

Definition of the Emerging Bio-Systems Engineering Disciplines in Europe.

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Abstract

Malta's entry into the EU, with its associated opportunities for funding, has provided close to €140,000,000 for Rural Development measures as from 2004 to 2013, and their focus on investments, agri-environmental and quality of life improvements in rural areas should help attain desired sustainability. Successful implementation of this development programme lies on the degree of uptake and hence participation of the rural community and on the effective and efficient processing of applications by the Managing Authority. Presently the University of Malta does not offer degrees in Agriculture Engineering. Nonetheless the capacity does exist to organise such courses. There is a severe shortage of experts to support the rural community. Ultimately, however, the resultant transformations in the rural sector shall but reflect the overall supporting framework and associated efforts to promote development in this area.

Engineering at the University of Malta

Malta has only one University tracing its origins to the founding of the Collegium Melitense which was set up through direct papal intervention in 1592. The foundation deed specified that philosophy, theology and other subjects such as grammar and the humanities should be taught. In 1675 a 'lettore' in anatomy and surgery was appointed at the Sacra, establishing the beginning of the medical school. In 1769, the 'Pubblica Università di Studi Generali' was established. Two years later the Collegio Medico was set up as one of the Faculties making up the University. The Evans Laboratories were opened in 1959 to accommodate the Faculty of Science and a new Medical School was opened in 1968. The Faculty of Mechanical and Electrical Engineering became part of the University when the former Polytechnic was incorporated within the University. During the British period the University experienced a series of changes in its statutes and regulations bringing it in line with universities in the United Kingdom. The present University structure was established by the 1988 Education Act.

Engineering sciences taught at the University of Malta can be termed as traditional. Mechanical and Electrical Engineering are offered by the Faculty of Engineering and Civil Engineering is available within the Faculty of Architecture & Civil Engineering. The following courses are accredited by the Fédération Européenne d'Associations Nationales d'Ingénieurs (FEANI):

- B. Eng. (Hons) including B.Elec.Eng, B.Mech.Eng and B.Sc. (Eng) running since 1967,
- B.E. & A. in the Area of Civil Engineering since 1992, and
- B.Sc. (Hons) IT in Computer Systems Engineering since 2004

This year a new Faculty of Information and Communication Technology was established. As from this year, the four year course B.Sc. IT (Hons) is being replaced by a 3-year B.Sc.(Hons) ICT course. No degrees in Agriculture Engineering are presently available at the University of Malta.

Challenges in Agriculture

Malta is handicapped by a number of structural constraints limiting its competitiveness in agriculture and agro-industry. The most obvious is the opportunity cost of land due to land scarcity. This issue is further compounded by fragmentation, tenure issues and poor soil quality. The other major constraint is the lack of fresh water reserves, resulting in the farming community tapping all water aquifers for irrigation. In view of these limitations, Maltese agriculture has to develop and adopt ingenious systems to attain competitive productivity standards. Although the agricultural sector accounts for only 2.4% of the total GVA generated by the Maltese economy, the role of agriculture goes far beyond that captured in figures. Agriculture has been particularly important in shaping the rural landscape and the environmental character of the islands. Agricultural and rural areas constitute a green lung and a venue of recreation to many. Today agriculture remains a major contributor in maintaining the quality of the landscape. It is also an integral component of the cultural heritage and a crucial backdrop to the tourism industry. In short, agriculture exhibits multiple functions and values beyond its economic contribution. The Rural Development Plans for 2004-2006 and 2007-2013 have been strategically compiled in such a way so as to encourage the multifunctionality dimension of Maltese agriculture coupled with quality production and sector sustainability.

Maltese Rural Development Plan

Malta became a full member state within the European Union in May 2004. On the 23rd June 2004, the first Rural Development Plan for Malta was approved. This plan was designed to establish a concrete base platform through which the Maltese agriculture sector could evolve and develop. The plan provided for the growth and development of the sector in a sustainable manner applying guidelines and procedures common to the rest of the other European Member States. It recommended that the overall strategy for Maltese agriculture should focus on the development and specialisation of agricultural *niche* quality products that are best suited for the Maltese agro-ecosystems. The 2004-2006 Rural Development Plan was the first ever serious attempt to put together a series of measures capable of acting and reacting in synchronization to achieve measurable results. The second Rural Development Plan 2007-2013 aspires to implement a follow-up strategy that builds upon the achievements and milestones of first Rural Development Plan. It seeks to offer a more deliverable programme that is well aware of the strengths of the rural sector while at the same time addressing relevant weaknesses in order to attain a more sustainable development of agriculture. The inclusion of past as well as recent experiences both from a technical and administrative point of view will strengthen the commitment in

focusing on present and future needs of all stakeholders as well on current European and world trends.

