

**40 YEARS OF EXISTENCE OF THE DEPARTMENT OF SOIL SCIENCE (AND
LAND RESOURCE MANAGEMENT):
THE JOURNEY SO FAR**

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INTRODUCTION

The concept of soil or its science cannot be discussed in isolation of the concept of the earth because it is a component of the earth resources and belongs, in an abstract form to the discipline, Earth Science.

In this context, soil is the outermost section of the crust, while the latter forms the outermost (and most solid) of the lithosphere. The lithosphere with the hydrosphere (water) and the atmosphere (simply the air) constitute the earth. Thus soil cannot be discussed or managed in isolation of water and air resources, hence the significance of the new name of the Department as reflected in the title (it used to be called the Department of Soil Science).

In the biological context, soil plays the single-most valuable role, since creation, of survival of human populations – soil sustains life. And this is precisely because soil is difficult renewable. There is, therefore, a need for the scientific study and elucidation of what soil is, the dynamic processes that produce soil and in which it participates; its involvement with plant growth and other biological processes and the study of factors relating to sustaining those characteristics which are most important and useful to “man”. The IUSS (International Union of Soil Science) has lucidly shown this in its revised scientific structure (IUSS Bulletin, 2000/1).

Soil Science discipline in Nigeria cannot be discussed in isolation of the contributions of the Department of Soil Science at the Obafemi Awolowo University. It is, therefore, the objectives of this write-up to highlight the historical growth of the department and discuss

in detail, but briefly, its contribution to the development of the managerial skills needed to fulfill the sustainable use and management of soils of Nigeria and by extrapolation to those of the world or at least on regional basis-the sub-Saharan region.

DEVELOPMENT: Historical

Although this University started in 1962/63 academic year, the Department of Soil Science (amongst others within the Faculty of Agriculture) would have been created in 1964 when the Faculty of Agriculture was established (Editorial Note, Eighth Annual Research Report, Faculty of Agriculture, University of Ife). The pioneering staff members were late Dr. Jaiyebo and retired Professor R.B. Corey (of USAID/University of Wisconsin Team). The decade of 1962/63 – 1972/73 was very eventful in the development of the Department. Other staff members of the USAID/University of Wisconsin team that came to assist in its development and growth include Retired Professors E.E. Schulte, M.I. Harpstead and Late Professor G.E. Wilkinson. This decade also witnessed the start of postgraduate programmes with some financial assistance from USAID for scholarship awards. Two M.Phil. degrees in Soil Science were awarded during this decade. The decade also saw to the growth of indigenous staff members through employment into permanent position (1) and many training positions.

Professor W.E. Fenster (Retired) on USAID/University of Wisconsin team joined the team in the early portion of the second decade and was the last of the USAID/University of Wisconsin team. Forty years and thirty eight years after the establishment of the University and the Faculty of Agriculture/Soil Science Department, the staff strength of the latter now includes 5 Professors, 2 Readers, 2 Senior Lecturers, 1 Lecturer and two staff members in training positions (Table 1).

* ***Professor and Head of Department***

** ***Awaiting Senate Approval***

Table 1: Staff of the Department as of 2001/2002

Academic Staff

Professors

Okusami, T. A., Ph.D	Head of Department Soil Classification and Survey; Soil Evaluation and Landuse Planning
Aduayi, E. A., Ph.D	Soil Fertility and Plant Nutrition.
Adepetu, J. A., Ph.D	Soil Chemistry, Soil Fertility.
Adebayo, A. A., Ph.D	Soil Microbiology and Biochemistry.
Aina, P. O., Ph.D	Soil Physics, Soil and Water Conservation and Management.

Readers

Obi, A. Olu, Ph.D	Soil Chemistry and Fertility.
Olayinka, A., Ph.D	Soil Microbiology and Biochemistry.

Senior Lecturers

Amusan, A. A., Ph.D	Soil Genesis and Classification.
Oyedele, D. O., Ph.D	Soil and Water Conservation and Management.

Lecturers

Ige (Mrs.), V. D., M.Sc.	Soil Chemistry.
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Assistant Lecturers

Muda, S. A. M.Phil.	Soil Mineralogy.
Idowu (Mrs.), M. K., M.Sc	Soil Fertility and Plant Nutrition.

Technical Staff

Fadeyibi, M. O.	Higher National Certificate in Chief Technologist Analytical Chemistry.
Alofe, M. K.	Higher Certificate in Science Laboratory Technologist II; Laboratory Technology.
Oyeyemi, R. S.	Higher Certificate in Science Laboratory Technologist II; Laboratory Technology.
Fabode, R. F. (Mrs.)	Higher Certificate in Science Laboratory Technologist II; Laboratory Technology.
Adediran, A.	Technologist Diploma in Geoinformation Production and Chief Technical Assistant Management Cartography.

