

AGRICULTURAL ENGINEERING EDUCATION IN NIGERIA

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Abstract

Early agricultural engineering services required on Nigerian farms were provided by civil engineers and agronomists some of who later retrained to form the first crops of Nigerian agricultural engineers. Agricultural engineering training was substantially done overseas until about the early 1960s when local opportunities started to be available. Agricultural engineering education started with training in farm mechanization laying emphasis on tractorization in the colleges of agriculture and polytechnics, and later expanded to cover all aspects of agricultural engineering. Agricultural engineering education in Nigeria is offered by the universities, polytechnics and colleges of agriculture. Ownership and funding of tertiary institutions include the federal and state governments, private individuals and religious organizations. Quality assurance is achieved through setting of minimum academic standards and occasional programme accreditations by the Nigerian universities commission, the national board for technical education and the council for the regulation of engineering in Nigeria. Agricultural engineers are engaged in virtually all sectors of the economy. This paper discusses the historical development of agricultural engineering education in Nigeria highlighting the entry requirements, training and regulations, professional bodies and the sectors where the products are making their contributions towards the national development. It concludes by calling on all stake holders to understand and appreciate the role of the profession in national development and give it the desired support.

Key words

Agricultural engineering, accreditation, Council for the regulation of engineering in Nigeria, minimum academic standards, National universities commission,

1. Introduction

Prior to the 1960s, engineering problems on Nigerian farms were tackled using the expertise and services of agriculturists and civil engineers, as agricultural engineering was unknown as a discipline in Nigeria. Because of the popularity the agriculturists and civil engineers enjoyed in providing engineering services on the farm, some of them took interest in the profession and sought for opportunities to retrain themselves in what today forms the agricultural engineering curriculum. Some of the pioneer agricultural engineers in Nigeria were therefore also specialists of other disciplines. Because there were no local training opportunities, those who were interested had to train outside Nigeria. Many of the

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pioneer agricultural engineers had a part or whole of their professional education outside Nigeria.

Gradually, the relevance of agricultural engineering began to be appreciated both by the government and those engaged in agricultural practices and local opportunities for full-fledged training of agricultural engineers were considered desirable. Local training of agricultural engineers in Nigeria started with the teaching of parts of the present day agricultural engineering curriculum to students in the schools and colleges of agriculture such as in Akure, Ibadan and Zaria, and faculties of agriculture in some universities. Some of such graduates were awarded degrees, diplomas and certificates in agricultural mechanization but not agricultural engineering.

In 1963, a department of agricultural engineering was established at the university of Nigeria, Nsukka and in 1967, the department awarded the Bachelor of Science (B.Sc) degree in agricultural engineering to two graduates: Messrs U.P Okudo and E.Nwalo. That was to usher in a new era of local training of agricultural engineers. Other universities took their turns in the establishment of agricultural engineering programmes while the programme also became a component of most of the polytechnics and colleges of agriculture established thereafter.

For the 2005/2006 academic session, the Joint Admissions and Matriculation Board, JAMB, conducted university entrance examinations to 16 federal universities, 3 federal universities of agriculture, 5 federal universities of technology, 15 state universities, 4 state universities of technology, 6 private universities, and 17 other degrees awarding institutions. During the same period, the board conducted entrance examinations to 18 federal polytechnics and 27 state polytechnics. Most of these institutions offer the agricultural engineering programme. (<http://www.jambng.com/institution.php>)

2. Admission and graduation requirements

Two criteria must be met by candidates who wish to be admitted to a university degree programme in any discipline in Nigeria, agricultural engineering inclusive. One is obtaining passes at credit levels in a minimum of five subjects at one sitting or six at two sittings in the Senior Secondary School or the General Certificate examinations. For agricultural engineering, these subjects include English language, mathematics, physics, chemistry and another subject, preferably a science related subject. The second criterion is sitting and passing the universities matriculation examination and obtaining a grade higher than the cut-off mark for the programme during the year the examination is taken.

Courses taken by students in tertiary institutions in Nigeria are grouped into three. These are the compulsories, the required and electives. Compulsory courses are those courses that are considered very important to the discipline which students must not only have knowledge of, but should have a minimum pass in them before they can be regarded as full

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baked products. Required courses are considered relevant and knowledge of such courses is considered adequate. Student must register for them and have the knowledge but they need not obtain a pass mark in the examination before they are graduated. There are a number of courses which would not put the students at a disadvantage if they do not register for them but because there could be benefits from having the knowledge, they are recommended. Students may ignore the recommendations and would suffer no penalty. These are the electives.

