Research - National Office of Research and Development

It includes a section for nutrition in which there is a dietitian and a nutritionist, both are foreigners. There are 2 physicians from Zaire who studied nutrition for short periods and who are now responsible for public health and nutrition. The nutrition section is responsible for the following jobs :

- (i) training of medical and non medical personnel on nutrition. Training of nurses. Such training takes place in the University
- (ii) Responsible for nutrition education programmes and this takes place in the Hospitals and some Health Centre or Social Centres. They have 15 social centres.

Training in nutrition sometimes take place through the church, but it is irregular and it is mainly on food consumption.

3. Food and Nutrition Research Centre

It is affiliated to the National Research Council. The Centre is working on the following projects :

- 1. Food microbiology and effect of radiation on soft drinks.

- 2. Preparation of bread from cassava.

- 3. Preparation of weaning foods for infants :

a study was made on children up to 3 years old; the study includes time when weaning foods are to be given with special advice to mothers on weaning practices.

- 4. Study on Mycotoxins : aflatoxins in ground nuts, maize and rice.

N.B. Reply for Questionnaires either not received or unavailable.

(Number of population 3,000,000 - rate of increase 2.5-3%)

The team held its meeting in the Ministry of Foreign Affairs. The Central African group was headed by the Minister of State for Health. The following officials attended the meeting :

1. The Director of Health
2. The Director of Agriculture
3. The Director of Rural Development
4. The Director of Statistics Department
5. Mr. F.R. Ratsirahonana, Director of Documentation Centre, OAU (Bangui)

The discussions revealed the following :

#### Food Production and Food Industries

1. 87% of the population, their main occupation is agriculture. Agriculture is not mechanical.
2. The following food crops are grown : coffee, cocoa, hot pepper, cola nuts, rice, maize, ground nuts, sesame and sunflowers. They succeeded in growing tea.
3. Rice is cultivated three times a year, the average crop per year is 2 tons/hectar.
4. All vegetables are grown but they are trying to grow more tomatoes.
5. The staple food is mainly cassava. They have also yam and plantain.
6. The staple dish is cassava with sauce to which meat, fish, vegetables are added.
7. The country is self dependant for their food, even they have excess foods. They have to import some food comodities for Europeans being in Bangui.
8. They prepare their own beer and their wine, palm wine.
9. They grow cotton as a cash crop. On the average 60,000 tons are produced every year.
10. They raise cattle, they have 400.000 heads of cows, 60,000 heads of sheep.
11. They have two large poultry farms. Around the capital, the inhabitants raise hens for meat and for eggs which are available everywhere.
12. They have no food industries. No dairy industries but for little cheese production.

1. They have no nutritional problems but they have some nutrition deficiency diseases including kwashiorkor.
2. Mortality rate 20 per thousand, mainly from malaria.
3. The child depends on his mother's milk for a long period.
4. They have neither nutritionist nor dietiticians but they asked for one from WHO.

Universities and Institutions

1. Bokassa University

A new established University. It includes schools for arts, law and science.

2. Agriculture Schools

There are 3 categories :

- A) Study for 4 years after finishing their primary school.
- B) Study for 4 years in secondary schools preparing for the secondary school certificate (Baccalauréat) then complete their study in an institute affiliated to the University. The number of graduates from this school were 47 in 1973.

There is also a Technical school in Bangui.

3. Medical Schools

There is no school of medicine, but they have a school for nurses.

The number of medical professionals are 500 - 550 including assistants.

There are 80 students studying medicine in France.

4. Department of Public Health :

Affiliated to the Ministry of Health. There is a laboratory for food analysis.

H.B. - No reply for questionnaires, either unavailable or not received.

B E N I N

(Number of population : 2,000,000)

Unfortunately the team was unable to meet any of the officials because of Saturday and Sunday, the week-end holiday. Even Professor Edouard Adjenoboun, University of Dahomey and member of the team did not join the team from the start.

FOOD PRODUCTION AND INDUSTRIES

No date was available.

A visit to the market of Cotonou, the capital, the following food commodities were exposed : chicken, guinea fowls, pigeons, smoked geese, beef, plenty of fish and all vegetables and fruits.

UNIVERSITIES AND INSTITUTIONS

The team, looking for Professor Adjenoboun, went to the University of Cotonou, then to its annex at Porto-Novo, but did not meet any official.

N.B. - Either no reply for the questionnaires or its being unavailable.

N I G E R I A

(Number of Population : 75,000,000 projection from 1963 census)

Rate of increase of population : 2.7% per annum.

The team visited Nigeria and also received replies for questionnaire from the ministries, universities and research institutes.

In Lagos, Ibadan and Ife, the team met and had discussions with the following officials :

- Mr. A. A. Razek  
Assistant Secretary, Scientific, Technical and Research commission, Lagos
- Dr. Mrs. Silva  
Federal Ministry of Health, Lagos
- Dr. Okezie  
Commissioner, Federal Minister of Agriculture, Lagos
- Dr. Bukar Sahib  
Permanent Secretary, Ministry of Agriculture, Lagos
- Mr. Adetula  
Manpower Division, Economic Development, Lagos
- Mr. Odelola  
Executive Secretary, Scientific, Technical and Research Commission, Lagos
- Professor A. Omolulu and the staff of Nutrition Department  
University of Ibadan.
- Professor V. A. Oyenugai  
Professor of Animal Nutrition and Pro-Vice Chancellor  
University of Ibadan. Ibadan
- Professor G.R. Hawat  
Professor of Food Science, and Technology and his staff  
University of Ife, Ife
- Dr. Ewart Brundrett  
Director, Institute of Applied Science and Technology  
Ibadan

FOOD SCIENCE & TECHNOLOGY : There are many Food Industries and Institutions in Nigeria. Most of these are on a medium level scale including oil seed production - using palm oil and groundnuts; Fisheries - mostly Frozen fish without canning; meat industry - freezing and canning are carried out as well as sausage and bacon production. There is also a lot of traditional processing of meat and fish - dried, cured by smoking salting etc...

Fruit juices are bottled in most areas - especially orange and pineapple - and other is canning of those as well as mangoes and other citrus fruits.

There is the traditional processing of maize to OGI - a staple food used all over the country and as a weaning food. Soy-Ogi a processed food produced by the Federal Institute of Industrial Research OSHODI, is planned to increase the protein content of this food for babies and adults. Poultry and egg production is carried out extensively all over the country.

Traditional processing of Cassava into Gari - one of the staple foods goes on all over the country. The food Technology Department and other research institutes are working on the mechanisation of Gari production.

At the present time (1978) there are Food Science and/or Food Technology Departments at the University of Ibadan, Ife, and Nsukka. There are also many research institutes including the Federal Institute of Industrial Research which has a Food Science and Technology section working on Soy Ogim supplementation of Gari and other such programmes, Institute of Agricultural Research at Ibadan, at the Ahmadu Bello University, Zaria, Institute of Veterinary Research, Vom working on Dairy products. There are also Institutes of Cereals Research, Institute of Food Crop Research - Root Crops, Vegetables, in different parts of the country.

There is a lot of work going on increasing the quality and quantity of food at the International Institute of Tropical Agriculture, Ibadan where work is being done on improving genetic strains better seed production, strain improvement of African food crops and increasing yields in tropical zone.

Department of Agriculture and Animal Science are to be found in most of the Universities with research going on Pest Control, Animal husbandry, Agronomy and Animal Science. Production of graduates in Agriculture and Food Science is above 2,000 per annum for the Country.



NUTRITION : The University of Ibadan has a Department of Human Nutrition, which has been the regional training institution for nutrition on the Continent. Over 300 students from most of the countries of Africa have been trained in this institute over the past 15 years. The courses given include middle-grade Certificate courses as well as postgraduate masters and Doctorate degrees. There is a food consumption Unit and a National Biochemistry unit in this department as well as a medical unit which works both at the teaching Hospital and in Health Centers. Food consumption studies have been carried out in most of the areas of the country by this department. On going research in the department includes studies on breastfeeding, weaning foods, analysis of African foods as cotton and studies on Protein - Energy, malnutrition.

There is also in the Federal Ministry of Health, Lagos, a Nutrition Unit, which coordinate nutritional work all over the states of the country. Some of the States have Nutrition Units attached either to the Ministry of Health or Ministry of Agriculture.

FOOD PRODUCTION : Nigeria is a big country and has both the Forest Savannah zones. Food production covers both zones. In the savannah area, sorghum, millet, ground nuts, beans, soya beans, alfalfa, shea nuts, potatoes, and vegetables like tomatoes, cabbages are available. Cattle, goats and sheep are reared - traditionally by Fulani herdsmen, but a few ranches and research stations now flourish.

In the forest areas, yams, cassava, maize, sweet potatoes, plantain, bananas, rice are grown as well as citrus fruits, pineapples, mangoes, all types of leafy vegetables, tomatoes, onions, sweet and hot peppers, ginger, coffee, cacao, palm oil.

The Federal government has started an operation "Feed the Nation" to increase awareness of food production by everybody and increase food crops. The sum of 518 million Naira (about 700 million US. Dollars) has been allocated to this fund. Agro-centres with fertilisers, tractors, improved seeds etc... are being set up all over the country to supply these at subsidised prices to everyone, research stations and better Extension services are also being developed. Irrigation from dams are being developed in many areas of the Savannah and Forest zones. Wheat production has started and there are 3 sugar-cane factories already in operation.

EDUCATION AND UNIVERSITIES : There is a free primary education scheme in Nigeria and over 8 million children attend school. There are 11 Universities in different parts of the country. Four of these Universities - Lagos, Ibadan, Ife, Nsukka producing post-graduate students in medicine, Agriculture, Food Science, Technology, Engineering, geology, and other subjects.

There are also 10 Polytechnics and Technical Colleges training in Engineering, Science, Business methods, Management and Technology.

Nigeria seems to the team, a country with manpower and potential. A lot is being done in all fields and both the government and people are aware of the need for more food and the importance of Food Science, Food Technology and Nutrition in attaining this end. Starts have been made in all three areas.

#### FOOD SCIENCE AND APPLIED NUTRITION UNIT (UNIVERSITY OF IBADAN)

##### A. Research Interests in the Department

1. Mineral utilisation from vegetable sources
2. Nitrogen utilisation from local diets  
Chemical and biological evaluation of the nutritive value of foods and diets.
3. Food consumption surveys
4. Nutrition and Public Health
5. Changing ecology of rural and urban areas and its influence on child feeding practice and family life and family planning.
6. Nutrition Education
7. Vitamin metabolism and their metabolic interrelationships with other nutrients.
8. Biochemical and Nutrition principles underlying causes and treatment of diseases.
9. Public health nutrition in Nigeria and its role in preventive medicine.
10. Dietary management of diseases.

##### B. Research projects presently at hand

11. A possible diagnostic method for the mental retardation of PCM (in collaboration with Osifo).
12. Nitrogen utilisation from locally available plant proteins
13. Calcium and magnesium utilisation from local vegetable sources.
14. Chemical evaluation of the nutritive value of varieties of banana (Musa, Sapientum, L.) grown in Nigeria.
15. Influence of fermentation period on the chemical composition of plantain wine (In collaboration with Scott-Emuakpor).
16. Changes in the nutritive value of sweet potatoes (Ipomoea batatas) during storage.
17. Effects of long breast feeding (22 months) on mothers and infants at Osebere (In collaboration with Olusanya, Omolulo and Scott-Emuakpor).

18. Food composition studies in households and institutions.
19. Nutritional requirements of an average Nigeria as worked out from previous dietary survey data.
20. Different methods of food preparation in Nigeria and the possible effect on nutrition.
21. A study of procedures in feeding and weaning infants in Nigeria
22. Collection of prices of local foodstuffs and the compilation of the list of best buy in terms of nutrients.
23. Effects of long breast feeding (22 months) on mothers and infants at Osegere (In collaboration with Ketiku, Omolulo and Scott-Emuakpor)
24. Child morbidity and mortality at Osegere village - collation of data collected.
25. Study of maternal and infant nutrition in Osegere and the effects of cultural taboos and restrictions.
26. Study of childhood nutrition, 1-5 years of age, at Osegere.
27. Effects of long breast feeding (22 months) on mothers and infants at Osegere and (In collaboration with Ketiku, Olusanya and Scott-Emuakpor)
28. Study of a fast diagnostic method for the liver damage that accompanies PCM in childhood (In collaboration with Dept. of Paediatrics).
29. Folic acid body stores of full-term and premature babies and their relationships to maternal folic acid levels. (In collaboration with Dept. of Gynaecology and Obstetrics).
30. A possible diagnostic method for the mental retardation of PCM (In collaboration with Ajayi).
31. A study of the causes and prevention of anemia that accompanies febrile diseases in childhood. (In collaboration with Dept. of Paediatrics).
32. Effects of nutrition education on food and eating habits of urban and rural population.
33. Food beliefs and taboos - cultural factors affecting good nutrition.
34. Influence of fermentation period on the chemical composition of plantain wine (In collaboration with Ketiku).
35. Effects of long breast feeding (22 months) on mothers and infants at Osegere (In collaboration with Ketiku, Olusanya and Omololu).

UNIVERSITY OF IFE ILE - IFE, NIGERIA (FACULTY OF TECHNOLOGY)DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGYHead of Department : Professor G.R. HowatINTRODUCTION :

The Department of Food Science and Technology was formally established in December, 1970. For a year or two before that it formed a sub-department of the Department of Animal Science.

Food Science is a relatively new subject of co-ordinated study although over many years different parts of it have been studied intensively and much knowledge gained. For example, edible oil refining, meat canning, fish processing, and the dairy industry are examples of areas of food science which have been studied for at least a century.

The course of studies presented here aims at providing adequately trained and qualified staff to work in the food industry, food commodity research stations, and in Government Departments related to these activities.

The first two years of the course provide a sound knowledge of the basic scientific subjects on which the successful study of food science and technology depends. The last two years of the course apply this knowledge to the nature, composition, and properties of food materials and to their behaviour during processing.

It should be noted that the course is so devised as to give the food technologist an understanding of the engineering principles involved in processing food so, that when necessary, he can modify existing processes or develop new ones. It should also enable him to understand the principles which guide design and process engineers in the manufacture and use of processing equipment. The programme gives special attention to this aspect of training.

PROGRAMME OF STUDIES

The four years course leads to the degree of B. Sc. Degrees with First Class, Second Class (Upper and Lower Divisions), or Third Class Honours are awarded. Alternatively a Pass Degree may be granted.

In the course, Parts I, II, III, and IV, each last for one session. Parts I and II aim at providing a sound knowledge of chemistry, physics, mathematics, biology, microbiology and biochemistry.

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The following staff are available for teaching duties and research in the Department :

Professor : G. R. Howat, B. Sc., Ph. D. (Glasgow)  
F.R.I.C., F.I.F.S.T.

Senior Lecturer : Vacant

Lecturers : P.O. Ngoddy, B. Sc. (Agric. Eng.)  
California Techn. M.S.,  
Ph. D. (Agric. Eng.) Michigan State,  
M.A.S.A.E., A.I.F.S.T., M.I.F.T.

J.B. Fashakin, B.Sc. (McGill), M. Sc.  
(Michigan State), M. Sc.,  
(Massachusset Inst. of Tech.)  
D. Sc. (Harvard).

(Esther Balogh, M. Sc., Ph. D. Eotvos)

\* M. O. Abe, B. Sc. Ph. D. (Ibadan)

\* A. O. Ogunsua, B.Sc., M.Sc. (McGill)

Visiting Specialist in Bakery  
Technology : Mr. James Hall, M.I.B.B., F.R.S.H.

Experimental Officer : Mr. J.O. Ogundiwin, H.N.D., M.Sc. (Reading)

Technician : Vacant

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\* on study leave

STUDENT ENROLMENT : At present 48 students are enrolled in the Department.

BUILDINGS : A large modern building (to be shared with Department of Chemical Engineering) is in the course of construction and will shortly be completed. This has full facilities for lecturing, practical classes, and research projects including pilot plant operations.

Full details of the syllabus of the individual courses are available on request.

FEDERAL INSTITUTE OF INDUSTRIAL RESEARCH OBIP. M. B. 1023 IKEJA - LAGOSNIGERIAPUBLICATIONS ON FOOD AND FOOD TECHNOLOGYRESEARCH REPORTS :

<u>NUMBER</u>	<u>T I T L E</u>
1	The preservation and bottling of plm wine (1957)
2	Some inexpensive improvements in Village scale gari making (1958)
4	Fermentation of coffee pulp (1959)
10	A preliminary investigation into the utilisation of cashew apples (1960)
11	The manufacture and utilisation of leaf protein (1962)
12	The manufacture of gari from cassava (1962)
13	Gari pilot plant (1 ton a day); results of 3 months trial run (1962)
15	Feasibility study on a two-stage method for the decortication of cashew nuts and the extraction of cashew nut shell liquid.
20	Further studies on the fermentation of cassava (1963)
27	Pilot scale production of dried flah at Aba, Eastern Nigeria. (1964)
29	Improvements on the 1 ton/day gari plant (1964)
33	The water relations of some processed Nigerian foods (1965)
38	The preservation and bottling of palm wine (1968)
41	Feasibility of mechanised processing of "instant Ogi" from Nigerian cereals (1968)
42	The development of Soy-Ogi (a corn based complete protein food (1970)

TECHNICAL MEMORANDA

<u>NUMBER</u>	
14	Estimates for a factory producing 10 tons a day of gari (1962)
20	A feasibility study for the establishment of a desicated coconut industry in Nigeria (1964)
22	A review of the lesser-known vegetables oils and oilseeds available in Nigeria, part I, (1964)
25	An economic feasibility study for the establishment of a glucose industry in Nigeria (1970)
26	Industrial specification for mechanical processing of cassava into gari (1971).

