Ife J. of Agric. 21 (2005) (33-87)

FOUR DECADES OF CROPS RESEARCH AND TEACHING AT OBAFEMI AWOLOWO UNIVERSITY

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Abstract

The Department of Plant Science became an academic and administrative entity within the University in the 1966/67 Session. Since then, the Department has been putting human and material resources in place for teaching of, and research into, crop production, improvement and protection. During the 40 years under review in this report, the Department produced many undergraduate and graduate students in the different subject-matter areas; including Plant Breeding and Genetics, Agronomy, Agroclimatology and Crop Physiology, Seed Production and Physiology, Entomology, Plant Pathology (Mycology and Bacteriology), Nematology, Virology and Weed Science. The Department made major breakthroughs in research in these areas and developed several high-yielding varieties of cowpea, maize and tomato that were released for cultivation by farmers. In more recent years, the Department has also been strengthening its capacity in research and teaching in the more contemporary areas of Seed Science and Biotechnology.

INTRODUCTION

The Department of Plant Science is one of the five Departments in the Faculty of Agriculture that have been in existence since the Faculty departmentalized in 1966/67 Session. Apparently, the vision of the Founding Fathers of the Department was that production and improvement of crops (arable, permanent and horticultural) and forestry species, along with the cognate disciplines of Entomology, Plant Pathology and Weed Science would be taught and researched in the Department. With the exception of Forestry, all of these subject-matter areas have been well taught and researched by scientists in the Department throughout the 40 years of existence of the University. Forestry has been taught and researched on only as it applies to agriculture; that is, Agro-forestry.

Of the 244 first set of undergraduate students admitted into the University at the take-off site in Ibadan in 1962, 23 were admitted to read Agriculture. The students at that time were being prepared for a comprehensive general B.Sc. (Agric.) Degree and there were no Departments. Thus, all staff of what eventually constituted the Department contributed to the growth and development of the Faculty in those initial years by teaching Plant Science courses, conducting research, providing administrative services and supervising final year students that opted for projects in Plant Science subject-matter areas.

This initial arrangement was in place till the 1977/78 Session, when the Faculty started running programs that led to the award of five undergraduate degrees, including B.Agric. (Plant Science), awarded by the Department. The first set of students on the new program graduated in the 1981/82 Session. The introduction of a Plant Science Degree Program necessitated the Department admitting undergraduate students of its own. Admission of students into the Department, which is primarily through the University Matriculation Examination (UME) conducted by the Joint Admission and Matriculation Board (JAMB), has been on an increasing trend over the years (Fig. 1). For example, students intake increased

from about 20 in the 1987/88 Session to about 60 in the 2001/2002 Session (Fig. 1).

Admission of graduate students into the Department started in the 1968/69 Session with only one student, Mr. (now Professor) B.A. Matanmi who opted for the M.Phil. Degree in Entomology, under the supervision of Professor J.T. Medler. He completed his program in the 1970/71 Session. Since then, graduate students have been admitted into and graduated in all disciplines covered in the Department. The Department awards M.Sc., M.Phil., and Ph.D. Degrees. The first Ph.D. Degree of the Department was conferred in 1981 on Mr. (now Professor) I.O. Obisesan, who specialized in Plant Breeding and Genetics, under the supervision of Professor T. Fatunla (now Olutunla).

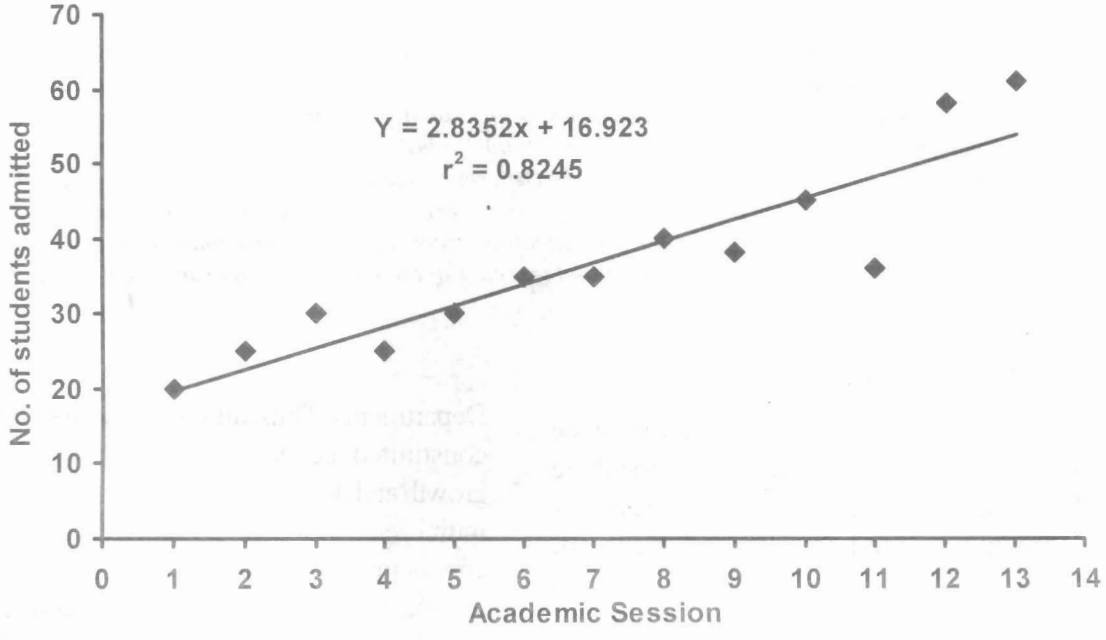

Fig. 1. Trend in admission of students into the Department of Plant Science from 1987/88 Session (coded 0 on the X-axis) to 2001/2002 Session (coded 13)

Objectives

The Department of Plant Science aims at providing academic, research and practical training opportunities to undergraduate and graduate students in all specialized areas of crop production; also to make the students feel confident and competent to enter into the job market after their training. Often after graduation, most of the undergraduate students seek employment in the Public Service, Teaching Service, and in the Industry in varied capacities. The undergraduate program has been designed to:

i. provide opportunity for acquaintance with commonly grown food, industrial, vegetable, and horticultural crops in the southwest zone of Nigeria as well as to impart the basic expertise in the management of these crops for maximum productivity;

ii. impart the technical know-how regarding the control of insect pests, weeds and diseases of economic crops and, at the same time, alert undergraduates of necessary precautions to be taken in crop protection activities to avoid environmental pollution;

iii. expose undergraduates to how these economic crops may be improved genetically for better and higher yields, resistance or tolerance to biotic and abiotic stresses, and be better adapted to unpredictable

environmental conditions;

iv. provide opportunity for students to eventually specialize in any of the core areas of Plant Science: Plant Breeding, Seed Production, Agronomy, Weed Science, Farming Systems, Crop Physiology, Horticulture, Insect Taxonomy, Insect Ecology, Insecticide Toxicology, Biological Control of Insects, Nematology, Virology, Bacteriology and Mycology.

In addition to the main objectives of Postgraduate Studies in the University, the Department of Plant Science aims at providing specialized in-depth academic, research and practical training opportunities for graduate students, which will prepare them to fill teaching, research, and administrative positions in the public and private sectors in Nigeria as well as in the international job market.

We present in the rest of this report the resources and curriculum put in place to meet the objectives of the Department, the research breakthroughs emanating from the Department, and the impact of the research and teaching of the Department on national and international development activities.

Administration

Most decisions affecting staff and students originate from the Departments. For example, courses, examinations and student results are based in the Departments. Recommendations for PG student admissions, staff promotion, entitlements and welfare in general emanate from the Departments. Administration of the Departments, therefore, is a vital component of the growth and development of the Faculty and University.

The administrative staff of the Department of Plant Science is made up of the Head of Department (HOD), who is the Chief Executive, one Secretary, one Senior Typist, one Senior Clerical Officer and a Messenger. Over the years, many individuals have served as HODs (Table 1).

Table 1: Pertinent information about Heads of Department (HOD) and Acting HODs of Plant Science, Obafemi Awolowo University, 1967-2003.

S/N	Name	Qualification	Status on Appointment	Designation	Tenure
1	D.C. Arny	Ph.D.	Professor	HOD	1967-1968
2	J.D. Moore	Ph.D	Professor	HOD	1968-1970
3	J.E. Kuntz	Ph.D.	Professor	HOD	1970-1972
4	E.R. Duncan	Ph.D.	Professor	HOD	1972-1974
5	B.E. Onochie	Ph.D.	Senior Lecturer	Acting HOD	1974-1976
6	A.O. Adenuga	Ph.D.	Professor	HOD	1976-1977
7	I.C. Onwueme	Ph.D.	Senior Lecturer	Acting HOD	1977-1981
8	J.L. Ladipo	Ph.D.	Reader	Acting HOD	1981-1983
9	A.E. Akingbohungbe	Ph. D	Professor	HOD	1983-1986
10	T. Fatunla (now Olutunla)	Ph.D.	Professor	HOD	1986-1989
11	J.O. Amosu	Ph.D.	Reader	Acting HOD	1989-1991
12	B.A. Matanmi	Ph.D.	Reader	Acting HOD	1991-1994
13	C.O. Alofe	Ph.D.	Reader	Acting HOD	1994-1996
14	I.O. Obisesan	Ph.D.	Reader	Acting HOD	1996-1999
15	O.A. Akinyemiju	Ph.D.	Reader	Acting HOD	1999-2000
16	I.O. Obisesan	Ph.D.	Professor	HOD	2000-2003

Normally, the Vice-Chancellor appoints Professors as substantive HODs, but in situations where there are no Professors or where all Professors have served as HODs in the Department, Readers or Senior Lecturers may be appointed as Acting HODs. Substantive HODs are appointed to serve for a 3-year term while Acting HODs serve for one year at a time, although their tenure is renewable for one or more terms of one year each. As from 1981, former students of the University had progressed enough to qualify as Substantive or Acting HODs. The first former student of the University to serve in that capacity was Professor J.L. Ladipo while Professor A.E. Akingbohungbe was the first former student of the Faculty to serve in that capacity. Other former students that have served thus far are Professors B.A. Matanmi, C.O. Alofe and I.O. Obisesan.

All members of the academic staff participate in the administration of the Department. Administrative responsibilities are shared out among all academic staff members by appointing them to serve on Departmental Committees. That way, the staff members are involved in the decision-making process of the Department. Examples of such Committees and their terms of reference are summarized in Table 2.

Each Committee reports to the Department, usually in a Departmental Meeting chaired by the HOD. This approach has effectively made the Department highly democratic. All departmental committees have corresponding Committees at the Faculty level. Two of the Departmental Committees are statutory; that is, Departmental Board of Examiners and Departmental Review Committee. In the Department of Plant Science, all members of the academic staff are members of these two Committees, although Graduate Assistants are excluded from Departmental Board of Examiners.

One important tradition in the Department is that the academic staff members rather than the Departmental Secretary record minutes of meetings in rotation, particularly at Departmental meetings. The members of staff rotate recording of minutes on semester basis. This approach provides hands-on training for the junior colleagues who would ordinarily be inexperienced in recording minutes of meetings. Another advantage of our approach to membership of committees, especially the two statutory ones, is that the junior colleagues have the opportunity to learn the extant regulations, procedures and traditions of the Department, Faculty, and University from the more experienced senior colleagues.

Facilities for research and teaching

Availability of human and material resources has played a vital role in the resounding success achieved so far by the Department of Plant Science. Although highly capital intensive, the University has made every possible effort to put in place the necessary facilities that would enhance the attainment of the objectives of the Department. The facilities will be discussed here under the following subheadings:

- Space for the Department within the Faculty Buildings
- Human Resources
- Laboratories – Central teaching Lab., research Labs
- Green and screen houses
- Libraries – University., Faculty, Departmental
- Insectarium
- The TEEAL
- Media Resources Unit
- The Teaching & Research Farm (TRF)
- Sources of research funds

Space for the Department within the Faculty Buildings

There are three large buildings housing the lecture rooms/halls, classrooms, laboratories and staff offices in the Faculty of Agriculture. In 1968 when the Faculty moved from Ibadan to Ile-Ife, the buildings had too much space for the Faculty and the Faculty was able to accommodate the

Table 2: Committees in the Department of Plant Science and their terms of reference.

S/N	Committee	Terms of Reference
1.	Postgraduate	Screens all applications for PG studies; monitors progress of all PG students.
2.	Examination Coordination	Computes students' grade points, prepares reports on academic standing of students for the Departmental Board of Examiners.
3.	Research Coordination and Review	Reviews all research proposals and reports before onward transmission to the Faculty.
4.	Farm Planning, Management and Production	Takes oversight of all Plant Science activities at the Teaching & Research Farm and makes recommendations for the consideration of the Department.
5.	Academic and Curriculum Planning	Reviews the curriculum of the Department as the need arises. Receives from academic staff members and deliberates on suggested modifications in the academic programs of the Department and makes recommendations to the Department. Handles lecture and examination time-tables, including fixing invigilators for examinations.
6.	Equipment and Infrastructure	Takes stock of research and teaching equipment, as well as items of furniture in the Department from time to time. Ensures the proper functioning of the equipment. Makes recommendations to the Department on servicing, repairs or purchase of equipment and furniture. Proposes space allocation to members of staff and Departmental activities.
7.	Departmental Review	This Committee reviews the performance of every staff member once a year and makes recommendations to the Faculty Review Panel on each staff. The Committee considers all applications for appointment and, in cases where there are many applicants for one position, shortlists the candidates for onward transmission to the Faculty Selection Panel. The Committee initiates all cases of appointment (including permanent positions, part-time positions, associate positions, visiting positions, contract appointments), promotion to all cadres, and determination of appointments and makes appropriate recommendations to the Faculty Review Panel for further processing in the University system.
8.	Internship	Takes charge of the administration of the Internship program at the Departmental level ad reports to the Department. At least one member of this Committee represents the Department in the Faculty Internship Committee.
9.	Junior Staff	Matters related to the conditions of service and welfare of the Junior Staff in the Department are handled by this Committee.
10.	Social	This Committee handles all social activities of the Department as well as those involving staff members of the Department and occasionally, the Faculty. Such activities include Annual End-of Year Get Together of the Department, Send-off for staff members leaving the services of the University (e.g. by retirement), naming, marriage and burial ceremonies, chieftaincy title and other awards, inaugural lectures, etc. The Committee deliberates on the exact role the Department would play and communicates the decision to members of staff of the Department.

Departments of Botany and Zoology conveniently. The Vice Chancellor's (VC) office and all the University Administration offices were also occupying some of the rooms within the Faculty building.

Now, the buildings do not have enough space for the Faculty as it has expanded over the years, despite the fact that the offices of the VC and Central Administration staff, and the Departments of Botany and Zoology have moved to their permanent locations on the Campus, leaving one floor in one of the buildings still housing the Natural History Museum. Although the Faculty buildings have been shared out among the Departments, the space allocated to our Department is not in one place. The Department occupies part of the third floor and most of the fourth floor of the central building of the Faculty plus the middle floor of the Natural History Museum Building. The Departmental office is located on the fourth floor. This arrangement adversely affects the efficiency of activities in the Department, especially because inter-office communication facilities, such as intercom and telephone, are non-existent.

Over the years, the Department also has expanded thus leading to inadequate space for its activities. Apart from the problem of inadequate space, the Faculty buildings have never been renovated for the 40 years of their existence. The water pipes, toilets, and electrical fittings are generally in a sorry state of disrepair and need some major overhauling to save the buildings from total collapse due to flooding during rainstorms and especially from burst water pipes.

The Faculty has three lecture halls (lecture theatres) for the use of all its Departments. Each theatre has a seating capacity of about 100. These were more than adequate in the initial years of the Faculty when the University ran a 4-year program and each class was hardly more than 50 students per set. At that time, each level of undergraduate students in the Faculty had a fixed lecture hall. The situation has since changed; the Faculty now runs a 5-year program and each class averages 200 or more students per set. The Department of Plant Science runs Faculty-wide courses, especially at the 200, 300 and 400 Levels. The number of students taking these courses in recent years has been in excess of 250, thus making it impossible to accommodate the students in the available lecture theatres. Furthermore, academic staff members of the Department of Plant Science teach some University-wide courses, General Studies in particular. The number of students offering such courses is large, at times over 500. Since we do not have the space to accommodate such numbers, the courses are taught in some other locations in the University. Another problem is that other Faculties are allowed to use the three lecture theatres in the Faculty of Agriculture; this frequently clashes with courses of the Department and Faculty thereby creating a competitive use of the facilities. The greatest challenge we are confronted with occurs during examinations. For many years running, examinations for our large classes have been scheduled for lecture theatres far removed from the Department and Faculty. Frequently, some students miss or come late to the examination halls while trying to locate the place.

Human Resources

Academic Staff. The Founding Fathers of Obafemi Awolowo University procured the best available teaching and research equipment for the initial take-off of the Faculty. Also, during the initial years, the Faculty had a USAID-sponsored affiliate relationship with the University of Wisconsin, Madison, Wisconsin, USA tagged USAID-Afr 262 Contract. This arrangement had many aspects that benefited our Department. First, many standard items of teaching and research equipment were imported for the use of the Faculty, some of which were specific to Plant Science. Second, experienced academic staff members were seconded from the University of Wisconsin, USA to the Faculty for about two years at a time after which others replaced them. Third, staff members still in training positions were sent to the USA to complete their Ph.D. programs after which they returned to the Department. Fourth, outstanding students were identified from each graduating class, employed as Assistant Lecturers and sent to the USA for graduate studies under a bond to

serve the University one year for each year of training. Many of the staff and students were sent to the University of Wisconsin while others were sent to some other US Universities identified as centers of excellence in fields relevant to the programs of the different Departments in the Faculty of Agriculture. In the specific case of the Department of Plant Science, one such other University was Iowa State University, Ames, Iowa where the two Plant Breeders trained on this program. Professors T. Olutunla and M.A.B. Fakorede, obtained their Ph.D degrees in 1973 and 1977, respectively. After the termination of the USAID-University of Wisconsin Joint Project in 1976, the University continued to send a few more staff members of the Department of Plant Science for training in the USA and Canada. Staff members, such as Mr. (now Professor) J.I. Olaifa and Mr. (now Dr.) A.S. Adegoroye received their training at Michigan State University, East Lansing, USA and the University of British Colombia, Canada, respectively in Pesticide Toxicology and Horticulture.