Graduation requirements have undergone changes all over the years. At a time the courses taken at the preliminary level which has now been replaced with the 100 level of the degree programme were not considered as part of the requirements for graduation. When the programme was increased to five years and the preliminary level was phased out, part of the courses taken at the first year were not taken into account. At that time, it was only the compulsory courses that needed to be passed and whatever total number of units that was required for graduation was made up from the best of the required and electives. At present, a number of Nigerian universities operate the cumulative grade point average system (CGPA). Under this system, all courses taken by a student are used in calculating his class of degree. That is of-course after meeting the other faculty and departmental criteria. Where a course is repeated, it is counted twice when computing the candidate's results. Although courses are still listed under the three headings of compulsory, required and electives, in practice, all the courses the student register for become automatically compulsory since the old leverage of 'pass some and fail some' and get a degree has ceased to apply.

3. Curriculum

Agricultural engineering is the application of engineering knowledge and principles to the solution of agricultural problems, aimed at the production and delivery of food and fiber to the world under safe working conditions while protecting the environment (Henry et al, 2000; Senzanje, 2003) If the agricultural engineer must be able to meet with this definition, he must be adequately equipped and hence the curriculum must be so designed that he gets the appropriate training. Early agricultural engineering curricula were heavily loaded in favour of farm machinery as the profession was assumed rightly or wrongly to be synonymous with tractorization. With time the meaning and role of agricultural engineering became more clearly understood even by the agricultural engineers themselves and the curriculum was re-developed.

The agricultural engineering curriculum is anchored on three points which are to ensure adequate theoretical instruction, adequate practical exposure and entrepreneurship. The curriculum can be broadly divided into three parts. In the first two years, students are exposed to the basic engineering courses such as design of machine elements, engineering drawing, fluid mechanics, soil mechanics, principles of electricity, statistics, economics, advanced mathematics, material science, meteorology, workshop practice,

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thermodynamics and land survey. In many universities, the agricultural engineering programme is based in an engineering faculty where the various engineering programmes are offered. This provides a ready opportunity for the agricultural engineering students to register and take these engineering foundation courses within the faculty and the department does not necessarily have to be saddled with the financial and human resources to meet this aspect of the curriculum.

Students actually get into the agricultural engineering program in the third year and they spend the third and fourth years in studying agricultural engineering courses in the various specialized areas of farm power and machinery, crop processing and storage, soil and water conservation, drainage and irrigation, structures and environment, electricity and energy. Of recent, information technology and computer application and simulation, have been emphasized.

With a broad knowledge of what agricultural engineering is all about at the end of the fourth year, students in their final year are encouraged to pick an independent student project which in most cases determines the area of specialization that they would be interested in after the first degree level.

The postgraduate programme is more specialized as most students come in with field experiences and are already focused as to what aspect of the profession they are interested in furthering their frontiers of knowledge.

The curriculum also referred to as the minimum academic standard is designed by the National University Commission in collaboration with the Council for the Regulation of Engineering in Nigeria, both of which depend on the expertise of the academic staff of the various agricultural engineering programmes for university programme, while in the polytechnics and colleges of agriculture, the responsibility is that of the National Board for Technical Education. The objective of setting minimum academic standards is to ensure that no matter which institution a student graduates from, he or she has the minimal capacity to provide the required agricultural engineering services. The benefit of this becomes more appreciated when it is realized that an individual has the option of undertaking an undergraduate programme in one university and the postgraduate in another. It is only a minimum standard at the undergraduate level that can guarantee that such a student will be able to pursue a higher degree in another institution.

The agricultural engineering curriculum is constantly being reviewed to accommodate new development in agriculture and to expand the entrepreneurial potentials of agricultural engineering graduates.

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4. Training duration

The Bachelor of Science degree programme in agricultural engineering is of five academic sessions during which the students are exposed to industrial training for a total period of twelve months. This industrial training period is broken into three parts of three, three and six months. The first industrial attachment is undertaken during the vacation period at the end of the second year, the second training comes during the vacation period at the end of the third year while the last one for a duration of six months commences at the beginning of the second semester of the fourth year and lasts till the beginning of the following academic session when the students return to school for the final year work.