T I T L EJ O U R N A L

Developing our food industry	Nigerian Opinion Vol. 1, Nov. 1965
Fermentation of Cassava	Journal of the Science of Food and Agriculture, Vol. 15, no.9 p.589, 1964
Fermentation studies on Maize during the preparation of a traditional African starch - cake food	Journal of the Science of Food and Agriculture, Vol. 21, no.12, p. 619 Dec. 1970.
Fermented food composition	British Patent no.1, 193, 135, May 28 1970
Leaf Protein	World Crops, Vol.15, no.12, Dec. 1963
Mechanised gari production at F.I.I.R.	The Nigerian Grower and Producer, Vol. 1 no.5, p. 100, Oct./Nov. 1962
Nutrient enrichment of gari	West African Journal of Biological and Applied chemistry, Vol. 10, no.1, p.19 1967
The nutritive value of "Ogi", a Nigerian infant food	Tropical Medicine and Hygiene, Vol.70 no.11, p.279, 1967
Assesment of the nutritive value of a maize-soya mixture, "Soy-Ogi" as a weaning food in Nigeria	British Journal of Nutrition, Vol.26, No.2, Sept. 1971
Effect of Soya flavour on the lactic fermentation of milled corn	Applied Microbiology Vol. 17, No.1 p.186, Jan. 1969
Wine from cashew apples	The Nigerian Grower and Producer, Vol.2, No.1, p.10, Feb./March, 1963
Industrial opportunities in palm wine Production	Investor's Digest, Vol.2, No.1, p.6 Jan. 1-15, 1969
A two-stage fermentation of cassava	Nature Vol. 183, No.4661, p.620, Feb.28, 1959
Problem of "Set up" in palm oil	The Nigerian Grower and Producer, Vol.1 No. 5, p. 97, Oct. 1962
The role of yams in West African Food Economics	World Crops, Vol. 17 No. 2, P.1. June 1965
Storage losses in yams	The Nigerian Grower and Producer, Vol.2, No. 3, p. 43, 1963
Mechanisation of gari production	Nigeria Trade Journal, Vol. 19, No. 3, July/Sept. 1971.

G H A N A

(Number of population 8,600,000 rate of increase : 2.7%)

Area : 92,000 sq. miles

The team made discussions with the following officials :

- (1) Dr. Idusogie, FAO
- (2) Prof. L. S. Joeries, UNDP, Aksamba
- (3) Mr. C.J. Vanderpuye, Specialist, Fish Biology, Aksamba
- (4) Dr. Fraser (Head)
- (5) Dr. Dr. David Doko
- (6) Dr. Andrew Yongo
- (7) Dr. David Doko
- (8) Dr. Marks Woolfe
- (9) The Vice-Chancellor, Legbon
- (10) The Deputy Regional Director FAO for Africa, South of Sahara.

Food production and industries

(1) In Ghana there are many forests, the biggest one was 30 sq. miles; it is now 8.4 sq. miles. The rest was either cultivated by crops or used in making roads or for building houses. Most of the soil is covered with fallen tree leaves or with organic matter.

(2) 51% of the national income come from agriculture including forestry and fish. 70% of the people work in agriculture.

(3) The following food crops are grown : yam, maize, plantain and cocoyams which are planted as shade crops. In the north, guinea corn and millets are grown. Rice, millet, cassava, a variety of vegetables and fruits are also grown.

(4) The following cash crops are also grown : cocoa, sugar cane, cotton, tobacco, timber and rubber.

(5) 10,000 tons of meat produce come from wild animals. This does not include game birds, snails and a wide range of rodents other than the grasscutter, the crested porcupine, the brush tailed porcupine and the grey rat.



(6) There is plenty of fish. Fish consumption increases year by year. In 1970, it was 172,950 metric tons. Most of fish is herring.

(7) Fish preservation is carried on by traditional methods, mainly by smoking. The biggest fish catch is at the port of Tema.

(8) Palm oil and palm kernel oil are produced from the oil palm tree which grown well in high rain fall belt.

(9) Shea trees from which nuts shea butter is extracted grow wild in the North.

### Universities and Institutions

#### A - Universities

(1) Lagon : Established in 1961, but it started in 1948 as a College affiliated to the University of London. It includes 32 departments among which is the Department of Food Science and Nutrition.

The Department of Food Science and Nutrition is a separate building of three floors, well equipped with modern equipments. The first floor is for Food Technology where there are many equipments and a complete food processing pilot plant. The Department is for teaching and training. It gives B.Sc. in Food Science and Nutrition. The courses were established in 1963. The total number of students already qualified are 75 and the number of present students are 27 (1975), all are Ghanians.

The number of staff are 9, two are nationals and seven are expatriates. The Head of Department, Dr. Frazer is an expatriate. The staff of the Department can be grouped as follows :

<u>Professional staff</u>	<u>Actual strenght</u>	<u>Qualifications</u>
- Food Scientists	3	3 doctorate
- Food Technologists	3	3 "
- Nutritionists	3	2 " , 1 M. Sc.

The Department finds difficulty in filling vacant posts either from nationals, Africans or expatriates.

The main problem with the Food Science is the lack of agricultural productivity.

There is animal experimental room for carrying biological experiments. There are all equipments for conducting nutritional surveys. The Department is concerned with teaching and reasearch. The research projects carried are : (1) improved rural preservation of marine fish (2) development of legume based infant foods (3) effect of malnutrition on blood enzyme levels.

The Department received an aid of 40,000 US\$. from Canada for a fish preservation project.

The Department is tending for expansion of M. Sc. and Ph. D. programmes. The course given by the Department is given under Annex.

The Department is affiliated to the School of Science.

There is a School of Medicine established in 1964. The number of students of Legon are 2,600 in 1973 and the number of staff are 450. All students live in the University Hostels inside the University campus.

There are two other Universities in Ghana, but they were not visited by the team.

(2) Science and teaching university including Departments of Agriculture, Engineering, Architecture, Pharmacy, Science and Social Sciences.

(3) There is thirt University at the Cape Coast.

B Council for Scientific and Industrial Research

It includes institutes for the following :

- i) Animal research
- ii) Cocoa research
- iii) Crop research
- iv) Forest products research
- v) Aquatic Biology research
- vi) Soil research
- vii) Building and Road research
- viii) Water research
- ix) Standard and Industry research and
- x) Food research

The Food Research Institute assists in the development of the food processing industry in Ghana by carrying out research in the processing, preservation, storage, transportation and distribution of the main vegetables and animal foods of the country with a view to producing new foods and improving the traditional ones. The activities of the Institute may be grouped into 4 main divisions :

- (a) Food economics and marketing
- (b) Food consumption, surveys and planning
- (c) Food Chemistry and
- (d) Food processing and engineering

C - Ministry of Health

The Nutrition Division - It is responsible for nutrition surveys and investigations throughout the country. Further information are being collected on protein-energy malnutrition especially in the forest and coastal area. A survey was carried on the incidence of goitre in the northern of Ghana.

- Nutrition education is carried out by various grades of public health staff, and besides taking part in the programmes, the Nutrition Division is responsible for the training of Ministry of Health staff and the staff of other Department taking part in these programmes.

- Nutrition Rehabilitation Centres have been set up (5 centres). At these centres, the children are fed so that their clinical status is improved and at the same time the mother is instructed how to use her available resources to ensure that her family are well fed.

- The Nutrition Division is responsible for advising the Ministry of Health on Nutrition Policies and Programme issues which concern several Ministries or Departments and which are referred to the Nutrition Advisory Committee.

- Investigations are made into the diets of various sections of the population, especially institutions such as day nurseries and boarding schools.

- Research is carried out in nutrition biochemistry of malnutrition in association with the Health laboratory service and in Paediatric Departments of the Hospital throughout the country. Studies are also carried out on infant and child growth and development.

- The Catering Advisory Service assists Government Hospitals and Institutions and other catering establishments in the country.

N.B. : a) There is a reply from the Food Science and Nutrition Department, Legon, on the Questionnaires.

b) Courses given to students are given below.

- Secretariat facilities are provided for the contact point for the International Codex Alimentarius and the Food Law Section of the Ministry of Health.

Each region of the country has a separate nutrition section inside the public health service but works in cooperation with the Maternal and Child Health Programmes. All public health staff participate in nutrition education.

There are MCH divisions affiliated to the Ministry of Health. It is responsible for the care of mothers and children who form over 70% of the population.

N.B. : a) There is a reply from the Food Science and Nutrition Department, Legon, on the questionnaires.

b) Courses given to students are given below.

DEPARTMENT OF NUTRITION & FOOD SCIENCEUNIVERSITY OF GHANABF. Sc.6(2)/72-73Three Year Degree ProgrammeYear I

<u>No.</u>	<u>Course</u>	<u>Hrs.</u> <u>Lects.</u>	<u>Hrs.</u> <u>Practs.</u>	<u>Units</u>	<u>Pre-</u> <u>Requisite</u>
C.111,121,191	Chemistry Physics with Maths, Biology)	Refer to Departmental Syllabuses			A level

YEAR II

NFS 201	Principles of Food Preservation	30	45	9	Year I
NFS 202	Principles of Nutrition	60	90	18	" I
NFS 203	General Microbiology	20	40	6	" I
NFS 204	Commodities I	30	45	9	" I

All courses to be taken by students intending to major in Nutrition and Food Science.

Students intending to major in Nutrition and/or Food Science are also required to take the following courses in Biochemistry :

Bo. 210 (4 units), Bo. 211 (6 units) Bo. 213 (4 units),  
Bo. 214 (6 units), Bo. 216 (8 units)

YEAR III

NFS 301	Applied Nutrition	20		4	NFS 202
NFS 302	Commodities II	50	75	15	" 201
NFS 303	Assessment of Nutritional Status	20	180	16	" 202
NFS 304	Energy & Nutritional interrelationships	20	75	9	" 202
NFS 305	Diet, Disease and Adaptation	15		3	" 202
NFS 306	Nutrient Needs	15	75	18	" 202
NFS 307	Regulation of Food & Water Intake	15		3	" 202
NFS 308	Food Engineering	40	60	12	" 201
NFS 309	Food Analysis		75	5	YEAR I

<u>C O U R S E</u>		<u>Hrs.</u> <u>Lects</u>	<u>Hrs.</u> <u>Practs.</u>	<u>Units</u>	<u>Pro-</u> <u>Requisite</u>
NFS 310	Food Microbioloty	20	30	6	NFS 203
NFS 311	Industrial Fermentations	10	15	3	NFS 203
NFS 312	Stored Prod. Entomology	10	15	3	Biology
NFS 313	Plant Management	10	-	2	NFS 201
NFS 314	Irradiation and Microwave Processing	15	-	3	NFS 201
NFS 315	Colour, texture, organoleptics, packaging	15	15	4	NFS 201
NFS 316	Biometry and Statistics	-	30	2	YEAR I
NFS 317	Food Chemistry	15	15	4	NFS 201,302
NFS 318	Food toxicity and indicator bacteria	10	15	3	NFS 203,304
NFS 319	Seminar and Tutorials Nutrition	30	-	6	NFS 202
NFS 320	Seminar, Food Science	25	-	5	
NFS 321	Practs., P reject, Field Work (Nutrition)		240	16	
NFS 322	Practical Project (Food Science)		135	9	

DEPARTMENT OF NUTRITION AND FOOD SCIENCEYEAR II

NFS 201 PRINCIPLES OF FOOD PRESERVATION : 30 lectures, 45 hrs.  
practical (9 units)

- General principles and methods of temporary and permanent preservation including; pasteurization, general steps in thermal processing, syrups and brines, exhaust and vacuum, dehydration, jams and jellies.

NFS 202 PRINCIPLES OF NUTRITION : 60 lectures 90 hrs.  
practical (18 units)

- Food as a sustenance of life; food groups. The body systems associated with delivery of food to the body; their properties and functions in health and in malnutrition. Aspects of metabolism; patterns and trends of carbohydrate and methods of evaluation; incidence, aetiology, treatment and prevention of protein-energy malnutrition. Distribution and function of minerals in the human body; dietary sources and requirements of these minerals; trace elements in nutrition. Landmarks in the discovery of vitamins; function and interrelationship of the fat soluble and water soluble vitamins; requirements and dietary sources; effects of dietary deficiencies of vitamins. Food as source of energy for body functions; energy value of foods; factors influencing energy expenditure; measurements of energy expenditure.

NFS 203

GENERAL MICROBIOLOGY : 20 lectures, 40 hrs. practical (6 units)

- History and scope of microbiology.  
Classification of micro-organisms.  
Eucaryotic micro-organisms, protozoa, algae, fungi including yeasts. Procaryotic micro-organisms; algae, bacteria, PPLO, PPLO-like organisms, B - forms, Rickettsia and viruses. Bacteria physiology, metabolism and growth. Bacteria-host interactions, serology.

NFS 204

COMMODITIES 1 : 30 lectures, 45 hrs. practical (9 units)

- Sugar cane technology; harvesting, cane preparation, clarification, crystallization, centrifuging, refining.
- Oil crops, vegetable oils, chemical composition of vegetable oils, physical and chemical properties, methods used in the oil industry, technological aspects.
- Leguminous plants, agricultural and botanical aspects, chemical composition, technology of vegetable proteins from leguminous seeds.
- Chemical and technology of cereals, production, composition, milling (including pre-treatment) and uses in West Africa of wheat, maize, rice, sorghum and millet. Theory and technology of bread making.
- Beverages; history of cocoa and chocolate, composition of unfermented cocoa, fermentation and drying of cocoa, manufacture of chocolate drying, changes in phenolic compounds during fermentation of tea, composition and fermentation of coffee.

YEAR IIINote :

NFS 312 and 316 may be taken as courses in another Department.

Students entering Year II will be committed to proceeding to Year III in the Department since at the end of Year II they will not have the background required to proceed to Year III in Biochemistry.

Students entering Year III may elect a major in Nutrition, a major in Food Science (i.e. essentially a 3: 2: 1 course) or they may combine courses to give a Nutrition and Food Science option which is essentially a 3: 2: 2.

- Requirements are as follows' :

1. Nutrition major : NFS 301, 303, 304, 305, 306, 307, 310, 319, and 321
2. Food Science major: NFS 301, 302, 308, 309, 310, 312, 317, 320 plus 10-15 optional units, not less than 6 of which shall be selected from NFS. 311, 313, 314, 315, 316, 318.

3. Combined Nutrition

& Food Science : NFS. 301, 302, 309, 310, plus not less than 18 units from Group A and 18 units from group B to be selected in consultation with a Departmental Committee.

GROUP 'A'

NFS 303, 304, 305, 306, 307, 319,

GROUP 'B'

NFS 308, 311, 312, 313, 314, 315, 316, 317, 318, 320.

NFS 301 APPLIED NUTRITION : 20 lectures (4 units)

Applied Nutrition programmes, their implementation and evaluation; relationships of food production; food importation and food prices; income and quality of diet; effects of urbanisation on food purchases and nutrition; population and food resources. Nutrition education and methods of delivery of nutrition information to the public; role of national and international organisations in combating hunger and malnutrition in the world. Protection of the consumer, food regulations.

NFS 302 COMMODITIES : 2 : 50 lectures 75 hrs. Practical (15 units)

- Fruit juice production; measurement of fruit quality, physiological and enzymological aspects, dearation and filtration, physical and enzymological methods of clarification, metallic contamination, chemical additives.
- Meat and fish; composition and structure of muscles, contraction of muscle, post-mortem changes in meat and fish muscle, conditioning of meat, factors affecting meat quality, cooking of meat; salting, curing and smoking of meat and fish, refrigeration and freezing of meat and fish, fishing methods, composition of fish, handling of fish and causes of spoilage, canning of fish.



- Eggs and poultry; quality, refrigeration and freezing, egg processing.
- Milk; manufacture of tinned and filled milk.

NFS 303 ASSESSMENT OF NUTRITIONAL STATUS : 20 lectures 180 hrs. practical (16 units)

- Food balance sheet, dietary surveys and techniques; assessing the adequacy of nutrient intakes; clinical appraisal of nutritional status; signs and stigmata of malnutrition and nutrient deficiencies; biochemical indices of good and poor nutriture; anthropometric measurements; vital statistics. Assessment of the nutritional status of a community.

NFS 304 ENERGY, NUTRIENT INTERRELATIONSHIPS AND THE VULNERABLE GROUPS : 20 lectures 75 hrs. practical (9 units)

- Human working capacity; diet in relation to working efficiency; energy balance; weight control and the development of obesity. Interrelationships among the macro nutrients; vitamin and mineral interrelationships; antimetabolites and antivitamins. Nutritional needs of the vulnerable groups. Food fortification and new foods. Investigation of protein, carbohydrates and fat metabolism, and animal experimentation.

NFS 305 DIET, DISEASE AND ADAPTATION : 15 lectures (3 units)

- Influence of diseases and infections on the nutrition of the host; diet in the treatment of disease. Nutrition and dental health. Concept of nutritional adaptation, adaptation and the formulation of recommended nutrient allowances.

