

## PROFESSIONAL IDENTITY CRISIS: AGRICULTURAL ENGINEERING IN A NON-DIRECTIONAL FLUX

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### **Abstract**

Agricultural engineering has been aptly described as a career for all seasons, denoting the fact that humanity can hardly survive comfortably without the services, products and goods provided by agricultural engineers. However, in the past 20 years there have been several developments in industry and academia which are inimical and detrimental to continued existence of agricultural engineering as a discipline in the universities and as a career in industry. Former agricultural engineering departments have acquired new names and curricula have been reviewed severally, ostensibly to make the course relevant to industry and attractive to potential undergraduates. Agricultural engineering graduates have faced a professional identity crisis since employers and statutory registration bodies have been extremely reluctant to recognize them as engineers. The objective of this paper is to identify the causes of, and possible remedies for the professional identity crisis that agricultural engineers face in Kenya. A literature review on the genesis of the problem is presented and the possible way to the future is explored. The opinions of the author on the issue, based on his observations and experiences as an agricultural engineer are presented. Apart from the huge remit of agricultural engineering as a degree programme, institutional and staff weaknesses are identified as major causes of the professional identity crisis. The author calls on agricultural engineers to promote and protect their identity as the most suitable engineers for agriculture and rural development. It is reaffirmed that agricultural engineering as a name is still the most logical, relevant and appropriate title for engineers who want to apply their expertise in agriculture and rural development.

**Key words:** Agricultural engineering, professional identity crisis, curriculum

## **1 Introduction**

Engineering can simply be defined as the application of mechanisms, machines or structures to solve problems in the physical, chemical, social or biological domains, in order to create products and services necessary for human comfort. Agricultural engineering is the discipline that applies the engineering science and technology to activities in the agricultural products value chain. As an academic discipline, agricultural engineering is a blend of civil, mechanical, chemical and electrical engineering but with a very good appreciation of animal, crop, environmental and soil sciences. This makes it a somewhat challenging multidisciplinary profession.

The main distinction of agricultural engineers from the other sub-disciplines of engineering is that they have an in-depth understanding of the interaction of animals, plants and their products with the biological, chemical, physical and social environments. One of their typical tasks is to offer engineering solutions to modify or optimize these environments for the overall benefit of mankind. However, in the past 20 years there have been several developments in industry and academia which are inimical and detrimental to continued existence of agricultural engineering as a discipline in the universities and as a career in industry. Former agricultural engineering departments have acquired new names and the syllabi have been reviewed severally, ostensibly to make the course relevant to industry and attractive to potential undergraduates.

In some universities in the world, efforts to modify the curriculum and rename the agricultural engineering programmes have resulted in disagreements and nasty altercations between academics, industry and government. This paper discusses the ongoing identity crisis for agricultural engineers in Kenya, looking at the genesis of the problem and exploring the way to the future. The writer reaffirms that agricultural engineering as a name is still the most logical, relevant and appropriate title for engineers who want to apply their expertise in agriculture and rural development.

## **2 Developments**

### **2.1 Origins of Agricultural Engineering**

Every modern society in the world had an agrarian beginning whereby people used simple hand tools to cultivate land to produce grains, vegetables and other crops required for their daily survival. This agrarian lifestyle was in juxtaposition with other activities such as hunting, gathering, pastoralism and fishing – all activities necessary for meeting the food requirements of a people. Cultivation being a laborious, energy-sapping activity, it became necessary for blacksmiths to invent implements to reduce drudgery and increase the acreage under crop production to feed growing farm families. Thus, the genesis of agricultural engineering is traceable to the origin of mankind.

The earliest university level research and teaching in agricultural engineering began in Europe after the early 1800s AD. According to von Zabeltitz (2011), teaching and research in the field of agricultural machinery engineering commenced at the Technical University of Hannover in 1905. The programme was then being offered from the department of mechanical engineering of the Technical University of Hannover. Before this, agricultural machinery engineering was already being offered at Berlin, Bonn and Weihenstephan universities in Germany. According to the American Society of Agricultural and Biological Engineering (2012), the first curriculum in agricultural engineering was established at Iowa State University in 1905.