Industrial attachment is not peculiar to the agricultural engineering discipline and all institutions have a unit that coordinates industrial training activities at institutional level while a national body by the name Industrial Training Fund (ITF), gives national supervision to the entire system. During the industrial training period, students are posted to places of relevance to the profession.

To ensure that students are serious with the training, they are regularly visited by academic staff from their various departments. At the end of each of the trainings, students are expected to present a written report of what activities they were involved in during the training and what experiences they have gained. A seminar is also arranged during which students share their field experiences. Industrial training reports and seminars are given the same weight as other academic courses. They are graded and form part of the requirements for the award of the relevant certificates.

The duration for the National Diploma is two years at the end of which students have the option to opt out and look for job or consider proceeding to the higher national diploma programme if they attain the minimum requirements of an average of 60% at the OND final examinations. Where a student qualifies to proceed to the higher national diploma level, the regulation requires the student to have a minimum of twelve months industrial training in a relevant establishment.

The postgraduate diploma programme is a one year programme designed to prepare HND graduates from the polytechnics and non-agricultural engineering university graduates so that they can be equipped to undertake a master degree programme in agricultural engineering.

The duration of the master's degree programme varies from university to university but it is for a minimum of three semesters. The doctorate is in most cases done on part-time basis but where it is undertaken full time, the minimum duration after the master's degree is four semesters.

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5. Certificates awarded

Agricultural engineering training at the university level leads to the award of degrees while at the polytechnics/colleges of agriculture, the diplomas are awarded. While the university is expected to train full fledged engineers and the programme is so designed, the polytechnics/colleges of education are targeted at students who are more practically oriented and to provide the middle level manpower required in the field and industries.

There are seven classes of certificates awarded in agricultural engineering training in Nigeria. These are the Ordinary National Diploma (OND), the Higher National Diploma (HND), the Bachelor of Science/Engineering (B.Sc/B.Eng), the Postgraduate Diploma (PGD), the Master of Science/Engineering (M.Sc/Eng) and the Doctorate degree (PhD). While the OND and HND are awarded by the Polytechnics and Colleges of Agriculture, the others are awarded by universities.

6. Regulatory Bodies and Professional Societies

A professional Regulatory body is a body established by a decree or law whose primary function is to regulate the training of members of the profession and the professional practice while a professional Society is an association formed by members of the profession with the primary objective of providing a forum where members of the profession can interact to share ideas.

For most programmes in Nigeria tertiary institutions, there are two regulatory bodies. One is an organ of the ministry of education who bears the burden of funding the programme and the second is a professional one concerned mainly with the adherence to the ethics of the profession. The National Universities Commission, (NUC) and the National Board for Technical Education (NBTE) are organs of the ministry of education that oversee all academic programmes in the universities and polytechnics/colleges of agriculture respectively. Each programme has its own professional monitoring body.

The professional regulatory body for agricultural engineering in Nigeria is the Council for the Regulation of Engineering in Nigeria (COREN). The Nigerian Institution of Agricultural Engineers (NIAE) provides a forum for Agricultural Engineers to interact among themselves while the Nigerian Society of Engineers (NSE), the umbrella association of all engineering disciplines in Nigeria provides a bigger forum where in addition to interacting with themselves, Agricultural engineers can interact with other engineering professionals.

(a) The Council for the Regulation of Engineering in Nigeria (COREN)

The Council for the Regulation of Engineering in Nigeria (COREN) is not a society but a regulatory body established under the Federal Government of Nigeria Decree No. 55 of

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1970 and amended by Decree No 27 Of 1992 , to control and regulate the practice of the engineering profession in all its aspects and ramifications in Nigeria.

The primary responsibility of this body is to determine who can be engineers through the screening of academic qualifications; evaluation of practical experience and performance in a written examination and/or oral interview. Those found suitable are admitted as engineers and their names, addresses, approved qualifications and such other particulars as may be specified are included in the *Register of Engineers*, which is a register that contains the names of all persons who have been considered by the Council as satisfying the requirements for registration as professional engineers.