NFS 306 NUTRIENT NEEDS : 15 lectures 75 hrs. practical (8 units)

- Methods of determination of nutrient needs; protein, amino acid, vitamins, minerals, needs of men and women. Trace elements in nutrition. Investigation of mineral, vitamin status; biochemical assessment of protein-energy malnutrition.

NFS 307 REGULATION OF FOOD AND WATER INTAKE : 15 lectures (3 units)

- Hunger, appetite and satiety; the role of the hypothalamus; theories of the control of food intake. Water content and compartments of animal body; water balance and disturbances in the system. Human starvation.

NFS 308 FOOD ENGINEERING : 40 lectures, 60 hrs. practical (12 units)

- Unit operations in food engineering
- Material and energy balance
- Unit operations involving heat transfer, theory of heat transfer, steam and steam production, simple heat transfer operations, dehydration, refrigeration and freezing evaporation.

NFS 309 FOOD ANALYSIS : 75 hrs. practical (5 units)

- Analysis of food additives e.g. preservatives, antioxidants, dyes. Microscopic examination of food. Techniques not covered in other courses.

NFS 310 FOOD MICROBIOLOGY : 20 lectures 30 hrs. practical (6 units)

- Natural flora of fruits, vegetables, etc., water hygiene, contamination from water, sewage, handling, processing, dust, etc., food and water borne diseases, food poisonings and infections, identification of food poisoning bacteria, toxins.

NFS 311 INDUSTRIAL FERMENTATION : 10 lectures, 15 hrs. practical (3 units)

- General introduction, definition of fermentation; yeast fermentations, alcoholic fermentations in distillery and brewery, baker's yeast production, lactic acid fermentations by bacteria, organic acid production by mould fermentations.

NFS 312 STORED PRODUCT ENTOMOLOGY (3 units)

- This course will be taught in the Department of Zoology, and will cover prevention and control of insect infestation in stored food products.

NFS 313 PLANT MANAGEMENT : 10 lectures (2 units)

- Role and organisation of a company, functions of a personnel department including discussion of job evaluation, production management. Research and development; objectives, product development and organization including discussion of critical path analysis and work study. Marketing, sales and distribution: planning, accounting and purchasing. Plant hygiene.

NFS 314 IRRADIATION AND MICROWAVE PROCESSING : 15 lectures (3 units)

- Uses and limitations of gamma and related energies sterilization.
- Uses and limitations of microwave energy in heat processing e.g. thawing, heating, cooking and sterilizing.

NFS 315 COLOUR, TEXTURE, ORGANOLEPTICS AND PACKAGING :  
15 hrs. lectures, 15 hrs. pract. (4 units)

- Significance and measurement of colour and texture in foods. Evaluation of food quality on the basis of flavours, odour, colour and texture.
- Methods and design of scoring systems and taste panels. Design and evaluation of food packages and materials.

NFS 316 BIOMETRY AND STATISTICS : 30 hrs. practical (2 units)

- This is the same course as BZ 210

NFS 317 FOOD CHEMISTRY : 15 lectures, 15 hrs. practical (4 units)

- Deterioration of lipids, autoxidation of unsaturated fatty acids, study of free radical reaction in terms of initiation, propagation and termination, and products, of reaction, enzymic oxidation, enzymic hydrolysis, stability of fats and oils in storage, pro-oxidants and anti-oxidants, effects on stability of processing. Chemical methods of measuring changes in lipids.
- Browning reactions, enzymic and non-enzymic; browning reactions in food processing and methods for their control. Maillard reaction, sugar-amine interaction, pigment formation and Strecker degradation, caramelization of sugars, acidic and alkaline degradation. Ascorbic acid oxidation.
- Flavour chemistry; theories of olfactory; sensing, chemical methods of isolating and identifying flavour compounds; flavours of fruits, vegetables, beverages and other food stuffs.

NFS 318 FOOD TOXICITY AND INDICATOR BACTERIA : 10 lectures, 15 hrs. practical (3 units).

- Food poisonings and food borne diseases. Isolation and detection of microorganisms in foods. Indicator bacteria and sanitation indexes.

NFS 319 NUTRITION SEMINAR AND TUTORIALS : 30 hrs. tutorial/seminar (6 units).

- Review of the literature in nutrition science, advanced topics in nutrition research.

NFS 320 SEMINAR, FOOD SCIENCE : 25 sessions (5 units)

- Selected topics of current interest. Students are required to give an oral presentation and to submit the material written up in suitable form.

NFS 321 NUTRITION, INDIVIDUAL INVESTIGATION AND REPORT :  
240 hrs. (16 units)

NFS 322 PRACTICAL PROJECT, FOOD SCIENCE : 135 hrs. (9 units)

- A short research project covering approximately one term. The problem will be selected to teach the student research methods and to test ingenuity and ability to improvise.

The team met the following officials . :

- 1) Mr. Juma M. Sei,  
Permanent Secretary,  
Ministry of Social Affairs.
- 2) Dr. Marcella Davies,  
Chief Medical Officer  
Ministry of Health.

The team was informed by the activity of the Ministry of Social Affairs on the production of protein rich food mixtures for infants and children. The team visited a kindergarten in the Ministry building.

In Freetown, there is the oldest University in West Africa "EL-MIALA" University with an Agricultural Department.

No data was given to the team.

N. B. No reply for the Questionnaire, or being unavalable.

The team only passed on night in Senegal. The following are the observations of two members of the team.

1) There is a University in Dakar including schools for Science, Medicine and Pharmacy.

2) The Senegal gives much importance on catching and exporting of fish. They have a big fleet equipped with cold rooms for catching fish, usually of big size, mainly tuna fish and shrimpe.

In the sea port there are 10 rooms 10 metres by 8 metres and a height of 6 metres for plast cooling at 40°C. A visit to such rooms showed the presence of plenty of frozen meat, fish, shrimps and lobsters prepared for export.

M O R O C C O

(Number of population : 15,397,259 )1971 census), growth rate : 2.9%)

Total land area in km<sup>2</sup>, 459,000

Two members of the team met and made discussions with the following officials :

- 1) H.E. Abdellatif Imani,  
Minister of State for Planning, Rabat.
- 2) Professor Abdelmalek Guesous,  
Member of the Scientific Council, OAU and  
Director, Ecole Normale Supérieure, Rabat.
- 3) Mr. Abdel Karim Halim,  
Under-secretary of State for higher education,  
Ministry of Education, Rabat.
- 4) Mr. Driss Amar,  
Director,  
Ecole Mohammadia d'Ingénieurs, Rabat.
- 5) Mr. Abdellah Bekkaly,  
Director,  
Institut Agronomique Hassan II, Rabat.
- 6) Mr. M. Besbes,  
Deputy Director,  
Ministry of Foreign Affairs, Rabat.

From the discussions made with the above officials, the plan for accelerated economic and social development (1973-1977), publications offered and replies on questionnaires for Member States, the following are given :

Food Production and Food Industry

1) The agricultural sector is presently the largest of the three sectors into which the Government concentrates its economic activity.

2) The country is dry, output fluctuates quite sharply with respect to rain fall. The Government is going to improve the existing irrigation facilities and to develop 1,000,000 acres of new agricultural land. It is also going to assure steady supplies of grain feed, oilseeds, milk and meat through better use of extensive dry lands. This will be done by intensifying agricultural research and training.

3) The Government is also concentrating its activities aiming to increase the production of different food commodities, e.g. citrue production will be increased by 3.6% fishing 5.2%, livestock 3.9%, grain production 1.9% and forestry 2%.

4) There is also a special desire to develop agro-industries in the irrigated zones.

5) To augment the fishing catch through better conservation methods and to increase both exports and domestic consumption of fish and fish products. The Government is establishing joint ventures with countries of advanced fish technology. The domestic consumption of fish, by 1977 is :

100,000	tons of fresh fish
250,000	tons of canned fish
8,000	tons of fish meal

The exports for the same year are :

1,000	tons of fish oil
25,000	tons of fresh and frozen fish
3,250,000	cases of canned fish
40,000	tons of fish meal

6) The following are the food industries found in Morocco :

#### Industry

##### 1. Canning

a) Industrial conservation	26	)	Conservation of fruits and vegetables
b) Manual conservation	32		
c) Preservation of fish and shrimps	49	)	Conservation of fish and crustacea
d) Manual conservation	5		

##### 2. Freezing

a) Industrial freezing	16	)	Ice making factories
b) Private sector	13		
c) Public sector	2		

##### 3. Sugar and allied industries

a) Sugar factories	7	)	All kinds of sugar making chocolates, confectioneries and sugar coated fruits
b) Combined industrial societies	14		
c) Private sector	48		

##### 4. Beverages

a) alcoholic industries	9	Bar, alcohols, liquors and operatives
b) non-alcoholic industries	20	carbonated waters, fruit juice and syrups.



5. Dairy industries

- |                     |                                |
|---------------------|--------------------------------|
| a) Oil industries   | 9 Olive oil                    |
| b) Manual factories | 188 Olive oil                  |
| c) Oil industries   | 9 Refining and bottling of oil |

6. Dairy industries

- |                    |                           |
|--------------------|---------------------------|
| a) Dairy societies | 9 Milk and dairy products |
| b) Private sector  | 31 Dairy Products         |

7. Flour mills

- |                  |                        |
|------------------|------------------------|
| a) Industrial    | 64( Flour and semolina |
| b) Private mills | 1,564(                 |

8. Rice milling

Bleaching of rice

9. Poultry industry

- |                 |   |
|-----------------|---|
| Poultry raising | 5 Production of chicken at a capacity of 1,500,000 chicks per month |
|-----------------|---|

10. Other industries

- |        |          |
|--------|----------|
| Starch | 3 Starch |
|--------|----------|

Health and Nutrition

1) There is an inter-ministerial Commission for Food and Nutrition.

2) The Government is planning to improve and extend both health care and planning services at all administrative levels. This is done by establishment of a full public health and family planning programme, assuring not only regular care, but also efficient emergency treatment.

3) Emphasis is placed on training of doctors and nurses.

4) A University hospital and another medical school are to be built having 2,130 additional beds. For regional hospitals, 2,359 beds and for provisional hospitals 2,305 beds will be added.

5) 66 health care centres will be added.

- 6) There is no Nutrition Institute.
- 7) Ministries of Agriculture and of Health are the two governmental bodies responsible for Food and Nutrition policy.

#### Universities and Institutions

- 1) Education and training are adopted to the needs of the country and of an active life.
- 2) Research organizations concerned with the development of human resources are in its way.
- 3) There is a war on illiteracy with the goal of giving 2,500,000 persons functional literacy. Expansion of primary education with a goal of 15,000 new enrolments per year for an annual growth rate of 6.4%.
- 4) More science, mathematics, and technology are now given to secondary schools. There will be an increase in secondary school enrolments by 12% per year.
- 5) There is an Institute for Agriculture at Rabat (Institut Agronomic Hassan II) in which there is a department (School of Food Technology and a Department (School) of Human Nutrition It has a big experimental farm.
- 6) In the School of Engineering, there is a Centre for Public Health Engineering.
- 7) There is a Medical School and a School for Education.
- 8) All mentioned schools are affiliated to the University
- 9) Schools and Departments are well equipped with modern equipments but the number of staff is not so much.



ALGERIA

NUMBER OF POPULATION : 15,000,000

The team met and made discussions with the following Officials :

1. Mr. Ben Adora                      Director Health Activation  
   Department and Head high Institute of Health.
2. Mr. Ben Zegho                     Director Plant Production Department  
   Ministry of Horticulture
3. Mr. Ben Arabi                     Director Animal Production Department  
   Ministry of Horticulture
4. Mr. Abdel Salam                  Director Polytechnic School, El Harash  
   University of Algiers.
5. Mr. Wahas                         Director Scientific Research  
  - Director of Planning
  - Director of Foreign Relations
  - Ministry of Higher Education and Scientific Research
6. Mr. Mourad Ben Shenho  
   Director National Institute for Horticulture Sciences
7. Staff of the Biochemistry and Food Technology Departments  
   National Institute for Horticulture Sciences
8. The General Secretary and Staff of Nutrition Section,  
   High Institute of Health.

As a result of the discussions and interviews, the following is given.

A) FOOD PRODUCTION AND FOOD INDUSTRIES

1. Staple food is wheat, there are small factories for making Koskosi from wheat.
2. Oil is mainly from olive oils fruits
3. In Sahah area where rain is scarce, wheat is dry, there is no agriculture in the proper sense, is used for grazing of sheep, goat, and cattle. Its area is 20 million hectare, out of which 15 million hectares are used for grazing and the rest for seed production.

4. The total population of sheep in this area is 8 - 10 million heads which are the main source for meat and for wool production.
5. The Government in its agriculture revolution gives much attention to grazing area to be the property of the state; equal distribution of sheep for the benefit of all who depend on for their life, improving the grazing centres giving direct aids in case of.
6. There are centres for cattle production, for artificial dissemination, a veterinary centre in each governorate. There is a veterinary hospital affiliated to each agricultural cooperative society.

Any how the country is giving much importance towards improving animal and plant production.

7. All kinds of fruits and vegetables are available all the year around.
8. There are factories for fruit and vegetables
9. There are factories for wine industry

#### B) STATE OF NUTRITION

1. The protein as well as the calorie intake of most of the population is adequate.
2. Among children and infants protein deficiencies malnutrition is reported
3. "Supramine" a protein rich food is prepared and packed in Algiers. In the nutrition Section of the High Institute of Health there is rehabilitation wards for children having protein Energy disease and are given Supramine.
4. Nutrition surveys carried out through the country are limited.

#### UNIVERSITIES AND RESEARCH INSTITUTES

In Algiers, there are three Universities :

- 1- University of Algiers
- 2- University of Wahan
- 3- University of Kostantina

The place teaching nutrition is the school of Medicine, while food science and food technology are taught in school of agriculture.

Teaching for primary schools is in arabic while in the Universities is either in arabic or in French.

Staff for the Universities are mostly recruited from Egypt or Syria. 40 Professors arrived from Romania in 1973, for teaching Medicine and Petroleum.

T U N I S I A

NUMBER OF POPULATION : 6,000,000    % annual rate of increase = 2.6

The team met and made discussions with the following officials :

- |                                  |  |
|----------------------------------|--|
| 1. Professor Dr. Zoheir El Kalal | Director, National Research Institute<br>for Nutrition and Food Technology |
| 2. Dr. Abdel Rahman El-Guezeri   | Director, High School for Nutrition  |
| 3. Dr. Gwadi Taha                | Nutrition Education High School for Nutrition                              |
| 4. Dr. Mohamed El-Koki           | Community Feeding High School of Nutrition                                 |
| 5. Mr. Abdel Aziz Ben Latif      | Director, Department of Foreign relation<br>Ministry of Health             |
| 6. Mr. Bakir                     | Director, Department of School Feeding<br>Ministry of Education            |
| 7. Mr. Monsef Zaofaran           | Ministry of Planning   |

A. FOOD PRODUCTION AND FOOD INDUSTRIES :

1. The cultivable land is 9 million hectares; 4,500,000 belong to the private sector and 2,100,000 collective lands. 900,000 hectares are woods, 300,000 men, their main work is in horticulture, besides 250,000 take the horticulture as a temporary job 250,000 women are engaged with agriculture work. Agriculture depends mainly on mechanisation.
2. The Government gives more emphasis on increasing production of vegetables, cattle raising, fisheries and olive trees. Two dams are recently built one in Sidi Salem and the second in Sidi Saud.
3. Cereal production was 1,138,000 Tons.
4. Vegetables grown include tomatoes, sweet potatoes, pepper, onions, sweet peas, cow peas, strawberry and melons. 44,000 hectares are used every year for vegetables production.
5. Olive trees, almond, apricot, orange and wine trees are grown. There are 52 million olive trees giving 180,000 tons of olive oil. Grapes are being replaced by almond and apricot trees.
6. The country exports 5,000 tons of tomato paste. It also exports salted fish.
7. Wine production is decreased from 950,000 hectolitre to 750,000 hectolitre. A new brewery of 100,000 - 200,000 hectolitre is built. Of the new projects are the production of weaning foods, light bread and animal food.

8. Meat products is 82,000 tons while the requirements are only 65,000 tons mild production 212,000 tons but the requirement are 260,000 tons. Meat comes from cows, sheep and goats. There is poultry industry, egg production is below the requirements, 100 million more eggs are needed.
9. The fish catch is about 53,000 tons with an annual increase of 4.7%.
10. Sugar is produced from sweet turnip. Sugar production is 80.000 tons.
11. Tobacco is grown in Tunisia, the annual production is 3,500 tons.

#### STATE OF HEALTH :

1. The Government is improving the health state of the population by developing preventive Medicine measures. Three hospitals are upgraded to big national hospitals to be health focus Centres; new biological laboratories are built, blood banks are organized. The number of medical practioners graduated every year are 150. There are sufficient numbers of nurses and Health assistants. Centres for School medicine as well as industrial medicine are under establishment. A school of pharmacy attached to the medical faculty is under establishment. 100 hospitals are to be built in rural areas in the new 5 years plan.
2. The Ministry of Health as well as the National Institute for Nutrition and Food Technology are responsible for the Nutrition Policy of the Government Nutrition Research education and eradication of nutritional diseases.