Dinglai (2008) traces the origin of agricultural engineering as a university degree programme in China from 1944 under the initiative and leadership of the agriculturalist Zou Bingwen. He notes that the post-war industrialization of rural China was dependent largely on agricultural engineers. He also reckons

that at that time there was a hot debate on what agricultural engineering should cover. In Kenya, the first agricultural engineering undergraduate degree programme commenced in 1978 at the University of Nairobi.

It is no wonder that when the Kenya and Japanese governments initiated a technical cooperation agreement in the mid 1970's, modernizing agriculture and enhancing food security was considered a priority theme. Thus, the Jomo Kenyatta College of Agriculture and Technology was founded, opening its doors to the first batch of students in 1978. The college started by offering diploma programmes in agriculture related disciplines and other engineering fields. Agricultural engineering was perhaps the most conspicuous subject at that time, given the low level of farm mechanization in Kenya.

## **2.2 Traditional Agricultural Engineering Careers**

Agricultural engineering is primarily concerned with finding technical solutions for maximizing farm production, processing and preserving the produce, reducing post-harvest losses and ensuring sustainable utilization of natural resources in order to assure food security. Agricultural engineers have been concerned with developing land development implements, machinery and power units, farm and storage structures, and agro-processing equipment. They are also involved in planning and installation of irrigation, drainage, soil conservation and rural water supply systems.

According to the International Commission on Agricultural Engineering (CIGR, 2012) the core knowledge base of agricultural engineers can be grouped under seven sub-themes: land and water engineering; farm buildings, equipment, structures and environment; equipment engineering for plant production; rural energy and other energy sources; management, ergonomics and systems engineering; postharvest technology and process engineering; and finally information systems. Field and John (2007) listed some of the specialties of agricultural engineers including, the use of machines at molecular level to help the environment. A common thread that runs through all the definitions of agricultural engineering is that the discipline is concerned with the applications of engineering principles and techniques to solve problems in the entire agricultural, horticultural and livestock value chains.

A degree in agricultural engineering can lead to exciting and diverse career paths, depending on the interests of the graduates. Typical job functions range from a farm manager in a mechanised farming operation to factory manager and even a design and production engineer in an automated production factory. There are a host of other job titles linked to the various thematic areas of agricultural engineering. These career paths may become clearer when a person chooses to concentrate on a sub-discipline and undertakes a post-graduate degree related to his area of interest. But many have observed that a career in agricultural engineering will never be interesting to people who have a negative attitude to farming. Is it not ironical that many people in sub-saharan Africa suffer serious hunger and food shortage problems while large swathes of good agricultural land is idle or underutilized!

## **2.3 Genesis of Professional Identity Crisis**

There has been a lot of fuss as to whether agricultural engineering is an agricultural science or engineering science, given that the discipline straddles both areas more or less equally. In Kenya, many agricultural engineers who graduated under the university faculties of agriculture encountered significant problems when they tried to register as professional engineers with statutory registration bodies. This has prompted the migration of agricultural engineering from agricultural to engineering faculties. This has also been the trigger for name changes for agricultural engineering programmes.

But considering the range of possible specializations mentioned above, it is very clear that the remit of agricultural engineering is indeed very broad. The amount of knowledge and literature that has been generated about this subject over the years is also enormous. This has led to the emergence of other engineering and non-engineering degree programmes with other names but which target the application of engineering techniques, knowledge and skills in agriculture and rural development. But the core content of some of these emerging degree programmes have sometimes deviated from the traditional agricultural engineering curriculum.

On the other hand, degree programmes have also been developed whereby the word 'agricultural' has simply been replaced with other words such as 'biosystems', 'biomechanical', 'bioresource', 'biological', 'ecological' etc., without significantly changing the core content in the curriculum, thereby causing a lot of confusion. For instance, it is known that 'biomechanical' is a word closely associated with biomedical engineering. In some universities, the former agricultural engineering departments have decided to pursue only part of the original remit of agricultural engineering in their undergraduate programmes while excluding huge sections of what is internationally recognized as agricultural engineering. There are also degree-level programmes targeting specific crops, such as sugar technology.

The differences in the names and the core content of the various degree programmes targeting the application of engineering in agriculture and rural development has caused significant confusion when it comes to employment since job functions are normally classified according to the content of academic degree programme, for the purposes of determining remuneration. It is simply not clear whether the people with these different undergraduate degree titles are comparable in terms of knowledge, skills, capability and performance. And this is the main cause of what is regarded as a professional identity crisis.