The Department did not restrict the recruitment of academic staff to only individuals who graduated from the University or those who were USAID-University of Wisconsin Joint Project Participants. Rather, staff members have been employed on their individual merit regardless of the place of training. For example, Professor L.K. Opeke, a Plant Breeder and one of the foundation staff members of the Faculty and Late Professor A.O. Adenuga, an Entomologist, received their Postgraduate Degrees from Britain. Others in this category were Professor I.C. Onwueme, Agronomist/ Crop Physiologist trained at the University of California, Davis, California, USA; Late Professor J.O. Amosu, Nematologist, trained at the University of Illinois, Urbana-Champaign, Illinois, USA; Dr. J.A. Adedokun, Entomologist, who was trained at Ohio State University, USA; Professor O.A. Akinyemiju, Weed Scientist, who was trained at Michigan State University, East Lansing, Michigan, USA; and more recently, Drs. O.C. Adebooye, Horticulturist and O.K. Adekunle, Nematologist who obtained their Ph.D. Degrees from the University of Ibadan.

With this critical mass of well-trained staff in place, it has been possible for the Department to train its staff as the need arose. In particular, this has been the situation in the last two decades or so when funds for sending staff members in training positions for higher degrees outside the country became impossible because of dwindling financial resources in the University. Rather, our Postgraduate program was strengthened to enable us train the younger colleagues in the Department. Individuals in this category are usually employed as Graduate Assistants and are expected to pursue higher degrees until they attain the Ph.D. Degree within a reasonable timeframe, after which they are regraded to the Lecturer I position. Individuals in this category include Professor I.O. Obisesan who obtained all his degrees from the Department and was employed as a Lecturer after completing his Ph.D.; Dr S.A. Ajayi, now Lecturer I; Mr. S.A.A. Abasi, Lecturer II and Messrs. B.J. Amujoyegbe, M.B. Sosan, O.A. Akinsanmi, J.T. Opabode and O.L. Soyelu, all of whom are academic staff members still at various levels of their higher degree training programs.

Non-academic Staff. There are three categories of non-academic staff members: Administrative Staff, Technical Staff and Farm Staff. Administrative staff are usually recruited by the Registry and deployed to the various Departments, Faculties and other units of the University. They can be re-deployed at anytime, thus making it difficult for the Departments to have control over their movement. Another disadvantage of this is that disruption in the continuity of departmental activities occurs from time to time, especially if a less conversant staff is newly deployed to replace an experienced one. The Department of Plant Science has often been a victim of this situation.

The Department had a Chief Technologist, Mr. S.O. Sagay, who was on the staff for many years. He supervised the preparation for all laboratory classes, ensured that all specimens, chemicals, media, and cultures for the lab classes were available. Next is a Principal Technologist, Mr. B.A.S. Oyenuga who was recruited specifically to provide technical support in the area

of insect taxonomy. He is in charge of the Insectarium. The Assistant Technologist, Mr. W. Osude and the three Laboratory Assistants in the Department work with the Chief Technologist in ensuring the smooth running of the lab classes. In addition, the Laboratory Assistants are assigned to specific Laboratories under the supervision of a relevant academic staff member; that is, Mrs V. Popoola – Plant Pathology Lab, Mrs E.A. Babalola – Physiology Lab and Mrs O. Adeyemi – Entomology Lab.

During the initial years of the University, the Teaching & Research Farm (TRF) had a Farm Manager and an Assistant Farm Manager. As the University continued to grow, it became necessary to divide the TRF into smaller units for effective management. Therefore, about 20 years ago, the Farm was organized along departmental lines and Farm Officers were employed for specific units. Mr. T.I. Oyetade, a former student in the Faculty, was employed as the Farm Officer for the Plant Science Unit at the TRF. He is presently a Senior Farm Manager. He oversees all aspects of field work in the Plant Science Unit and is assisted in this aspect by two Principal Agricultural Superintendents, Messrs. O.O. Tanimojo and R.G. Idowu. These Farm staff members assist the academic staff in all aspects of research work in the field.

In-house training courses were organized for the Farm staff that joined the services of the University with very low qualifications. The University accepts successful completion of the training program as additional qualification for purposes of promotion to higher levels within certain cadres of staff.

Laboratories

Agriculture is an applied science; therefore, it is strongly practical oriented. Many of the undergraduate and graduate courses are more or less laboratory-based. Some of these courses apply to all agriculture students at the relevant level and are, therefore, considered as Faculty courses. For this reason, there are some central teaching and research laboratories in the Faculty one of which is the Plant Science Laboratory. The lab is well laid out with the plumbing, electrical and gas-supply fittings and prep room in place. Provision is made for about 75 places in the lab, which was more than adequate in the initial years of the Department. In recent years, however, the number of students registered for Plant Science courses has escalated, making it imperative for the lab classes to be run in groups. In the last 3-5 years, students registered for the 200 and 300-level Plant Science courses had to be divided into three groups and lab classes had to be done three times per week for each course. Similarly, the laboratory staff, equipment, chemicals and supplies are over stretched, especially at the face of dwindling financial resources. Despite these problems, the Department has tried very hard to keep up the standard of teaching.

There are a number of other laboratories in the Department but these are primarily for research, although they are used for teaching graduate and, occasionally, final year undergraduate students. The specialist laboratories include Crop Physiology lab, Cropping Systems lab, Post-harvest lab, Virology lab, Plant Pathology lab, Nematology lab, Insect Taxonomy lab, Biological Control/Insect Pathology lab, Seed lab, Weed Science lab and Herbarium, and a dirt lab. Space has been earmarked for a Tissue Culture and Genetic Engineering lab but the lab is yet to be equipped.

Greenhouses and Screenhouses

The Greenhouse facility was constructed in 1971 with the objective of providing support for research, teaching and public service activities at the Obafemi Awolowo University. The facility consists of three standard screen/greenhouses constructed of fibreglass. One of the buildings is fitted with facilities to control the ambient environmental conditions to some extent. There are three other buildings; one is used as the administrative/ technical block, the store, and for sample preparation and nursery. The other two are screenhouses. The Greenhouse facility has over the years provided training for undergraduates and graduate students, not only in the Department of Plant Science but also in the Departments of Soil Science, Botany, Microbiology and Ecology. It is particularly invaluable for studies in the fields of plant breeding, plant virology, soil chemistry and

microbiology. The Greenhouses have been particularly useful to the cowpea breeders for controlled crosses any time of the year. The Facility has also been very useful to the Virologist, Professor J.L. Ladipo who has been able to maintain virus cultures therein for many years.

At present, the Greenhouse station cannot adequately provide the services for which it was set up as a result of breakdown of facilities required for efficient functioning. The buildings need renovation, the cables supplying power to the station are damaged and need replacement, the soil sterilization unit needs replacement, and the benches are old and are giving way. They also need replacement.

Library Facilities

The Faculty presently has a library containing over four thousand volumes of books, journals, magazines and grey literature. There are reading spaces for fifty persons at a time. When funding was available, the Faculty had a line budget for operating the Library. In the last 20 years, however, there has been a general constraint University-wide that has made it almost impossible to carry on such expenditures as usual. In the last 3-5 years, the University benefited from a book donation project by the Petroleum Trust Fund (PTF), although this has not been on a sustainable basis. The Department also has a relatively small library facility made up of books, journals, magazines, and grey literature. The materials in the Departmental Library were acquired through donations to the Department rather than by direct purchases and subscriptions. Copies of final year students project reports and postgraduate theses are also available in the Departmental Library. The materials are kept in one section of the Departmental Office and individual staff and students may loan the materials over specified periods of time. The Departmental Library has been particularly useful to students for accessing books that are placed on 1- or 2-hr reserves.

In July 2001, the Vice-Chancellor commissioned The Essential Electronic Agricultural Library (TEEAL) of the Faculty of Agriculture. TEEAL, popularly called the Library in a Box, is a project executed by Albert R. Mann Library of Cornell University and the Rockefeller Foundation in the United States. The project involved writing on compact discs (CDs) full texts of journal articles in agriculture and related disciplines and making them available to individuals and institutions. The basic set included 130 journals written on 256 CDs with the index on a separate CD. The journals in the basic set covered issues from 1993 to 1998. Grants from the Rockefeller Foundation made it possible for the Faculty to purchase the basic set from Cornell University, USA as well as the updates till 2001, a total of 381 CDs.

All of the offices, laboratories, lecture theaters and classrooms in the Faculty of Agriculture have internet connectivity, which has created limitless opportunity for our students to access many libraries, journals, books and other information resources online. In particular, our University has been granted free access to AGORA, an agricultural database consisting of over 400 journals with current and archival issues online. All of these library facilities have greatly facilitated teaching, learning and research in the Faculty, including the Department of Plant Science.

Insectarium

The Insectarium is one of the research and teaching facilities that have been in place since the inception of the Department. Preserved insect specimens of agricultural and medical importance are stored inside eight insect metal cabinets each containing 12 insect drawers with glass top. The specimens form the reference collection for research purposes. The Department has another two cabinets containing the teaching collection, used strictly for teaching undergraduate (such as PSC 202, PSC 303 and PSC 503) and graduate (such as PSC 628 and PSC 629) Entomology courses.

The entries in the Insectarium were collected from various crops and habitats, processed for preservation, carefully stored and properly maintained and protected in special insect boxes, drawers and cabinets. Insect collections of this nature constitute archives of biodiversity, which serve as scientific resources for taxonomic and applied research. Identified insect specimens of

the same species are usually placed together in the same unit tray and several of such unit trays are continuously arranged in a row in the same glass-topped insect drawer. A label bearing the name of the genus / species is affixed inside the unit tray or on the edge of a flat strip of rectangular wooden block on top of the row containing all the specimens of the particular species. Each of the 8 metal cabinets has a nametag or label indicating the Order of insects stored in it. This arrangement allows easy reference to the several thousands of insect specimens stored in the research collection.

The insect specimens in the teaching collection are arranged according to host plants. Other arthropods such as ticks, mites, spiders, centipedes, millipedes, crabs and scorpions are also collected, preserved and stored in the Insectarium.

The specimens are constantly protected from damage by psocids and other museum pests, as well as from mould infection. In order to achieve adequate protection of the specimens, the Insectarium is fitted with an air-conditioner and a dehumidifier, and the specimens are regularly dried in a drying cabinet where naphthalene balls are placed in every insect drawer from time to time to serve as insect repellants.

Media Resources Unit

The Media Resource Center equipped with cameras, photographic equipment and supplies, overhead projectors, slide projectors, reprographic equipment and cartographic facilities was initially housed in the Faculty. Presently, each Department purchases these items of equipment. Presently, only a few of the items are available in the Department of Plant Science. Our aspiration is to have the LCD (Multimedia) Projector.

The Teaching and Research Farm (TRF)

The University Farm started functioning in 1967 at its permanent site in Ile-Ife. It covers approximately 1500 hectares located eight kilometers North of the Faculty of Agriculture buildings. It is made up of the Farm Center and areas for teaching and research activities of the Departments of Agricultural Economics, Agricultural Extension and Rural Sociology, Animal Science, Plant Science and Soil Science. The Farm center comprises the Farm Office, the Feed Depot, the Workshop, Processing Units for the preparation of farm products for sale and storage, Field Laboratories, Carpentry Shop and the Farm Classroom. The Farm Center serves as the effective nerve center of all farm activities. The TRF has its own administrative set up and, presently, the Senior Farm Manager is the Head. Normally each department has its own Farm Manager, Agricultural Superintendent, Farm Supervisor and labor force. The staff capacity of the Farm is about 144; however, only 90 are presently in place. The University makes direct budget allocation to the TRF for its activities.

The farm center coordinates the execution of research of individual scientists, graduate students as well as undergraduate final year projects. Land preparation, planting of the experiments, production of rations for livestock and maintenance (weeding and cleaning the livestock facilities, feeding etc.), litter collection and all other activities related to research are carried out by different categories of farm staff under the supervision of the researchers. There is a close working relation between all the researchers in all the departments and the Farm Center.

The Plant Science facilities include a laboratory and 30 hectares of land for teaching, research and production purposes. There are about 10 hectares for oil palm, 6 hectares of cacao, 10 hectares for arable crops, 2 hectares for citrus, and 0.5-1 hectare each for coconut, cashew and banana/plantain. The Department also has two dams capable of irrigating 10 hectares of land during the dry season. Other facilities for the Department are:

- Field space
- Field Laboratory
- Irrigation Facilities
- Meteorological Station
- The Crop Type Collection (CTC)
- Permanent crops

Field Space. Research efforts have been concentrated on a few arable and horticultural crops; that is, tomatoes (*Lycopesicon lycopersicum (L)* Karst, cowpea [*Vigna*

unguiculata s.sp. *unguiculata* (L.) Walp], maize (*Zea mays* L.). Other arable crops that have been researched to some extent include yam (*Dioscorea* spp.), cassava (*Manihot esculenta* Cranz), soybean [*Glycine max* (L) Merill.] and several horticultural crop species. Adequate field space is available for these crops in the Plant Science area of the TRF. For convenience, the field space has been divided into two areas, designated Old Arable Field and New Arable Field. As the names suggest, the Old Arable Field has been under cultivation for a longer period of time than the New Arable Field. In both cases, deliberate efforts are made to impose soil conservation practices, such as crop rotation, during cropping. However, much of the fields have been under continuous cultivation for many years. Areas that could be regarded as being under fallow have been invaded by Guinea grass (*Panicum maximum* L.). By now, the soil structure and texture have been greatly disturbed and the organic-matter content is very low. The Department plans to open up new land in its section of the TRF in the near future.

Field Laboratory. The field laboratory building, which is about 26 m long and 10 m wide, has the following facilities: offices for senior members of the farm staff, an open space for processing farm produce such as shelling and threshing, an air-conditioned room for short-term storage of seed and perishable farm products such as water melon and tomato fruit; separate stores for pesticides, knapsack sprayers, and other tools and items of equipment.

Irrigation Facilities. The Plant Science Unit of the TRF has two dams for purposes of irrigation. The Old dam, which was constructed since the inception of the Farm, has about 30 ha surface area when full. A second dam, referred to as the New Dam, was constructed in 1974 with a surface area of about 5 ha. The dams are equipped with irrigation pumps, along with pipes and sprinklers to irrigate at least 1 ha at a time.

The Meteorological Station. The Plant Science Unit of the Teaching and Research Farm accommodates the Meteorological Station. This station, which was installed in 1969, had a manual and a self-recording rain guage, a USDA Class A open-pan evaporimeter, wind vane, 3-cup anemometer, Campbell Stokes Sunshine recorder, soil thermometers installed at the soil surface and at 10, 20, 30, 40 and 50 cm soil depth, and a Stephenson's Screen of standard height containing the maximum and minimum mercury thermometers, wet and dry bulb thermometers, and Piche evaporimeter. In 1980, the Department purchased a LI-COR LI-200SB pyranometer sensor connected to a LI-1776 solar monitor programmed to integrate and store electronically solar radiation for a 24-hr period. The sensor had a very low response at 0.4 μm, increasing nearly linearly to a maximum at about 0.95 μm before decreasing to a cutoff near 1.2 μm. Thus, it had a good response in the spectral region particularly favorable to photosynthesis (0.4 to 0.7 μm). The sensor was used for about four years before it was no more serviceable and, unfortunately, the Department has not been able to source funds to replace it.

Weather data have always been recorded daily at 1000 and 1600 h local time at the Station since 1969. The data include rainfall, maximum and minimum ambient temperatures, soil temperature at different soil depths, sunshine hours, solar radiation, maximun and minimum relative humidity, atmospheric pressure, and potential evaporation.

The Crop Type Collection (CTC). The Department maintains year-round Crop Type Collection (CTC) in a nursery at the Old Dam site of the TRF, where the crops can be irrigated during the dry season. The CTC contains as many crop species as can be supported by the environmental conditions of Ile-Ife, which is a typical rainforest location with distinct rainy and dry seasons. Different species and varieties within species of cereal crops, grain legumes, root and tuber crops, fruit and vegetable (horticultural) crops are grown annually in the CTC. Permanent and forage crops are not included in the CTC because they are always growing in the field and life specimens may be obtained from them at anytime.

The CTC serves several research and teaching purposes. First, it provides an opportunity for staff and students to see crop types *in situ*. This is particularly important for a proper understanding of the basic principles of crop science. Second, specimens are obtained from the CTC for teaching the introductory Plant Science courses, which are mostly laboratory oriented. Third, the CTC affords us an opportunity to study the crops in relation to the environmental factors, climatic and biotic factors in particular.

Permanent crops. Permanent crops are very important to the economy of Nigeria. For several decades before the advent of the oil boom, cocoa (*Theobroma cacao* L.) was the mainstay of the national economy and most of the cocoa produce of those years was from the southwest. The oil palm (*Elaeis guineensis*) is another important crop in the economy of the country. The Department has about 2 ha of cacao and 7 ha of oil palm for purposes of teaching, basic research and production research.

The Production Unit. During the first 15 years of its existence, the TRF was used exclusively for teaching and research. This was however contrary to the intention of the founding fathers of the University. The original intention was to have a University system similar in activities and goals to the Land Grant University system operating in the United States of America. In other words, there should be a meeting point of town and gown to boost agricultural production that would lead to food security and improved productivity and livelihood of farmers. In the mid-seventies, therefore, the University incorporated a Commercial Farm under the supervision of the TRF. The Commercial Farm produced crops and livestock for the University community and beyond until it was impossible to continue at the expected tempo for various reasons, particularly financial constraints. However, production oriented research project continued on a relatively smaller scale at the TRF until recent years when the Governing Council of the University specifically approved seed money for resuscitating commercial production on the farm. The production unit of the Department of Plant Science presently operates on a 15-hectare piece of land at the TRF for production of arable crops, including maize, cassava, watermelon, leaf and fruit vegetables, apart from oil palm, cocoa and citrus species, which had been established for a long time.

Sources of research funds

Members of staff of the Department of Plant Science, like their colleagues in other Departments of the Faculty of Agriculture, have obtained research funds from several sources; including the Western Nigeria Marketing Board Endowment Fund to the University, Research grants from the University Research Committee and external donors. The Western Nigeria Marketing Board endowed the Faculty with the sum of 500,000 pounds sterling. Interest that accrued from this fund was used in part as research grants to staff members below the rank of Senior Lecturer.