#### EDUCATION :

1. The number of pupils enrolled in schools are as following :
 

Primary schools	883,734
Secondary Schools	171,914
University Students	10,646
2. There is only one University that includes Faculties of Education, Science, Engineering, Medicine, law and Religion subjects. The number of medical students was 1,008 in 1972 increased to 2,254 in 1976. The capacity of the University of Tunis is 15,000 students only while the predicted number of students who are going to the University will be 30,000.
3. There are institutes for Agricultural production, but the number of students enrolling in these institures is low as the wages for agricultural workers is below that of industrial ones.

3. There are institutes for Agricultural production, but the number of students enrolling in these institutes is low as the wages for agricultural workers is below that of industrial ones.

Institut National de Nutrition et de Technologie Alimentaire

1. The institute includes 4 sections which are :

- i) Human nutrition
- ii) Food Technology
- iii) Nutrition Training and Documentation
- iv) Food economics and Food planning

2. OBJECTIVES :

It is engaged mainly in doing studies and research in the fields of human nutrition, dieting and food technology especially :

- i) The state of nutrition of the population studies on the growth and development of certain groups especially vulnerable groups, preschool children and adolescents.
- ii) Nutritional diseases due to food shortage
- iii) Experimental and metabolic studies leading the exploration of such syndromes.
- iv) Dietary treatment and rehabilitation
- v) Establishment of a standard diet for the population
- vi) Development of food technology; analysis of food commodities and preparing food composition tables; food control measurement and food supplementation.
- vii) Training in Nutrition and food technology
- viii) Planning for food production.

The National Institute among other tasks is participating in the realization of food research programmes affecting classes of the population having different socio-economic standards.

The National Institute is administered by a director and 11 members designated by order of the Secretary of State of National Education. There is a Nutrition High School affiliated to the Institute, it gives a diploma of Nutrition after 4 years study.

There is also a nutrition clinic and nutrition wards in which nutritional studies and training and treatment of malnutrition is carried on. These are part of nutrition teaching in the University but run under the supervision of the Nutrition Institute.

A new building for the nutrition Institute was built in 1974. It has a metabolic ward, a nutrition clinic, animal house, Biochemical laboratories. etc... and general services.

Some nutrition projects in combination with Harvard University as enrichment of wheat flour with lysine were conducted by the staff of the Institute.

There are a good number of food technologists and nutritionists working in the Institute.



( No. of Population 38,000,000 )

(Annual rate of increase of population = 2.8)

The team met and made discussions with the following officials :

1. Prof. El-Tohami Mousa Abdel Rahman  
Director National Research Centre, Dokki, Cairo
2. Prof. S. R. Morcos (Member of the team)  
Head of Food Science and Nutrition Research Department,  
National Research Centre, Cairo.
3. Prof. A.M. Gad  
Head of Fat Research Department, National Research Centre, Cairo
4. Prof. I. Refaat  
Head of Dairy and Food Technology research Department
5. The staff of the Food Science and Nutrition Research Department
6. Dr. Ismael Abdou,  
Director, Nutrition Institute,  
Ministry of Health, Cairo
7. Prof. H. Ashmawi  
President of Food Industries organization, Cairo
8. Mr. Mohamed El-Nahas  
President wine and vine Company  
Gianaklis, Egypt
9. Prof. M. Safwat  
Head, Food Technology Department, Faculty of Agriculture,  
University of Alexandria,  
Alexandria, Egypt.
10. Prof. Y. Foda  
Director, Brewery Company Cairo, Egypt
11. The Director  
Company for Aroma and Extraction  
Cairo, Egypt.
12. Prof. and Staff of Pediatrics  
Children Hospital  
Faculty of Medicine, Kasr El Aini  
University of Cairo, Egypt
13. Under Secretary of State,  
Ministry of Agriculture, Egypt
14. Prof. of Food Technology, Faculty of Agriculture  
Egyptian Universities, Cairo

The followings publications were made available to the team :

1. A review on the state of Nutrition in Egypt. By S. R. MORGOS
2. Problems and some solutions by S.R. MORGOS
3. Volumes 1, 2, 3, and 4, Bulletin of Nutrition - Institute of Cairo
4. Food and Balance Sheets, Ministry of Agriculture, Egypt.
5. The National Research Centre : Research Program
6. The Food Science and Nutrition Research Department  
National Research Centre : Research Program and some relevant publications.

As a result of all discussions, interviews and visits to different Food Industries the following is given :

#### Food Production and Food Industries

1) Egypt is 1,000,000 km<sup>2</sup> in area of which 3.3% is cultivated. The number of population is 38,000,000 of which 89.8% inhabit the Nile Valley. The population grows at a rate of 2.8%. The cultivated area is about 6,000,000 feddans. The average increase of cultivated land is 20,000 feddans a year, which does not keep pace with the increase in number of population. The agricultural sector contributes about 40% of the National income.

2) As far as food production is concerned, Egypt is more fortunate than many other countries of the region. A study of the Food balance sheet shows that the energy value of the total food supplies for the year 1974 - 1975 is 3,122 k calorie/head/day and the protein intake is 77.8 gr. of which only 10.7 come from animal origin.

3) The main agricultural products are cereals, legumes, different variations of vegetables and fruits. Cereals, mainly wheat are the staple food. Bread is made from wheat in the cities, from maize in the villages in the north, from millet in the south of the Nile Valley and from barley in the oases and some isolated areas of the country rice is mainly consumed in urban areas especially in the north. Legumes, especially beans and lentils are most widely consumed. Fresh vegetables are available all the year round at reasonable prices. Different varieties of fruits are cultivated among which are oranges, tangerines, lemons, grapes, figs, guavas, mangos, apricot, bananas, dates and pomegranates. Their prices are within the reach of all.

4) Animal foods include meat, poultry, eggs, fish and dairy products. Meat goes to those who can afford it. In rural areas, the farmers sell their own produce of milk, butter, cheese, eggs and poultry in order to buy larger quantities of cheap foods like bread and beans to feed a large number of children.

In rural areas when the financial resources are available animal protein is restricted to one day of the week, that on which the market is held because it is unavailable at other times and no facilities of refrigeration exist.

Chickens are commonly deep throughout the Nile Valley, the eggs are more usually sold than eaten by the farmers unless the family are better off than the average. During the last 10 years poultry industry increased whether those farms belonging to the private sector or those belonging to the General Organisation for poultry (Public Sector) or those belonging to the Food Security projects.

Fish and other sea products constitute one of the Republic's most important richest sources of natural wealth. The country has coast lines of about 2,400 kilometers in length. There are also many lakes in various parts of the country. With the object of increasing the country's wealth in fish, various kinds of fish have been introduced from abroad to be acclimatised in Egypt's waters.

Many of the farmers own cattle (cows or buffalo) but the milk is either sold or converted into butter and cheese. Dairy companies belong to the Public Sector are found in Cairo, Alexandria, Damietta and lower Egypt. They collect milk, pasteurise and bottle in poly-ethylene bags to be sold in the near towns in the market. Also they make cheese (wet or Damietta cheese) and the dry one. Dry milk powders are either prepared in the country but the majority is imported from abroad to be used partially by the dairy compounds in making cheese.

There are many dairy companies belonging to the private sector but they mainly concentrate their activities on making cheese.

5) The cooking oil comes from cotton seed, but the crop now is not enough, so cotton seeds are imported. Cotton seed oil represents more about 95% of the total local production of vegetable oils. The rest comes from sesame seeds, peanuts and sunflowers seeds. Some of the oil is transformed into vegetable fats, for such reason more oil is also imported. Corn oil is also prepared. Animal fats or "Samna" is also consumed it comes either from buffalo or cows.

6) Food Industries :

i) Public Sector : The Organisation of Food Industries :

It is one of the biggest sectors in the country. It has many companies representing all food industries. There are companies for canning and for vegetables and fruit preservation; companies for sugar and alcohol industry; companies for the manufacture of oils and soap; companies for confectionaries and biscuits, companies for wine industry.

There are companies for dairy and milk products; companies for aroma, perfumery and extractures; companies for salt and soda, companies for tobacco and cigarette manufacture, companies for alcoholic beverages and companies for soft drinks : Coca Cola and Pepsi Cola.

ii) The General Organization for Flour mills and bakeries. It runs many flour and bakery distribution all over the country.

iii) The General Organization for Fisheries

iv) The General Organization for poultry industries

Private sector.

Besides such organizations, the private sector plays his role in all above mentioned food industries. Such small firms are distributed all over the country. In each town you can find at least 2 flour mills and one or more bakery, In villages they prepare their own bread at home. Price of bread is subsidized by the Government. In all governorates and in big towns there are cooperatives societies to sell all food commodities at a fixed reasonable price.

STATE OF NUTRITION IN EGYPT

1) Egypt generally suffers from very high infant and child mortality, where of infant deaths are recorded, over 50% are ascribed to diarrhoea and enteritis. The infant mortality rate for the year 1973 was estimated to be 11.6 and the rate among children in the age group 1 - 5 was 25,7 per thousand births. The total mortality among Egyptians for the same year was 14.5 per thousand of the total population.

2) During the first 5 - 6 months of life, the average weight and its rate of change in the Egyptians infants differs little from standards adopted for European and American infants. From the second half of the first year of life onwards the weights of Egyptian infants probably due to malnutrition and infection are decidedly lower than those set as European standards.

3) The average haemoglobin contents, as well as the number of red blood corpuscles of normal Egyptians at different ages are much lower than those of Europeans and Americans. A valmio is a common condition in Egypt, the great majority of the cases belong to the hypochronic microcytic type originating from parasitic infection and intestinal disorders. The mean serum protein values of Egyptian infants, adults males, when compared with Europeans show a lower level of serum albumin and an increase of gamma globulin at the expense of other fractions. The observed differences may be due to malnutrition and parasitic infections.

4) The most common human infestations in Egypt are bilharziasis, A.sariosis and amaebiasis. Such parasitic infections play a big role in conditioning dietary deficiencies.

5) Vitamin a deficiency has been reported to occur in the cases and in certain rural areas. The incidence of rickets is 12 - 13%, this high incidence is characteristic of groups of low socio-economic status. Peripheral neuritis due to thiamine deficiency is rare. This is attributed to the high consumption of whole cereals. Pelleyra is less frequent than it was in the early decades of the present century.

The overall incidence is under 0.5%. Scurvy is very rare; this is due to the high consumption of fresh green leafy vegetables and citrus fruits.

6) Poor diet and blood loss due to parasitic infestations are possible factors responsible for iron deficiency in Egyptians. Goitre is common in the cases. Dental caries is not a major health problem. The percentage caries per children varies between 26.7% and 54.7%. The water supply is mostly from the Nile which contains a reasonable amount of fluorine.

7) Protein energy deficiency diseases are the commonest causes of wasting seen among infants. The underlying cause of such disease is poverty. Kwashiorkor is not common it is caused by diets consisting mainly or entirely of starches and lacking milk or animal proteins.

The high death rate, the prevalence of anaemia, rickets, protein energy deficiency among infants and children all point out that the food is the people's being deficiency.

Distribution of foods within the family should be made to give the vulnerable groups protein rich materials. Poverty, ignorance and tradition are of course, responsible for this unfortunate attitude.

UNIVERSITIES AND RESEARCH INSTITUTES ACTIVITIES :

A. UNIVERSITIES

In Egypt, there are 12 Universities distributed as follows:

CAIRO	:	University of Cairo, University of Ain Shams, University of Helwan and Al-Azhar University	(4)
ALEXANDRIA	:	University of Alexandria	(1)
LOWER EGYPT	:	University of Tanta	(1)
		" " Zagazig and its branches at Qualiobia	(1)
		" " Mansoura	(1) with its branches
		" " El-Canal	(1)
UPPER EGYPT	:	" " Assuit and its branches at Sohag, Qena and Assuan	(1)
		" " Minia	(1)

In most of these Universities there are faculties of : Medicine, Dentistry, Pharmacy, Veterinary medicine, Science, Engineering, Agriculture, Arts, Law, Commerce and Economics. The activities of their departments are classified as follows :

i) Departments that :

Work in the field of Food and Nutrition Research secondary as a part of their activities.

- Departments of Biochemistry and Physiology Faculties of Medicine, Veterinary Medicine, Science, and Agriculture.
- Department of Home Economics - Faculty of Home Economics - University of Helwan.
- Department of Rural Home Economics - Faculty of Agriculture - University of Cairo.

ii) The following Department that work only in the field of Food Science and Food technology:

- Departments of Food Science and Food Technology - Faculties of Agriculture
- " " Dairy - Faculties of Agriculture.
- " " Cereals - Faculties of Agriculture.

iii) Departments that work in the field of Public health and nutrition diseases.

- High Institute of Public Health and Hygiene - University of Alexandria.
- Departments of Public Health, Hygiene and Preventive Medicine - Faculties of Medicine.
- Departments of Pediatrics, Medicine - Faculties of Medicine.

The activities of the above mentioned Departments are

- Teaching under graduate and post-graduated students;
- Carrying on research work
- Training.

There are more than 150 qualified staff (having their Ph.D Degrees) including Professors assistants Professors and Lecturers in the Egyptian Universities, working in the Field of Food Science Technology and Nutrition. There are very big schools in these Fields.

#### B. INSTITUTIONS

1. The Nutrition Institute : It is affiliated to the Ministry of Health. It is a big building of 5 floors located in Kasr El Aini Street Cairo. Its main work is research, training general services and nutrition education. Giving service to different ministries.

The institute is divided into 4 big departments.

- Department of Field Surveys
- " " Clinical Nutrition
- " " Food Science
- " " Chemistry

The Institut has its own nutrition clinic, mobile units, animal house and library. The activities of these Departments are summarized in the following :

- Collecting data on the state of nutrition, Food consumption and food habits of different groups of the population and studying factors affecting these parameters and these data are to be evaluated.
- Pilot studies on the practical methods used to study the nutrition problems in the country to help the Government in treating such problems and to know the best methods for the use of grants giving by different UN agencies.

- Help in development of ECH centres and School feeding programmes either by giving service about types of meals given or training personnel.
- Preparing nutrition aids for teaching and training of nutrition.
- Training of Personnel (Medical Doctors, dietitians, nurses, social workers, teachers, graduates of Faculties of Agriculture) in the field of nutrition.
- Carrying research in the fields of Food Science, Technology and Nutrition.
- Collecting and revising Food composition tables.
- Giving advice for feeding different Institutions.

The nutrition institute has a board and a Rector about 18 of the Staff have their Ph. D. Degrees in the fields of Biochemistry, Food Technology and Nutrition from the Egyptian Universities or from Europeans and American Universities.

Besides their main job in carrying in the programme of the Institute most of the Junior staff are registered for post-graduate degrees in the Egyptians Universities. Some of them has their M.Sc. degrees and are working for Ph. D. Degrees.

The number of the staff of the institute is about 250. They are either graduates of Faculties of Medicine, Science, Dentistry, Pharmacy, Agriculture, Home Economics, and Social Sciences. They are aided by an auxiliary staff of technical assistants, labs boys.

#### The National Research Centre (NRC)

Sb - El - Tahrir, Dokki, Guiza - It is affiliated to the Academy of Scientific Research and Technology,

It is a multipurpose institute for basic and applied research. It was founded by the Government in 1956 to conduct research contributing in natural welfare, particularly in the fields of agriculture, industry and Health.

The NRC is located in Dokki, Guiza (a suburb of Cairo) where it has its own campus complete with laboratories, administrative offices, pilot plant, and support facilities. The basic administrative unit is the laboratory of which there are 4.7 These are organized with only minor exceptions into 14 divisions.

- |                                  |                               |
|----------------------------------|-------------------------------|
| 1. Textile Industries            | 8. Physics                    |
| 2. Health and Environment        | 9. Chemical Industries        |
| 3. Metallurgy                    | 10. Applied Organic Chemistry |
| 4. Food Technology and Nutrition | 11. Inorganic Chemistry       |
| 5. Pharmaceutical Industries     | 12. Agriculture and Biology   |
| 6. Animal Resources              | 13. Basic Medical Sciences    |
| 7. Basic Sciences                | 14. Engineering               |



2. AGRICULTURE AND NUTRITION

Integrated research on plant and animal production. Food and agricultural by - products and unconventional methods of food production.

3. HEALTH AND ENVIRONMENT

Concerned with public health, environmental pollution problems, epidemic diseases (with special emphasis on Schistosomiasis), ophtalmological diseases and the manufacture of drugs from local natural products.

4. NATURAL RESOURCES

Concerned with the search of various ores in the land and seas of Egypt.

5. ENERGY Studies on the possible use; and the development of unconventional sources of energy, especially solar energy.

The NRC conducts training courses for people from industries. There are usually 8 to 10 of these courses each year and they run from one to three weeks averaging about 20 participants each. There are training courses in nutrition and in Food and Dairy Technology.

The NRC also provides training for young scientists from other Arab countries. These programmes are arranged on a specialized basis according to the needs of the individual.

THE FOOD TECHNOLOGY AND NUTRITION DIVISIONS OF THE NRC

It includes three laboratories :

- Laboratory for Fat and Oils
- Laboratory for Dairy and Food Technology
- Laboratory for Food Science and Nutrition.

The main research programme of this division is more than better food for the Egyptians.

In the Food Technology and Nutrition Research Division, there are more than 100 research full time workers, 27 of them have Ph.D. degrees in Food Science, Nutrition and allied subjects, 24 have M.Sc. degree and the rest hold only B. Sc. degrees. They are graduates of schools of Medicine, agriculture science, Pharmacy, home economics and social workers.