Administrative Staff

Tijani, A. B.	O.G.T. (120 w.p.m. Shorthand). B.Sc. (Business Administration). Principal Confidential Secretary I
Adesina, S. (Mrs.)	O.G.T. (50 w.p.m. Typewriting) Senior Typist

The non-academic staff strength of the department currently consists of 4 administrative and 5 technical staff; and field staff under the administration of the Farm's Office.

The progression in curricular development has been phenomenal especially in the undergraduate programme. It grew from 2 courses at inception to 14 courses (1978-1980) and currently at twenty-three when the new/modified programmes would come into full operations (Table 2). This has clearly demonstrated the dynamic nature of the department's response to changes in the

nation's needs as dictated by socio-economic factors, environmental concerns, and the need to adapt modern technology to solve the use and management of our land resources for sustainable development. This growth has been gingered mostly by the fact that the Faculty evolved from a single B.Sc., Agric. Hons. Programme to that of B.Sc./B. Agric. with final year options into departments of choice mostly decided at the time of admission. Thus, the department continues to be of value towards a broad-based degree programme. The student population catered for within the Faculty, therefore, steadily increased from the initial total of thirty-six (36) students for

Table 2: Significant Periods of Curricular Development: 1962-2002

1962-1970	1970-1972	1976-1977	1978-1980	2001-2001
<p>- Pedology (Year 2) - Soil Fertility and Management (Year 3)</p>	<p>Soil Science 201: Introduction to Soil Science. Optional Courses: Soil Science 401: Soil Genesis and Classification; Soil Science 402: Soil Fertility.</p>	<p>Soil Science 301: Introduction to Soil Science. Optional Courses: Soil Science 401: Soil Genesis and Classification Soil Science 402: Soil Fertility.</p>	<p>SOS 202: Agric. Chem. II SOS 301: Introductory Pedology and Soil Physics. SOS 302: Introductory Soil Chemistry and Microbiology SOS 501: Soil Fertility SOS 502: Soil Physics. SOS 503: Soil Conservation. SOS 504: Soil Survey. SOS 505: Soil Microbiology. SOS 506: Soil Chemical Analytical Techniques. SOS 507: Soil Morphology, Classification and Mapping. SOS 508: Introductory Soil Mineralogy. SOS 510: Fertilizer Tech. SOS 512: Soil Cartography. SOS 514: Research Methods in Soil Science.</p>	<p>SOS 201: Agric. Chem. II. SOS 202: Introduction to Soil Science. SOS 301: Introductory Pedology and Soil Physics. SOS 302: Introductory Soil Chemistry and Microbiology SOS 303: Soil Resources and the Environment. SOS 400: Internship Courses (401, 402, 403 & 408). SOS 501: Soil Fertility. SOS 502: Soil Conservation and Water Management. SOS 503: Soil Physics. SOS 504: Soil Survey and Land Evaluation. SOS 505: Soil Microbiology and Biochemistry. SOS 506: Soil Chemical Analytical Techniques. SOS 507: Soil Microbiology and Classification. SOS 508: Soil Mineralogy. SOS 509: Soil Erosion and Land Reclamation. SOS 510: Fertilizer Technology. SOS 511: Waste Management and Soil. SOS 512: Computer-Based Terrain Analysis. SOS 513: Drainage and Irrigation of Agricultural Land. SOS 514: Special Project in Soil Science. SOS 515: Soil Ecosystem. SOS 516: Watershed Hydrology. SOS 517: Soil Microclimate.</p>

the first decade to an approximate total of nine hundred and fifty (950) students during the 2001/2002 academic year. The percentage that selected the soil science option has also increased and has consistently ranged between

14% and 17% of the total intake into the Faculty.

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** **Awaiting Senate approval**

Table 3 shows the postgraduate courses that currently form the course-requirements in addition to the requirement of a research thesis at both master and Doctoral levels.

Table 3: Available Courses for Postgraduate Studies

Course Code	Course Title
SOS 600	Soil and Plant Analysis
SOS 601	Soil Chemistry
SOS 602	Soil Physics
SOS 603	Soil Genesis and Classification
SOS 604	Soil Microbiology and Biochemistry
SOS 605	Soil Survey and Land Use Planning
SOS 606	Soil Mineralogy
SOS 607	Soil Fertility and Plant Nutrition
SOS 608	Soil Conservation and Management
SOS 609	Studies in Soil Organic Matter
SOS 699	Graduate Seminar

SUB-DISCIPLINES WITHIN THE DEPARTMENT

Almost all the sub-disciplines as enunciated by the International Union of Soil Science (IUSS, 2000/2001, pg. 8-12) are represented in the programme of the Department. Currently, however, the following sub-disciplines reflect the soil-based courses that cater for the teaching and research foci of the Department.