Curriculum

Over the years, the curriculum of the Faculty of Agriculture has gone through three stages, which are presently referred to as the Old Program, the Course Unit System and the Internship Program.

The Old Program. At the inception of the University, courses were run on sessional basis. The Old Program covered three or four academic sessions, depending on the mode of admission of the students. The 4-year program involved students admitted through what was referred to as concessional entrance examination. The examination was conducted for prospective students that had the results of the West Africa School Certificate Examinations (WASCE) or the Ordinary Level (O-L) results of the London General Certificate in Education (GCE) or their equivalents. To be admitted into the University, the applicants were required to have passed in Division I or II of WASCE, or have at least five passes at credit or better level in the GCE O-L, in addition to a good performance in the concessional entrance examination. Prospective students who, in addition to meeting the O-L requirements had the results of the Higher School

Certificate (HSC) Examination or the GCE Advanced Level (A-L) in two or three relevant subjects were admitted into the 3-year program in Agriculture.

The Old Program consisted of lectures, laboratory practical classes and the farm class, which was held on Saturdays. The Preliminary Year covered mostly the basic science courses – Botany, Zoology, Chemistry (Inorganic and Organic), Physics and Mathematics. Students that had a deficiency in English Language took a remedial course coded English 001. General Studies (GNS) courses were not in existence to start with, but were later introduced and *Use of English* became a standard course for students in the preliminary program. The relevant Departments in the University taught the courses to Agriculture students. In the First Year of the Degree Program, Agriculture students offered advanced Botany, Zoology, Organic and Inorganic Chemistry courses in addition to courses from the Department of Economics (Faculty of Social Science) and some Rural Sociology courses taught in the Department of Extension Education & Rural Sociology (now Department of Agricultural Extension & Rural Sociology) in the Faculty of Agriculture. Core courses in Agriculture were offered as from the Second Year of the degree program. During the second year, only three courses were offered in the Department of Plant Science; that is, PSC 201 – Arable crops, PSC 202 – Entomology and Plant Pathology and PSC 203 – Agricultural Engineering. One or two other courses were offered from each of the Departments of Agricultural Economics, Animal Science and Soil Science. During the Third Year (final year) of the Degree Program, only a few courses were compulsory for all Agriculture students. In the Department of Plant Science, only PSC 301 – Permanent Crops and PSC 302 – Agricultural Statistics and Biometry - were compulsory for all Agriculture students. Students were free to choose optional courses from the Department of their choice. Courses available to students interested in the Department of Plant Science were PSC 303 – Plant Breeding, PSC 304 – Crop Protection (which consisted of Weed Science, Entomology and Plant Pathology), and PSC 306 - Agricultural Mechanization).

One more feature of the Old Program was the final year project. During the long vacation following the end of the Second Year of the Degree Program, Agriculture students chose a Department in which they would like to have their project and work with one of the Lecturers in that Department throughout the long vacation, which usually lasted three months. All Agriculture students were allowed to pay for and remain in the Halls of Residence during this vacation. They were also paid a stipend of 20 pounds sterling per month, which was about the amount paid undergraduates that had vacation jobs in the country at that time. Students that opted for Plant Science consulted the Lecturers in the area of Plant Science that was of interest to them and finally settled with one of the Lecturers as the project supervisor. Execution of the project continued into the Third Year and it was usually examined orally by the staff and moderated by an External Examiner.

Although the number of courses taught under the Old Program was relatively few, they were covered in great details and the final examination, which covered the whole course, was held once at the end of the session, which was normally May/June. Questions for the examinations were normally prepared and sent under strict confidentiality to External Examiners by mid-session at the latest. It was not uncommon for the course instructor/lecturer to have forgotten completely the content of his examination paper by the time the exams actually took place. Examination malpractices were rare at that time. Although students that had reference in one or two courses were permitted to have re-sit examinations in those courses in September, most students took the examinations very seriously because those that scored below certain cutoff marks (bad failure) or were referred in more than two courses would repeat the whole class. Students that had references in the final year would not only repeat the whole class but also could not obtain more than Third Class or Pass grade in the final degree. For these reasons, the sessional examination was nicknamed "the Almighty June" by the students.

Courses taken in the Second and Third Years of the Degree Program were used to compute the class of B.Sc. (Agric.) degree. Letter grades were assigned to marks, and each grade was assigned a grade point as follows:

Mark, %	Letter Grade	Grade Point
70 and above	A	5.0
60-69	B+	4.0
50-59	B	3.0
45-49	C	2.0
40-44	D	1.0
35-39	E	0
34 and below	F	0

Using the Grade Point Average, classes of degree were:

4.5 and above	- First Class Honors
3.5 – 4.4	- Second Class Honors (Upper Division)
2.5 – 3.4	- Second Class Honors (Lower Division)
2.0 – 2.4	- Third Class Honors
1.5 – 1.9	- Pass
Below 1.4	- Fail

The first person to make First Class Honors in Plant Science was Mr. Gbadebo Olaoye, who completed his B.Sc. (Agric.) in 1983. He has since obtained the M.Phil. Degree from the Department, and Ph.D from the University of Minnesota, USA. He specialized in Genetics and Plant Breeding and is presently a Senior Lecturer in the Department of Crop Production, University of Ilorin.

The Course Unit System. The Old Program had many flaws that put students at a disadvantage. First was the "almighty June" examination. Students had to revise course material covering about 9 months while preparing for the examination. Second, there was no uniformity in the way and manner continuous assessment was incorporated into the final course grade. Third, due to increased knowledge, information was accumulating and it became necessary to float new courses that may not necessarily cover a whole session.

Meanwhile, many of the staff and former students that had been sent abroad for higher degrees, especially to the USA, had returned and were on the staff, having been exposed to the Course Unit System in the USA. Proposals were made through the established channel to the University Senate, which finally approved the Course Unit System, beginning from the 1977/78 Session. With this approval, each Department in the Faculty of Agriculture awards its own degree, which for the Department of Plant Science, is B. Agric. (Plant Science). In place of the three terms under the Old Program, the session was structured into two semesters

designated Harmattan and Rain. Approximately, the Harmattan Semester runs from October to February while the Rain Semester covers March to July. Courses were re-organized and odd-numbered courses were assigned to the Harmattan Semester while even-numbered courses were assigned to the Rain Semester. Continuous assessment was formalized; that is, the Faculty of Agriculture allocated 40% of the final course grade to continuous assessment while the remaining 60% was allocated to the final examination. Exams are now conducted at the end of each Semester rather than the "almighty June" of the Old Program. Unlike in the Old Program, courses were assigned credit units that correspond to the number of contact hours per week, and pre-requisites were specified as necessary. The Grading system has been modified slightly; that is, ≥70% = A, 5 points; 60-69% = B, 4 points; 50-59% = C, 3 points; 45-49% =D, 2 points; 40-44% = E, 1 point; and <40% = F, 0 point. Similarly, CGPA for the different classes of the B. Agric. Plant Science Degree has been modified; that is, ≥4.5 = First Class, 3.5-4.49 = Second Class (Upper Division), 2.5-3.49 = Second class (Lower Division), 1.5-2.49 Third Class, 1.0-1.49 = Pass, and <1.0 = Fail.

New courses added to the Plant Science curriculum included the following:

PSC 502 - Crop Physiology - Study of the functioning of plants, its significance in agriculture, and the manipulation of these functions by man to attain maximum crop productivity.

PSC 503 - Applied Entomology - Origin and classification of crop pests. Methods of insect pest control with emphasis on Nigerian Agriculture.

PSC 505 - Introductory Plant Biochemistry – Buffers and pH; the cell and its organelles; enzyme structure; photosynthesis, respiration, nitrogen metabolism, and their biochemical relationships.

PSC 506 - Plant Disease Control - Fundamental and practical aspects of diseases of important crop plants.

PSC 507 – Horticulture - Production, handling, storage and utilization of vegetables and tropical fruit crops. Elementary ornamental horticulture. Diversity of indigenous fruits and vegetables. Effects of horticultural practices on the environment. Post-harvest physiology of fruits and vegetables. Principles of landscaping.

PSC 508 - Seed Production and Certification - Production, processing, certification and distribution of improved seeds. Role of seeds in crop production.

PSC 510 - Principles of Weed Control - Biology and ecology of weeds. Losses due to weeds and principles of weed control practices.

PSC 512 - Plant Breeding Methods - Techniques and principles involved in breeding and maintaining crop varieties; Field-plot technique in crop breeding research.

PSC 514 - Research Methods in Plant Science - Research methodology; principles of field experimentation.

As in the Old Program, specialization into tracks is effected only during the final year. During that year, Plant Science students execute their projects and take all of their optional courses from the Department. Grading of Final Year Project reports has been modified somewhat from that of the Old Program. The students are expected to submit two copies of the draft report to their supervisors, who grades one copy and gives the second copy to a colleague in the same discipline within the Department to grade. Average of the two forms the write-up grade, with 25 marks as the maximum obtainable. In addition, the supervisor awards project execution mark up to a maximum of 15 to the candidate. The remaining 60% are from continuous assessment activities, including three seminar presentations, one of which is based on the student's project.

Initially, some of the processes of the Old Program were carried into the Course Unit System. For example, re-sit exams took place in

the first few years of the Course Unit System, but it was soon realized to be too burdensome and incompatible with the new system. Rather, a new examination-related terminology emerged with the Course Unit System. Terms such as Courses Still Outstanding (CSO), Carry Over, Total Credit Points (TCP), Total Number of Units (TNU), Grade Point Average (GPA), Cumulative Grade Point Average (CGPA), Probation, and Withdrawal among others have all emerged with the Course Unit System.

Adoption of the Course Unit System was accompanied by some problems and it became necessary to educate both staff and students on the new system. Computation of the GPA was done manually at the initial stages of the new regime and this was rather slow, prone to errors and it consumed a lot of time and man-hours. Presentation of the results in a form that would be easy to read by members of the various committees set up to vet exams was a challenge. Hitherto, the largest stencil and paper used in the Department of Plant Science was foolscap size. The Department had to purchase wide carriage typewriters and cyclostyling machines that would easily accommodate A3 stencils and paper. Over the years, the University has gradually solved these problems by developing computer packages that compute the results and print them on A4 paper, which are more readily available.

Staff and especially students had to be educated very well on the importance of the CGPA. Students that have CGPA less than 1.0 in a semester are placed on probation. If the situation does not improve in the next semester, such students are to withdraw from the University. They cannot change to another Department or Faculty in the University.

In the Old Program, students registered for all of the courses stipulated for the level they had attained, but in the Course Unit System, students may register for only what they can cope with effectively, provided such students carry the minimum number of credit units stipulated by the University. Similarly, it is possible for students to carry a heavy credit load provided they do not exceed the maximum number of units stipulated by the University. Thus, students that were admitted into the University at the same time for the same program of study may not graduate at the same time. However, the maximum period a student may stay in the University is 1.5 times the period normally required to complete the program into which the student has been admitted; that is, a maximum of 15 semesters for Agriculture students.

The Internship Program. With the successful introduction of the Course Unit System, the Preliminary Year of the Old Program became the First Year of the Course Unit System, and the courses were given the 100 level codes. Thus, the B. Agric. Degrees covered four years. All of the 100 level courses for Agriculture students are still taught in the Faculty of Science. As a first step toward professionalism, all Agriculture students nation-wide are mandated to spend one full year of internship before earning their degree. This policy was put in place only a few years into the actualization of the Course Unit System at OAU. Up to the time of the new policy, the Farm Class of the Old Program had continued into the new system.

For the internship program, internees were attached to large commercial farms in neighboring states and academic staff members visited the farms once in a while to monitor the students' progress. This arrangement was fraught with many flaws:

i. Commercial farms that met the standard of exposure expected of our students were too few in Nigeria at that time.
ii. Because of their profit orientation, most commercial farms were too specialized to provide balanced exposure of our students to all aspects of agriculture.
iii. Activities in most commercial farms were too routine to challenge the internees who were used to various activities on the Campus.
iv. Since the internees had to work with non-graduates most of the time, they saw themselves as laborers and, therefore, paid little attention to the training.
v. There was the problem of

accommodation of the internees in the commercial farms to which they were assigned. While some of such farms were able to provide relatively decent accommodation for our students, most others could not.

vi. Closely related to that was the lack of interaction with their peers and recreational activities to which they were very much used to on the Campus.

vii. It was too expensive for staff to effectively monitor the progress of the students and the government did not make funds available for this specific purpose.

viii. Similarly, the program was too expensive for the internees in terms of living costs.

ix. Staff of the commercial farms had little or no control over the internees during the intervening period between the visits of the academic staff from the Faculty. For this reason, many students took laws into their hands and did not participate in the activities of the farm much of the time.

x. The exposure was of little benefit to the internees since they could not have independent production project to practise the theory to which they had been exposed in lectures on the Campus.

For these and perhaps other reasons, the Faculty decided to organize the internship year on Campus. To begin with, the Commercial Farm of the University was used for this purpose. Later, a section of the Teaching & Research Farm was set apart on a more permanent basis for this purpose and production facilities such as irrigation, tractorization and inputs were made available specifically for the Internship Program. The Faculty has set up an Internship Committee, with the Faculty Internship Coordinator, who is at least of Senior Lecturer status, as the Chairman. The Committee, which reports to the Faculty Board through its Chairman, is the management board of the Program. Each Department in the Faculty is represented on the Committee. Also, each Department has its own internship Committee. In the case of the Department of Plant Science, the Chairman of the Departmental Internship Committee is usually the Departmental representative on the Faculty Internship Committee.

The Departmental Internship Committee proposes the farm activities students would be engaged in during each Semester of the Internship Year and presents the proposal to the Department for approval. Academic staff members from the Department are assigned internship courses to teach as well as practical and demonstration classes to handle. Courses offered by the Department of Plant Science during the internship year are summarized in Table 3.

Table 3: Code, title and other pertinent information on Plant Science courses in the internship year.

Fourth Year (Part IV) Internship Year (Harmattan Semester)

Course Code	Course Title	L	T	P	Units	Examination
PSC 401	Processing and Storage of Plant Produce	0	0	3	1	1-hr paper
PSC 403	Management of Arable Crops	0	0	3	1	1-hr paper
PSC 405	Green House Operations	0	0	3	1	1-hr paper
PSC 407	Field-Plot Techniques	2	0	3	3	3-hr paper
				Total	**= 6**	

Fourth Year (Part IV) Internship Year (Rain Semester)

Course Code	Course Title	L	T	P	Units	Examination
PSC 402	Management of Tree Crops	0	0	3	1	1-hr paper
PSC 404	Crop Propagation	0	0	6	2	2-hr paper
CPP 406	Nursery Practices and Vegetable Production	0	0	3	1	1-hr paper
PSC 408	Report Writing in Crop Science	0	0	3	1	1-hr paper
AGR 400	Farm Practices	0	0	9	3	3-hr paper
				Total	**= 8**	

Total Units for the Internship Year = 43; Total from Plant Science = 14

Out of a total of 43 course units earmarked for the internship year (21 in the Harmattan Semester and 22 in the Rain Semester), courses from the Department of Plant Science carry 14 units (6 and 8 units in the Harmattan and Rain Semester, respectively).

Certain rules and regulations guide the interns. Students having outstanding 100-level courses may not register for the Internship Program. Internees may not register for courses other than those stipulated for the Internship Year. Successful completion of internship is pre-requisite to all Part V (final year) courses. Students admitted into the Faculty with the National Diploma (ND) or Higher National Diploma (HND) in Agriculture may be exempted from internship. All internees must have their individual crop production plots, which they manage from land preparation till harvesting. Academic staff members in the Department monitor and grade the individual plots from time to time. The academic calendar of the Internship Year is slightly different from that of the other arms of the University. This is necessary in order to ensure that the different farm activities to be undertaken by the internees synchronize with the appropriate weather conditions.

Current Status of the Undergraduate Curriculum

Given the increasing trend toward specialization and professionalism in agricultural circles, the name Plant Science has lost its meaning and outlived its usefulness. The Department of Plant Science as presently constituted does not teach or research all plants. Rather what is covered by our mandate is the study of crops and, to a limited extent, forestry species. Therefore, the present name of our Department does not reflect our mandate and is far from catchy.

Over time, candidates that end up as students in the Department, in most cases, did not make the Department their choice and this has often been of concern to the academic staff of the Department. The students were all raked from cognate Faculties and Departments in this and

other Universities where, as JAMB candidates, they could not meet the cut-off points in their choice Departments. The students often ask, "What is the difference between Botany and Plant Science?" "What are the prospects of a bright future of a B. Agriculture (Plant Science) graduate?" "Can't the Department effect a change of name?"

In an effort to impress these questions on the powers that be in the Faculty, the students through the National Association of Agricultural Students (NAAS) wrote a letter to the Dean of Agriculture, copying all Heads of Departments that they would be happy if our Faculty could effect a change of name of Departments in the Faculty to reflect the realities of what we teach and research. In the letter, the students argued that Botany deals with generalized study of plants forms and functions while Plant Science deals with study of crop production and protection. They argued that our Department deals with the crops in particular and not plants in general.

Another argument put forward by our former students who are now in the labor market is that employers at different interviews ask them to distinguish between Plant Science and Botany. Except to an agriculturist, particularly Ife graduates, Plant Science is taken to be synonymous with Botany.

> These facts justify the need to effect a change in the name of the Department to reflect what the layman will appreciate and understand. This is also in consonance with the current trends in the country in particular and the world in general. The Department has therefore been considering proposals for a new name.

The Department considered the numerous fields of specialization in crop science and thought that the present trend of developments in research in the different disciplines should be considered while designing courses for undergraduate programs. The Department further considered the fact that introduction of new courses should be done with restriction because the undergraduate program is covered by all the Departments in the Faculty and courses are distributed equitably among the Departments. Notwithstanding this limitation, the Department carefully considered new developments in science vis-à-vis the available opportunity for introduction of new courses into the undergraduate programs. In arriving at the decision for a new name and new courses, the need for graduates to be self reliant after graduation in the face of limited employment opportunities in Nigeria has prompted the Department to think of a course that can generate employment for graduates of our B. Agric. program. In the light of the above, the Department felt strongly that bee keeping is a lucrative business that is now being promoted internationally because it can be started with a low initial capital outlay. The Department therefore proposed that a course on Apiculture be introduced as a restricted elective for Part V students across the Faculty programs.