Laboratory for Food Science and Nutrition

There are one Professor, 6 Assistant Professors, 2 Researchers, 16 assistants researchers, 3 technicians and 4 Lab. assistants.

The Research program of this laboratory is as follows :

1. A study of the amino acid content and biological value of the protein in the major varieties of food crops grown in Egypt.
2. Studies on the toxic substances present in legumes :
  - i) The determination of the nature of the toxic factors in local legumes and the removal of these substances by simplified methods.
  - ii) The effect of the protein value of the diet on the toxicity of certain substance present in legumes.
3. Development and evaluation of protein-rich mixtures for feeding the young in developing countries.
4. Studies on the nutritive value of present and improved Egyptian dishes and the application of the results obtained from the solution of some nutritional problems in Egypt.
5. Biological enoblement : Studies on the nutritive value of some fermented foods of common use in Egypt.
6. Studies on the interaction between nutrients and their effect on their absorption and utilization.
7. Fish preservation. old and new, with special reference to its nutritive value.
8. Feeding of industrial workers : Effect of feeding subsidised meals on the health and productivity of workers.
9. Studies on anaemia as a major health problem in the country and its relations to parasitic infestation and nutritional diseases.
10. Improvement of nutrition status of pregnant and nursing malnourished mothers in Egypt and its effect on growth and development of their offspring.

11. Effect of malnutrition on the endocrine and enzyme system of experimental animals. Studies on the relation between the state of nutrition and the adrenal cortex hormone in boys and girls during puberty.

12. Use of the educational approach instead of the mainly curative approach in reducing malnutrition in infants and preschool children.

The Laboratory has its own animal house.

In the campus the NRC there is a central library, an Instrumentation Centre for maintenance and repair and establishment of equipment. There is also a workshop and a pilot plant.

Besides the Food Technology and Nutrition Research Division there are two other divisions working in the fields of plant and animal production. These are the Division of Animal Resources and Agriculture and Biology.

#### AGRICULTURE RESEARCH CENTRE

It is affiliated to the Ministry of Agriculture.

It is a multidisciplinary Centre for applied research. They conduct research in the fields of Plant and animal production, Dairy and Food Technology. Improving cash crops and developing new varieties, having high yields and resistant to pest diseases. Attached to this Centre there are many research institutes for Cotton Research vegetables and Fruit Research, Meat and poultry research. Attached to these institutes there are many research stations distributed all over the country.

The majority of the old staff in these institutes did not have Ph.D. degree but they have a very good experience in applied research.

#### NATIONAL COMMITTEES

There is a National Committee for Nutritional Sciences, the Egyptians Nutrition Society, the society for Food Science and Technology, Egyptian Society for Dairy.

Nutrition is also taught in High Institutes for Nursing.

The Ministry of health give nutrition courses to nurses, health visitors and technical assistants studying in its institutes for 2 years after having their secondary schools certificates. Graduates of these institutes work in the Ministry of Health.

MINISTRY OF HEALTHHIGHLIGHTS OF THE HEALTH POLICY OF THE ARAB REPUBLIC OF EGYPT

A summary by Professor M. M. MAHFOUZ, Minister of Health

Health goals are but one component of overall development goals and hence our health policy is guided by two fundamental assumptions :

- health care is a right of every Egyptian
- health of the citizens is an investment in human capital and is a mean to improvement of the national socioeconomic status.

The health policy aims at providing at least a minimum level of service to all. The minimum given must be based on an awareness of what is medically and socially needed if the citizens (and consequently the country) are to attain higher levels of living. Our major health problems are :

- Environmental health problems
- Epidemic, endemic and infections diseases
- High infant and early childhood mortality due primarily to diseases which are preventable.

Therefore, our health policy has the following core priorities.

- preventive programs aimed at eradicating or controlling diseases
- maternal and child health services of which family planning is an integral component.
- upgrading preventive and curative services through the integrated health service.
- Programs developed for the implementation of these priorities stress the pressing importance of providing preventive and curative services together at every point in the health delivery system; the tremendous dependence on universal health education; the necessity of participation by other Ministries and all national organizations. For these programs to successfully attack the problems we need to :

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- KNOW the actual facts about each individual's health status - therefore we need a personal health identity card and health registries at the point of contact with the health system.
  
- USE the appropriate technology -- therefore we need to upgrade the purchasing, distribution and prescription of drugs and products for eradication and control of disease. Train cadres of health workers especially nurses and other paramedical personnel.
  
- HAVE a system for delivery of the appropriate technology at the right time and in the right place -- therefore need a health service system which is vertically and horizontally integrated.

no. of Population - 18,000,000

Percentage rate of increase in population : 2.8 per annum

The team met and made discussions with the following officials :

1. Mr. Wadic Habasky                      President  
National Research Council - Khartoum
2. Dr. Samani, Yacoub                      Secretary General,  
National Research Council
3. The Chairman                      Agriculture Research Council  
National Research Council
4. The Chairman                      Industry Research Council  
National Research Council
5. Mr. Farouk and the Directors  
of Sugar, and Oil Organisation                      Industrial Production Corporation Khartoum
6. Mr. Joseph Zoki Boutros                      Deputy Government analyst Chemical  
Laboratories Ministry of Health, Khartoum
7. Professor Dr. Refaat Boutros                      Professor of Pharmaceutical Chemistry  
University of Khartoum
8. Dr. Abdel Raheem Saeed                      Director and the Staff of Food Research  
Centre - Shambat
9. Dr. Abdulla A. Abdulla                      Faculty of Agriculture University of  
Khartoum
10. Dr. A. Abdulla                      Deputy Director Arab Organisation for  
Agriculture and Development, Khartoum
11. Mr. Mobaster                      Director Sugar Factory, Guizera
12. Dr. Osman                      Director Agriculture Research Centre,  
Guizera

## FOOD PRODUCTION AND FOOD INDUSTRIES

1. Sudan is the highest country in Africa with an area of approximately one million square miles. The country has distinct regional differences in climate, soil, and other geographical characteristics. Food production characteristics in the country have marked regional variations. Even with a very limited percentage of land being under cultivation, the food production status on a national basis is not desperately low. The national per capita food availability in the country is satisfactory in terms of protein and most other nutrients. Calorie deficit of minor nature is present. Cattle, wealth of the Sudan is a great proportion and naturally, the animal protein intake, mostly meat is of very high level, one of the highest in the region.

2. The food crops of the Sudan are : cereals including wheat, millet, sorghum and rice, root crops, pulses, sugar crops, oil crops, vegetables and fruits, beverages and also spices. The important cereal crops are sorghum and millets and wheat. Rice and maize are also grown on a small scale.

3. Cassava, yams and coco-yams are grown to a very limited extent in southern Sudan. Sweet potatoes is widely distributed, it is of importance as a reserve crop in few areas.

4. Pulses constitute an important source of dietary protein, particularly in areas where annual protein is short. The most important pulses grown are broad beans, haricot beans, chick pea, pigeon pea, cow pea, sweet pea, lima bean and green grass bean.

5. The most important oil seed crops in the Sudan are sesame and groundnut. The average annual total production was about 166,000 metric tons for sesame and groundnuts are considered cash crops. A part from these crops, cotton seeds constitute an important source of vegetable oil for cooking purposes.

6. Sugar crops : Sugar cane production has increased rapidly in recent years. At present, there are two factories at Guneid and Khashun El Girba. The total annual output from these factories is about 110 thousand tons of sugar, while the total requirement of sugar is estimated at 200 thousand tons. This difference is met by import.

7. Due to the diversity of the environment, a wide range of vegetables and fruits are grown in the Sudan. The local production at present does not satisfy the local needs. The problems facing horticultural expansion are the marked seasonality of production, and lack of good seed, poor transport, storage and processing facilities and the prevalence of a wide range of pests and diseases.

8. Only the main towns are consuming reasonable proportion of fish. The average consumption of fish is 1.3 kg/per head.

9. Sudanese generally consume considerable amounts of mutton and beef and to a lesser extent meat from goats, cereals, games, poultry and many other small creatures. Milk is also consumed by most of the Sudanese, especially infants. The sources of milk to consumers include imported milk powder or fresh milk in bottles and collopene bags from established dairies or provided daily by the milkman. Many Sudanese, though keep a few numbers of milking animals within the vicinity of their homes for supply of milk to the family.

10. There is the Industrial Production Corporation to which all Government Associations and companies are affiliated as an example of this are the following.

- i) Food industry sub corporation
- ii) Sugar industry
- iii) Plastic, leather and textile Industry

Of the different food industries there is sugar and oil industry, many breweries and a factory for cherry and wine production.

11. Canning and dehydration of vegetables and fruits do exist. They dry onions in Kasla, dried milk powder, gum arabic and karkade are also carried out in some small factories.

12. There are 4 flour mills belonging to the Public sector and 3 belonging to the private sector.

#### STATE OF NUTRITION

1. Protein - energy malnutrition is one of the most significant child health problem in the Sudan. Its magnitude is reflected in the high morbidity and mortality in the most vulnerable age group of 1-3 year.



Although there is no proper reliable statistical survey for this problem, yet clinical observations in the health centres, outpatients and the hospitals indicate malnutrition to be the most important factor in the pathology of infancy and childhood in Sudan and the main cause behind the high mortality rate. Improvement of nutrition of vulnerable groups central of infection and infestation and early screening and rehabilitation of malnourished children are the three main approaches towards the control of P.C.M.

2. Among the home made weaning Foods for sudanese children are :

i) NIAMA prepared from sorghum flour, milk, egg and sugar, its NDp Cal% = 14

ii) ISMA prepared from sorghum flour, dry meat and oil, it NDp Cal% =

8.

Both foods were tried by Sudanese adults and children of varying ages, both were quite acceptable. When left highly covered at room temperature for 24 hours, there was no change either in taste or consistency.

3. Breast feeding is fully adequate to the child in the first six months, but soon after that it rapidly falls short of his increasing demands. It is reported that up to 97.5% of babies are breast fed until they are 5 months old, 84% until they are one year old and 35% until they are two years old.

4. The nutrition revision of the Ministry of Health realise the importance of Nutrition Rehabilitation centre. The experience gained in the running of this centre will be utilized for establishing such centres in different parts of the country at the community level.

5. Children at the preschool age (3-5 years), the incidence of malnutrition gets a harp drop. This is presumably due to a variety of food from the family diet given to the children, whereas in the crucial age period of 1-3 years with a high incidence, the children are given small portion of the family diet.

6. Goitre in endemic proportions has been demonstrated in Darfur and in a minor degree in Khartoum province. It was suggested that endemic goitre may exist in other parts of the country.

7. The health agency is the one which comes in contrast with sufferers of malnutrition, they collect basic information on which programmes can be built, the agencies related to agriculture and animal production, on the basis of this information, formulates the policy for producing food of adequate quality and quantity for the people. Those concerned with Education. The ministry of Education is responsible for implementing nutrition education programmes on the basis of information collected by the Health Agency in different parts of the country.

The Nutrition Division, under the control of the Ministry of Health has the prime responsibility of getting in touch with the people in different parts of the country, collecting information and compiling them into recommendations on which the other three agencies can operate.

### C. UNIVERSITIES AND RESEARCH INSTITUTES

#### 1. University of Khartoum

a) Nutrition is taught to the medical students among the courses given : Biochemistry, Physiology, Medicine, Paediatrics and Public Health and Preventive medicine. There are some research activities in nutrition going in the Departments of Physiology and Paediatrics.

b) Animal nutrition, Food Science and Food technology, are taught in the Faculty of Agriculture and in Shamhat High Institute of Agriculture. There is also research activities in the mentioned disciplines in the Faculty and in the Institute of Agriculture.

#### 2. Moslem University of Omdurman

There is Department of Home economics in the Faculty of Science of this University. The first group to be graduated in Home economics including nutrition will have their B.Sc. degree in 1979.

#### 3. Ministry of Education :

- Programmes in Home Economics, School gardening and school feeding are given by the Nutrition training centre, Ministry of Education to school boys.
- Nutrition Education of women with special reference to infant and child feeding is given in schools through home economics teachers and in the Nutrition village centres and community Development centres.

- Training guides for preschool institutions has been conducted to improve the health of children in Kindergardens.
- Training personnel to supervise and advise : The cooks in schools where food is prepared for pupils, so as to teach them the hygienic way of preparing the meals.

#### 4. Ministry of Health

- Health visitors are trained to work in health centres for teaching the mothers the benefit of using nutritious food during pregnancy and lactation period. Also to teach them how to take care of their babies in respect to feeding, weaning and cleaning, etc....
- Food analysis and food composition tables as well as research in food toxicology and preparing of codex alimentaries is carried on in the chemical laboratories of the Ministry of Health.

#### 5. Sudan Food Research Centre - Shambat. Khartoum North, P.O.Box 213

#### INTRODUCTION :

The Sudan Food Research Centre has been established in 1965 under the United Nations Development Programme as a joint undertaking by the Ministry of Agriculture and the FAO. The purpose of the Centre is to provide research, educational and advisory services in support of Food industry.

The Centre is situated at Shambat area in close proximity to the Faculty of Agriculture of the University of Khartoum and the Agricultural institute.

The centre consists of a pilot plant equipped with small scale replicas of commercial processing machinery, cold storages, a lecture room, offices, a library, and a refectory.

The Sudan being a vast country of high potential natural resources had a wide range of climatic variations. Such climatic range conditions have resulted in wider range of agricultural crops and animal resources.

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The immediate objectives of the project include :

1. Study current and potential markets, foreign and domestic for fresh or processed fruits and vegetables, cereals, oil crops, meat and meat products and local marketing methods.
2. Study traditional food and food handling methods and improve them.
3. Select and introduce those modern techniques which are suitable to local conditions.
4. Provide technical guidance to the food industry
5. Establish & Code of quality standards.
6. Demonstrate modern technique of food handling, grading, processing and marketing.
7. Train national personnel in food preservation, processing, hygiene, sanitation and marketing.

The duties assigned to the Centre fall into three interrelated categories : research training and extension services. The training and extension services are based on the programme of applied research conducted at the centre. This harmony is kept well running by ten well staffed well equipped sections :

- |                     |                            |
|---------------------|----------------------------|
| 1. Canning          | 6. Marketing               |
| 2. Chemistry        | 7. Meat Technology         |
| 3. Dehydration      | 8. Microbiology            |
| 4. Engineering      | 9. Post Harvest physiology |
| 5. Grain Technology | 10. Oils and fats.         |

Research projects are undertaken with the objective of obtaining data or developing methods which have a practical application in factories markets or farms of the Sudan.

Training and Technical Assistance :

Comprehensive training programmes have been conducted by the Centre to those who are engaged in food industry. The training courses are given on different aspects of laboratory technique, quality control, machine operation and maintenance, food preservation and handling, sanitation and hygiene.

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The well trained staff of the centre are keen and ambitious to give advice and guidance on technical problems in factory operation, plant lay-out, products and processing techniques, sanitation and general hygiene as well as packaging and marketing.

Besides, the F.R.C. has participated in lecturing theoretical courses as well as demonstrating a practical work at a university level to the students of Faculty of Agri. (University of Khartoum) high Teaching Institute, Khafad University College, Health College, Food and Nutrition Dept. (Ministry of Education), Central Lab. (Ministry of Education) Central Lab. (Ministry of Health), & Shambat Institute of Agriculture.

More than 400 persons have benefited from the training facilities given by the centre.

The services of the Centre has extended to :

1. Armed forces
2. Ministry of National Economy
3. Ministry of Industry
4. Ministry of Health
5. The Industrial Bank of Sudan
6. Some of the Ministry of Agriculture affiliates such as the Mechanized Crop Production Corporation and the Gezira Scheme.
7. The centre has also provided advices to a good number of private sector individuals & firms.

The centre's activities covered in addition to what is mentioned above the following research.

1. 1. Economic & Technical feasibility studies for dehydration and canning factories in the Gezira area. These studies were sent to their respective areas of jurisdiction.
2. 2. A study for the canning factory in Shendi area, privately owned by a citizen.
3. 3. A big share in the Economic and technical feasibility studies for Sennar and Shendi factories which are incorporated in the Five-year-plan. This was sent to the Ministry of Industry.

RELATIONSHIP BETWEEN FRC. AND PUBLIC & PRIVATE SECTORS :

The relationship between the Food Research Centre and some other government and private bodies which have direct attributes to food industry, has emerged out as an important role played by the centre in this field. During the last few years the remarkable research work conducted by the centre has attracted the interests of many scientists in their various prospective fields.

The future development in the field of Food industry necessitates some aspects of co-ordination between the centre and some other research, educational and industrial units.

a) Agricultural Research Corporation :

To fulfill some of its objectives the food research centre has to coordinate its future work with certain units of the Agricultural Research Corporation such as crop production, crop protection horticulture and other. The purpose behind this relationship is to work jointly to improve the quantity and quality of the produce e.g. oil crops, cereals, pulses, horticultural crops so as to meet the demand of both the foreign and local market and to provide raw material for the industry.

b) Department of Animal Resources :

The Sudan is a rich country in animal resources. The Foundation of a meat technology section as an integral part of the FRC is highly appreciated by food technologists as well as by those who are involved in the field of animal production, the future work in meat technology might lead the Sudan to play a major role in the world meat market.

c) University of Khartoum :

A close relationship has been established between the centre and some faculties of the University of Khartoum namely Agriculture, Engineering, Pharmacy, and general sciences. This relationship has proved to be beneficial for both sides. The centre is planning in the near future to expand on its activities so as to bring into the picture a more elaborate work with some other university faculties e.g. veterinary sciences and medicine.

d) Ministry of Industry

The centre has long been working jointly with the Ministry of Industry to solve the problems facing food industry and to improve the quality of the produce so as to meet the industry requirement of the following : Kerona, Wau, Kassala, Babanousa and others. The current expansion in food factories and the future erection of new food factories requires a more close and a joint programme of work with this Ministry and food research centre.