***Soil Physics/Soil and Water Conservation and Management**

- Courses had been developed in Soil Physics, Soil and Water Conservation and Management to fill educational needs involved in modern land use.
- Research activities are primarily field-oriented and include tillage and its effect on soil properties and crop production; the effect of soil erosion on soil productivity; spatial variability of soil properties in relation to developing technologies for sampling field soils and land clearing.

***Soil Chemistry/Soil Fertility/Plant Nutrition**

- Soil Chemistry courses aim at the understanding of the chemistry, reactions and transformation of chemical nutrients in soils.
- Research includes soil P-and S-sorption and-adsorption processes as they are influenced by physical and chemical properties of soils; K: Mg interaction in soils and K-availability; soil acidity generation process and its amelioration; changes in soil macronutrient status under continuous cultivation; boron and sodium utilization; fractional distribution of macro-elements in soils as influenced by soil type and soil use, etc.
- Soil fertility studies have been designed to evolve rational, accurate and scientific basis for developing efficient soil-testing and soil fertility management advisory services for farmers.

***Soil Microbiology and Biochemistry**

- This aims at exposing students more to the microbiological and biochemical influences of microorganisms in soil fertility sustenance especially in low input agriculture.
- Research focuses at assessing ecological parameters affecting biological nitrogen fixation in tropical grain legumes.

*** Soil Genesis/Classification/Survey/Soil Evaluation and Land Use Planning/and Soil Mineralogy**

- The essence here is to inculcate into learners what soil is? And how soils evolved from the original parent rocks (materials) and to teach the pattern of distribution, and the characterization and classification.
- Research activities include soil and land characterization for pedogenesis, classification, and soil evaluation/land use planning studies (soil characterization includes physical, chemical and mineralogical analysis); and the use of GIS and Remote Sensing in terrain analysis and evaluation.
- Research into soil mineralogy is to avail us with the dynamic nature of the soil system in its continual transformation of primary minerals to secondary minerals and to evaluate the mineralogical stock in the soil environment and how the soil environment affects their availabilities. It also includes the quantitative assessment of minerals (primary and secondary) available within the regolith.

*** Others (non-soil)**

- Climate components.
- Hydrology (water).

CONTRIBUTIONS

Teaching:

Table 2 brings into focus once again the kind of courses that had been taught to the past graduates of this University and the Faculty of Agriculture in particular within the last forty years. During this period, over three thousand (3,000) students had taken some of these courses. The 2001-2002 curricular offer new specters as dictated by environmental needs and availability of new technologies for solving soil productivity and management problems. Courses at both the undergraduate and postgraduate levels are available to agriculture/soil science majors and other science-based programmes.

Training:

All courses have field and/or laboratory components. Internship courses at the fourth year level are to expose students in their penultimate year to practical aspects of courses encountered especially at second and third year levels.

At the undergraduate level, the course, SOS 514 – Special Project in Soil Science, is intended to inculcate the attitude of in-depth studies towards getting research results into selected problems. It involves literature search, techniques learning, experimentation (field and/or laboratory), analytical techniques (including statistical techniques) and writing skill. It is also a medium for learning results/discussion presentation via seminars. Project reports in many instances have formed the foci of beautiful publications in both local and international journals.

At the postgraduate level, the Department continues its strong contributions to the manpower needs of the nation. The Department provides an M.Phil/M.Sc. and Ph.D. training in all sub-disciplines of soil science. The training is thorough and performance enhancing. Currently, the Department has produced 27 Masters (M.Phil. or M.Sc.) and 14 Ph.D. degree holders in Soil Science. All these graduates occupy important niches in the nation's institutions of learning and research centers. Staff members,

viz. Prof. E.A. Aduayi/Dr. A. Olayinka and Dr. D.J. Oyedele have participated in the supervision of research work of postgraduate students from the Institute of Ecology and Environmental Sciences. These have produced the theses of Oduekun (2002); and Asonugbo (2002). Atama (2002) and (Wahab, 2002) respectively. Our laboratories have always been available to the analytical needs of both the undergraduate final year projects and the postgraduate thesis research work of all Departments within the University.