To be qualified for registration as an Engineer by COREN, a candidate must have attended an approved course of training in any of the branches of Engineering in an approved Institution within or/and outside Nigeria at the end of which the candidate has been successful and is awarded a certificate or degree recognized by the Council.

Candidates intending to be registered as Engineers obtain relevant application forms from the Council which when duly completed is returned along with a Post-graduate engineering experience Report of the candidate. Such candidates may be required to sit for an examination and an interview the successful outcome of which would determine their registration.

As the regulatory body for engineering practice in Nigeria, it is an offence for an individual who is not registered with this Council to address himself as an Engineer, hold an engineering position in any establishment or supervise the execution of engineering projects.

(b) The Nigerian Institution of Agricultural Engineers (NIAE)

Attempts to have a forum for agricultural engineers in Nigeria date back to 1965. That year, Professor Cargill of the University of Nigeria, Nsukka, Mr. Hewitt of BEWAC Nigeria Limited, Dr. Layide Onafeko, Engr Deji Osobu and Professor F.O. Aboaba got together to start a professional society to be known as the Nigerian Society of Agricultural Engineers. It was decided to include non-graduates such as technologists with National Diploma or certificate in agricultural engineering as members. Such members included Messrs Achike, Otuyalo and Solagbade. Mr. Hewitt was elected chairman while Professor Aboaba was the secretary.

The society took off with regular holding of meetings and held the first conference in Benin City in 1967. It was during the conference that the state of Biafra was declared which marked the beginning of the Nigerian civil war from 1967 to 1970.

The Nigerian civil war prevented the society from functioning until 1975 when with the incoming of a crop of young and dynamic Nigerian agricultural engineers; the society was

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resuscitated with Professor Ayo Makanjuola as president. The society effectively took off once again with the following objectives:

- (a) To promote the science and art of engineering in agriculture.
- (b) To encourage agricultural research.
- (c) To foster and promote agricultural engineering education.
- (d) To advance in every possible ways the standards of agricultural engineering.
- (e) To promote the intercourse of agricultural engineers among its members and with allied technologies.
- (f) To encourage the enhancement of professional competence of its members.

These objectives are pursued through seminars, workshops and conferences which provide fora for interaction among members; constant review of the Agricultural Engineering curricula taught in various tertiary institutions and funding of relevant researches in Teaching and Research Institutions.

Membership of the society is opened to those who have either undertaken or are undergoing a professional Agricultural Engineering Curriculum and others who may not necessarily be Agricultural Engineers by training but who in the course of their employment or research have contributed or are contributing to the advancement of Agricultural Engineering. Table 1 outlines the various grades of membership of the institution.

Between when it was founded and 1999, the institution existed as a society and was then known as the Nigerian society of agricultural engineers (NSAE). Considering the benefits derivable from being a division under the umbrella organization for the engineering profession in Nigeria; the idea of a merger with the Nigerian Society of Engineers (NSE) was mooted. On the 27th of July 1999, a formal merger agreement was signed between NSE and NSAE. Upon signing the agreement, the name was changed to NIAE and it became a division of the NSE.

The Institution maintains a national secretariat within the premises of the National centre for agricultural mechanization, Ilorin

(c) **The Nigerian Society of Engineers**

The Nigerian Society of Engineers (NSE), is the national umbrella organization for the Engineering Profession in Nigeria. It was founded in 1958 with the objective to promote the advancement of engineering education, research and practice in all its ramifications. This is with a view to maintaining and enhancing the professional capabilities of its members so as to better equip them to fulfill the needs of the profession for the good of the public and the nation.

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Membership of the Society is open to all those who possess qualifications that are acceptable to the Council of the Society and registrable by the Council for the Regulation of Engineering in Nigeria (COREN). There are seven grades of membership namely Honorary Fellow, Fellow, Corporate Members, Associate, Graduate, Student and Corporate Firm.

The highest policy making body in the Society is the Council which is elected by Corporate Members and headed by the President. The Society operates a Secretariat, currently housed at the National Engineering Centre, Lagos. A full time Executive Secretary heads the Secretariat. Overall Co-ordination of the Society's activities is carried out from the Secretariat.