The private sector has benefited to a reasonable degree from the consultation of the members of staff, training and research facilities of the FRC. However, the centre is very keen to strengthen its relationship with this sector because of the important role expected to be played by this sector in the economy of the country.

RESEARCH PROJECTS :

In the past most of the work programme was limited to fruits and vegetables and their products, however, due to expansion in the scale of production and the emphasis on erection of more sections as intact bodies of FRC., the present programme of work includes oils and fats, grain technology, meat and meat products. The current research work includes :

1. Study the effect of environmental conditions on the processing of different varieties of tomatoes.
2. Study on different varieties of mango and possibility of processing either in a form of slices, juices or concentrates.
3. Studies on jams and marmalades have been successfully carried out, and the present work is directed towards seeking new raw material produced locally for the production of jam.
4. To attain the right specifications of prepared foods consisting of meat and vegetables which are acceptable to Sudanese and Eastern taste.
5. To find the best way for the production of tomato ketchup
6. The study of the effect of storage under Sudan hot weather on the keeping quality of tomato paste, citrus squash and mango.
7. Production of carbonated drinks from Karkadeh.

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8. Karkadeh extraction and its production as powder. This has been successfully accomplished as a secondary product in Babanousa Milk products Factory.
9. The study of imported and locally bred onion varieties for dehydration suitability.
10. A successful study on mango dehydration
11. Successful studies on the dehydration of sapsicums, okra and jew mallow.
12. A successful study are the dehydration of minced beef, and the preparation of a popular dish (Molah Khadi & Mulah Akhdar) in a powder form.
13. The study of the different varieties of wheat and sorghum grown in Sudan
14. The study of different varieties of sorghum for their suitability for the production of starch and glucose.
15. The study of the composite flour of wheat and sorghum; and bread making from a composite flour consisting of wheat, sorghum, and groundnut.
6. The study of biscuit manufactured from sorghum, and starch obtained from cassava.
7. Sorghum grinding in wheat mills to obtain better sorghum flour.
8. Projects on oils and Fats include :
  - i) Laboratory investigations to study and improve the quality of cotton seed oil.
  - ii) Survey of vegetable oil production and processing in the Sudan and problems facing the oil industry.
  - iii) Storage of oil seeds : cottonseed and groundnut and study of the effect of some environmental conditions on free fatty acid and aflatoxin incidence in seed.
  - iv) Oil content and free fatty acids in different cotton seeds picks.
  - v) The search for new oilseeds in the Sudan e.g. Sunflower nigerseed watermelon, nuts, sunflower and karkadeh.
  - vi) Service done to Mechanized Agriculture and the Agriculture-re land private sector include analysis of oilseeds of same, sunflower, nigerseed, and groundnuts for oil and protein content.



19. The study of the industrial utilization of local varieties of vegetable and fruits.
20. Necessary studies were carried out at the centre on the possibilities of exporting some vegetables e.g. tomato, subergines, capsicums, beans, and courgettes, to the United Kingdom and Lebanon markets. Information were collected on potential crops, size, containers, costs, etc...
21. The study of onion storage
22. The study of the effect of storing different varieties of potatoes under different environmental conditions.
23. The study of grape-fruit storage at different temperature and conditions .
24. The study of the harvesting and production of banana.

In the applied field, the expatriates and scientists of the Food Research Centre visited many food factories of public and private sectors where they were able to contribute in solving many problems. e.g. :

- 1) The problems of cans seeling at Kareima canning Factories.
- 2) Helping in the tin specifications for Kareima and Wau Factories.
- 3) Solving problem of coliform bacteria contaminating the produce.
- 4) Helping in the installation of the Modern Refrigeration potato storage at Khartoum.
- 5) Solving some of the problems faced at bakeries, Sweets and biscuits factories.
- 6) Helping in the construction and installation of the dehydrator at the People's Farm.
- 7) Improve the status of hygiene and sanitation in Blue Nile brewery.
- 8) The Centre is an expedient and consultee to the Ministry of Supplies in the importation of wheat and rice, and helps also in the importation of wheat and rice, and helps also in the casting of bread.
- 9) A visibility study was carried out for Zayat Jam Squash Factory, and the necessary machines were imported.
- 10) Helping in the establishment of a code of quality standards for processed foods.

Any how there are qualified personnel who can be responsible for teaching research and training in Food Science, Technology Nutrition.

C A M E R O O N

The team did not visit Cameroon, but from their reply on the questionnaire, the following is reported :

There is a Research Institute for Tropical Agriculture "IRAT" (Institut de recherches agronomiques tropicales, B.P 44, DESHANG. They have no department teaching Food Science, Technology and Nutrition.

The main work of the Institute is the improvement of the quality and increasing the yield of some food crops including maize, rice, soya bean and groundnut. This is done by selection of seeds, use of fertilizers and improvement of the methods of cultivation. Such research is done for the benefit of the Government of Cameroon.

There is no specialist in nutrition working in the Institute and they have no difficulty in filling vacant jobs in Food Science, Technology and Nutrition. They contacted ORSTOM (Yaoundé) for help.

The main research project in which they urgently need to undertake locally is increasing lysine concentration in maize.

I V O R Y   C O A S T

The team did not visit Ivory Coast, but from their reply on the questionnaire the following is reported :

They have no department teaching Food Science, Technology and Nutrition. They have an Institute at Abidjan, ITIPAT, B.P. 8881 ; concerning the professional staff they have four engineers (Food technologists) qualified from ENSIA, and they have only one trainee in nutrition.

The equipments they have in the Institute are Mixers, Centrifuges, concentrating apparatus and drying ovens.

The Research activities of the Institute are concentrated on :

- 1) Industrialisation of Cassava and Yam
- 2) Industrialisation of tropical fruits
- 3) Development of new methods for the preservation of cocoa nuts and cola nuts.

These researches are carried on for the Government of Ivory Coast.

They have vacant posts in Food Science, Technology and Nutrition and they have no difficulty in filling such vacancies.

They want to send one of their staff abroad to work on the production of protein rich foods for the young.

They did not receive any external aid for carrying projects.

LIBYAN ARAB REPUBLIC

(Number of population : 2,000,000 )

The team did not visit Libya but the reply for the questionnaire to Member States shows the followings :

- 1) The number of students leaving secondary schools are :

<u>Year</u>	<u>No. of Students</u>
1970	7,000
1971	8,000
1972	9,000

- 2) The number of students studying in the Department of Food Science which is part of Faculty of Agriculture are :

<u>Year</u>	<u>No. of Students</u>	
1970	253	427
1971	313	603

- 3) The Ministries of Agriculture, Health and Industry are responsible for Food Science, Technology and Nutrition in the Country.

- 4) There is a central policy-making for Food Science, Technology and Nutrition. This is done through the Ministry of Planning and Industrial Research Centre.

- 5) There is a Department for Food Technology, University of Libya, P.O. Box 636, Tripoli, Libyan Arab Republic. There is no local training in University Institutions for personnel employed in Food Science, Food Technology and Nutrition.

- 6) The regular Food Science, Technology and Nutrition services undertaken within the country are :

- i) Food analysis, Industrial Research Centre
- ii) Microbiological food analysis, Ministry of Health
- iii) Consultation to food industry, industrial Research Centre
- iv) Implementing plans for new food plants, national organization for industrialisation

.../

7) Laboratory equipments for food technology are available at the Industrial Research Institute (IRC) ; laboratory equipments for Food microbiology are available at both the Ministry of health and at IRC. The Laboratory equipments for both food technology and food microbiology are also available in the University of Libya, Tripoli.

8) They are provided by an expert in food processing for 4 years by UNIDO.

9) They need to carry on analysis of foods chemically and biologically. They also need to plan for new food crops.

10) There is food research already carried on in the IRC in which 7 professional are engaged.

11) The food industries in the country are summarized as follows :

<u>Industry</u>	<u>No.</u>	<u>Type</u>
1. Canning of fruits and vegetables especially tomato paste	11	Establishment engaging 20 or more persons
2. Canning of fish	4	Establishment engaging 20 Or more persons
3. Sugar confectionery	7	Establishment engaging 20 or more persons
4. Soft drinks & carbonated water	8	Establishment engaging 20 or more persons
5. Olive oil manufacture	27	Est. engaging 20 or more persons
6. Dairy plants	3	Plants with more than 20 pers.
7. Flour Mills	4	Plants with more than 20 pers.
8. Macaroni manufacture	6	Plants with more than 20 pers.
9. Bakery products	4	Plants with more tha 20 persons.

CM/981 (XXXIII.)

Part III

Appendix 1

Distribution: LIMITED

Original: ENGLISH

December 10th, 1972

OAU PROGRAMME TO ESTABLISH INTER-AFRICAN  
CENTRES FOR TRAINING AND RESEARCH IN AFRICA

PROPOSED CENTRE FOR FOOD SCIENCE  
AND TECHNOLOGY

DRAFT submitted by SABRY R. MORCOS, Cairo, 23-11-72

PREFACE  
(Platt, 1956)

"There is a particularly urgent need for trained personnel in developing countries to help in sizing up problems, in planning food policies having a sound nutritional basis and to help in initiating and developing action programmes designed to eradicate malnutrition and ultimately to build up nutrition services and nutrition education activities through which the health and welfare of the population can be sustained as far as it can be achieved by adequate feeding".

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(Platt, 1961)

"A department of food science and technology strategically placed in a centre of higher education in a developing country could be an education and training ground as well as a meeting place for students who later may become teachers in a variety of disciplines and whose co-operation in the future in the campaigns against malnutrition will be essential".

-----  
(Ten years later)

In November 1971, the Scientific Council for Africa in its fourth meeting in Ibadan advised that among the ten centres proposed, the second to be established is the one for Food Sciences and Technology. For implementing the realization of this project, I wish to submit the following points for consideration by the honourable members of the team.

A) Siting of the centre of centres

1. The Organization of African Unity encompasses a vast continent with a large variety of geographic and climatic conditions. Their obvious effects on food production differ from one region to another. The inhabitants have different cultures and different food habits.

2. An attempt at simplification based on bringing together neighbours of more or less the same ethnological background would divide the continent into 4 main regions:

- North Africa
- West Africa, south of Sahara
- East Africa and
- Central Africa

3. In spite of the variety of languages spoken, English, French, and Arabic are those of major use in schools and by the professionals.

4. The advantages of establishing more than one centre outweigh the extra expenditure. Three centres are advised and two are considered a minimum.

5. It may become possible to specialize the centres to give emphasis to some particular fields, e.g. cereal, meat, fish, fruit, wine or oil technology. Whereas if a single centre is to be recommended for the whole continent, it should necessarily include all these disciplines.

6. Before deciding upon the country representative of its region, consideration should be given to the points of the questionnaire (Appendix 1). However, attention should also be given to the language spoken by a country which may have priority as a result of the questionnaire in order to have good representation of languages as well as regions.

7. While accepting the idea of siting a "Centre" within a town which already has a University or Research Institute for the many professional and social advantages, it is recommended that the Centre be sited in a separate place, preferably within a campus including living quarters for staff and students. Since the "Centre" or "Centres" would deal with training and research, it should be sited in a place where Food research and food industries exist, so that to have a right scientific environment.



B) Curricula for training and research in food science and technology

All candidates admitted to the Centre whether for training or research should be university graduates from schools of agriculture, home economics, science (chemistry and biology), social sciences, medicine and veterinary medicine.

1) Post graduate teaching and training in food science and technology

i) Courses given by the Belgian and Dutch Universities (appendix II), those by the University of London (appendix III), and that of the Egyptian Universities (appendix IV), but moulded to the local requirements and needs of African countries will be the basis of studies suggested.

ii) There is no necessity to specify the changes which shall make any of these courses desirable for African needs as these will come as a natural result of:

- a) the choice of the teaching personnel chosen from workers in African countries and,
- b) from the desires of Member States.

iii) This basic course which will last 6 months will be followed by 6 months training in practical problems in the field, factories and applied nutrition programmes.

iv) The maximum number of trainees should not exceed 50 per year.

2) RESEARCH

i) Facilities for research are provided for the scientific personnel in fulfilment of a programme accepted by the OAU.

ii) Research students can be accepted for post graduate studies with the accredited professors in the Centres. Their number will not exceed 10 students in each institute chosen after personal interview.

### 3) ASSISTANCE TO MEMBER STATES

Assistance to member states is given by study of the problems submitted after approval of the OAU and according to the research programme and time budget established by the Organization.

### 4) PUBLICATIONS

i) Progress reports of the Centre should be periodically published and circulated to the member countries.

ii) World wide publications following authorization from the Centre's board of directors is encouraged. This will be carried out by a documentation centre.

A documentation centre, a central library, a workshop, animal houses and a technical instrument centre should be established.

### C) STAFF AND SERVICES

1) Recognized University lecturers and experts from the food industry will form the core of the academic personnel in the food science and in the ancillary subjects.

2) Provision should be made for inviting scientists for limited periods to share in the activities of the Centre.

3) The privileges and diplomatic immunity granted to the United Nations Agencies should be enjoyed by the staff except the non-academic and non-technical.

D) FINANCE

Planning of a Centre depends on a planned budget.

1) If an already working National Research Centre is chosen, one million dollar will be enough as a capital for strengthening such existing Centre. If new installations are recommended, at least 3 million dollars will be needed for establishment of each centre.

2) Recurrent annual expenditure for operating each centre tsnhrd gtom 500,000 - 700,000 dollars.

3) Each member state sends annual financial contribution to the OAU who will be responsible for the establishment and the running expenses of the centre or centres.

4) Each member state pays the fees for its selected students (300 dollars per year for a trainee, and 500 dollars/year for a research student).

5) The OAU would still have the right to exempt any country from these stipulations without affecting the centre's budget.

6) Fees for the services, the OAU has also the right to exempt any country from these stipulations.

7) Source of aid:

- i) Grants from international and national foundations
- ii) Grants from governments.

APPENDIX I  
QUESTIONNAIRE

What are the number of inhabitants? .....

- How much is your national income? .....

- agriculture .....

- industry .....

- natural resources .....

- others .....

- total .....

- Is there any existing Food Science Institute, if so please  
give plan and nature of work?

.....  
.....

- Is there Food Industries

.....

- Is there any existing Nutrition Institute? If so, please  
give plan and nature of work.

.....  
.....

- To what Organization is such Institute affiliated?

University

Higher College

Firm

Ministry

Academy

Others

N.B. The Bulletin, plan and type of work of each Institute  
should be enclosed with the answer giving full  
description of the number of staff, and their qualifi-  
cations.

- What are the number of Universities or Higher Colleges  
(Institutes for Higher Education)?

- Schools of:

Agriculture  
Medicine  
Veterinary Medicine  
Basic Science (Chemistry & Biology)  
Social Sciences  
Home Economics  
Pharmacy

- Is there a National Committee for Food Science and  
Nutrition Policies?

YES

NO

- as a separate entity .....

- part of an existing health or agriculture service  
or Ministry .....

- What is the number of University Graduates in the Field of:

- Agriculture  
- Medicine  
- Veterinary Medicine  
- Basic Sciences  
- Social Sciences  
- Home Economics  
- Pharmacy

- What is the number of:

- Nutritionists and/or Dieticians  
- Food Technologists

- What are the kinds of financial help your Government is  
willing to contribute towards establishing a Centre?

.....  
.....

APPENDIX IIINTERNATIONAL COURSE IN FOOD SCIENCE AND  
NUTRITION

( with reference to the problems of social and economic  
development)

The Netherlands 1973, Belgium 1974

The Dutch and Belgian Universities supported by NUFFIC & A.G.C.D.  
in Co-operation with the food and agriculture organization of  
the United Nations FAO.

PROGRAMMESECTION I - BASIC PRINCIPLES OF FOOD AND NUTRITION SCIENCES

## 1. Food Chemistry

- a) Carbohydrates, proteins, fats, vitamins, macro- and trace nutrient elements and water as constituents of food: composition, properties, stability.
- b) Chemical food analysis
- c) Food tables. Food groups
- d) Food additives
- e) Toxic components: alcohol, stimulants, naturally occurring toxic elements, naturally occurring organic toxic substances, residues of
- f) pesticides and hormones, residues from processing
- g) Food legalisation: principles and examples. Food control laboratories. Consumer organizations.