Research:

Research activities in Soil Physics/Soil and Water Conservation and Management have centered in the following main areas:

- Soil characterization
- Soil erosion and climate erosivity.
- Soil physical amendment by use of animal wastes and chemical stabilizers.
- Water conservation and soil management systems to enhance the environment.

Early research work was directed towards understanding the physical regime of humid tropical soils of Nigeria as it relates to plant growth and development (Wilkinson and Aina, 1976; Aina *et al.* 1977; Aina, 1979a, b). Later research dealt with the management and conservation of soils (Aina, 1980b; Aina and Lal, 1986; Aigbomian and Aina 1988; Oyedele and Aina, 1989) for sustainable crop production (Aina, 1980a; Aina and Egolum, 1980; Aina, 1984; Fapohunda *et al.* 1984). These research programmes have been national in scope and included on-farm experimentation with soil management and conservation technologies. Collaborative and sponsored works by Institutions include the UNDP, FAO, IAEA, the United Nations University, and IFS (Sweden). These have led to the following breakthroughs: the early research in the characterization of the physical regime of soil has been a landmark contribution to the knowledge of the soils, their responses to use and hence providing a basis for soil management. A major breakthrough has been the discovery that humid tropical soils can be managed successfully for continuous production on an agronomically and ecologically

sound basis (Aina and Egolum, 1980; Aina, 1984). This is attributable to the Department's leadership role in the identification of erodible soils, their characteristics and distribution, and the development and application of erosion-control and effective soil management technologies that increase the resiliency of the agro-ecosystems in the region. Badly eroded and run-down tracts of lands through good conservation practices, including mulch tillage and rotational tillage have been developed into productive farms.

In Soil Microbiology and Biochemistry sub-discipline, the research activities have been towards solving the problems of low input agriculture in a low fertility environment. A review would show examples of attempts towards improving the fertility and physical nature of our soils. Sawdust - a waste product of the wood industry - could be successfully converted to a useful organic fertilizer by pre-incubating for four (4) weeks with poultry droppage or cowdung (Olayinka and Adebayo, 1984, 1985). This organic fertilizer was significantly better than inorganic fertilizer in enhancing soil physical and chemical properties and promoting plant growth and nutrient uptake. In the course of the study in this area, the QT_{10} for southwestern Nigerian soils was found to be between 25-35°C and not 20-30°C as found in temperate countries (Olayinka and Adebayo, 1984). Also our studies on the assessment of the determination of organic matter in Nigerian soils indicated that there is no need for a conversion factor when using the Walkley-Black method for organic matter determinations; that the latter method is as good as the Wet Combustion Method of organic matter determination in tropical soils (Olayinka, *et al.*, 1998).

Work in the area of biological nitrogen fixation has indicated for the first time that under Nigerian conditions, nitrogen fixation in Ife Brown Cowpea (*Vigna unguiculata*) (a cowpea developed at our own Faculty of agriculture here) will benefit tremendously by applying a starter dose of 18ppm of inorganic nitrogen (Daramola, *et al.*, 1982). Some herbicides commonly used in weed control in cowpea fields were found to be harmful to nodulation and nitrogen fixation in cowpea. Such herbicides include Dual [2, ethyl-

6-methyl N- (2 methoxy-1- methyl-ethyl-*α*-chloro-acetanilide)] and Dacthal [dimethyl-tetrachloro-terephthanate]. Whereas herbicides like Preforan [2, 4-dinitro-4-fluoromethyl-diphenyl] enhances nitrogen fixation (Daramola and Adebayo, 1981). Herbicides like Atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino) S-triazine] and its derivatives have no deleterious effects on nitrification and nitrogen fixation in Nigerian soils when used at recommended dosages (Adebayo *et al.*, 1979).

Sesbania rostrata is a legume green manure that was discovered in Senegal in the mid-eighties as an excellent source of nitrogen in irrigated rice fields and was shown to possess both root and stem nematodes. It was the pioneering work of a member of staff of this department working in collaboration with scientists at the International Rice Research Institute (IRRI), Manila-Phillipine that showed the epiphytic occurrence and survival of the *Azorhizobium caulinodans* on the leaves and flowers of *S. rostrata* - (Adebayo, *et al.*, 1989).

The complementary use of organic and small amounts of inorganic fertilizer in the face of scarcity of inorganic fertilizer has boosted farmers' production and enhanced soil productivity in the southwest part of Nigeria.