As an umbrella organization, all the engineering disciplines that are currently practiced in the country are duly catered for. Some of the disciplines are organized as Divisions of the Society to enhance individual career development. Some of these divisions include Civil, Mechanical, Electrical, Structural, Chemical, Metallurgical, Industrial, Agricultural, Geotechnical, Association of Professional Women Engineers, Petroleum, Aeronautical and Environmental. The Chairmen or Co-coordinators of Divisions are all members of Council. The Society is also organized into branches based in various cities around the country to cater for the local activities of members

d) The National Universities Commission (NUC) and the National Board for Technical Education (NBTE)

These two organs of the federal government are responsible for the supervision of the universities and the polytechnics/colleges of agriculture respectively, and it is through them that funds are disbursed to the institutions. The Nigerian Universities commission was established by decree No. 1 of 1974 which has been amended at various times as the need arises to enable the commission function effectively.

These organs in collaboration with the various professional bodies, set minimum academic standards for all academic programmes, agricultural engineering inclusive. These standards are also regularly reviewed to accommodate new frontiers of knowledge. Regular visitation to ensure adherence to the minimum standard is a major responsibility of these bodies.

Although the ownership and funding of tertiary institutions in Nigeria cuts across the federal and state governments, private individuals and religious organizations, the approval to run any programme is vested on these bodies whose responsibility, it is to ensure that the minimum standards are met before an institution can commence a programme

e) The Joint Admissions and Matriculation Board (JAMB).

The joint Admissions and Matriculation Board was established by decree No 2 of 1978 and amended by decree No 33 of 1989, to screen through examinations and place those qualified and subject to existing vacancies in the universities, polytechnics and colleges of education or by whatever other names they may be called in Nigeria. It is this body that

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recommends candidates to the various institutions for admission after having verified that they have the requisite passes at the senior secondary school final examination or its equivalent and pass the entrance examination conducted by the body.

Table 1: NAIE Membership Grade

<u>S/No.</u>	<u>Membership Grade</u>	<u>Definition and Qualification</u>
1	Student Member	An undergraduate or postgraduate student who is registered in a professional Agricultural Engineering curriculum (or its engineering equivalent) in a school approved by the society
2	Graduate Member (Grad. NIAE)	A person who has undergone a professional Agricultural Engineering curriculum or its engineering equivalent in a school approved by the society <u>but</u> has less than two years of post-qualification experience in the practice of Agricultural Engineering
3	Member(MNIAE)	A person who has successfully undergone a professional Agricultural Engineering curriculum or its engineering equivalent at a school approved by the society and who after graduation has had not less than two years of experience in agricultural engineering practice
4	Fellow (FNIAE)	A person who satisfies the requirements for the grade of member and has actually been a member for not less than ten years and must have been actively involved in the agricultural engineering profession for not less than twenty years.
5	Affiliate Member	This may be an individual who is not necessarily a professional engineer, but who through employment, scientific attainment or practical experience is considered qualified to co-operate with agricultural engineers in the advancement of engineering knowledge. A holder of the higher National Diploma (HND) in Agricultural Engineering is qualified for the grade of affiliate.
6	Honorary Member	An Honorary Member is a person who is not an agricultural engineer but who has made outstanding contributions to the profession of agricultural engineering. This criterion is also used in some cases to elect non-agricultural engineers to the position of Honorary Fellows of the Institution.

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7. Accreditation

Henry et al (2000), outlined the benefits of academic programme accreditation as follows

- i) it helps students choose educational programmes and even the institution where to go.
- ii) it assures parents of the quality of education being given to their children
- iii) it helps the institutions to improve their programmes since during the visitation period the programme deficiencies are always pointed out. (In many instances, programmes receive substantial grants in preparation for accreditation and proprietors always ensure that the deficiencies are rectified with minimum delay).
- iv) it helps employers to recruit well-prepared students, (since from the visitation panel reports which are not classified documents, employers know the rating of programmes in the various institutions where they are offered.)
- v) it allows the industries to voice out their educational needs to the institutions.
- vi) it provides a base for registration licensor and certification boards screening applicants for entry into professional practice.