#### **2.4 Institutional and Staff Issues**

In Kenya, the professional identity crisis of agricultural engineers has been exacerbated by a number of factors including; institutional weaknesses, poor career guidance, motivation problems, career marketing failures and unethical competition of jobs. Institutions that are supposed to be involved in the determining the title, duration and content of degree programmes include the university senates, professional accreditation bodies and government oversight bodies such as the Commission for Higher Education in Kenya. There are also interested stakeholder groups such as industry representatives who are active in the agricultural, engineering and construction sub-sector.

One glaring failure of these institutional stakeholders is the failure to define conclusively who is a 'specialist' or 'professional engineer'. There has also been undue emphasis on soft management skills in the Kenyan industry, even for jobs which require core expertise in engineering. Whereas some amount of curriculum overlap is unavoidable in the various branches of engineering, there have been cases where deliberate overlap is promoted to protect business interests and professional turfs. Industry stakeholders in particular have shown little interest in the affairs of the tertiary training institutions in the past; they want good results without an active participation on the process of graduate formation.

Another institutional weakness is the frequent review of content of university curriculum. There have been cases whereby academic programmes are reviewed even when the performance of the first batch of graduates has not been independently assessed or verified. There have been several instances in the past of students pursuing degree programmes in which they have little or no interest. The current students' admission system in Kenya allows undergraduates to choose a desired career carefully, but it is the damage that has occurred in the past which is showing its symptoms today. It is apt to mention that most students will show interest in any academic discipline if the self-employment or job prospects are good. Students also tend to follow successful career role models, who are very few in the case of agricultural engineers in Kenya.

In some instances, academic staff in the universities have sought to move from the departments of agricultural engineering to other departments because they no longer have any interest in what they have actually studied. Thus, the supposed champions of the agricultural engineering agenda have been wavering, making other departments to look down on the course. This has made it difficult to market agricultural engineering as a respectable career. This negative attitude has been caused by the fact that many typical agricultural engineering jobs have been taken up by engineers from other disciplines. There are very few agricultural engineers in the engineering consultancy business in Kenya, meaning that their tasks are taken up by other consultants or foreigners.

There is also an element of unethical competition in the professional identity crisis facing the agricultural engineers. There has been a cold war from other branches of engineering. This is mainly because in terms of higher academic qualifications, agricultural engineering seems to have grown faster than the others. Hence, there is a false perception that agricultural engineering is easier than the other branches of engineering, and should not be regarded as a proper engineering programme.

### **3 Conclusions and Recommendations**

Agricultural engineering remains critical to the attainment of the food, feed and fibre needs of any nation, including Kenya. It should not be diluted or destroyed because of institutional failures, career rivalry and individual failures. The core content of any agricultural engineering curriculum should follow what is recommended by the International Commission for Agricultural Engineering but with slight modifications to provide for special conditions obtained in our own context.

A deliberate balance between the agricultural and engineering content of the agricultural engineering curriculum has to be maintained, because the course primarily targets the agricultural, horticultural and livestock sectors. This does not mean that agricultural engineers cannot work in other sectors of the economy. Qualified agricultural engineers should also strive to promote and protect their identity so as to compete favourably for jobs involving the application of engineering in agriculture, rural development and closely related areas.

There is currently a deliberate and vigorous push by policymakers in African countries to ensure that food security becomes a reality in the continent. Agricultural engineers working in tandem with other agriculturalists will be instrumental to achieving this objective. Policy makers should underscore the importance of agricultural engineering to our economy. Indeed the Kenyan Vision 2030 economic blueprint may remain a pipedream unless agricultural engineers are engaged to tackle food insecurity decisively.

After a period of relative obscurity and professional identity crisis, agricultural engineering is now slowly re-emerging as a career of first choice for potential under-graduates. This is because a few agricultural engineers have been very ardent in promoting agricultural engineering as an important, respectable and indispensable career. Jomo Kenyatta University of Agriculture and Technology is one of the leading universities with experienced faculty and facilities to support the agricultural engineering profession. The number of agricultural engineers attaining professional recognition by their peers within the Kenya Engineers Registration Board has also been increasing steadily.

Indeed a self-sustaining and regenerative progeny is not possible without adequate food. Agricultural engineering is crucial to the survival, comfort and socio-economic advancement of our country.

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