The sub discipline that consist of Soil Chemistry, Soil Fertility, and Plant Nutrition has its main concern in the improvement and management of soils in terms of adequate availability of essential nutrients from soil to growing crops for optimum yield. This concern has been addressed in multifarious ways but initially by assessing the general levels of the fertility of Nigerian soils through soil and tissue analyses. Early work in this area, from the department, was through nutrient survey studies in both the forest and derived zones of southwest Nigeria (Agboola and Corey, 1973, Corey and Adepetu, 1971; and Schulte *et al.*, 1973 a, b). An update on this data was later carried out by Adepetu and Adebayoyi (1985), Sobulo and Adepetu (1987), and Adetunji and Adepetu (1990). Some of the salient points that arose from all the above are that:

- N and P were generally deficient in the soils.
- Zn was adequate in the forest but

deficient in derived savanna soils.

- Ca, Mg, Na, Cu, Fe, and Mn were all adequate in soils.
 - K was inadequate in the soils but plant (maize - *Zea mays L.*) analysis indicated adequacy in the soils.
- these threw a challenge leading to further research work, i.e.,
- (i) **the need for** the chemical analytical methods that will be appropriate for the determination of the amounts of nutrient available to plants from soils (especially those located within Nigeria);
 - (ii) the critical soil values, i.e., the soil nutrient level below which the soil is considered deficient in that nutrient and above which the soil is said to contain adequate amount of nutrient for optimum yield;
 - (iii) the need to know which fractions of a chemical element should be assessed as a good index of nutrient availability to crops.

Attempts made to solve the above problems were notable in the works of Adepetu and others (1975; 1977 and 1983), showing that soil organic P is a good predictor of P availability in the early years of long-term cultivation experiment and that Al-P with Fe-P are more appropriate indices in subsequent years. Other indicator indices are that exchangeable K plus fixed K is a better predictor of K availability than exchangeable K alone (Adetunji and Adepetu, 1993); and that water soluble S coupled with surface adsorbed inorganic S is the appropriate index of S availability. (Also see Schulte and Osiname, the Sulphur and Zinc Status of Soils of the Western State of Nigeria in Eighth Annual Research Report (1st October, 1972 to 30th September, 1973) of the Faculty of Agriculture, University of Ife, University of Ife Press, Ile-Ife: for the best predictor of available S in a multiple regression equation relating available S(Y) to organic matter and total S:

$$Y = 1.21 + 0.48 (\% \text{ O. M.}) + 0.024 (\text{total S, ppm}) \quad R^2 = 0.373^{**}$$

Adepetu and Adebayoyi (1985) research works on soils of southwest Nigeria and in

conjunction with colleagues from the eastern and northern parts of Nigeria developed critical soil-test values for assessing the fertility status of N, P, K, OM, S, Mg, Zn, B and pH in soils of Nigeria. These have led to the establishment of a table of critical nutrient concentration in plants and in soil for evaluating the nutritional status of the following major arable crops of Nigeria: maize (*Zea mays*) rice (*Oryza* sp.) sorghum, cowpea (*Vigna unguiculata*) and cassava (*Manihot utilisima*).

The Department, in conjunction with other groups, through the works of Adepetu and Sobulo (1987) also contributed to the national establishment of the criteria for grouping the nation's soils into different fertility classes viz., low, medium or high fertility classes. Further work led to the department of Soil Science at Ife producing the First Approximation of the Soil Fertility Classification Map of Southwestern Nigeria (Adepetu, 1986) with an accompanying table of fertilizer recommendation for the component fertility zones of the mapped area. The work has been published by the Federal Government as "Farmers' Advisory Handbook" which is used till date as a standard reference by agricultural extension workers and farmers. A step-by-step procedure was also developed (Adepetu, 1986) for the Federal Department of Agricultural Land Resources which has since been used to develop similar soil fertility improvement advisory guidelines for the other geopolitical zones of Nigeria.

Too short or non-existent fallow period typical of present-day agricultural land use systems has resulted in low soil productivity. Thus, about three and a half decades ago, the Department started Nigeria's first long-term field study experimentation to evaluate the changes in soil physical and chemical properties and its productivity following continuous cultivation with or without fertilizer application. Major conclusions reached after eighteen (18) years of study were that:-

- crop yields decline with years of cultivation, even when chemical fertilizers are applied to the soils;
- the capacity of the plough layer of soil to retain cations from being leached had been reduced by 70% and the soil

organic matter declined by 75% while surface clay reduced by 40%;

- aggregate stability, porosity, and water infiltration rate declined significantly over the years (Aina, 1979);
- uniquely, soil organic matter declined by about 30% within a year of cultivation (Adepetu and Corey, 1975; 1977).

All these point to the significance of organic matter in a continuous cultivation of the soils of Nigeria.