From time to time, NUC/NBTE and COREN send visitation panels to institutions offering engineering programmes the aim of which is to ensure that the minimum standards in terms of curriculum, number and calibre of teaching and technical staff and facilities including laboratories and classrooms specified by the Council for the training of potential engineers are met. Among the criteria considered during such assessments are as follows:

a) Curriculum: Although the three bodies, NUC, NBTE and COREN set minimum standards for agricultural engineering programmes, the various institutions offering the programme are not only to ensure that the minimum content is taught but rather what is actually delivered to the student should be above the minimum. The regulatory bodies from time to time visit the various departments where the programme is offered to ensure compliance with these minimum academic standards.

b) Laboratory facilities and classrooms: No matter how well written a programme may be, if there is no conducive environment for its delivery, the products will at best be half baked. Minimum standards for classrooms, and laboratory space and equipment are set which departments either offering or intending to offer the programme must meet before it can either be granted permission to take off or continue to train students. The panel does not only satisfy itself by sighting the facilities but in most cases they are demonstrated to convince the panel of their functionality.

c) Quality of academic and technical staff: The visitation panel will also be interested in the academic and professional qualifications and teaching experiences of the academic staff. Added to this, is the fairly even spread of the academic staff among the various areas of agricultural engineering so that there is no aspect that is left uncovered. A good proportion of the academic staff are supposed to be registered with the council for the

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regulation of engineering in Nigeria (COREN). By COREN regulations, no department offering agricultural engineering programme in either the university, polytechnic or college of agriculture should be headed by an individual who himself/herself is not a registered engineer. This regulation applies to all fields of engineering. Since technical staff are often responsible for the conduct of practical classes, the panel must satisfy itself that sufficient number of such personnel are available to carry out the practical component of the various courses.

d) Quality of examination questions: specimen of past examination questions, marking schemes and external examiners' reports form part of the submission to the panel. These self explanatory documents present the standard of questions taken by the students passing through such a programme. In some cases, students' practical reports and field notes may be requested.

e) Office accommodation for staff: Just as important as the classroom where lectures are delivered, so also is the office accommodation of persons expected to teach. Minimum office space and furnishing are recommended and the panel must be convinced that this is met.

Depending on the submission to each of these criteria, the panel may pass any of the three verdicts: fully accredited, interim accredited and not accredited.

A programme is said to be fully accredited if in the opinion of the visitation team, the content of the curriculum does not fall below the minimum standard, classrooms and laboratory facilities are adequate compared to the number of students on the programme, and there are adequate number of qualified and well spread personal to teach the curriculum to the students such that at the end of the training period, the graduates are adequately equipped to practice and deliver agricultural engineering services.

Interim or partial accreditation means that the programme has not completely passed the acid test. Such a programme has met some of the criteria but has not met the others. For example, one programme may have a good curriculum and good classroom and laboratory facilities but does not have the personnel to teach the programme, while another programme may have a good curriculum and well qualified staff but does not have the classrooms and laboratory facilities needed to teach the students in the programme. Where this is the finding of a panel, the flaws are outlined and the department where the programme is hosted is given a time frame within which such deficiencies should be rectified and a repeat visitation made.

Denied accreditation arises when in the opinion of the panel; the programme is ill-equipped to train students. For example, if a department has only a few young lecturers with limited experience and lack most of the relevant laboratory equipment, even though

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such a department may issue certificates to its products, such products are not worth the paper on which their names are written and they are a potential danger to the profession. Where the panel meets such a programme, it will be denied accreditation. By regulation, a programme that is denied accreditation should be scrapped since it is incompetent to deliver the services for which it was established.

In recent years, full accreditation has become a herculean task and only very few departments have been able to achieve this with a majority getting an interim accreditation. The reasons for this development are obvious. The brain drain syndrome in Nigeria has not spared the profession as most of the experienced and practically oriented agricultural engineers have shun teaching jobs and either leave the country for greener pastures or are within in the private sector where their prospects are better. The irregular academic session which has become part of the Nigerian tertiary educational system for close to a decade arose out of demand by academic staff in the institutions for increased funding which would guarantee the provision of minimum learning and teaching environment. While it will be unfair to say that the various bodies responsible for funding the institutions have not responded to these demands, their response is a drop in an ocean and a far cry from what will be needed to provide the required facilities.