2. Physiology and Biochemistry of Nutrition

- a) Development of knowledge of nutrition. The concept of optimal nutrition
- b) Digestion, absorption, storage, metabolism, excretion, physiology of appetite

- c) Food as source of energy
- d) Functions of water, proteins and essential amino acids, essential fatty acids,
- e) Nutrition in relation to body composition, growth and mental development
- f) Nutrition requirements in relation to age, activities, climate, pregnancy, lactation, etc...
- g) Recommended dietary allowances for nutrients
- h) Commonsense

3. BIOSTATISTICS

4. FOOD MICROBIOLOGY

- a. General microbiology
- b. Prevention of food born diseases of microbial origin
- c. Food preservation
- d. Microbial food production
- e. Microbiological quality control

5. FOOD TECHNOLOGY

Production, contents and stability of nutrients, processing, storage, packaging and marketing of:

- a. Meat, fish, poultry, eggs
- b. Milk and dairy products
- c. New protein sources
- d. Fats
- e. Cereals and tubers
- f. Pulses
- g. Vegetables and fruits
- h. Water, beverages

6. DEMONSTRATIONS, EXERCISES, VISITS

- Visits to institutes, factories and laboratories
- Demonstrations of chemical methods for food analysis
- Demonstrations of microbiological control of foods
- Calculation of nutrients, e.g. on protein evaluation
- Evaluation of section I by the participants:  
importance and practical value of the subjects  
and their presentation.

SECTION II - NUTRITIONAL DISORDERS

- a. Features, causes epidemiology and prevention of  
important nutritional deficiency diseases:  
Caloric deficiency  
Protein - caloric malnutrition  
Nutritional anemia  
Vitamin deficiencies  
Other disorders
- b. Over-nutrition
- c. Assessment of the nutritional status of a population  
group
- d. Nutrition and infection
- e. Relation between nutrition of man and his productivity.

SECTION III - MAIN HUMAN FACTORS AFFECTING THE  
NUTRITIONAL SITUATION

- a. Ecological factors (among others regional differentia-  
tions, food consumption surveys
- b. The economy of food
- c. Cultural factors affecting food consumption



#### SECTION IV - POLICIES FOR BETTER NUTRITION

After the course participants who have obtained the Diploma may, in exceptional cases, be enabled to specialize in a subject important for their activities back home, e.g. a specialization in a technological subject, a training in nutrition education or in chemical or microbiological laboratory methods.

#### APPENDIX III

##### LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE UNIVERSITY OF LONDON

Course of study for the Proposed M.Sc. Degree in Human  
Nutrition and Diploma in Human Nutrition 1971/1972

#### Physiology and Biochemistry of Nutrition

Energy; nutrients; biological synthesis and cellular metabolism; water and electrolytes; adaptive mechanisms; physiological requirements and recommended allowances.

#### State of Nutrition and Pathology of Malnutrition

Assessment of state of nutrition; growth and development; under-nutrition and overnutrition; pathological conditions associated with malnutrition; nutritional and metabolic factors in disease; interactions of nutrition and infection.

#### Food Consumption and Food Science

Composition of foods and the use of food tables, the processing, preservation and hygiene of food; methods of studying food consumption and factors influencing food consumption; population and food supply.

Practice of Nutrition .

Statistical methods; vital statistics; the epidemiology of malnutrition and the conduct of nutrition surveys; prevention and treatment of malnutrition; pregnancy and lactation; the feeding of young children and other vulnerable groups; education in nutrition; the application of nutrition in social medicine and applied nutrition programmes.

APPENDIX IV  
UNIVERSITY OF ALEXANDRIA  
COLLEGE OF AGRICULTURE  
Department of Agricultural Industries  
Camp Cesar, Alexandria, Egypt.

PROGRAMME

Food Science and Technology 10 (Introductory Food and  
Food Preservation)

A brief account on the chemistry of food constituents and the changes they undergo in processing. Food spoilage, methods of food preservation. Visits to food plants.

Food Science and Technology 101 (Essentials of Foods and  
Food Preservation)

Theoretical and practical studies on foods and their chemistry. Important methods of food preservation. Canning, freezing, drying, refrigeration, food preservatives, fermentation, radiation, preservation, technological applications and visits to food plants.

Food Science and Technology 102 (Canning of Foods)

Theoretical basis of food preservation by heat and radiation. Technological applications.

Food Science and Technology 103 (Drying, Refrigeration and  
Freezing; Preservation of  
Foods)

Theoretical and technological basis of food preservation by drying, refrigeration and freezing. Machinery and equipment and their calculation. Technological and laboratory applications.

Food Science and Technology 104 (Sugar Technology)

Theoretical and technological studies of cane and beet sugar industry. Important sugar food industries and by products.

Food Science and Technology 107 (Food Microbiology)

A detailed study of the bacterial flora foods and as influenced by handling and processing. Microorganisms of importance in the food industry and microbial food spoilage and poisoning.

Food Science and Technology 108 (Food Control)

Faculty and laboratory quality control. Controlling raw materials for food factories. Standards and specifications of flour, tea, coffee, spices and essential oils. Water analysis.

Food Science and Technology 109 (Human Nutrition)

State of nutrition in the world in general and in Egypt in particular. Population explosion. Digestion and absorption. Caloric and water requirements. Proteins, fats, carbohydrates, minerals and vitamins requirements and deficiencies, fortification of foods. Obesity and leanness. Nutrition of sensitive groups.

Food Science and Technology 110 (Chemistry and Technology of  
oils, fats, and their Products)

Raw materials for oil and fat products methods of its extraction, refining, bleaching, deodorization and hydrogenation. Chemical and physical tests. By-products of the oil and fat industry.

Food Science and Technology 111 (Chemistry and Technology  
of Cereal and their Products)

Important cereals for man processing of wheat and rice.  
Bread baking. Biscuit and cakes. Breakfast cereal products.  
By-products.

Food Science and Technology 112 (Food Plant Organization)

Food Science and Technology 113 (Sanitation and Hygiene in  
Food Plants)

Organization of a sanitation programme in the food industry.  
Cleaning compounds. Methods of disinfection and sterilization.  
Sanitary aspects, buildings and equipments. Safe water-supply.  
Waste treatment and disposal. Insect and rodent control.

Food Science and Technology 120 (Chemistry and Technology  
of Fish & Meat)

Importance of meat and fish as a source of animal protein.  
Muscle structure and its chemical composition. Factors  
influencing fish and meat quality and consumer acceptance;  
spoilage and preservation, by-products and utilization of  
wastes.

Food Science and Technology 130 (Unit Operations)

Fluid flow - Heat transfer - Evaporation - Drying - Extrac-  
tion - Distillation - Crystallization - Filtration - Mixing -  
Materials handling.

Food Science and Technology 199 (Special Studies in Food  
Science and Technology)

An undergraduate level research work in the area of Food  
Science and Technology.

Food Science and Technology 200 (Research)

Thesis research work in the area of Food Science and Technology for students registering for M.Sc. and Ph.D. degrees.

Food Science and Technology 201 (Seminar)

An obligatory seminar for graduate students in the department on selected topics.

Food Science and Technology 202 (Advanced Food Chemistry)

Selected advanced topics in food chemistry assigned to graduate students.

Food Science and Technology 203 (Advanced Food Chemistry)

Selected advanced topics in food chemistry assigned to graduate students.

Food Science and Technology 203 (Advanced Food Microbiology)

Selected advanced topics in food microbiology assigned to graduate students.

Food Science and Technology 204 (Advanced Food Technology)

Selected advanced topics in food technology assigned to graduate students.

Food Science and Technology 205 (Organoleptic properties of Foods)

Basic principles of food colour, texture and flavour. Subjective and objective methods for their measurement. Laboratory application.

Food Science and Technology 206 (Food Rheology)

Colloidal systems. Food structure and texture. Viscosity. Elasticity and plasticity. Surface tension. Colloidal systems in foods. Emulsions and emulsifiers. Suspension. Gels, practical applications.

Food Science and Technology 207 (Meat and Poultry Technology)

Food Science and Technology 208 (Fish Technology)

Modern fishing gear - problems of catch - freshness and fish handling on the market. Quality evaluation and grading of fish and fish products. Fish waste utilization.

Food Science and Technology 210 (Instrumentation in Food Analysis)

Principles of recent instrumental methods for the analysis of food and his laboratory application.

Food Science and Technology 211 (Food Lipids)

A study of the chemical and physical structure of food lipids and methods of its separation. Chemical and physical properties and its relation to different uses in the food industry. Practical application.

OAU PROGRAMME TO ESTABLISH INTER-  
AFRICAN CENTRES FOR TRAINING AND  
RESEARCH IN AFRICA

PROPOSED CENTRE FOR FOOD, SCIENCE & TECHNOLOGY

Team of Experts

1. Prof. Sabry Riad Morcos,  
National Research Centre, Egypt  
Dokki, Cairo, (Egypt)
2. M. Omar Hal El-Khidir  
P.O. Box 2341 Sudan  
Khartoum (Sudan)
3. Dr. Adewale Omololu  
Director Food Science & Applied Nutrition  
University of Ibadan Nigeria  
Ibadan, (Nigeria)
4. Prof. Edouard Adjenohoun  
University of Benin Benin  
Porto-Novo (Benin)

Purpose for which the team is appointed :

1. The OAU has decided to appoint the above team of African Experts to draw up a project-plan for the establishment of a Centre or Centres for Food Science and Food Technology (See recommendation XV of the fourth ordinary Session of the Scientific Council of Africa.)



INTRODUCTION :

2. In 1967, and by resolution CM/Res. 116 (IX), the Council of Ministers and the Assembly of Heads of State and Government of the OAU, approved in principle, the proposal to establish Inter-African Centres for training and Research in Africa. At that time, only eight disciplines had been selected, in applied science and technology. But in 1968, at the joint OAU/UNESCO Conference on Education and Scientific and Technical Training in relation to Development in Africa, two more disciplines were added, bringing the total to ten Centres. Thus, the hopes, which were expressed in the early meetings of the OAU in 1963, 1964, and 1965, relating to the need to expand the infrastructures for training and for research and development in Africa, took an implementation form. The ten selected areas are :

- i) Earth science (including geology, geophysics, mineralogy, etc..)
- ii) Applied science and Engineering,
- iii) Food science and Technology,
- iv) Water resources, planning and development
- v) Marine science and technology;
- vi) Human medicine and Pharmacology
- vii) Veterinary Science;
- viii) Climatology and Meteorology;
- ix) Basic sciences (Physics, Chemistry, Biology, Mathematics)
- x) Social science (Documentation, teaching and research )

3. In implementing this resolution the Centre on Earth Sciences was chosen as pilot scheme and a team of experts was appointed. They produced a report which is being circulated to Member States at present.

The Scientific Council for Africa in its 4th meeting in Ibadan from 1-4 Nov. 1971, advised that the second centre to be established is the one for Food Sciences and Technology. The Council proposed a committee of four African experts to the Council of Ministers meeting in its 19th Ordinary Session.

The names of the team of experts for the Centres for Food Sciences and Technology are :

- |    |                         |         |
|----|-------------------------|---------|
| 1. | Prof. Sabry Riad Morcos | Egypt   |
| 2. | Mr. Omar Hag El-Khidir  | Sudan   |
| 3. | Dr. Adewale Omololu     | Nigeria |
| 4. | Prof. Edouard Adjenhoun | Benin   |

The task of the team :

4. The team is expected to draw up a project plan for the proposed Centres for Food sciences and Technology or if they see it fit to avoid duplicating existing work and research promotion in progress, they can plan for and recommend strengthening the existing Centres which are already functioning with high efficiency. As presently envisaged the proposed Centre (s) for Food Science and Technology shall undertake two main functions i.e.

- a) the training of personnel at post-graduate level, in the relevant professional scientific skills, as well as the training of research workers at that level , and
- b) the provision of facilities for, and the undertaking of, advanced research and development to complement, support and stimulate the development efforts of individual Member States.

5. Although the training envisaged at present is at post-graduate level, it is however intended at a later stage to offer training to under-graduate and to middle-grade scientific personnel at the Centre or Centres. The plans for the proposed Centre (s) should therefore contain possibilities of expansion on these lines. The research and development to be carried out, will mainly be applied, in so far as it is expected to be closely geared to the solving of problems and the removal of obstacles encountered by Member States in their development efforts. However, there should be plenty of opportunities for fundamental research and development in support of, or as a stimulant to that development effort of individual Member States, and also as part of the human search for new knowledge.

6. The project-plan which the team is being asked to draw up for the Centre for Food Science and Technology would appear to include the following main aspects.

- A. 1) The curricula for the professional training courses at post-graduate level in the individual sub-disciplines composing Food Science and Technology which would be moulded to the development needs of Member States.
- 2) Level and quantity of research and development activities to be undertaken, as indicated by the expected demands from Member States.
- 3) Level and quantity of relevant ancilliary training or services to be provided.
- 4) Recommendations on the specifications of the equipment and materials appropriate for the courses and for the research and development.
- 5) Entry requirements into the various courses.
- 6) In case the team suggests one centre the following can be taken into consideration : qualification and number of staff for teaching and for research and development.
- 7) Non-academic and non-technical facilities and services e.g. for the welfare of the staff and students, etc...
- 8) Qualifications and number of non-academic and non-professional staff e.g. for administrations, .....
- 9) The rate of admission of students and hence the size of student body to be catered for.
- B. 1) a) Criteria for siting of the proposed centre including the definition of what is the appropriate scientific environment which would ensure a smooth, effective and efficient operation of the centre.
- b) Whether to endow a chair in Food Science and Technology to an existing University, or whether to build a wholly new Institution.
- c) Recommendations of sites in Africa which meet with the requirements decided upon under B. 1. (a) above.

- 2) a) Recommendations on the modalities of effective control, direction and development of the Centre by OAU Member States
  - b) Recommendations of appropriate machinery for B. (2) above.
- C.
- 1) Estimates of the capital expenditures for the entire scheme.
  - 2) Estimates of the recurrent annual expenditure for the operation of the Centre.
  - 3) Recommendations on methods of financing the capital and recurrent expenses of the Centre,
    - a) types and levels of direct contributions from Member States
    - b) fees from students
    - c) fees for services rendered, especially in research and development and in other professional services
    - d) external aid.
- D. The team should feel free to examine the idea of proposing one centre or strengthening the existing centres to achieve the same aims. They should also feel free to examine and make proposals on any other relevant aspects on the proposed centre (s) whether included in the above list or not, provided it is within the objectives and other limits enunciated herein.

If the team decided on strengthening some of the existing centres, they should be nominated and the methods of strengthening them should be pointed out.

OBSERVATIONS ON SOME OF THESE ASPECTS :

7. The professional content of post-graduate courses to be provided in sub-disciplines of Food Sciences and Technology are familiar to the member of the team. However, since the courses are to be "moulded to the development needs of Member States", they have to reflect the needs of the majority members without sacrificing professional excellence. For example, the needs of Member States in the effective utilization of their food resources have to be ascertained and catered for in the courses to be offered at the Centre. The team has to ascertain these and similar needs in other sub-disciplines of Food Science and Technology and suggest courses which satisfy these needs. The courses to be offered are to be the highest desirable for African needs.

8. The level and quality of research and development to be carried out, would mainly be determined by the development problems and obstacles within Food Science and Technology which Member States may encounter. Facilities and services for research and development could be offered for example in methods of improving food production, procession, preservation and storage and analysis of food stuffs. Applied research and development could also be undertaken on adapting these processes to local conditions. Fundamental research and development in Food Science and Technology could be dictated by the available types of food, animal breeds, agriculture, fish and climate in Member States.

One should of course include the carrying out the research and development activities as efforts in the human search for new knowledge, or for the advancement of man's stock of ideas. These, and other relevant aspects connected with the efforts of Member States to attain accelerated development, would determine the level and quantity of the facilities and services to be available for research and development in Food Science and Technology at the proposed Centre (s). It should be envisaged that the facilities and services should allow not only the staff and students of Centre (s) to do the research and development but also the research workers from the Member States, who may wish to complete their national research efforts at the Centre (s) using (what may be) more sophisticated equipment for the payment of stipulated fees.

To ascertain the needs of Member States under A.(1) and A. (2) it may be necessary for the team to visit a representative sample of Member States.

9. There are no observations to be made at this juncture, on A. (3) "Level and quantity of relevant ancillary technical training or services to be provided". The same applies to A.(4) "Recommendations on the specifications of the equipment and materials appropriate for the courses and for the research and development", but attention is invited to the comments in paragraphs 10 and 11 below.

10. In case one Centre is suggested the rate of admission of students would naturally be determined by several things, including the demand by Member States for the skilled personnel concerned and by the need for maximum permissible utilization of the facilities and services provided.

To start with, consideration may be given to admitting say, two students from each Member State, every year. The ideal would be to use only one language. But present realities in Africa indicate the use of a minimum of two languages at the proposed centre. English and French are the main teaching languages used in institutions of higher learning, and, it may be necessary to plan for both the English and French streams for each course, but using the same facilities and services provided at the proposed centre. While this phenomenon will definitely increase some of the costs, e.g. staff expenses, it may be used to advantage by allowing for maximum and hence more economic utilization of some of the facilities e.g. laboratories. Entry requirements into the courses would however need to be the same or equivalent.

11. The qualifications and experience required of the teaching staff and of the research workers in Food Science and Technology, are familiar to member of the team. Besides offering courses in Food Science and Technology, the teaching of social and human sciences, as minor subjects at the Centre (s) may be considered as being important in helping to mould society conscious citizens out of the students and improve the understanding of different social environment. The number of such teaching staff and also of the research workers would be determined not only by the requirements of each course, of the students body and of specified research and development effort, but also by the separate needs of the English and French streams.