Soil and plant tissue sampling and handling techniques are very vital to the study of nutrient availability and needs of plants. Jaiyebo (1968) studied the role of sample preparation and storage on the exchangeable potassium content of soils of Western Nigeria. Aduayi (1981) deduced that soil samples for fertility evaluation could be stored for up to 3 months and at the temperature of between 15 to 18°C if the interpretation of the results should reflect closely the chemical nature of the soil in the field. And also to achieve a proper assessment of N, P and K requirements of yam plant, leave samples should be taken from the middle portion of the lower canopy and during the period of maximum tuber development. Further studies on crop nutrient requirement (Aduayi, 1980a, b) showed that yam plant would require 200kg Nha⁻¹ while yellow maize would require between 160-200 KgNha⁻¹ using ammonium sulphate as source of N. This, in addition to improving yield of crops, also enhanced the levels of N, Mg crude protein contents of grains, fruits and total chlorophyll contents of leaves (Aduayi, 1979, 1980a, b). Still on yam, studies have shown that excessive usage of ammonium sulphate adversely affected the pounding and storage quality of yam and caused yam tuber to be more susceptible to rot and disease. Works on "Ife plum" tomato showed that B, Zn, and Mo are essential to its growth and that of okro (*Abelmoscus esculentum*). Agbede and Aduayi (1978) on nutrient balance studies reported that tomato plant performed best at P to Mg fertilizer ratio of 1:2 or 1: 1, and that the treatment combinations of 224kgK.ha⁻¹ with 4.5KgBha⁻¹ (i.e., K:B of 50:1) improved plant growth and effectively suppressed the adverse effect of B toxicity in the plant. In a greenhouse

study, Aduayi and Onesirosan (1979) found that the addition of 200 ppmK, which would give a leaf-K value of 1.37%, would result in high fruit yield and growth of tomato plants.

Nitrogen deficiency is a big limiting factor - the most deficient-in most soils. The department therefore, established the second long-term study in 1971 tagged "Nitrogen Fertilizer Trials in Nigeria." The essence is to assess the effect of continuous cultural practices on soil properties and consequently on crop growth and productivity. So far, results showed that ammonium sulphate has an acidifying effect in contrast to those of urea and calcium ammonium nitrate (Obi, 1977) as sources of nitrogen. Using maize, cowpea and tomato as test crops for tolerance to soil acidity, Obi *et al.* (1987) found that maize was the most tolerant and tomato the least tolerant to soil acidity during the more than twelve years of continuous cultivation of field trials. It was also found that continuous cropping of a tropical ultisol with or without nitrogen fertilizer increased soil acidification and reduced soil organic matter and productivity (Obi, 1989). Further addition of nitrogen fertilizer failed to increase yield due to decline in soil pH, increase in the amount of soluble aluminium and consequently inefficient utilization of added nutrients. This study has been recognized as a significant contribution to the Global Directory of Long-Term Agronomic Experiments (Obi, 1993) and also documented as one of the summaries of Models and Experiments contributing to the Global Change and Terrestrial Ecosystem-Soil Organic Matter Network (SOMNET) (Obi, 1996).

Soil acidity reduces soil productivity. Amendment of acid soils with lime is a common agricultural practice world-wide and it brings about improved soil productivity as manifested in the significant increase in fruit yield of tomato when its acid soil growing medium was lined (Obi and Akinsola, 1994). And because of financial impediment in the purchase of imported liming materials, the Department pioneered the use of domestic, industrial and farm wastes as liming materials and as sources of nutrients for arable crops. Obi and Ekperigin (2001) found that wastes such as fluedust, woodash, and silicate slag when added to acid soils significantly

affected the exchangeable Ca, Al, Fe, and Mn, the effective cation exchange capacity, percent base saturation and percent aluminium saturation. The alternative to liming was also evaluated, i.e., alternative or supplemental source of N, to substitute for N fertilizers especially those that hasten the development of soil acidity. Towards this end, Obi and Molindo (1994) evaluated the nitrogen supplying potential of soybean (*Glycine maxima*) and found that the grain yield of maize, which followed soybean cropping and its residue incorporation, was significantly increased.

Within the realms of soil genesis, classification and mapping; soil mineralogy; soil evaluation and land use planning, the focus has been on the characterization of soils and landforms for better understanding of their genesis, classification, and for sustainable soil management and use.