8. Areas of employment

Most of the early agricultural engineers in Nigeria were employed by the state and federal ministries of agriculture while a few took up teaching and research appointments with the schools of agriculture and agricultural related research institutes where they taught basic agricultural engineering courses such as farm tractor, irrigation and drainage. These avenues of employment expanded when later agricultural engineering programmes were established in the universities. More research institutes involving agricultural engineering research were also established. Employment was not a problem as the population of agricultural engineers was inadequate to meet the requirement of the ministries of agriculture. The order was transition from the classroom to a well paid- employment. This situation applied to all disciplines in Nigeria.

As the profession became popular in the country, the number of graduates increased and the ministries, teaching and research institutions could not absorb all the graduates. Early alternative employers were private and corporate large scale mechanized farms and equipment manufacturers and service provider. Such companies which had their parents' bodies overseas included the BEWAC; J.Allen; R.T Briscoe and the UTC to mention a few. These companies did not only provide good conditions of service for the recruited agricultural engineers but they were in addition sent to their home country for further practical exposure. Up till the late 70s, there were still guaranteed employments for graduates and agricultural engineers had the option of choosing where they wanted to work. The scenario however changed between 1979 and 1983, when the problem of

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unemployment in all sectors of the economy started to manifest and the hope of transforming from school to well paid job became a mirage. The one year national youth service scheme which hitherto provided ample time for graduate to look for jobs became more of a curse than blessing as most employers found it cheaper to utilize youth corpsers, whom they were at best paying meal allowance and were sure that one set will always come after the other. It was therefore not important employing graduates on a permanent appointment.

As the situation worsened, most agricultural engineering graduates considered the option of looking for jobs which traditionally would not be sought for by agricultural engineers, and all they needed was a little re-orientation. Building on their agricultural engineering background, the curriculum of which spread across all engineering disciplines, statistics, general agriculture, economics and engineering law, many agricultural engineers went for both full time and part-time short courses in management and could fit in into various sectors such as the oil companies, the financial industry, the manufacturing industries especially the agro-based ones and even in the information technology industry.

Some agricultural engineers felt it was not worth it taking up paid employments, and would rather be self-employed and graduate to employers even if they had to start from the scratch. There is at present a large number of agricultural engineers who are self employed and have grown to become employers of both agricultural engineers and graduates of other disciplines Machine fabrication companies, animal and crop production farms, manufacturing companies started by agricultural engineers on a small scale but which have today metamorphosed to large scale enterprises abound in various parts of the country.

In wherever they are working, most agricultural engineers attribute their success to their agricultural engineering background

The Nigerian institution of agricultural engineers in 2001 attempted a compendium of places of employment of agricultural engineers in Nigeria, but the project was unsuccessful because it became virtually impossible to capture all areas where agricultural engineers were working

9. Professional hurdles.

A name is an identity, and one school of thought has it that the name of an individual gives an impression, although most oftentimes wrongly, as to what the fellow is, his failures and success in life. Agricultural engineering is one profession whose name, aims and objectives and its role in the society have been grossly misunderstood even by the agricultural engineers themselves. Because the earliest agricultural engineering intervention had much to do with the reduction of drudgery with the use of tractor, for a very long time

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agricultural engineering was synonymous with tractorization. Early agricultural engineering curricula dwelled mainly on tractor application and repairs such that when the name was change to farm mechanization and much later agricultural engineering following a better knowledge of the profession, its widening curriculum and role in agricultural development, many did not perceive it beyond the already well known tractor maintenance and use.

This wrong notion and the herculain task of disabusing people's mind have seriously affected the development of the profession in many areas. At least in many of the universities, the agricultural engineering programme is based in the faculty of engineering where a number of other engineering disciplines are offered. Data from annual results print out from the Joint Admission and Matriculation Board (JAMB), normally show agricultural engineering as one of the least subscribed engineering courses. In many cases, those who choose the course, make it a second choice as a guarantee of securing a place into the universities should they not be offered admission to the course of their first choice. The long term plan of such candidates is to get admitted into the university and thereafter seek for change of course to those other more competitive engineering disciplines they are interested in. Faulting potentials candidates for this attitude is difficult as there are enough evidences to prove to them that opting for agricultural engineering as a career is tantamount to mortgaging their future.