12. There are no observations on "non-academic and non-technical facilities and services e.g. for the welfare of the staff and student etc..." which include facilities for sports and games. The qualifications and experience required of non-academic and non-professional personnel are again familiar to member of the team. It may be observed that the existence of the English and French streams may not necessarily require duplicated appointments of most of these. These are sectors where it may be possible to obtain the services of bilingual personnel or where a small all-purpose bilingual unit in the centre (s) may be established.

If several Centres are suggested the above conditions will of course differ with the different institutions.

13. Since the programme on Inter-African Centres for Training and Research was announced, substantial debate has taken place, particularly on the question of siting. There appears to be a strong opinion which thinks that the centres should be part of the existing Universities so as to reduce costs through sharing of some of the facilities. There is also substantial opinion, which, after noting that the proposed centres would be international as opposed to national institutions which existing Universities are, has tended to think of having the proposed centres as separate self-contained institutions. The economics arising from sharing facilities and services and the social advantages of belonging to a higher community of academicians are all too obvious. But, in so far as existing universities are national institutions, the absolute sovereign right of the governments concerned to determine curricula development channels of expenditure and other matters such as their compulsory closure in the interest of the state, should not be overlooked. For an international institution, special guarantees relative to such important aspects as uninterrupted pursuit of learning and of continuous operation, freedom of movement while on legitimate business of the centres and the uninterrupted availability of vacancies for students from Member States that may be at political variance with the host country, have got to be given.

14. There is what has come to be called the right scientific environment for a Centre(s) such as the one on Food Science and Technology. Since the Centre(s) would deal with training and research and development in these subjects, it requires an environment that offers ample opportunities for practical training and on-the-job observations. For the Food Science and Technology, this may mean that the Centre(s) have to be sited where there is or where there is known potentialities for a complex of Food research and industries. Such an environment would not only itself benefit from the activities of the centre(s), but the students and staff of the centre(s) would benefit immensely through contact with actual conditions which they are learning about, and research and development activities could be those direct from the field, thus offering the centre(s) opportunities for involvement in real situations.

The symbiotic relationship between the centre and its environment would have positive and desirable effects to both - and by extension, to the other Member States.

15. Siting the centre(s) in a separate place, within a town which already has a University, university college or research institutes for Food Science and Technology would also have beneficial professional and social results. The academic (professional) staff can consult and liaise with their counterparts, in the other institutions, while the mingling of students to exchange views, etc... would have healthy professional and social results. Where possible, the sharing of facilities and services could be arranged, thus economizing on scarce human and financial resources.

16. These and other aspects relating to siting, have to be considered when deciding on the criteria to be used for selecting possible sites for the centres. It may then be necessary to short-list some places, which may be visited by the team, before final recommendations of likely sites are made to the OAU.

17. It may be appropriate to mention here that there is no intention to restrict or influence the growth (under national efforts) of any of the existing or proposed universities, into the areas being proposed for the Inter-African Centres for Training and Research. The demand in Africa for highly trained personnel in scientific disciplines is so high at present that the more training facilities available in Africa, the better. It must be clear however, that the team is not restricted to think in terms of one centre but can also think in terms of strengthening existing institutions dealing in Food Science and Technology. The merits of this idea should be given due consideration.



18. Machinery has to be established to ensure that effective control direction and development of the Centre (s) remains in the hands of OAU Member States in consultation with the staff of the Centre (s). Such control would take cognizance of the obvious rights, which a national government of the host country, may need to exercise over the Centre or the part of it that exists in that country.

Although there is an implementation committee which is to keep under constant review, the whole execution, operation and development of the proposed centre(s), the Committee would probably not more like an advisor to the international machinery being called for in (B.2) for the operation of the Centre (s), and to the OAU itself.

19. There are no observations for C. (1) and (2) relating to capital and recurrent estimates. On the question of funding the projects, efforts are being made to secure grants or loans from bilateral and international sources. In the absence of a project-plan for the establishment of the Centre(s) none of these sources have been formally requested to make a commitment. With the project-plan prepared by the team, it should be possible to proceed to the stage of asking for firm commitments from sources of aid. In the meantime formula for methods of contributions from Member States, students and from services to be rendered, have to be worked out and proposed to the OAU.

20. It is hoped that the team will be able to carry out all the aspects covered under A., B., C., And D., but should any of these require outside help (e.g. consultants) this will be considered within the limited financial means available. After the project-plan is received - together with capital and recurrent estimates - it is hoped to obtain the services of two firms of consultants, one to carry out the physical planning and related preparation of construction documents, and the other to prepare the architectural plans for the centre (s) if a single centre is decided upon, or if extensions to existing institutions are to be constructed.

ORGANIZATION OF THE TEAM'S WORK

21. It is hoped that the team will accomplish its work through meetings, visits, interviews, questionnaires, written submissions and use of referral documents. The first meeting is expected to be short where tasks will be defined and apportioned. The Secretariat will invite written proposals from Member States and from African Institutions as well as from other selected non-African sources. It will also prepare drafts for interviews and questionnaires as directed by the team, as well as arrange for meetings visits and interviews required by the team, within the rather limited financial provisions allocated for this task.

22. It is suggested that during the short first meeting, the team could draw up its visit-schedules, and may be, indicate the type of information to be gathered by member of the team, and by the secretariat from questionnaires and written statements. It would then draw up its time budget for accomplishing the work to be done. The final and longer meeting could be used for sifting the information received, discussions on the various aspects, and the drafting of the project-plan for the Centre or Centres for Food Science and Technology. The scientific and Cultural Department of the OAU Secretariat will act as the secretariat of the team.

23. Some background documents, as well as other documents in the possession of the Secretariat which may be of help to the team, will be made available for information or reference.

24. Copies of the completed work of the team on the Centre for Food Science and Technology will be circulated to the implementation Committee and to all Member States for individual opinion, before being presented to the political organs of the OAU for consideration.

IN CONCLUSION :

25. The team on the Centre (s) for Food Science and Technology is the second that has been appointed for drawing up a project-plan for one of the ten selected Inter-African Centres for Training and Research. The programme itself is expected to supplement the efforts of Member States to train highly skilled scientific personnel, for various national services as part of their development efforts.

It is also expected to supplement and support through research and development, the efforts of Member States to achieve accelerated progress, aimed at giving higher living standards to their citizens.

26. This programme to establish co-operative inter-african Training and Research Centres, is one that stands to benefit all Member States whether rich or less rich, small or big. These countries that cannot afford constructing and maintaining many institutions of higher learning and research, and whose demand for highly trained scientific personnel is still small, will find that the proposed centres will offer them comparatively cheap training and research services for their growing requirements. Those countries that are wealthy enough to be able to build and maintain such institutions of higher learning and research on their own, will find the facilities and services offered within an inter-African environment at the proposed centres, to be a desirable supplement to their national efforts. Also because of the present stage of development of Member States (excepting the Arab Republic of Egypt) their abilities to fully utilize personnel with certain high scientific qualifications, may be limited. In such cases, it appears that most Member States can provide employment for only a few of such persons at a time. Candidates for training from such Member States may therefore be few every year to justify the building and maintenance of a national institution in a given discipline, but taken on a continental level, the sum-total of such candidates from all Member States would be more than adequate to fully use the facilities and services in training and research, which are expected to be provided at the proposed Inter-African Training and Research Centres. Furthermore, the expected level of training and research that is to be provided at the proposed centres are one that are at present mainly offered by institutions outside Africa. By training Africa's personnel in an African environment, under curricula moulded on African needs, and which allows them to practice on and help solve local problems, would not only benefit such personnel, but also it would benefit Member States directly. The venture by the OAU into building co-operative Training and Research Institutions in Africa is therefore one on which there are many hopes and expectations, and which must not fail. The team on Food Science and Technology, by accomplishing the tasks given to it to draw up a project-plan for the establishment of the centres on Food Science and Technology- would be contributing to the success of this desirable and necessary programme, from which Africa has so much to gain.

SC/HN/100/15-73

31 January, 1973

Dear Sir,

I have the honour to inform you that the Organization of African Unity is implementing Resolution No. CM/RES. 116 (IX) passed by the Council of Ministers in 1967 and approved by the Assembly of Heads of State and Government. This resolution calls for the establishment of Inter-African Centres for Training and Research by the OAU and the Secretariat has now begun the necessary studies on the establishment of the second Centre for Applied Food Science, Technology and Nutrition.

A team of four experts on Food Science, Technology and Nutrition, selected by the Scientific Council of Africa at its meeting held in Ibadan from 1 to 4 November, 1971 and approved by the Council of Ministers, has been charged to advise the OAU on how best to implement the project. The team held its first meeting in Addis Ababa from 11 to 13 December, 1972.

The experts discussed the matter at length and decided to send a set of questionnaires to action Ministries in Member States and to Institutes and Faculties which are dealing with Food Science, Technology and Nutrition in the African Universities. You will please find enclosed the set of questionnaire for your Institute or Faculty. It will be much appreciated if great care and detail are exercised in answering them. We expect the reply at your earliest convenience so that it may be put at the disposal of the team of experts.

Yours faithfully,

J.D. Buliro

Assistant Secretary General

TRAIN OF DEPARTS ON INTER-AFRICAN CENTRE FOR TRAINING  
AND RESEARCH IN FOOD SCIENCE, TECHNOLOGY AND NUTRITION

(OAU Resolution - CM/Res.116 (IX) 1967).

QUESTIONNAIREUNIVERSITIES, ACADEMIES OF SCIENCE, TRAINING AND RESEARCH INSTITUTIONS :

A. Name and address ..... COUNTRY .....

B. Is there a department teaching Food Science, Technology and Nutrition or any of these in your University ?

YES/NO

If yes - which of the 3 disciplines are taught : Food Science - Food Technology - Nutrition.

1) Staff and Students

YOUR COURSE Established	S T A F F			P R E S E N T   S T U D E N T S			Total number of : Students already qualified
	Nationals	Other African	Expatriates	Nationals	Other Africans	Expatriates	
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....

2) Please state below the Courses offered : and send curricula of all courses and training Programmes.

3. Qualification of Personnel

<u>A. Professional staff</u>	<u>Actual strength</u>	<u>Qualifications</u>
Food Scientists		
Food Technologists		
Nutritionists		
Others (specify)		

## B. Please list any special equipment that is available or on order:

Present :

- 1.
- 2.
- 3.
- 4.

On Order :

- 1.
- 2.
- 3.
- 4.

C. Research and Development

Please describe briefly departmental or own research and development activities being undertaken in these three spheres :

- 1.
- 2.
- 3.
- 4.

Please attach list of titles of main publications.

.../

D. List other research and development activities in these sciences being carried out by you and for whom.

Description	For Whom
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

E. Please indicate any research and development activities which your staff in the field of Food Science, Technology and Nutrition have to go abroad to undertake due to lack of facilities or more sophisticated equipment.

Description	Equipment/Facilities	Country where done
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

F. Please describe briefly, nay planned expansion of courses, research and development capacities in these fields in your institution.

G. Are there any vacan posts in your establishment in Food Science, Techno-  
logy or Nutrition ? YES/NO

Have you any difficulty in filling vacant posts in these fields with  
your nationals ?  
Other Africans ?  
Expatriates ?

- H. Please describe briefly any food Science, Technology or Nutrition Services or research that you urgently need to undertake locally ?
- I. Please give a brief description of special Food Science, Food Technology or Nutrition projects - since 1970 - for which you have received or requested for external aid.

Description	Money requested in US \$	No. of Professional Staff	Country Providing aid
1. ....	.....	.....	.....
2. ....	.....	.....	.....
3. ....	.....	.....	.....

J. Other Comments :



The General Secretariat of the Organization of African Unity presents its compliments to the Ministries of Health and of Agriculture of Member States and has the honour to refer to Resolution No. CM/Res.116 (IX) passed by the Council of Ministers in 1967 and approved by the Assembly of Heads of State and Government. This resolution and some subsequent ones call for the establishment of Inter-African Centres for Training and Research by the OAU. The project-plan for the Centre on Earth Sciences was approved by the Council of Ministers in February 1973.

The Secretariat has now begun taking the necessary steps towards the establishment of the Second Centre for Food Science, Technology and Nutrition. A team of four experts on Food Science, Technology and Nutrition selected by the Scientific Council of Africa at its meeting held in Ibadan from 1 to 4 November, 1971 and approved by the Council of Ministers, has been charged with the task of drawing-up a project-plan for that Centre. The team held its first meeting in Addis Ababa from 11 to 13 December 1972.

The experts discussed the matter at length and decided to send a set of questionnaires to action Ministries of Member States and to Institutes and Faculties which are dealing with Food Science, Technology and Nutrition in the African Universities.

The General Secretariat would be much obliged if the Ministry could kindly complete the enclosed questionnaire and return it to the Secretariat before the 15th June 1973.

The General Secretariat of the Organization of African Unity avails itself of this opportunity to renew to the Ministries of Health and of Agriculture of Member States the assurances of its highest consideration.

Addis Ababa, 22nd March, 1973

Ministry of Health of Member States

" " Agriculture of Member States

cc. Ministry of Foreign Affairs

" of Industry.

(OAU Resolution CM/Les.116 (IX) 1967)

QUESTIONNAIRE

A. Name of the Country ..... Population .....

2. What are the numbers of students admitted to institutions (not Universities) of higher education in :

3. What are the numbers of students graduated from the above institutions in :

4. What are the number of students admitted to Universities in :

5. What are the numbers of students graduated from the Universities in a

1970  
1971  
1972

...

6. What are the numbers of students graduated from the Universities in :

Year	Agriculture	Medicine	Nutrition	Veterinary Medicine	Basic Sciences	Engineering
1970						
1971						
1972						

C. 1. Which governmental Ministry/or Department is responsible for Food Science, Technology and Nutrition in the Country ?

2. Describe how it functions

3.

3. Is there a central policy-making or advisory body for Food Science, Technology and Nutrition ?

YES/NO

If yes, please describe briefly how it functions

D. 1. Is there any existing Food Science, Technology and/or Nutrition Institutes (s) ? YES/NO

If yes, please give their names and addresses.

Food Science	Food Technology	Nutrition	Food Science and Nutrition
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

2. If yes, Please describe briefly their :

a. Structure

b. Function

c. Activities

3. To what Organization are such institute (s) attached ?

a. University

b. Academy

c. Ministry

d. Higher College

e. Firm

f. Non-African Govern-  
ments

g. Others

4. What are the numbers of professional staff in these institutions ?

A. Food Science & Technology	b. Nutrition & Dietetics.
1.	
2.	
3.	
4.	

5. Do you train locally in non-University Institutions any of the personnel employed in Food Sciences, Food Technology and Nutrition.

YES/NO

.../

If yes, please provide information below :

Name of training Institutions	Year established	Courses Provided (description)	Duration of course	No. of Staff	No. of students for 1st year of each course
1.					
2.					
3.					
4.					
5.					

E. Please give details of your regular Food Science, Technology and nutrition services undertaken within your country :

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

F. Please list special equipment that you have or which is on order in these fields :

Present :

- 1.
- 2.
- 3.
- 4.
- 5.

On order :

- 1.
- 2.
- 3.
- 4.
- 5.

- C. Please give details of regular Food Science, Technology and Nutrition Services undertaken for you by outside agencies or countries.

Description	Frequency per year	Country or Agency providing service
1.		
2.		
3.		
4.		
5.		

- H. Please describe briefly below any Food Science, Technology or Nutrition Services that you urgently need to undertake locally ?

1.  
2.  
3.  
4.  
5.

- I. Please give a brief description of special Food Science, Technology or Nutrition projects since 1970 for which you have received or requested external technical aid :

Description	Money requested in US \$	Number of Professional staff required	Country providing aid
1.			
2.			
3.			

- J. Research and Development :

Please list any research and development activities being undertaken.

Description	Number of Professional staff engaged on it	Name of Institutions where being done
1.		
2.		
3.		

K. Manpower Training in Food Science, Technology and Nutrition

Please indicate in the space provided, the approximate number of candidates or students the Government would supply to be trained in Food Science, Technology and nutrition in local and other institutions :

Professional Staff :

	1974	1975	1976	1977	1982
a. Food Scientists & Technologists					
b. Nutritionists & Dietecians :					

L. Please describe briefly any planned future expansion in the services provided and in the research and development in Food Science, Technology and Nutrition including purchase of specialized equipment.

M. Please state the number and type of food industries in the country :

<u>Industry</u>	<u>Number</u>	<u>Type</u>
-----------------	---------------	-------------

1. Canning

a.

b.

c.

d.

2. Freezing

a.

b.

c.

d.

...

<u>Industry</u>	<u>Number</u>	<u>Type</u>
3. <u>Pickling</u>		
a.		
b.		
4. <u>Dehydration</u>		
a.		
b.		
c.		
5. <u>Sugar and allied Industries</u>		
a.		
b.		
c.		
d.		
6. <u>Beverages</u>		
a. Alcoholic		
b. Non-Alcoholic		
7. <u>Edible Oils</u>		
a.		
b.		
c.		
8. <u>Dairy Industries</u>		
a.		
b.		
c.		
9. <u>Flour mills</u>		
a.		
b.		
c.		
d.		

.../.



10. Rice milling

11. Poultry Industry

a.

b.

12. Others (Please specify)

13. Other comments



1979-07

# Report of the Secretary-General on a Project Plan for an OAU Inter-African Centre(S) for Training and Research in Food Science, Technology and Nutrition

Organization of African Unity

African Union

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