Postgraduate Programs

As noted by Badu-Apraku *et al.* (2004), sustained and well-focused research normally leads to the discovery of new technologies, improved research methodology and accumulation of information. Researchers are always improving existing methodologies for efficacious results. New and more effective and efficient methodologies and technologies, such as information technology and biotechnology are continuously being developed that can render Bachelor's Degree holders out of date within a few years after graduation. Additionally, a Bachelor's Degree, in most instances, is often inadequate to cope effectively with the responsibilities involved in research and teaching at the tertiary education level. Therefore, Bachelor's Degree holders, particularly those who desire research and teaching jobs, need to be exposed to additional in-depth training and education in areas of interest to them. Indeed, post-graduate students occupy a vital position

in the growth and development of a strong academic department in any university.

With these and perhaps other reasons in view, the Department of Plant Science started Postgraduate (PG) Programs during the 1968/69 Session with only one student who opted for Entomology. Since then, the Programs have continued to increase in number, expand in scope and improve in quality. Over the years, a large number of students have successfully completed M.Sc., M.Phil, and Ph.D. Plant Science programs in the different areas of specialization offered in the Department (see Table 4).

Table 4: Disciplines, areas of specialization and number of available courses for M.Sc., M.Phil, or Ph.D. degrees in Plant Science or Seed Science offered in the Department of Plant Science, Obafemi Awolowo University, Ile-Ife.

	Discipline	Areas of Specialization	No. of courses available	
			Harmattan	Rain
(a)	Crop Production	Farming Systems, Agronomy, Agro-climatology, Crop Physiology, Plant Nutrition, Horticulture, and Weed Science.	9	11
(b)	Entomology	Insect Taxonomy, Insect Ecology, Insect Pathology, Toxicology, and Control of Insect Pests.	8	9
(c)	Plant Breeding	Conservation of Plant Genetic Resources, Crop Improvement through Genetics and Breeding.	6	5
(d)	Plant Pathology	Applied Mycology, Virology, Nematology, and Phytobacteriology	8	6
(e)	Seed Science	Seed Production, Seed Technology, Seed Health, Seed Analysis and Certification	8	6

Admission Requirements. To be eligible for the M.Sc. Plant Science or Seed Science, the candidate must possess a Bachelor degree not lower than Second Class (Lower Division) in Agriculture or related discipline from an approved University. The Department requires Second Class (Upper Division) from candidates desirous of admission into the M.Phil. An applicant for the Ph.D. Program must possess M.Phil. or M.Sc., with a minimum average of 60% (B+) in the course work.

Execution of PG Programs. The Departmental PG Committee screens completed application forms received from applicants, supervisors are assigned to the successful ones and recommendation for admission is made to the PG College through the Faculty PG Committee. The PG College issues the letter of admission to the applicant. On resumption, the student interacts with his/her supervisor, who suggests the courses the student will take. Coursework is an important component of the PG programs in the Department of Plant Science. M.Sc. and M.Phil. candidates are required to complete at least 24 units of course work, including PSC 613 – *Statistical Methods* (4 units), PSC 614 – *Design and Analysis of Experiments* (3 units) and no more than 2 units of Seminar in addition to the research project. At least 15 units must be taken from courses listed under the student's area of specialization in the PG College Handbook. Ph.D. candidates are required to complete at least 36 course units, including PSC 613, PSC 614 and no more than 3 units of seminar. At least 24 of these units must be from courses in the candidate's area of specialization.

Sometime within the first semester on the program, the student is expected to present a propositional seminar to the Department on his research project. Before presenting the seminar, however, the supervisory committee of the student should have been constituted and the members should have gone through the project proposal. The student's supervisor usually heads the supervisory committee, which normally has a membership of three persons for M.Sc. and M.Phil., or five for Ph.D. At least one member of the supervisory committee is from a cognate Department in the University. The primary duty of the supervisory committee is to assist in planning the student's course work and research, and also to review the student's progress from time to time. To be in good standing in the Department, PG students must have an average of 60% (B+) in the course work. M.Sc. and M.Phil. students that score less may not be allowed to proceed to the Ph.D. program.

In principle, the M.Sc. and M.Phil. Programs are for a minimum duration of two and four Semesters, respectively. In practice, however, it takes longer to complete the programs, especially the M.Sc. programs that involve field work for the thesis project. Masters students that have completed their courses and submitted satisfactory thesis are required to take a final oral examination. Ph.D. students are required to pass a qualifying examination before submitting their thesis for the final oral examination. In the Department of Plant Science, the qualifying examination is in two parts: written and oral. For the written examination, two papers of at least four hours each are set for the candidates. The candidate's supervisor, one or two other members of staff from within the Department, and a member of staff from a relevant area within the University submit questions on the examinations. The Head of Department, who serves as the Chief Examiner conducts the examinations. After satisfactorily passing the written examinations, the candidate may take the oral qualifying examination on a date to be approved by the PG College. Thereafter, the candidate completes the Ph.D. thesis and submits himself for the oral defense, as slated by the Department after due consultation with the External Examiner.

Research

The Department has conducted intensive and extensive research in all areas of crop production. Tomato (*Lycopersicon lycopersicum* L), cowpea [*Vigna unguiculata* (L) Walp] and maize (*Zea mays* L.) have received the greatest

research attention. Other crops that have been researched include yam (*Dioscorea* sp), cassava (*Manihot esculenta* Cranz), winged beans (*Phosocarpus tetragonolobus* L.), bambarra nut, (*Arachis subterranean* L.), soybean (*Glycine max* Merill.), and horticultural crops such as *Amaranthus* sp and *Celosia* sp. Research has also been conducted to a limited extent on permanent crops such as cacao (*Theobroma cacao*), babanas (*Musa sapientum* L.), oil palm (*Elaeis guuinensis* Jacq) and *Citrus* spp. In some cases, research has been conducted in areas that cut across crop species, such as farming systems, agroforestry and production research. A special case of farming systems research was a crop rotation experiment conducted for many years, first by Dr. B.E. Onochie, an Agronomist, and later by the Late Professor J.O. Amosu, a Nematologist. Also in the case of production research, the Department was particularly interested in the profitability of crop production practices recommended to farmers on the basis of research findings.

The academic staff members constituted themselves into groups and developed long-term research programs that attracted funds from the University Research Committee (URC) or outside the University. The research programs are:

(i) Cowpea Research Program
(ii) Maize Research Program
(iii) Vegetable Research Program

There were also some other smaller research projects lasting for a few years, depending on the nature of the project and the source of funding. For example, the Western Nigeria Marketing Board Endowment Funds and the International Funds for Science (IFS) provided short-term support for the Winged Bean Research Project. Team members on each of the Research Programs consisted of Breeders, Pathologists, Entomologist, and Agronomist. This approach has made it possible for the Department to have a focus and minimize duplication of efforts.

In the following sections are summaries of some of the research breakthroughs of the Department. In order to put the findings in a generalized perspective, the presentation is made on subject-matter rather than individual crop basis.

Weather at the Teaching & Research Farm

Rainfall and, to a lesser extent, temperature are the most important climatic factors determining the crop to grow and the timing of agronomic practices in the ecologies of Nigeria. The Department of Plant Science has kept historical records of climatic factors at the Meteorological Station of the Teaching and Research Farm (TRF) of the University for about 35 years. Rainfall data were obtained with a manual rain gauge. Temperature and potential evaporation data were obtained from mercury thermometers and a shielded Piche evaporimeter, respectively. The thermometers and evaporimeter were kept in a Stevenson's screen of standard height. Weather records were taken twice daily at 1000 and 1600 hrs local time; that is, 1 hr ahead of GMT. Duncan (1974) summarized the data for the first five years. Fakorede and Akinyemiju (2003) analyzed the data from 1975 to 2000 to determine the trends in climatic variables and obtain evidence for climatic change at Ile-Ife, if any. Similarly, Fakorede *et al.* (2004) analyzed the rainfall data for the 1975-2000 period to determine drought probability during the cropping season at the TRF.

Monthly rainfall showed bimodal distribution with peaks in July and September and reduced amounts in August (Fig. 2). Total annual rainfall varied from 740 mm in 1983 to 2040 mm in 1985 with peaks (maxima) occurring at fairly regular intervals of 5-6 years (Fig. 3). Mean annual rainfall for the period under study was 1263.2 mm. Rainfall for March, April and May showed decreasing trends, particularly from 1980 to 2000 with a linear regression coefficient (b-value) of –22.1 mm; that is, total rainfall for the three months decreased at the rate of 22 mm per year (Fig. 4). These results show clearly that the TRF has four dry months in the year; that is, November to February.

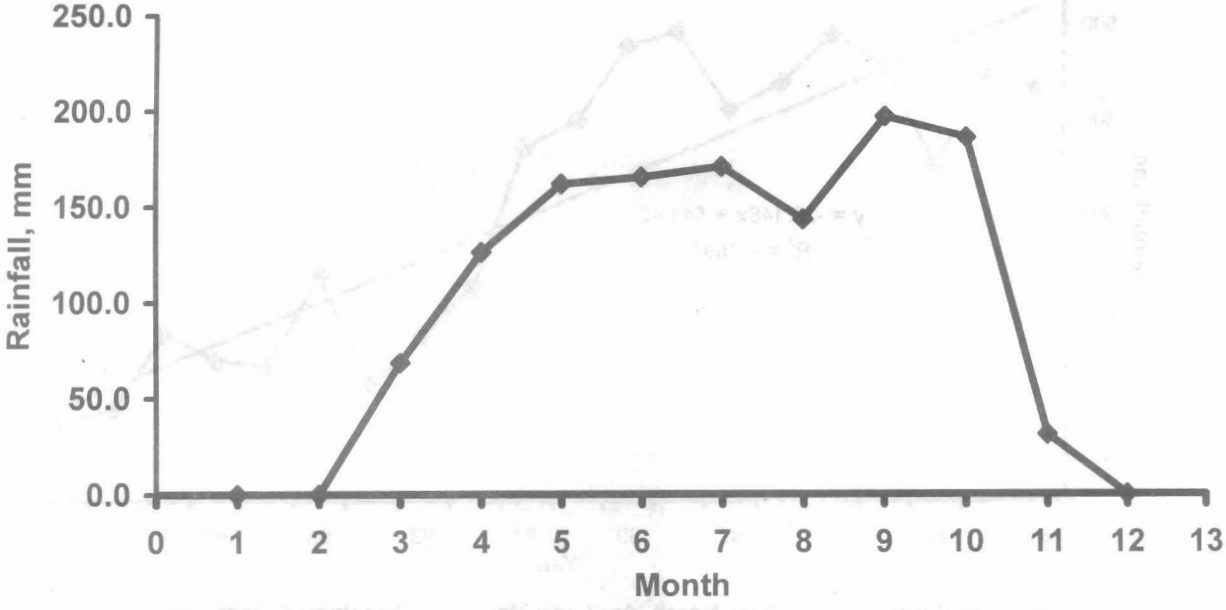

Fig.2: Mean monthly rainfall at the TRF of Obafemi Awolowo University, Ile-Ife, 1975-2000 (month 1= January).

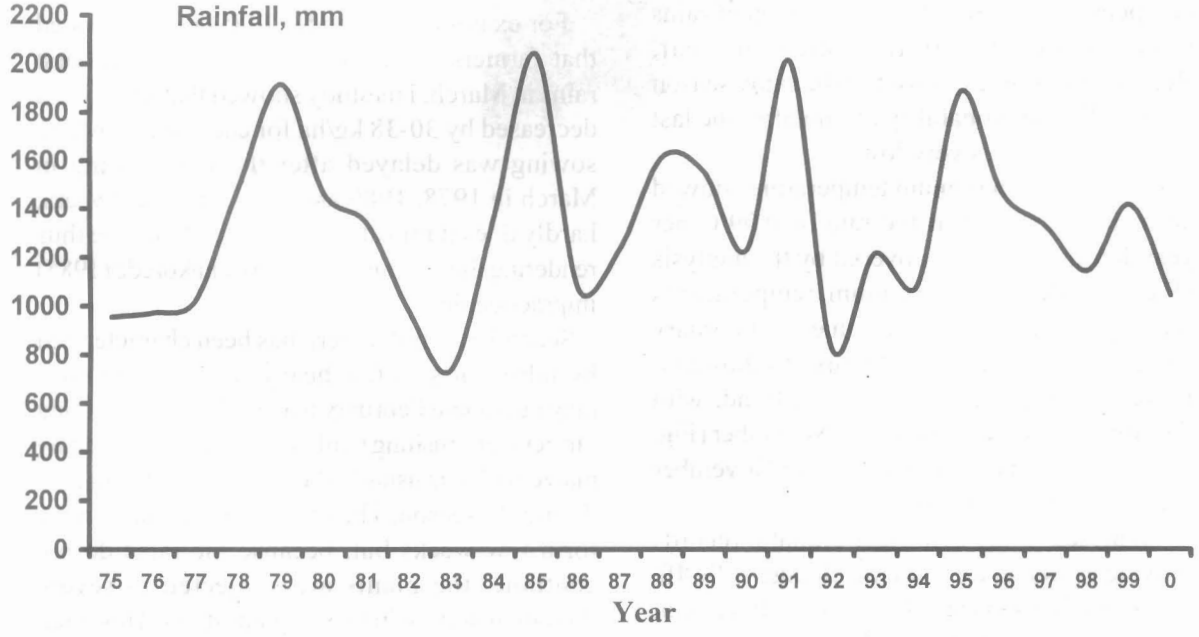

Fig. 3. Total annual rainfall (mm) at the Teaching & Research Farm of Obafemi Awolowo University, Ile-Ife, Nigeria, 1975-2000 (from *Fakorede and Akinyemiju, 2003*).

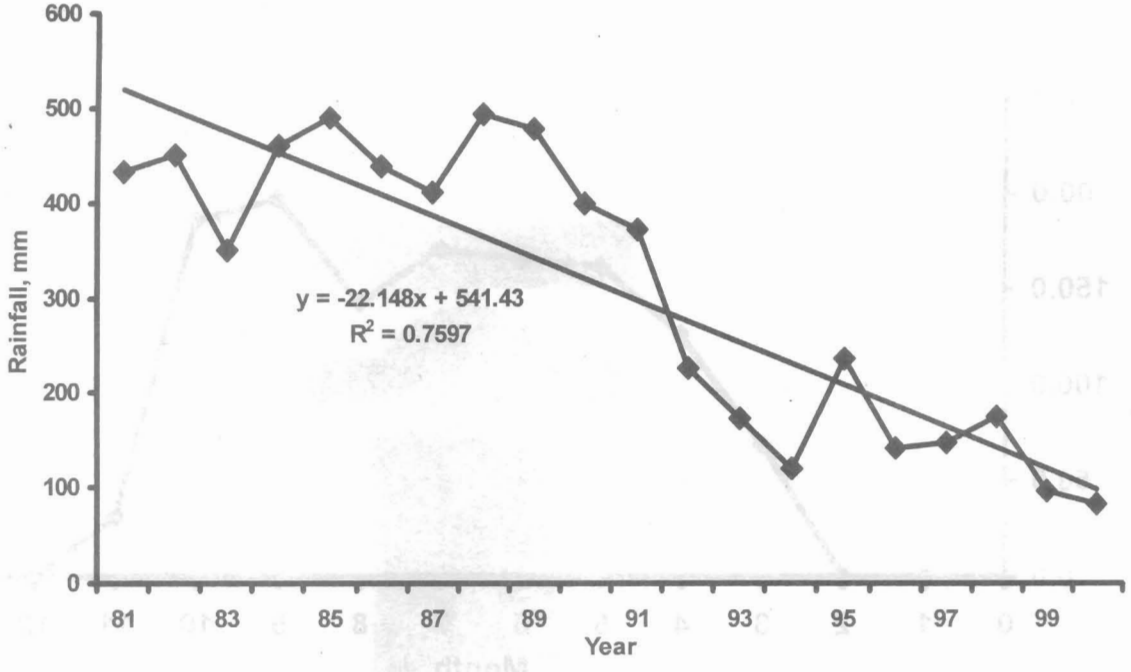

Fig. 4. Total annual rainfall for March, April and May at the Teaching & Research Farm of Obafemi Awolowo University, Ile-Ife, Nigeria, 1980-2000 (From *Fakorede et al*. 2004).

The data failed to support the popular belief that delayed onset of the rainy season would be compensated for by delayed recession of rains towards the end of the calendar year. Regardless of time of onset of the rainy season at the TRF, the probability of rain after the last week in October is very low.

Mean annual maximum temperature showed an increasing trend at the rate of 0.09°C per year during the period covered by the analysis (Fig. 5). Monthly maximum temperatures remained more or less the same for February to July each year. For August to January, however, there was an increasing trend, with the largest increase occurring in November (Fig. 6). Average temperature increase for November was 0.13°C per annum (Fig.6).

Analyses of the historical climatic records provide evidence for climatic change at Ile-Ife during the last 40 years. The changes have been manifested in several ways. First is the delay in the onset of the rainy season without a corresponding delay in the recession of the rains. During the 1980s and earlier, researchers as well as farmers were able to plant their crops as early as the first week in March.

For example, Fakorede (1985) recommended that farmers should plant maize after the first rains in March. His study showed that grain yield decreased by 30-38 kg/ha for each day by which sowing was delayed after the first sowing in March in 1978, 1980 and 1981. In recent years, hardly does it rain at all in March at this site thus rendering the recommendation of Fakorede (1985) impracticable.

Second, rainfall pattern has been characterized by false starts. A few heavy, soil-soaking rains may fall in late February to early March deceiving farmers into rushing to plant their crops, especially maize which is usually the first crop to be planted during the season. The plants emerge and survive for a few weeks but, because the rains do not continue, the plants are subjected to severe drought resulting in loss of plant stand. This often results in crop failure and it is very common for farmers to replant two or three times during such years.