The Department has contributed significantly in the area of contemporary soil genesis. One of such contributions is that exchangeable Al is a potential useful index of an active weathering soil environment, especially in hydromorphic soils formed in parent materials rich in mixed clay minerals of 1: 1 and 2: 1 types (Okusami *et al.*, 1985; and Okusami, 1986a). The pedological studies of floodplain materials and other associated landforms (Amusan, 1984; Amusan and Ashaye, 1989a & b; Oyediran, 1990), and granitic gneiss derived soils in Ife/Ilesa area (Amusan, 1991; Amusan and Ashaye, 1991 and Amusan *et al.*, 1993) have made available additional information on the "Mineralogy of the Soils" needed for deciphering genesis of these different soils from different parent materials. Soil colloids do not easily form clay skins or argillans because of their inability to stay in suspension due primarily to the acid medium (Okusami, 1986c) and this is one of the reasons why absence/presence of argillic horizons has dominated the argument on classification of some of our soils as is typical in all humid tropics of the world.

Within the context of soil resource inventories, the refinement of Nigeria's soil mapping units has been a continuous effort of the Department's research efforts (Ojanuga, 1975; Okusami and Oyediran, 1985; and Okusami, 1986b). Studies have also revealed the proper

placement of Ipele series on a toposequence of soils formed in parent materials of quartzite/quartz schist origin (Okusami, 1991). Okusami (1996) also contains soils on the coastal end of southwest Nigeria that previously constitute gaps in knowledge on soils formed on the lower coastal plain sand of Nigeria. Of particular interest too is the study on the indigenous knowledge (IK) of farmers as it relates to local system of soil classification, land use planning and management (Amusan and Warren, 1993; and Amusan, 2002).

The Department has pioneered researches into the occurrence, properties and utilization potential of some of our neglected wetlands soils in central western Nigeria (Okusami, 1971; Okusami *et al.*, 1974; Okusami and Ojanuga, 1984). Further work by Okusami, while on study leave, gave more information on Nigeria's wetland soils' occurrences by landform/parent material types, their characteristics (including their mineralogy and classification) and management requirements (Okusami, 1986a; Okusami and Rust, 1992). The postgraduate theses of Oyediran (1987 and 1990) produced in the Department extend the knowledge on the extent and variability of this soil type within the subhumid parts of Nigeria. These research efforts have been stimulated by the desire towards optimal utilization of these wetlands for rice production and dry season crop (Okusami *et al.*, 1974). Increase in upland rice production through appropriate soil management for improved soil productivity also features in the Department's research outlook (Okusami, 1991).

Studies into the identification of criteria for the evaluation of soils/land for sustainable use and management (Okusami, 1990, 1991) are on-going. Some of the preliminary results indicate that depth of the surface soil horizons, presence of plinthite and petrophinthite, water-table regime and associated physiographic units are important indicator properties for mapping degradable landscapes.

Modelling to evolve equations that will improve the ability of tropical based soil scientists to extrapolate is documented in Okusami *et al.* (1987). This is expected to facilitate the derivation of CEC (cation exchange

capacity), a value very vital for taxonomic categorizations of our soils especially at higher taxa. The idea was to evolve ways of using minimum data set to generate data that mostly are sometimes currently very expensive or impractical for our laboratories to generate on a routine basis.

Soil evaluation and appropriate land use plans have been used to add value to pedological investigations into several of our soils and their landforms. The Department has ably participated in such studies and advisory programmes (Okusami *et al.* 1988; Okusami, 1989; Department of Soil Science Staff, 1979, 1982; Obafemi Awolowo University, 1993, etc.).

Soil is part of the environment. And since soil is the medium and/or depository of the pollution generated from industrial, agro-industrial and urban wastes, some of the works emanating from the Department have also studied soils in the context of soil and environmental quality. Such works include those of Oyedele *et al.* (1995) and Amusan *et al.*, (2000).

LINKAGES: Past and Present

- **USAID/University of Wisconsin, Madison, U.S.A.: 1962-1975**

The Department benefited from this linkage just like other Departments within the Faculty. Early teaching and research foci of the department were clearly defined. Some of the existing staff members benefited from training programmes initiated by this linkage.

- **International Centre for Theoretical Physics (ICTP), Trieste, Italy.**

Some staff members (Aina, P.O., in 1978, 1989; Okusami, T.A. in 1985 Oyedele, D.J., in 1998) participated in sponsored workshops/conferences organized by the Centre. Notable linkage was a staff member that went on the Associateship programme (Aina, P.O. 1988-1993, Oyedele, D.J. 2002-2007). The Department is now on the mailing list of its news and information bulletins from ICTP. We also receive regular updates on other related issues.