Even though many secondary schools have carrier units which counsel students on what career they could best be fitted , taking into account records of their school performance, interaction with a number of secondary school students reveal that many are influenced into choosing a particular carrier by their impression of people who are in that profession. That one could choose a particular career and yet not successful does not convince them but rather, the affluence of an individual is a result of his chosen carrier. This becomes difficult to disabuse when in the same society, members of one profession live in affluence while those of another are struggling to make ends meet. In the Nigerian context, the purpose of pursuing a higher education is to lay the foundation of future progress in life and the agricultural engineering in the opinion of prospective candidates does not offer the best option.

This opinion which one would attempt to convince the students to discard is rather confirmed while pursuing the programme by the non-availability of any form of financial aids for agricultural engineering students. Where students from other engineering disciplines especially petroleum and civil, have the option to choose as to which of the scholarship schemes they would want to apply and compete for, none exists for the agricultural engineering students. It is clearly difficult to convince the student that his role in the society is as same as that of students from other engineering disciplines.

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The agricultural engineer has his first post-graduation unpleasant experience when he either sees an advertisement for a job that is clearly an agricultural engineering in nature, but the list of those qualified to apply does not include agricultural engineers. Some have ignored such advertisements and put in application and at interviews are bluntly told that an agricultural engineer is not the best trained person for that job. Interestingly, such interview panels have an agricultural engineer on the team.

These and a catalogue of other problems have militated against the number of students who are admitted into the programme every year. Besides the smallness in the number of annual intakes, some at the end of the first year fail to meet the requirements to proceed to the second year since they were not the very best, and are asked to withdraw while some of those who qualify to proceed to the second year, and bent on pursuing the programme of their initial dream, request for transfer to other programmes. The university regulations allow this. The resultant consequences are a further reduction in the number of students that proceed and graduate.

Disturbed by this development, the Nigerian institution of agricultural engineers has at various times taken measures to redeem the situation. The first initiative was a review of the curriculum. The curriculum was reviewed to accommodate more courses from other engineering disciplines, the humanities and social sciences. This was to increase the entrepreneurial potentials of the agricultural engineering graduate. This yielded very little positive results as most employers who already formed an opinion, did not see the individual called an agricultural engineer different from a mechanic or tractor driver no matter what additional information was taught to him for as long as he wears that tag *agricultural engineer*.

The problem of relegation in the profession is not only peculiar to Nigeria and what others have done elsewhere is to change the name of the profession to others such as agricultural and environmental technology, agricultural engineering technology, agricultural operations management, bioresource engineering technology and agricultural technology management.

The Nigerian institution of agricultural engineers saw wisdom in this and decided to take a cue. At the 1999 Annual General meeting of the institution held at the Federal Polytechnic Bauchi, on the 9th of September 1999, the institution passed a resolution to the effect that the name agricultural engineering be changed to such other names that were more easily understood by employers of labour in both the private and public and which will remove any ambiguity and vagueness in the meaning and possible roles of members of the profession in the society. Beyond the change of name, the existing curriculum was to be reviewed to be in line with the new expectations of the profession. Between then and now, a number of institutions have changed the name of the programme from *agricultural* to *agricultural and environmental* engineering, while many are in the process of changing. It

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is expected that this changed of name and the revised curriculum will put the profession on a higher pedestal.

10. Conclusion

Agricultural engineering is the bedrock of agricultural development and its neglect is a potential threat to the future survival of any country. Most of the countries who in recent times cried out for international aids are where the agricultural system has failed either due to drought or insect invasion. Interestingly, most of these problems are what agricultural engineering as a profession could have arrested given the facilities and challenges. The profession has great potentials to solve most of the problems facing agriculture especially in developing countries. Stake-holders should recognize these and exploit them to the fullest.

Agricultural engineering, which is the grassroot profession has hardly been involved in the conceptualization and implementation of programmes aimed at improving the well being of the people at the grassroot in Nigeria. This is perhaps why the populace cannot appreciate the role of the profession. A change of attitude is strongly recommended and the agricultural engineers should be involved in programmes targeted at addressing rural poverty if the national food security programme is to be a reality.

There is an obvious lack of professional commitment among members of the engineering profession. This has arisen because the professional bodies have not taken the welfare of the members seriously. For over a decade, the proposed engineers' salary structure has remained a mirage. If the various engineering societies must enjoy the fellowship of their members, there is urgent need to address the issue of members' welfare and conditions of service which must be enforced.

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