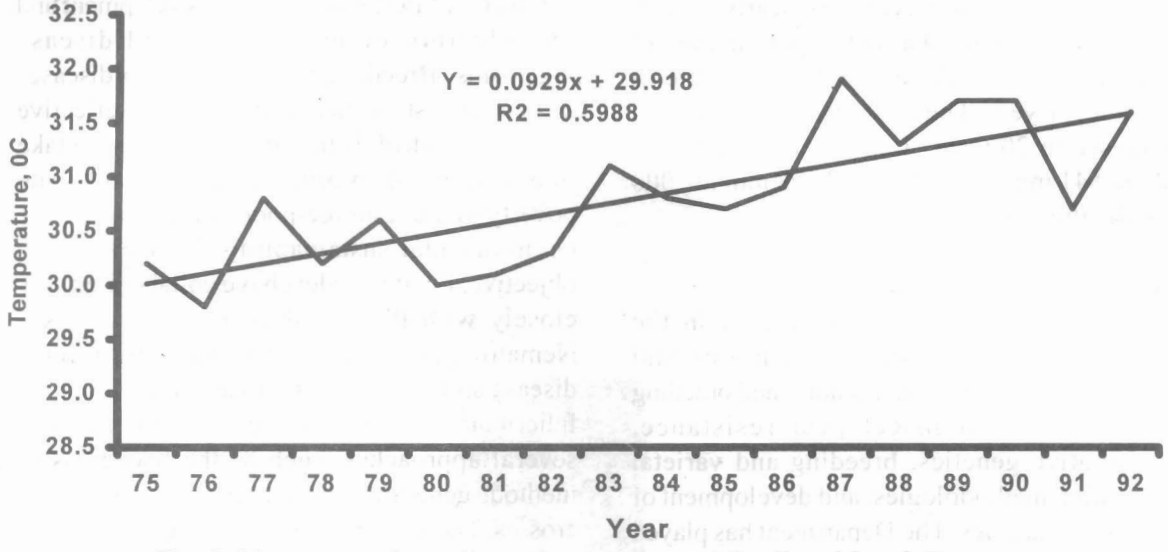

Fig. 5. Mean annual maximum temperature at the Teaching & Research Farm of Obafemi Awolowo University, Ile-Ife, Nigeria, 1975-1992 (From *Fakorede and Akinyemiju, 2003*)

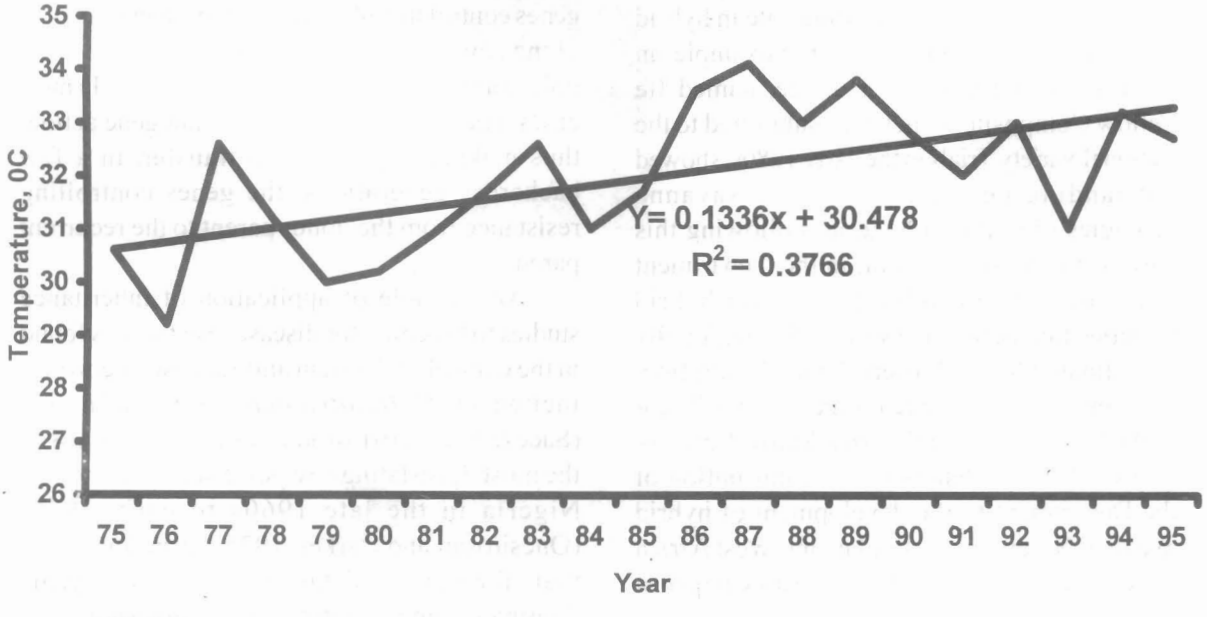

Fig. 6. Mean annual maximum temperature for November at the Teaching & Research Farm of Obafemi Awolowo University, Ile-Ife, Nigeria, 1975-1992 (From *Fakorede and Akinyemiju, 2003*)

The third manifestation of the climate change is reduced total rainfall for March, April and May. This downward trend was clearly evident from 1980 to 2000. During this period, rainfall decreased for the three months at the rate of 22 mm per year. Thus, as given by regression analysis, in 20 years, rainfall decreased from about 541 mm in 1980 to about 98 mm in 2000 for the three months.

Genetics and Breeding

Most of the research conducted in the Department in the area of Genetics and Breeding cover inheritance studies and breeding for disease and insect pest resistance, quantitative genetics, breeding and varietal evaluation methodologies, and development of improved varieties. The Department has played prominent roles and made immense contributions to the improvement of tomato, cowpea and maize production in Nigeria. For example, the Ife 1and Ife Plum tomato varieties are very much popular in the southwest of the country. Ife Brown cowpea is very well known, not only in Nigeria but also throughout West Africa. The Maize Improvement Program in the Department played a leading role in hybrid maize development in Nigeria. For example, an open-pollinated variety of maize, named Ife Yellow Composite, which was submitted to the National Variety Trials in the early 1980s, showed outstanding performance in the savanna ecologies of northern Nigeria. Following this variety, the Maize Program in the Department developed several inbred lines and hybrid varieties that performed well in the Nationally Coordinated Maize Variety Trials. In addition, the Department has been a major contributor to the West and Central Africa Maize Network (WECAMAN). Details of the contribution of the Department to the development of hybrid maize in Nigeria in particular, and West Africa in general, are contained in a separate paper in this volume.

Inheritance studies and breeding for disease and insect pest resistance. Diseases and pests are major biotic constraints to crop production in Nigeria, especially in the rainforest agro-ecology of the southwest. In this ecology, the weather conditions are particularly favorable to infection/infestation, growth, development and reproduction of insect pests and disease organisms. Breeding for resistance to diseases and insect pests, which is the most cost-effective means of control, is the first logical step to take in a strategy to improve crop yield, alleviate poverty of the resource-poor farmers and ensure environmental sustainability. To achieve this objective, Plant Breeders have collaborated very closely with Plant Pathologists, Virologists, Nematologists and Entomologists to develop disease and insect resistant varieties.

Inheritance studies have been conducted using several approaches, such as the backcrossing method, generation means analysis and diallel crosses. These methods have been applied to both self- and cross-pollinating species and the information generated from the studies have been very useful in breeding improved varieties of tomatoes, cowpea and maize in the Department of Plant Science. Studies on the inheritance of resistance to cowpea diseases and pests have received greater attention than other crops. The studies have identified that only a few pairs of genes control the inheritance of resistance to most of the cowpea diseases, although there are other traits controlled by multigenic inheritance. In most cases, resistance is under dominant gene action, thus making it possible to transfer, in a few backcross generations, the genes controlling resistance from the donor parent to the recurrent parent.

An example of application of inheritance studies to breeding for disease resistance is found in the control of the stem anthracnose of cowpea, incited by *Colletotrichum lindemuthianum* (Sacc & Magn) Briosi and Cav., which was easily the most devastating cowpea disease in southern Nigeria in the late 1960s to early 1970s (Onesirosan and Barker, 1971). Breeders found that, for most resistant sources, monogenic dominant genes controlled the inheritance of resistance to this disease. This information was used to develop cowpea lines that are resistant to the disease. Within a short time, the disease was put under check and is presently not a threat to cowpea production in Nigeria.

Inheritance of, and screening for resistance to several other diseases of cowpea, such as target leaf spot, *Corynespora* leaf spot, web blight, *Rhizoctonia* stem rot, brown blotch and virus diseases have been studied and well documented by researchers in the Department (Onesirosan *et al*., 1974; Oyekan *et al*., 1976; Onesirosan, 1977; Fatunla and Ladipo, 1980; 1982; Arowolo and Obisesan, 1986; Obisesan *et al*., 1988). Studies of inheritance of resistance to tomato diseases conducted in the Department include target leaf spot (Bliss *et al*., 1973) and root-knot nematodes (Fatunla and Amosu, 1977; Fatunla and Salu, 1977).

Inheritance of resistance to the cowpea seed beetle has also been studied (Fatunla and Badaru, 1983). In particular, the Entomologists have identified the insect developmental stage and the cowpea growth phase for screening for insect resistance. They have screened large numbers of cowpea lines and varieties for resistance to several insect pests, including the black cowpea moth, *Cydia ptychora* (Meyrick [Lepidoptera: Tortricidae], the flower and pod borer, *Maruca testulalis* (Geyer) [Lepidoptera: Pyralidae] (Ofuya and Akingbohungbe, 1986; 1987; 1988; Echendu and Akingbohungbe, 1989; 1990a, b). Sources of resistance have been identified and utilized in breeding programs. For example, H144-1 and H64-3 showed high level of tolerance to thrips while H113-1 and II-V-5-6 showed low tolerance.

Quantitative genetics. Inheritance studies provide information on the mode of gene action controlling genetic traits in plants but provide no information on the proportion of the genes in parents that are transmissible to offspring. Quantitative genetic studies partition the observable (phenotypic) variability among individuals into the different components, including the variances attributable to genetic, genotype-by-environment and environment sources of variation. These parameters are quantifiable and their estimated values may be substituted into mathematical formulae to obtain heritability, which is the proportion of phenotypic variance that is due to genetic causes. The higher the estimates of heritability, the closer the offspring will resemble the parents from which they were derived. Indeed, the performance of the offspring may even surpass that of the parents. High heritability estimates also indicate that the breeder will likely make high gains from selection within the population for which the heritability estimates were obtained.

Plant Breeders in the Department of Plant Science have conducted many quantitative genetic studies, especially in cowpea and maize (Fakorede and Obilana, 1979; Obilana and Fakorede, 1981; Fakorede and Ojo, 1981; Ogunbodede and Fatunla, 1981; 1982; Adeyemo, 1986; Ajala and Fakorede, 1987a; Opeke and Fakorede, 1986; Emebiri and Obisesan, 1988a,b; 1991). The salient points from the studies may be summarized as follows:

(i) Large genetic variances, especially additive genetic variance, exist for most agronomic traits in the available cowpea and maize germplasm in Nigeria.

(ii) Heritability estimates are greatly influenced by the germplasm and the progeny type from which they are derived.

(iii) Heritability is usually low under stress conditions (such as drought, low soil fertility, and high plant density) but increases as optimum growing conditions become available.

(iv) Vegetative and flowering traits tend to be more highly heritable than yield and yield components.

These conclusions are consistent with those reached for many crop species in other parts of the world.

Breeding and varietal evaluation methodologies. Although the principles of plant breeding methods are applicable to both self- and cross-pollinating species, the approach may differ in certain respects when applied to the two types of crops. Two breeding methods that appear to be about the same regardless of the crop to which they are applied are pedigree (PD) selection and the single-seed descent (SSD)

methods of developing pure (inbred) lines. Obisesan (1992) compared the two methods for cultivar development in three cowpea crosses and made the following observations:

(i) Genetic variance tended to be larger for SSD than PD.

(ii) There was no consistent relationship between the magnitude of genetic variability and percentage of superior lines.

(iii) Both procedures were effective in producing superior lines for yield and number of pods.

(iv) PD was more effective in producing superior transgressive segregants.

(v) SSD allowed a more rapid completion of breeding cycles.

(vi) Lines developed through both procedures differed more in their population means than in the performance of the highest yielding lines.

In some other studies, Obisesan (1987) found that visual selection during the process of inbreeding was ineffective for identifying high-yielding lines in cowpea. These conclusions are generally similar to those reached when the breeding methods were applied to tomatoes (Fatunla, 1977) and maize. One difference between the two types of crops (i.e, selfers and crossers), however, is that in maize, the SSD method permits the handling of a potentially larger zygotic sample because of the larger number of lines the breeder can handle during each successive generation of inbreeding. This is particularly important in minimizing genetic drift, which usually occurs easily in crossers. The disadvantage of the SSD method is that selection during the inbreeding process is minimized or totally eliminated. To minimize the adverse effect of this disadvantage, the maize breeders in our Department evaluate the lines per se and in hybrid combinations after the desired generation of inbreeding has been attained. The need to use this approach has been reinforced by the poor correlation coefficients between yield performance of early generation inbred lines and their counterparts in later generations (Ajala and Fakorede, 1988b).

Development of improved varieties. Breeders, in collaboration with pathologists, entomologists, virologists and nematologists in the Department as well as at the Institute of Agricultural Research and Training (IAR&T), Moor Plantation, Ibadan, have successfully developed several varieties of tomato, cowpea and maize. The popular Ife No. 1 and Ife Plum tomato, Ife Brown cowpea and Ife Yellow Composite maize are a few examples of crop varieties developed and released from the Department. Researchers in the Department have developed several other varieties that were submitted into the national variety evaluation system and some of the varieties have been widely adopted by farmers nationwide. The Department has made major contributions to the development of maize inbred lines and hybrid varieties in Nigeria and this has been reported in some greater detail elsewhere in this volume.

Entomology

A lot of work has been done on cowpea insect pest management. The biology of the beetle, *Ootheca mutabilis* (Sahlberg) was studied (Akingbohungbe, 1978); and as a follow-up, artificial defoliation of cowpea was carried out to simulate damage by the flea beetle (Akingbohungbe, 1980). These studies showed that cowpea can compensate for damage due to the flea beetle defoliation and led to a recommendation for the discontinuation of the insecticide sprays that was till then applied in the vegetative phase of cowpea in Nigeria.

The identity of the pod-sucking bugs, *Riptortus* spp. associated with cowpea was clarified. Observations on their biology were reported together with information on how their population varied over the seasons, along with

another allied species of pod-sucking bug, *Mirperus jaculus* (Thunberg). This study showed that *Riptortus* spp. are predominantly early season (April-July) pests, while *M. jaculus* is predominantly late season (August-December) pest on cowpea (Akingbohungbe, 1979). Further studies on seasonal pattern of insect pest development on cowpea were also carried out, relating the pattern to reproductive performance and yield of the crop (Akingbohungbe, 1982). These studies revealed that incidence of pest attack is generally much lower on mid-season cowpea (June–August/ September) than in the early season (April–June/ July) and the late season (September–December), with the heaviest pest pressure on the late season crop. However, the high incidence of overcast skies on the mid-season crop militates against optimal seed yield. The studies further showed that *Megalurothrips sjostedti* (Trybom), *Maruca vitrata* (Fabricius) and the coreid pod-sucking bugs, *Anoplocnemis curvipes* Fabricius, *M. jaculus* and *Clavigralla tomentosicollis* Stal are key pests of cowpea; and that management of the pests (especially the pod-sucking bugs) is best achieved with three weekly insecticidal spray schedules on the late season crop, starting at the onset of flowering if planted by first week in August. The black cowpea moth, *Cydia ptychora* (Meyrick) that was in the early years of cowpea research in Nigeria regarded a major pest, was shown to be actually an occasional pest that, in nature, is subjected to a high level of parasitism (Olaifa and Akingbohungbe, 1982a,b). Presumably, the use of lindane and some other contact insecticides in the early years of chemical control of cowpea pests regularly led to a resurgence of the insect.

Host plant resistance studies were also a major component of cowpea entomological research at Ife. Two varieties, H144-1 and H64-3 were identified as manifesting tolerance to the flower thrips, *M. sjostedti*. Ovipositional preference on different cowpea varieties by *C. ptychora* was demonstrated (Akingbohungbe, Agbede & Olaifa, 1980). Field screening trials and intensive screenhouse tests were subsequently conducted on larval damage by this insect, (Ofuya and Akingbohungbe, 1986a,b; 1987; 1988). These various studies revealed promising levels of resistances in seven cowpea varieties (i.e. EW/1, ER-7, BPES-1, TVx 32360/ G, Vita 5, TVu 2994 and TVu 3709). Larval antibiosis was implicated as a basis of resistance in some varieties such as BPL-3-1 and TVu 2994. Field screening trials and intensive free-choice and no-choice cohort tests were similarly conducted on *Maruca vitrata* (Echendu and Akingbohungbe, 1989; 1990a,b). Four varieties, TVu 946, TVu 1896 AG, H51-X and 2AK were identified as possible sources of resistance; and non-preference for oviposition and larval feeding as well as antibiosis were implicated as bases for resistance. Identification of pod wall resistance to the cowpea seed beetle, *Callosobruchus maculatus* Fabricius was pioneered in the Department based on the premise that farmers do store harvested cowpea unshelled. The study (Akingbohungbe, 1976) revealed that egg hatching and adult emergence of the seed beetle had significant negative correlation coefficients in cowpea varieties with thick pod shells. Hence, the variety TVu 1534, manifesting a very high (93%) egg hatching, had a very poor adult emergence of only about 1%. These findings led to further subsequent work on the genetics of pod wall resistance to *C. maculatus* (Fatunla and Badaru, 1983).

Reference insect collection and systematic studies. Other aspects of entomological work in the Department include the development of a reference insect collection and the systematic studies of some insect groups, notably the plant bug family, Miridae, which belongs to the Suborder Heteroptera in the Order Hemiptera. A reference collection of insect pests of Nigerian crops was initiated in 1966/67 by the Late Professor John L. Libby who was then on secondment to the University under the USAID/University of Wisconsin/University of Ife Africa Contract 262. With funds from this Contract and the Western Nigeria Ministry of Agriculture, the reference collection of insect pests, which was largely used for teaching the crop protection entomology course, expanded substantially. It eventually culminated in the publication of the first monumental research bulletin on insect pests of Nigerian crops (Libby, 1968). Subsequently,

Professor J.T. Medler succeeded Prof. J.L. Libby on the USAID/University of Wisconsin/ University of Ife Africa Contract 262. As a Taxonomist, Professor Medler broadened the horizon of the Insect Reference Collection. He kept the reference collection of insect pests separate for teaching purposes. In addition, he embarked on the establishment of a Research Reference Collection of all groups of insects in Nigeria. This led to the formal establishment of a Departmental Insectarium housing several thousands of preserved insect specimens belonging to various orders and families, and largely derived from numerous collection trips to various habitats in Nigeria. Professor Medler secured the assistance of many taxonomic experts on different groups of insects in identifying several of the insect specimens and eventually published the first and till now, the only comprehensive checklist and bibliography on Nigeria insects (Medler, 1980). Series of taxonomic studies have been carried out by Professor A.E. Akingbohungbe who, so far, is the only known African (south of the Sahara) with taxonomic expertise on the suborder Heteroptera, and indeed, a recognized world authority on the family Miridae. His numerous taxonomic studies on the Miridae have covered the fauna of Nigeria, a number of other African countries and the Middle East. He has described seven new genera and 62 new species. A very important contribution in this respect is the monograph on the predaceous sub-family Isometopinae, which is the first comprehensive revision of the group as known to occur in Africa, Europe and the Middle East (Akingbohungbe, 1996).