- **International Board for Soil Research and Management (IBSRAM), Bangkok, Thailand (IFE/IDRC/IBSRAM ACID-SOIL PROJECT)**

This center coordinated "An International Project on the Management of Nigerian Acid Soils for Optimum Crop Productivity" with funding from the International Development Research Centre (IDRC) of Canada. The project was initiated in 1992 with the major objective of evolving soil management techniques for sustainable optimum crop productivity on the acid soils of Nigeria. The research team was led by Dr. A. Olu Obi, but initiated principally by Late Professor T.I. Ashaye.

- **Third World Academy of Science (TWAS), Trieste, Italy.**
- * Okusami, T.A. - Associate Member, 1998-
- **United Nations University Institute for Natural Resources of Africa (UNU/INRA), Accra, Ghana.**
- * Aina, P.O., Consultant, United Nations University Programme on Natural Resources in Africa.
 - Work Plan Phase IV Natural Resource Field Survey, 1993.
- * College Research Associate (CRA)
 - Okusami, T.A. - foundation member of the College Research Associate of UNU/INRA: 1999 - present; recipient of a research grant, 2002.
 - Oyedele, D.J. - member CRA, 2002.
- **International Foundation for Science, IFS (Sweden)**
 - Oyedele, D.J.: recipient of IFS Research Grant (1997)
 - Okusami, T.A.: Scientific Adviser, 2002 -
- **University Development Linkage Programme (UDLP)/USAID.**
 - Amusan, A.A., was a member of the UDLP group, an international manpower development programme that involved four higher institutions each in Nigeria and the U.S.A. and funded by USAID.
- **Inland Valley Consortium (IVC)/WARDA, Boake, Ivory Coast.**
 - Okusami, T.A.; represents the Department/University as a member of the National

Coordinating Unit (NCU) on the characterization and utilization (actual/potential) of inland valleys in Nigeria.

- **Food and Agricultural Organisation (FAO) of the UN, Rome.**
 - Aina, P.O.; Consultant, Appropriate Rotational Tillage Systems for Soils and Crops in Southwestern Nigeria, 1991-1994;
 - Consultant, Management Options for Productive Surface Soil Maintenance, 1992-1994.
- **DAAD (German Academic Exchange Programme)**
 - Okusami, T.A.; University of Kiel, Kiel, Germany, Oct. - Dec., 1990.
 - Aina, P.O.; German Institute for Tropical and Sub-Tropical Agriculture, .. Witzenhausen, Germany- Sept. - Nov., 1991;
 - Institute for Soil and Plant Nutrition, Braunschweig, Germany, Sept. - Nov., 1995.
- **IAEA (International Atomic Energy Agency) Fellowship:**
 - Aina, P.O.; Visiting Research Fellow, Land, Air and Water Resources Department. 1984-1985.
- **Journal of Plant Nutrition:**
 - Aduayi, E.A.; Associate Editor (1977-1997)
- **International Rice Research Institute, Manila, The Philippines.**
 - Adebayo, A.A.; Visiting Scientist, 1987-1989.
 - Department of Soil Science, O.A.U.: On the mailing list of the International Rice Research Notes and other educational materials.

SERVICES TO THE COMMUNITY

- **Professional Societies**
- * **Soil Science Society of Nigeria**
 - Dr. A. Olu Obi, Treasurer: 1988-2003
 - Dr. A. Olayinka, Business Manager, Nigerian Journal of Soil Science (A Publication of the Society).
Professor T.A. Okusami, Chair, Honours/Awards Committee: 2001 -

date; and Deputy Editor-in-Chief, Nigerian Journal of Soil Science: 2002

***African Soil Science Society**

- Dr. A. Olu Obi, Secretary: 2002 to date
- Member, Editorial Board, African Soils: 2002 to date

Community:

- Professor J.A. Adepetu, Member, Board of the National Universities Commission (NUC) of Nigeria, 2002 to date
- Professor E.A. Aduayi, Member, National Universities Commission (NUC) Accreditation Panel.

OUTLOOK FOR THE FUTURE

This Department is normally highly capitalized. It should normally house such equipment as the atomic absorption spectrophotometer (including the plasma model); flame photometer; infrared spectrometer; x-ray diffractometer and fluorescence; electron microscopes; petrographic microscope and accessories; and GIS and Remote Sensing Analytical Equipment to mention some of the highly technical analytical ones that are needed to study the chemical and mineralogical characteristics of soil, water and plant. By implication, different laboratories have different functions and therefore would house different equipment and other facilities needed to characterize and monitor the environment. It is hoped that the Department would continue to grow in time and space to face the teaching, training and research challenges that present and future land use changes would foster on our expertise and facilities.

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