Disinfection of stored produce with gamma irradiation. Radiation disinfestation, which is a relatively more novel physical method of store product pest control, has been studied in the department. Radiosensitivity studies were conducted on the cowpea seed beetle, *Callosobruchus maculatus*, the kola weevils, *Balanogastris kolae* Desbrochers and *Sophrorhinus gbanjaensis* Daramola and Taylor; the leather beetle, *Dermestes maculatus* De Geer, the cigarette beetle, *Lasioderma serricorne* (Fabricius); the tropical warehouse moth, *Cadra cautella* (Walker); the yam scale, *Aspidiella hartii* (Cockerell) and the maize weevil, *Sitophilus zeamais* (Motschulsky. Wholesomeness studies were in addition conducted on yam, maize, cowpea and dried fish. The various studies (Akingbohungbe, 1993; Awoyinka and Akingbohungbe, 1994; Olaifa *et al*., 1990; Olaifa, 1994) demonstrated the efficacy of irradiation at about 0.5 KGY in precluding the development of *C. cautella* and *D. maculatus*; and that a much lower irradiation dose of about 20 GY disinfested kolanuts of the kola weevils, while 50GY was adequate for the disinfestation of *S. zeamais* and *A. hartii* on maize and yam, respectively. The wholesomeness studies also showed no adverse effect of the irradiation on the treated food commodities.

Insect Pathology - Between 1975 and 1978, a modest Insect Pathology Laboratory was established in the Entomology Unit of the Department of Plant Science, under the leadership of Professor B.A. Matanmi. Until then, Insect Pathology as a discipline was more or less unknown in Black Africa. The Lab is equipped with Compound Research Microscope; Wild Photomakroskop ® Photoautomat, fitted with 35-mm Camera, Drawing tube, Occular micrometer; Portable Transfer Hood; Illuminated Incubators; Refrigerators; Portable and Automatic Desk Autoclaves; and numerous other small items of equipment.

The initial field surveys and pathogen forays, coupled with isolation, characterization and culture of the etiologic agents in the laboratory, as well as pilot field trials of the promising entomopathogens such as: *Beauveria bassiana, Entomophaga grylli, Batkoa apiculata et cetera*, and of commercial formulations of the crystalliferous bacterium, *Bacillus thuringiensis*, formulated as Dipel® and Thuricide®, and the Baculovirus, *Baculovirus heliothis*, formulated as Elcar®, have been published in many reputable journals (Matanmi, 1979; 1980; 1983; 1989; Matanmi and Libby, 1975; Lutwama and Matanmi, 1988; Matanmi *et al*., 1990). Information accumulated from the research formed the basis for the formulation and delivery, over the years, of the Course, PSC 632 – *Insect Pathology*. Thus the Department of Plant

Science became the first Academic Department in Black Africa to teach Insect Pathology at the postgraduate level (cf Survey of The Society for Invertebrate Pathology of the late 70's). Meanwhile, research collaboration / partnership has been fostered between the Insect Pathology Unit of the Department and the following: U.S.D.A.–A.R.S., Plant Protection Research Unit, United States Plant, Soil & Nutrition Laboratory, Cornell University, Ithaca, New York, U.S.A.; Division of Biological Control, Department of Entomology, University of California, Riverside, California, U.S.A.; Department of Entomology and Nematology, University of Stellenbosch, Stellenbosch, Republic of South Africa, *et cetera.*

Insect Ecology and Integrated Pest Management (IPM) – Elucidation of the life history and biology of crop pests and research information on their ecology provide the necessary options for devising control strategies. The Department had an Insect Ecologist, Late Professor A.O. Adenuga, who researched this area for many years. Through the study of insect ecology, he was able to develop a control protocol for stem borers of maize. The ant mosaic pattern usually present on cocoa farms can be manipulated to control the black pod disease of cacao, which is actively spread by some ants. This is a concrete contribution from the Department of Plant Science to our knowledge of biological control of crop pests and diseases.

About 35 years ago, Professor B.A. Matanmi initiated investigations on the biology, taxonomy, and control of tephritid fruitflies attacking Cucurbits in Ile-Ife and environs. The studies yielded, among other things, 4 Dacine Tephritids from different melons. The flies were found to be parasitised consistently by *Opius phaeostigma* and *Opius sp.* (Hymenoptera, Braconidae) and to show considerable promise as biological control agents of melon fruitflies. The field and laboratory investigations and the ensuing thesis (Matanmi, 1971), constituted part of the requirements for the award of the first M. Phil.Degree in Plant Science of the then University of Ife. Since then, several other parasitoids, predators and parasites have been investigated and reported upon. Meanwhile, since 1977, Professor Matanmi has been teaching another Postgraduate Course, PSC 631- *Biological Control of Insect Pests*, in the Department. Here again, the then University of Ife was the first Institution in Black Africa to offer the course at that level of instruction.

The concept of Biological Control was later brought to bear upon the following: problem of synanthropic filth flies that are associated with confined poultry production; the use of the giant African mosquito, *Toxorhynchites brevipalpis* as effective biological control agents (natural enemies) against mosquitoes which, apart from being of great nuisance value, are known to be of major concern in the transmission of such diseases as malaria, yellow fever, dengue, filariasis, and viral encephalitides. These studies have strengthened in no small measure the delivery of another Postgraduate Course in Entomology, PSC 626 – *Veterinary and Medical Entomology*.

In these respects, the Entomology Section has also collaborated in research, over the years, with colleagues based in some of the afore-mentioned renowned Institutions and also with The Rangeland Insects Research Laboratory, Montana State University, Bozeman, Montana, U. S. A.

All of these concerted efforts have led to the Integrated Pest Management (IPM) Strategy, whereby natural enemies such as parasites / parasitoids, predators and pathogens of pest arthropods and other alternative measures are made to play significant roles in Crop Protection and Animal / Public Health. They also constitute one aspect of sustainable agriculture and environmental sanitation that attempts to minimize negative environmental impact and other deleterious effects on the national landscape. It is therefore little wonder that the Department also offers at the Postgraduate level, PSC 633 - *Integrated Pest Management*.

Investigations on naturally occurring insecticides from plants. In collaboration with experts from the Department of Chemistry, the Entomologists in our Department have carried

out bioassay of plant extracts/products from local plants such as Monodora sp., *Ocimum* spp., *Glyricidia* sp. and *Hemizygia* sp. for their potential as insecticides. For the control of grasshoppers which attack many crops, Professor Adenuga and Dr. J.I. Olaifa extracted a natural product pesticide using either leaves or kernels of neem (Dongoyaro) and a saponifier (which is also locally sourced). The technology of production is simple and has been extended through various workshops mounted across the country and sponsored by the Federal Department of Pest Control Services based in Kaduna. Other areas researched by Professor Adenuga included insect biology and control of field pests of maize, cocoa and vegetable crops, using insecticide and biological control methods (Adenuga, 1969; 1971a;b; 1975; 1977; Igboekwe and Adenuga,1983; Adenuga and Adeboyeku, 1987; Olaifa and Adenuga, 1988).

Plant Pathology

For much of the mid-1970s to early 1980s, most of the effort on fungal and bacterial diseases of cowpea was directed at observation, evaluation of predisposing factors and screening for resistance. Studies were also conducted on yam anthracnose and fruit rot diseases of tomato. The following major findings were recorded:

- ***Stem anthracnose of cowpea*** This disease, which might have been brought into Nigeria along with cowpea introductions from other countries, was observed for the first time in Nigeria during the late 1960s, about the time IITA was being established. Because the disease was new, little was known about its environmental requirements. It was necessary, therefore, to investigate the factors predisposing the host plant to the causal organism, *C. lindemuthianum*. Fakorede (1976) found that maximal growth, greatest conidia production and highest level of host tissue infection occurred at 25°C. There was no fungal growth or host tissue infection at 34°C. These results corroborate those of earlier workers on *C. lindemuthianum* of beans (*Phaseolus vulgaris*). Significant isolate x temperature interaction suggested that some isolates developed under tropical conditions whereas others were probably introduced to Nigeria along with exotic cowpea germplasm from temperate environments.

- ***Web blight*** (incited by *Rhizoctonia solani* Kuehn) was found to be one of the most serious diseases of cowpea in the south west of Nigeria. Cowpea varieties had differential reaction to the disease in the greenhouse relative to the field. In the field six lines and varieties, including Ife Brown, had considerably high level of resistance. Resistance was characterized by a considerable restriction in the size of lesions while susceptible lines had rapidly coalescing lesions, the resistant lines had small lesions that developed short holes. *Rhizoctonia solani* is seed-borne in cowpea and seeds are therefore a probable source of primary inoculum for web blight.

- ***Mouldiness of early season cowpea.*** Traditionally most of the cowpea production in southern Nigeria has been confined to the late season to enable the pods to ripen in the early part of the dry season. This planting pattern was partly due to the fact that most of the local cowpea types are sensitive to day length and so will not flower in the early season. Now that the problem of day length has been overcome by development of day-neutral types, another problem had become apparent; mouldiness of the pod and seed. Experiment at the T&R Farm, Ile-Ife showed that yields in the early season are much higher than in the late season. However, the high humidity and low amount of sunlight encourage the development of mould, which destroys practically all of the harvest in most cases. The fungus inciting the mouldiness was identified as a species

of *Fusarium* and the hilum is the entry point of the fungus to the seed. Infection starts from the pod and could therefore be minimized by early harvesting. There is an inverse relationship between the percentage of germinated seeds and the percentage of seeds attacked by the *Fusarium* spp. Sources of resistance have been found for this disease.

- ***The yam anthracnose disease***. Studies on the occurrence of yam anthracnose disease and the reaction of water yam (*Dioscorea alata*) to the pathogen (*Colletotrichum gloeosporioides* f.sp. *alatae*) provided insights into the conditions for epiphytotic development of the disease, the etiology of the diseases and the yield loss associated with the disease, which could be up to 95% in severe cases. The studies also showed that *D. rotundata*, *D. cayanensis* and *D. bulbifera* developed only mild symptoms of the disease and were, therefore, classified as tolerant. On susceptible cultivars, symptoms develop in 5-6 days and the host dies within 8 weeks after inoculation (Amosu and Ladipo, 1975; Ladipo and Amosu, 1980).

- ***Fruit rot of unripe tomato***. Studies on *Geotrichum* fruit rot of tomato demonstrated wide genetic variability for resistance to the disease. Earlier studies conducted in other parts of the world indicated that *Geotrichum* fruit rot was a disease of ripe tomato fruits. Our Department was the first to report its occurrence on green tomato fruits (Ladipo and Amosu, 1975).

Virology

Many viruses have been isolated from the cowpea plants that showed varied symptoms of virus infection. These virus isolates were identified and research work on the control methods, including host-plant resistance, were carried out. Following are some of the viruses that have been researched over the years in the Department.

Southern bean mosaic virus (SBMV). Several isolates of this virus were found. Using serological reactions, the Virologist in the Department, Professor J.L. Ladipo identified that four of the virus isolates, including one from Oyo and one from Moor Plantation, were related to the southern bean mosaic virus (SBMV). One of the four was studied rather intensively. It has a dilution endpoint of between 10-7 and 10-8, was found to be infective after keeping in the laboratory for 15 days or after heating untreated crude sap for 10 min. at 90°C but not at 95°C. Necrotic local lesion hosts included *Canavalia ensiformis* on which it produced pin point necrotic lesions, *Cyamopsis tetragonoloba* (Guar) and *Vigna unguiculata*_subsp. *unguiculata*_cvs. Brabham and Victor. Victor was used as the assay host for the quantitative work. The virus induced systemic mottle or mosaic in *V. unguiculata* cvs. Blackeye, Mississippi Silver and Mala and caused rapid defoliation of *Phaseolus vulgaris* (H 65008).

In view of the diversity in sources (Oyo, Ibadan and Ile-Ife), SBMV appeared to be one of the widely distributed viruses in Nigeria (Ladipo and Allen, 1979a; Arowolo and Obisesan, 1986).

Cowpea ahphid-borne mosaic virus (CAMV). Another virus that has been identified is the vein-banding strain of the cowpea aphid-borne mosaic virus (CAMV). The virus induced characteristic systemic veinbanding symptoms on *V. unguiculata*_cvs. Mak 1/1 and C20-55, which was used as an indicator host for the virus. It induced local lesions on *Chenopodium amaranticolor* and this was used as the assay host for the quantitative work. The thermal inactivation point was between 50°C and 55°C, the dilution endpoint of between 10-4 and 10-5 and the aging in vitro of between 8 and 23 hr. The virus caused the death of infected *P. vulgaris* (H65008) but failed to infect *V. unguiculata*_cvs. Brabham and Victor. Using C20-25 as the susceptible parent and Brabham or Victor as the immune parent, the mode of inheritance of the resistance to this virus was studied and some

resistant varieties have been developed (Ladipo and Allen, 1979b; Arowolo and Obisesan, 1986).

The reaction of Ife Brown to this virus was particularly striking. When Ife Brown cowpea plants were inoculated with CAMV, four reactions were observed:

(1) Lethal infections; i.e., complete death of some of the infected plants.
(2) Severe infection
(3) Mild infection
(4) No infection

These reactions suggested that the variety was segregating, at least at the loci controlling reaction to this virus and that selection of sub-lines of Ife Brown resistant to CAMV should be done. This was pursued and Ife Brown carrying resistance to CAMV has now been developed.

Aphid transmission of CAMV. Aphids (*Myzus persicae*) reared on eggplants in cages in the greenhouse were used. The non-viruliferous insects were starved for 2 hr. and allowed an acquisition-feeding period of 10-15 min. on systematically infected C20-55 cowpea plants. Insects were transferred singly to test C20-55 plants (10 insects/plant) and allowed an infection-feeding period of about 18 hours at the end of which the plants were sprayed with Rogor 40 to kill the insects. The symptoms that developed later were similar to what developed when the plants were incubated by the mechanical method.

Recovery of CAMV from flowers of infected plants. Cowpea flowers have been found to be sources of inoculum for CAMV. Studies conducted in the department showed that the virus could be found in flower bud, newly opened flower and dropped flowers.

Transmission of CAMV through cowpea seeds. Seeds were harvested from mechanically infected cowpea plants grown in the greenhouse. The harvested seeds were allowed to dry naturally on greenhouse benches. They were shelled and seed planted in flats of pasteurized soil. The flats were kept in insect-proof cages and were examined for symptom development. Average seed transmission ranged from 0 % in resistant varieties to greater than 20% in some other varieties.

Discovery of new virus diseases of cowpea. *One of the areas where the Virologist in our Department made major contributions to knowledge is in the discovery of new virus diseases. One such virus was observed for the first time in the 1974 growing season. On most of the cowpea cultivars, early symptoms of the virus disease included prominent yellowing of the veins (vein chlorosis) and as infected leaves aged, the symptoms either faded out completely or reduced in intensity but the symptom was still expressed in new and young upper leaves. On some varieties, such as 'Arlington' however, the symptom appeared persistent on old lower leaves with the vein chlorosis symptom turning into vein or general necrosis. This later symptom on Arlington appeared to be peculiar to certain varieties. Several other apparently new virus diseases have been identified, their mode of transmission studied and efforts were made to develop resistant varieties and other control measures.*

Nematology

Research into the control of plant parasitic nematodes started in 1970 when the Nematologist, Professor J.O. Amosu returned from study leave at the University of Illinois, Urbana-Champaign, USA. He conducted research primarily in the area of nematode population dynamics in cultivated soils, host-parasite relations and nematode interac ions with other soil-borne pathogens. The research concentrated on integrated control of three plant parasitic nematodes; *Meloidogyne incognita*, *Pratylenchus brachyurus* and *Helicotylenchus pseudorobustus* on cowpea, maize, sugarcane, cotton and tomato. The research efforts were concentrated on (i) evaluation of various management practices and cropping systems for ability to suppress root-knot and other plant parasitic nematode populations and attain maximum yield production even for susceptible varieties; (ii)

evaluation of the interaction effects of other soil-borne pathogens with nematodes on hosts, disease development and nematode population dynamics, and (iii) screening and evaluation of available germplasm for sources of resistance and breeding cowpea and tomato for resistance to the nematodes. Specific findings from these studies are presented hereunder.

- **Population dynamics of plant parasitic nematodes in cultivated soils** – High densities of *H. pseudorobustus* were found in soils sown to pigeon pea, rice, maize and cotton while relatively low populations were found on soils grown to yam, cassava, groundnut and melon. Soils planted to maize, rice, cotton and cassava favored high population of *P. brachyurus* but its population was low or not detectable in soils sown to groundnut, melon, pigeon pea, and yam. Results of these studies imply that, when the parasitic nematodes are known, selection of crops for rotation could easily be used to eliminate or, at least, minimize the nematode population (Amosu, 1982; 1988).
- **Nematode interaction with soil-borne pathogens** – Depending on the nematodes, when two or more are together in soil, they tend to multiply in geometrical proportion, but multiply in arithmetic proportions when they are alone in the soil. Multiplication of nematodes may increase or reduce by the presence of other pathogens in the soil, depending on the pathogen (Amosu, 1974; Amosu and Adeniji, 1984; Onapitan and Amosu, 1982).
- **Screening and development of nematode-resistant cultivars of cowpea and tomato** – A single dominant gene govern the inheritance of resistance to *M. incognita* in cowpea and in tomato, respectively. New nematode resistant cowpea cultivars were developed that could replace the susceptible, though popular Ife Brown. Tomato cultivars, such as Atkinson, Nematex, MSU, Rossol and VFN 8 were found as sources of resistance to nematodes. Using backcross breeding, the gene conditioning nematode resistance in MSU was transferred into Ife 1 tomato to develop five new lines named Ife II series. The development of Ife II lines has extended commercial production of tomato into areas where root-knot nematodes have been a limiting factor (Amosu, 1974; Amosu and Franckowiak, 1974; Amosu and Babatola, 1976; Fatunla and Amosu, 1977).

Based on the active nematode research program in the Department, our Nematologist, Professor Amosu was elected as one of the nearly 90 Cooperators from 8 regions of the world in a global research tagged International Meloidogyne Project (IMP), with headquarters at the North Carolina State University, Raleigh, North Carolina, USA. The IMP involved (i) collection of nematode population from diverse habitats, hosts, and agricultural systems, (ii) identification of species from field collections, (iii) determination of the resistance or susceptibility of economic crops to the root-knot nematodes present in each region, (iv) differential host tests to detect pathogenic variation, (v) search for new sources of resistant germplasm in crop varieties, plant introductions and breeding lines, (vi) determination of the relationships of ecological factors to survival and pathogenicity of *Meloidogyne* spp., (vii) use of crop response information in developing effective rotation schemes for control of root-knot nematode, and (viii) evaluation of nematodes and appraisal of their role in an integrated crop protection system.

Following the demise of Professor Amosu, the Department employed another Nematologist, in person of Dr. O.K. Adekunle (formerly Fatoki). Dr. Adekunle has been conducting research into the use of plant materials and wastes as plant extracts or organic amendments for the control of plant-parasitic nematodes against the backdrop of growing global demand for a safe environment. Results from his studies have indicated that plant extracts and organic amendments applied at the rates of 40,000 mg/ kg and 30 kg/ha, respectively

could effectively control plant parasitic nematodes. Additionally, he has characterized active nematicidal ingredients in neem leaves, and siam weed leaves and roots. Some of the ingredients are tannins, amines including methylamine; alkaloids, flavonoids, amides including benzamide, and ketones including benzylethanone and o-hydroxylbenzanone (Fatoki and Oyedunmade, 1996; Fatoki and Fawole, 1999; 2000; Adekunle, 2002; Adekunle and Fawole, 2003a; b).

In continuation with the study of nematode interaction with other soil-borne pathogens initiated by Professor Amosu, Dr. Adekunle found that filtrates from two fungi, *Fusarium oxysporum* f. sp. *glycines* and *Sclerotium rolfsii* could be used as sources of biological nematicide for the control of root-knot nematodes and that the pathogenicity of root-knot nematodes on legumes reduced drastically when these fungi interacted with the nematodes. This was the first report of these fungi having this kind of influence on nematodes (Adekunle and Akinsanmi, 2005; Akinsanmi and Adekunle, 2003).

Agronomy, Agroclimatology and Crop Physiology

As noted earlier herein, the Department of Plant Science consists of many interrelated disciplines. One of the disciplines, a complex of several sub-disciplines in itself, is Crop Management (Production), which is usually partitioned into Agronomy, Agroclimatology and Crop Physiology. Over the years, members of staff in these areas have included Dr. B.E. Onochie (Agronomist), Professor I.C. Onwueme (Physiologist), Professor C.O. Alofe (Agronomist/Physiologist), Professor O.A. Akinyemiju (Weed Scientist/Physiologist), Dr. (now a Professor in another University) R.O. Fadayomi (Weed Scientist), Dr. (now a Professor in another University) P.O. Adetiloye (Systems Agronomist), Dr. A.S. Adegoroye (Post-harvest Physiologist), Dr. O.C. Adebooye (Horticulturalist/ Physiologist), Mr. S.A.A. Abasi (Agroclimatologist) and Mr. B.J. Amujoyegbe (System Agronomist). Plant breeders, entomologists, nematologists and plant pathologists in the Department have collaborated with these specialists to conduct research into different aspects of crop management in general. Some specific areas of research pertinent to Agronomy, Agroclimatology and Crop Physiology conducted in the Department are:

- Date of planting studies: maize, cowpea
- Systems agronomy and crop management studies; including spacing, plant density, fertilizer studies
- Physiology; including phenology: root and tuber crops, maize, cowpea
- Climatology of specific crops: maize, cowpea, oil palm

Only some of the highlights of the contributions to knowledge in these areas will be covered herein. Greater details may be found in the cited references.

Date of planting studies. Studies were conducted not only to determine optimum planting dates for maximum growth and productivity of crops, but also from the viewpoints of insect pest dynamics and disease development on the crops. For example, Ladipo and Fakorede (1992) monitored the incidence of maize streak virus disease in monthly plantings for three years, using supplemental irrigation during the dry season. Incidence of the disease started to rise in September and reached the peak in October or November. Thus, the greatest damage from this disease is to the second season maize. We repeated the study in the late season of 2001 and found similar results (Fig. 7).

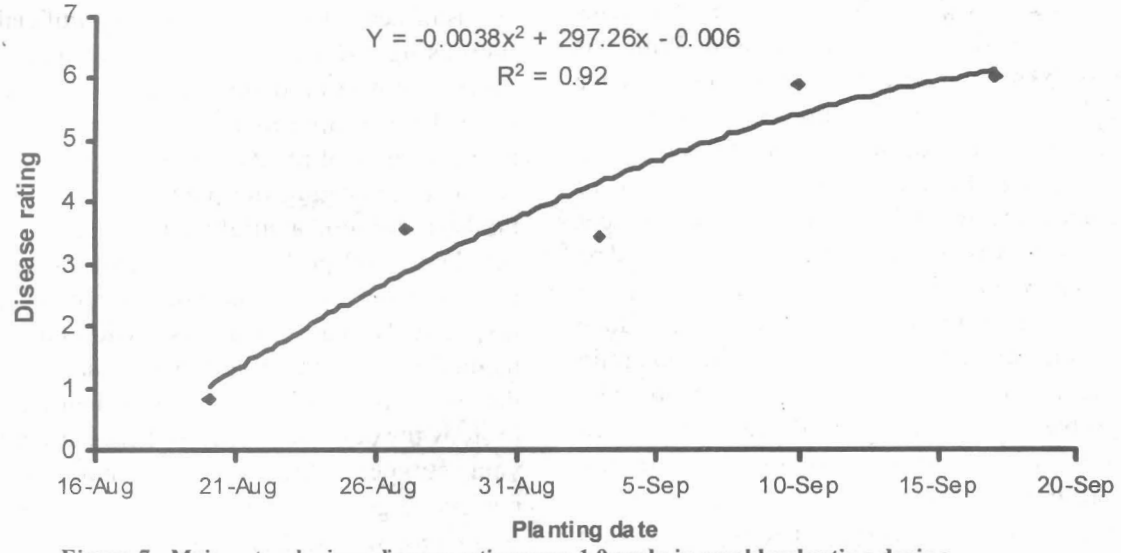

Figure 7. Maize streak virus disease rating on a 1-9 scale in weekly planting during the late season of 2001

Similarly, based on the results of a 3-year study involving monthly plantings, Akingbohungbe (1982) recommended planting cowpea by the first week in August to ensure that the reproductive phase of the crop escapes from peak pest population thereby reducing the damage due to insect pest infestation. Planting by this time will also reduce the number of weekly insecticide applications from six to three.

Research conducted in our Department has established that maize should be planted as soon as there is sufficient rain to moisten the soil for seedling emergence and plant establishment in the early season, which now occurs about early to mid-April. In a 3-year study, Fakorede (1985) found that grain yield decreased by 30-38 kg/ha for each day by which sowing was delayed after the first planting in March. Although there is the risk of drought occurring in the early part of the season (Fakorede *et al.*, 2004), maize does not require much water in the early vegetative phase and, to a large extent, plants that survive the drought compensate for the missing stands to produce higher grain yield than the delayed plantings. Researchers in the Department have recommended that second season maize should be planted within the first three weeks of August.

Systems agronomy and crop management studies. Yam (*Dioscorea* sp.), which is a popular staple throughout the tropics (and especially in Nigeria), is faced with numerous production problems. Chief among these problems are the long period of field occupancy of the crop (sometimes up to 11 months), the high cost and quantity of planting material needed (i.e. the low multiplication ratio), and the high amount of labour required for harvesting, staking, and weeding. All these problems have continued to increase the cost of yams to the consumer. Agronomic research on yams received a major thrust in the 1960s and '70s in the Department. In one such studies, Onochie (1972) found that planting time, soil fertility level and sett size, individually and interactively affected mid-season production of seed yams. Onwueme (1972; 1975) reported similar results on white yam (*Dioscorea rotundata* Poir). Most of the information on yam physiology and agronomy available in our Department was accumulated from extensive research carried out under the leadership of Professor I.C. Onwueme. The research included the physiological behavior of the yam plant, such as processes involved in sprouting, shoot expansion, tuber formation and tuber bulking. These processes are now well understood, and the interplay of environmental factors on them has also been well elucidated (Onwueme, 1973).

The problems of long field occupancy and low multiplication ratio were tackled

simultaneously. A method of pre-sprouting yams before field planting was devised. With this method, a high percentage of field emergence could be attained, and emergence was extremely rapid, so that the farmer could eliminate the long wait from planting to emergence. In addition, a crude index of tuber maturity was devised so that cropping could be economically terminated before actual plant senescence. Furthermore, studies were done which established that the multiplication ratio increased as sett weight decreased. The problems of staking and weeding have received a lot of attention of researchers in the Department. Based on the results of the studies, a package of cultural practices for yam production without stakes in the humid tropics was developed in the Department and made available to farmers (Onwueme, 1977a; b; 1978; Onwueme and Fadayomi, 1980; Oriuwa and Onwueme, 1980).

Crop plants growing in the tropics quite often experience heat stress, particularly in the seedling stage when most of the plant is close to the soil surface, and ground cover is minimal. Seed-bed temperatures as high as 45°C have been recorded in the TRF at planting time. Research has been conducted to investigate how the peculiar heat stress conditions encountered in the tropics affect crop production and how heat tolerance in plants may be manipulated to maximum advantage. Studies were conducted to characterize the effects of heat stress on various plant processes, including enzyme systems, coleoptile growth, chlorophyll and protochlorophyll accumulation, hypocotyl growth and seedling emergence from various depths. The studies showed that the phenomenon of heat tolerance was under genetic control. The higher the heat tolerance level of a plant, the better able it is to survive and yield well under heat stress conditions. In crop production the average heat tolerance of the crop can be increased either by selecting and using heat tolerant cultivars, or by artificially increasing the heat tolerance through the process of heat hardening. In each case there is need for a rapid method of measuring the heat tolerance of plants without sacrificing or seriously damaging the plants. Since such a method was not available, the Department developed and perfected two methods based on conductivity and on plasmolysis with staining respectively. The plasmolysis-with-staining method is more rapid and more reliable than the conductivity method. It is now being used to study the best conditions for heat-hardening yam, cowpea, okra and crops that require nursery stage such as tomatoes, melon, okra, *Amaranthus* and *Celosia* before they are transplanted to the field (Onwueme, 1974; 1979; Onwueme and Lawanson, 1973; 1975; Lawanson and Onwueme, 1973; Ojemakinde and Onwueme, 1980).

Physiology and agronomy of maize, cowpea, soybean and tomato have been researched fairly extensively in the Department, with Professor C.O. Alofe taking the leadership position. The primary thrust of the research has been on nitrogen metabolism and mineral nutrition of the crop plants. Other areas include the physiology of growth and dry matter partitioning, ecology, environmental physiology and crop response to fertilizer, spacing and population density (Alofe and Somide, 1982; Alofe and Amusan, 1982; Okeleye *et al*., 1989; Alofe and Okeleye, 1990; Olowe and Alofe, 1990; Alofe and Oyetade, 1997). Alofe *et al*. (1996) showed that, at the OAU TRF maize varieties, especially hybrids, respond very well to N fertilizer, even up to 240 kg/ha (Fig. 8). A spacing of 75 cm x 5 cm with two plants per stand produced the highest grain yield regardless of variety or N level. Earlier studies with open-pollinated varieties had established 100 kg N/ha as the most economic for optimum grain yield (Alimi and Alofe, 1992).

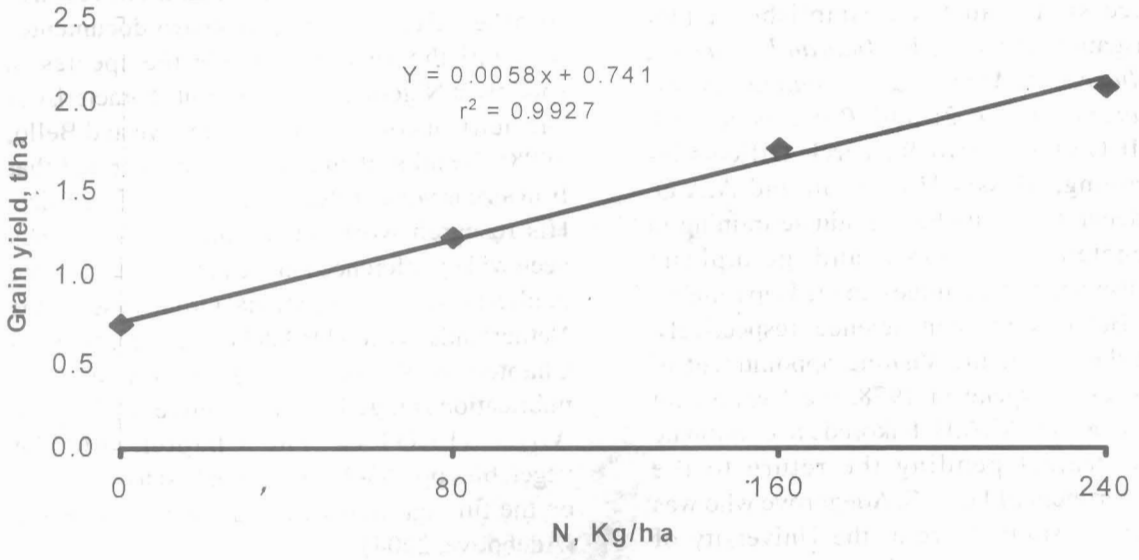

Figure 8. Response of maize to N fertilizer at the T& R Farm, Obafemi Awolowo, Ile-Ife (Alofe *et al.*, 1996)

Researchers in the Department have studied the effects of the interval between specific developmental stages and grain yield in cowpea and maize. Emebiri and Obisesan (1991) found that days to podfill followed by days to pod maturity made the largest positive contribution to cowpea yield. Amujoyegbe and Obisesan (1997) reported similar results for a set of 32 cowpea varieties of diverse genetic backgrounds and characteristics. Fakorede (1993) summarized the results of studies conducted at the TRF, involving 226 maize entries, including inbred lines from several sources, hybrids and open-pollinating cultivars. The material had wide genetic variations for grain yield and phenological traits. As was observed in cowpea, the interval from silking to maturity, that is, grain-filling period had the largest correlation coefficient with grain yield ($r = 0.64$, $p<0.001$). Path-coefficient analysis results showed that fast emergence plus vigorous vegetative growth, followed by rapid completion of flowering and extended grain-filling period would give high grain yield. Our present knowledge of yield physiology in maize is that grain yield is indirectly influenced by grain-filling period duration (GFPD), and directly by ear number. This explains why late maturing varieties are higher yielding than early maturing ones.

The Department made some contributions to the knowledge of crop responses to intercropping, including an attempt at mathematical modeling for formulating intercrop proportions, land equivalent coefficient (LEC) for evaluating competitive and reproductive interactions in simple to complex crop mixtures and the concept of monetary equivalent ratio (MER) for evaluation of yield advantages in intercropping systems (Adetiloye, 1984; 1987).

Horticultural crops. Dr. (now Professor) L.K. Opeke initiated research into the production of horticultural crops at the inception of the University (Opeke, 1963; 1964). Unfortunately, work in this area could not continue because Professor Opeke left the services of the University to work for the Cocoa Research Institute of Nigeria (CRIN). In 1976, when the University offered him a Visiting Professor position, Professor Opeke resumed research on horticultural crops in the Department of Plant Science. He wrote a proposal for, and served as the Coordinator of a collaborative project between the National Horticultural Research Institute (NIHORT), Idi-Ishin, Ibadan and the University known as NIHORT/IFEVARSITY Project 1 & 8. Work commenced on this Project with the germ plasm collection of indigenous vegetable

types and by January 1978, the following 81 accessions had been established under irrigation at the TRF: *Amaranthaceae* 17; *Tiliaceae* 4; *Malvaceae* 7; *Solanaceae* 41; *Curcubitaceae* 2; and *Portulaceae* 10. NIHORT sent two Research Officers-in-training, Messrs H.C. Illoh and A.A.O. Edema, to pursue Post-graduate training in vegetable taxonomy and germplasm conservation techniques, in the Departments of Botany and Plant Science, respectively. At the end of the Visiting appointment of Professor Opeke in 1978, the Department assigned Dr. M.A.B. Fakorede to coordinate the Project pending the return to the Department of Dr. A.S. Adegoroye who was then on study leave at the University of British Columbia, Canada. During this period, we collected a germplasm of 36 accessions of grain amaranths from the Rodale Institute, USA. Mr. Edema evaluated the collection, along with some local amaranths, and used the data for his M.Phil thesis. Dr. Adegoroye took over the coordination of the Project after his return from study leave in 1980. In collaboration with Professor O.L. Oke of the Department of Chemistry, we carried out various trials on grain amaranths and actually evolved a production package for the crop. Dr. Adegoroye has since left the services of the University and Dr. O.C. Adebooye has been employed as the Horticulturalist/Crop Physiologist.

Dr. Adebooye's research work has centered primarily on the local indigenous vegetables, including neglected and endangered species. In continuation of the Horticultural Crops Research Project in the Department, Dr. Adebooye has documented the nutrient composition of 36 indigenous leaf vegetables of southwest Nigeria (Adebooye, 1996; Adebooye and Obisesan, 2003; Adebooye *et al.*, 2003). He also categorized the vegetables into endangered, semi-cultivated, wild and cultivated groups. His research work on *Jatropha spp* is the first detailed report ever published on the full botanical description and food value of this plant (Adebooye and Olorode, 1999). The study documented the floral formulae and chemical composition of this plant. The research work he did on *Irvingia gabonensis* documented in detail the variation within the species in southwest Nigeria in terms of fruit characteristics and nutrient composition (Adebooye and Bello, 1998). Results of this study demonstrated that fruit size is not a perfect determinant of seed size. His research work on *Solanecio biafrae* has been widely referenced in the literature and online publications. An international Group based in the Netherlands invited Dr Adebooye to contribute a Chapter on *Solanecio biafrae* to a series of publications tagged Plant Resources of Tropical Africa (PROTA). The Chapter (PROTA vegetables pp 365-367) was the first to be written on the full agronomy of this plant in the world (Adebooye, 2004).

Dr Adebooye's research works on *Mucuna urens (*agbaarin), *Spondias mombin* (iyeye) and *Trichosanthes cucumerina* (tomati elejo) have attracted international audience. The studies established very strong scientific basis for the domestication and industrial utilization of these under-exploited plants. He documented the food values of these plants that may be exploited by manufacturing industries; including utilization of the fruit of *S. mombin* for fruit juice and the seed of *M. urens* for protein and oil for humans. The oil content of *M. urens* compares favorably with that of groundnut (Adebooye and Phillip, 2005; Owolarafe *et al.*, 2005). The quantity of Vitamin C in the fruit of *T. cucumerina* more than doubles that of the regular tomato fruit.

Seed Physiology, Production and Technology. The work of the Crop Scientist is transferred to the farmer as a miniature plant called seed. Without the availability of seed for farmers to plant, the research work of the Crop Scientist is of no consequence. With this in mind, all researchers in the Department of Plant Science have been involved in seed production in one form or another. However, this was in a haphazard, non-focused and poorly coordinated manner. In 1980/81 Session, the Department started teaching a 3-unit undergraduate course in seed production; that is, PSC 508 – *Seed Production and Certification*. The Department solicited the assistance of Dr. Adeyemi Joshua and Mr. Amir

Singh, the Co-Directors of the National Seed Service (NSS), Ibadan to give the course a sound footing. Thereafter, the Plant Breeders in the Department have handled most of the course content with the Plant Pathologists covering aspects of seed pathology. With the advent of hybrid maize in the country in the mid 80s, a lot of requests for hybrid maize seed came into the Department from individual as well as corporate farmers. In addition, because the Maize Program in the Department has been one of the leading programs on hybrid maize in the country, the NSS selected our Department as the only institution to maintain and produce breeder seed of all inbred lines in the country. Funds were made available to the Department by the NSS while the University gave a matching grant to enable the program to take off effectively. Furthermore, the Federal Government, recognizing the strong potential of the Department to produce high quality seed, made some funds available to the Faculty of Agriculture to establish a Seed Bank.

Considering all of these, there was a felt need that the Department should strengthen its Seed Technology and Production Section. Earlier, the Department had put up a Postgraduate Program in this area, which had been approved by the University Senate. In 1993, the Department hired a Graduate Assistant, Mr. (now Dr.) S.A. Ajayi, who pursued an M. Phil. Degree in Seed Physiology and Production. After completing the M.Phil. Degree, Mr. Ajayi proceeded to Germany where he obtained his Ph.D. Degree and has since returned to the Department as our first specialist in Seed Physiology and Production.

Since his return to the Department in 2003, Dr Ajayi has established a Seed Science Laboratory in the Department. The German Government donated laboratory equipment worth over N5 million to the Department. Although the Laboratory is relatively new, it already has international recognition. The Department has made major contributions to the world literature on seed physiology and production. Some of our findings are summarized in the following.

- Most of the indicators that are used to predict physiological maturity of seeds of maize in temperate environments are not relevant in tropical environment (Ajayi and Fakorede, 2000; Ajayi *et al.*, 2001a).
- Attainment of maximum maize seed quality is less dependent on seed dry weight (Ajayi and Fakorede, 2001a). Based on the results of our research, Ajayi and Fakorede (2001b) made an international call for a re-definition of physiological maturity in maize.
- During development, maximum storability is attained earlier than maximum vigour (Ajayi *et al.*, 2001b).
- Biochemical seed composition at harvest influences seed quality more than seed dry weight *per se* and in the case of maize, while the amount of starch has a direct positive influence on seed quality, amounts of protein, oil, and fibres have negative effect on physiological quality and storability (Ajayi *et al.*, 2005).
- In the face of limited research funds, locally available substrata could be used for seed testing to minimize costs (Ajayi *et al.*, 2000).
- Optimum sample size for the evaluation of maize seedling traits is five.
- Seeds of '*Ugu*'- fluted pumpkin, are sensitive to chilling and are easily damaged at storage temperature as high as 16°C (Ajayi, 2005).
- Fast drying extends the range of water concentration over which fluted pumpkin seeds can tolerate desiccation.
- The minimum water concentration, to which the embryonic axis of fluted pumpkin can be dried before germination declines, is too high for cryostorage.
- Excised embryonic shoot tips and vine cuttings are suitable explants for regenerating fluted pumpkin.

Weed Science. When seeds are planted and the seedlings emerge, unwanted plants, called weeds, also emerge and compete severely with the young crop plants, depriving them of having adequate moisture and nutrients for proper growth. In most cases, weeds out-compete the crop plants and are therefore potentially dangerous to the crop plant. If the plant-weed competition continues beyond a critical stage, crop yield becomes adversely affected, even if the weeds are

subsequently removed. Weed control is, therefore, an important aspect of crop production. Taking cognizance of this fact, the Department of Plant Science incorporated Weed Science courses into its curriculum. Weeds and weed control methods of specific crops are also covered extensively in courses dealing with arable, horticultural and permanent crops.

Weed Scientists in the Department have worked on several areas of weed science, including:

- Determination of critical stages of weed interference in yield of crops;
- Development of weed control prescriptions;
- Herbicide persistence and downward movement in tropical soils;
- Herbicide rate calculations, equipment calibration and maintenance;
- Control of water hyacinth.

Determination of critical stages of weed interference in yield of crops. To obtain high yields, arable crops must be weed free right from the early growth stages up to a certain age, which varies for different crops (Fadayomi, 1979; Akinyemiju, 1988). The maize crop, for example, must be weed free from emergence till flowering. Severe weed competition drastically reduces grain yield (Akinyemiju, 1988).

Development of weed control prescriptions. A major part of weed science research in the Department has focused on the development of weed control prescriptions for the common arable crops of the forest ecology of southwest Nigeria. In particular, the weed scientists have developed or validated weed control prescriptions for maize, rice, cowpea, soybean, cassava, yam and tomato (Akinyemiju, 1987a; Akinyemiju, 1993; Akinyemiju and Echendu, 1987; Akinyemiju and Igori, 1986; Evbuomwan and Akinyemiju, 1995; Adesina *et al*., 1998)

Herbicide persistence and downward movement in tropical soils. The persistence and downward movement of herbicides applied to the soil or body of water received considerable attention from Weed Scientists in the Department because of its environmental significance and implication. Evidence from the studies showed that herbicides have much shorter persistence in the humid tropical environment than in temperate environment (Akinyemiju *et al*., 1986; Badejo and Akinyemiju, 1989; Oyeniyi and Akinyemiju, 1990; Evbuomwan *et al*., 1993a, b). Results of this extensive research, which was the first to focus attention on this aspect of crop production, has the following implications:

- Farmers in the tropics may not have a season long control of weeds in arable crops except where crop canopy closes early in the crop growth cycle.
- Due to the short persistence, herbicide residues will not persist to injure a susceptible crop that may follow in the rotation. For example, cowpea (a susceptible crop to atrazine) may follow maize sprayed with atrazine in rotation.
- Environmental pollution resulting from residue problem is minimal in the humid tropical environment.
- When used according to the instructions, herbicides for the control of aquatic weeds have no harmful effects on aquatic lives, including fish, plankton, microbes and humans.

Herbicide rate calculations, equipment calibration and maintenance. When pesticides are not properly applied, they are ineffective and constitute safety problem to the applicator and the environment. In order to minimize these negative effects of herbicides, Professor O.A. Akinyemiju of our Department initiated national training for pesticide users and the environment. The training covered herbicide rate calculation, equipment calibration and maintenance, and the overall effectiveness of the herbicides and their safety to both humans and non-target components of the environment. This concept formed the basis of the First National Pesticide Training Workshop held at OAU, Ile-Ife, 23-27 November 1992.

Control of water hyacinth. Research on the control of water hyacinth [*Eichhornia crassipes* (Mart.) Solm-Laub] under the leadership of Professor Akinyemiju, provided for the first time scientific data for the herbicidal control of this water weed, which had infested many large water

bodies in the country (Akinyemiju, 1987b; Akinyemiju, 1998; Akinyemiju and Olaleye, 1999; Olaleye *et al.*, 1993).

Services Provided within the University by the Department

At the Faculty level, academic staff of the Department have been members and Chairmen of Committees and made tremendous contribution to the growth and development of the Faculty. During the 40-year period under review, three members of staff from the Department served as Deans of the Faculty; that is,

- Professor A.O. Adenuga, who served two consecutive terms 1977/78 to 1978/79 and 1979/80 to 1980/81.
- Professor J.L. Ladipo – 1989/90 and 1990/91 Sessions.
- Professor J.O. Amosu – 1991/92 Session. Professor Amosu's tenure was prematurely terminated by death and was thus the first Dean in the Faculty of Agriculture to die on active service as Dean.

At the University level, members of the Academic Staff of the Department have served in many capacities, including Senate membership, election to Council, Committees of Senate and Council, Officers of the Congregation and the Academic Staff Union of Universities (ASUU). The Department produced three Deputy Vice-Chancellors during the 40-year period reviewed herein; that is,

- Professor A.O. Adenuga, 1982/83 and 1983/84
- Professor J.L. Ladipo – DVC (Admin.) 1991/92 and 1992/93.
- Professor A.E. Akingbohungbe – DVC (Academic) 1998-1999.

No other Department in the Faculty has produced these many candidates for the post of DVC. Before being elected as the DVC (Academic), Professor A.E. Akingbohungbe served as the Director of the Natural History Museum from 1990 to 1996. One important legacy he left behind in the Museum is the computerization of the database and computer training for the staff of the Museum.

Distinctions and Awards

The following Distinctions and Awards have been given to members of staff of the Department.

Dr. O.C. Adebooye

- Fellow, College of Research Associates, United Nations University/Institute for Natural Resources in Africa (UNUINRA), 2001 to date.
- Award for the Best Presentation at the 3rd International Conference on *Sustainable Use of Indigenous Food and Medicinal Plants*, University of Karachi, Pakistan, September, 2000.

Dr. O.K. Adekunle

- Third World Academy of Sciences (TWAS) Post-Doctoral Research and Advanced Training Fellowship, Institute of Himalayan Bioresource Technology, Palampur, India, 2003-2004.

Professor A.O. Adenuga

- Harvard Visiting Research Fellowship in Entomology, 1970-71.
- Listed in '*Who is Who' in Nigeria*, 1980.
- Listed in '*Who is Who*' IBC, Cambridge, England, 1981.
- Listed in '*Who is Who' in the Commonwealth*, 1982.
- Listed in 'Men in the World of Achievement' 1982.
- International '*Who is Who' of Intellectuals*, Vol. VI, IBC, Cambridge, 1985.

Dr. S.A. Ajayi

- Professor Werner Schulze Fellowship for Young Agricultural Scientists, Institute of Crop and Grassland Science, FAL, Braunschweig, Germany, 2000.
- Vavilov-Frankel Fellowship, International Plant Genetic Resources Institute (IPGRI), Rome, Italy, 2002.
- International Society for Seed Science Award, Salamanca, Spain, 2002.
- South Africa National Research Foundation Post-doctoral Fellowship, 2003.

Professor A.E. Akingbohungbe

- German Academic Exchange Postdoctoral Fellowship – 1976.
- Commonwealth Academic Staff Fellowship – 1982-83.
- IAEA/FAO Fellowship for a study tour of Radiation Disinfection Centers in the Netherlands, Hungary and USSR – August/September 1986.
- Royal Society/Nuffied Foundation Developing Country Fellowship – 1986-87.
- Rockefeller Foundation Scholar-in-Residence at Villa Serbelloni, Bellagio, Italy – October/November, 1988.
- Fellow, Entomological Society of Nigeria.

In addition, Professor Akingbohungbe has the following nine Biographical Listing to his credit:

- Agricultural and Veterinary Sciences International Who's Who – Longman.
- International Directory of Distinguished Leadership – American Biographical Institute (ABI)
- Five Thousand Personalities of the World – ABI.
- International Leaders in Achievement – Cambridge International Biographical Center (IBC).
- Men of Achievement – IBC.
- Marquis Who's Who in the World.
- 2000 Outstanding Scholars of the 21st Century – 1st Edition (IBC).
- 2000 Outstanding Intellectuals of the 21st Century – 2nd Edition (IBC).
- World List of Honors – IBC.

Professor O.A. Akinyemiju

- Post-Doctoral Fellowship, US Forestry Service, 1981.
- Visiting Scientist, CIMMYT, Mexico, 1987.

Professor C.O. Alofe

- Visiting Scientist, Department of Agronomy, University of Wisconsin, Madison, Wisconsin, USA, 1985.
- African Crop Science Society (ACSS) Meritorious Award, 2001.

Professor J.O. Amosu

- Wright Fellowship in Plant Pathology, 1969.
- Fellow, Science Association of Nigeria (FSAN), 1985.

Professor M.A.B. Fakorede

- Editorial Board Member, *Euphytica* – the Netherland Journal of Plant Breeding, 1983-1986.
- Editor for the Africa Region, *Journal of Genetics & Breeding* (Rome, Italy), 1983 to date.
- Visiting Collaborating Scientist, Maize Program, International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, 1988-89.
- Consultant, West and Central Africa Collaborative Maize Research Network (WECAMAN), Bouaké, Côte d'Ivoire, 1996.
- Editorial Adviser, Training Materials Unit, IITA, Ibadan, Jan-Dec., 1996.
- Consultant (Editor), West and Central

Africa Collaborative Maize Research Network (WECAMAN), Bouaké, Côte d'Ivoire, 1997, 1999, 2001.

- Consultant, West Africa Rice Development Association (WARDA), Bouaké, Côte d'Ivoire, 1998-1999.
- Visiting Scientist, Maize Program, CIMMYT, Mexico City, Mexico, 1997.
- Consultant, Maize Program, CIMMYT-Kenya, Nairobi Kenya, 2000.
- Member, Ad Hoc Expert Group on Africa Green Revolution, United Nations Economic Commission for Africa (UNECA), Addis Ababa, Ethiopia, 2003 to date.
- Fellow, British Society of Commerce, 2000 to date.

Professor B.A. Matanmi

- Fellow, Entomological Society of Nigeria.
  Listing in World Directory for Current Research on the Entomopathogenic Fungi, Genus *Entomophthora*. (Life Sciences and Agric. Expt. Station, University of Maine Misc. Report 182, Ed. R. S. Soper, 1976, Second Edition by R. S. Soper and A. A. Evlakhova, 1978.
- Listing in Directory of Invertebrate Pathology Ed. J. D. Briggs, The Ohio State University, Columbus, Ohio, U.S.A. and Ohio Agric. Research and Development Center, Wooster, Ohio.
- Listing in World Directory of Vector Research and Control Specialists. Compiled by Eugene J. Gerberg for American Mosquito Control Association, 1982.
- Travel Fellowship Awards by: PFIZER, 1980 and BIODE, 1981.
- Member, Society for Invertebrate Pathology Working Group on the Safety of Microbial Control Agents.
- Listing in: Sixth Edition, Marquis' Who's Who in The World.
- Who's Who in the Commonwealth, 2nd Edition.
- Men of Achievement, 10th Edition.
- International Book of Honor, 1st Edition.
- Profiles of African Scientists, 1st Edition.
- Who's Who in The 21st Century, 2002.
- Who's Who In Science And Engineering 2005-2006.
- United States Agency For International Development / African American Institute Fellowship Award, for Research in Insect Pathology at The University of California, Riverside, U. S. A., 1987.
- Co-Grantee, South African Foundation For Research Development Award at The University of Stellenbosch, Stellenbosch, South Africa. 1995-1996.
- Between January 1984 and August 1985, I was appointed as Commissioner for Agriculture and Natural Resources, Kwara State of Nigeria. My professional training and learning experiences over the years in the University enabled me to contribute meaningfully, as a Member at that time, towards the formulation of Memoranda and Policies of The National Council of Agriculture and Water Resources.

Professor I.O. Obisesan

- Member, National Steering Committee on AFRA 5.029 (African Region Cooperative Agreement) for Research Development and Training related to Nuclear Science Technology with regard to Food crops; 1998 to date.
- Fellow, International Atomic Energy Agency (IAEA), Nov. 1993 to Oct. 1994; University of Naples, Portici, Italy. Course of study: *Tissue culture and transformation in cowpea*.
- Visiting Associate, Istituto Agronomico,

Campinas (IAS), Brazil, September 4 o December 3, 2003; under the aegis of TWAS/UNESCO Associate Scheme at Centers of Excellence in the South. Research Focus: *Conservation of avocado pear germplasm.*

Publications

Members of staff in the Department have edited or published monographs and books or book chapters both locally and internationally. Some of the publications are listed below.

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Present and future emphasis

The Department of Plant Science at Obafemi Awolowo University is well established for research and teaching. The experience accumulated over the years makes it possible for the staff members to chart a new direction for the Department as the need arises. As may have been obvious to the reader from all of the foregoing, the Department has been moving with the changes in the times. For example, in recent years, the Department has firmly established a Seed Science and Technology Unit, with a modestly equipped seed science laboratory. Similarly, in collaboration with other Departments and Units in the University, the Department of Plant Science has gradually introduced Biotechnology into the curriculum. For example, the recent thrust of nematology research has been on the application of biotechnology to detect nematodes that are vectors of viruses. He used Enzyme Linked Immunosorbent Assay (ELISA) and reverse Transcription Polymerase Chain Reaction (RT-PCR) to detect latent ringspot nepovirus transmitted by a nematode, *Xiphinema diversicaudatum*. Similarly, the seed Specialist in the Department has been applying biotechnology approaches to gain insights into the behavior of recalcitrant seeds, such as seeds of the fluted pumpkin and cocoa. To the best of our knowledge, ours is the first attempt in these areas of study. To sustain research and teaching in these areas, several members of the academic staff have received training in relevant disciplines. The Department will continue to strengthen its capacity in research and teaching in these more contemporary areas without relenting on improving the already established areas.

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