The 2007-2013 Rural Development Plan has the following core objectives:

- 1) Farm modernisation with emphasis on increasing value added and quality plus cooperation between producers, and collaboration with the Agro industry sector, further supported by education and provision of qualified advise to the farming community
- 2) Agro-environmental measures with respect to sustainable environmental management
- 3) Improvement in the quality of life in rural areas.

These initiatives are spread over the various measures and are nested within the different axes that make up the programme. Achievement of these objectives lies on the extent of uptake and hence participation of the rural community and on the effective and efficient processing of applications by the Managing Authority. This Rural Development Plan has to be seen as a link within a larger complex that contributes to the gradual evolution of the rural community in line with other European rural communities. There is an obvious “catch up” factor as compared to the rest of the European member states that the rural community has to go through to develop and mature in mentality, organisation and implementation.

The expectations from the plan have to be realistic and not confounded. Success depends on leadership and followers. There is a desperate need for homebred leadership to spearhead and manage projects aimed at the development of appropriate innovation, to implement new infrastructure, to modernise facilities, and to the adoption of strong agro-environmental ethics. In the recent Lisbon Review of 2006, Malta ranked rather low in innovation and knowledge transfer scale. The National Strategic Plan for Research and Innovation for 2007-2010 outlines national priorities and courses of action that should lead to significant improvements in the innovative capacity of the country. For the past fifty years, Maltese agricultural had few incentives to rationalize production through the upgrading of plant and produce.

Definition of Agricultural Engineering in Malta

Malta requires Agriculture Engineers who are able to apply knowledge of engineering technology, biological/environmental science and project management to agriculture. Specialised expertise is required to design machinery, equipment and structures as they relate to agriculture, food technology and bioprocess. Engineers will be expected to improve crop production system, design animal facilities, analyze food production systems, or test machinery in the process of applying with the measures of AXIS 1 (farm modernisation) of the Rural Development Plan. Expertise in the agro environmental field is also in high demand to coordinate projects under the AXIS 2 of the Rural Development Plan that deals with the wellbeing of soil and water resources. They may participate in legal or financial consulting regarding agricultural processes, equipment, or issues. They *must* therefore be in possession of strong analytical skills and be detail oriented. In addition, they must work well in team situations as they would be called upon to work in a group setting with other engineers and others to solve problems and develop solutions custom fitted to our local situations. In addition to the Engineering / Agricultural core component, our Engineers would have to have project management and leadership skills and a good understand of the content and procedures of the local Rural Development Plan. They will spearhead the

implementation of the Rural Development Plan by compiling and placing applications and overseeing the actual completion of the funded projects.

Institute of Agriculture

The Institute of Agriculture of the University of Malta was established in 1993 to set up courses at tertiary level in agriculture. Along the years courses were initially developed to improve basic knowledge among those working in the sector, future generations of agriculturalists, and soon after to enlighten agriculture students through more complex science based graduate training. However, it is felt that the available formal training is not thoroughly addressing the actual and emerging needs of the sector. Food security and safety and their relationship to sustainable agriculture and rural development have become matters of concern. Economic perspectives in the new EU realities within the larger framework of World Trade Organisation compliance are undergoing a constant process of dynamic development. In this rapidly changing social and natural environment, the Institute of Agriculture has a critical role to play and needs to closely mirror, if not anticipate the requirements of such a changing playing field.

The Institute of Agriculture is actively striving to enhance the varied facets of the local agricultural knowledge base. These include animal and crop husbandry, food science, environment, and rural development among others. An enhanced and up-to-date knowledge base can only be achieved by offering courses and striving to fill in any remaining lacunae through the development of new programmes. Agricultural engineering is one such lacuna. Hybrid professionals who have a solid agricultural (including food science and safety) and engineering base together with knowledge of environmental science are lacking in Malta. A preliminary search to identify engineering, agriculture, food safety and other related topics currently offered to students by various faculties of the University of Malta has been carried out. A USAEE working document that presented a model for an Agriculture Engineering degree curriculum that is intended to meet FEANI standards was also scrutinized. A comparison of both information sets revealed that the Institute of Agriculture, Institute of Health Care, Faculty of Engineering, Faculty of Architecture and Civil Engineering, Faculty of Science, and Department of Geography offer modules proposed by the USAEE/FEANI working document.

Master of Agriculture Engineering (M.Agr.Eng.) 90 ECTS (60 taught + 30 thesis)

Discussions with the Faculty of Engineering to collaborate in offering an Agricultural Engineering stream are underway. The Faculty of Engineering is presently restructuring its undergraduate study programmes to comply with the 3 year norm. The understanding is that the Agricultural Engineering will be offered as a 2nd Cycle degree to graduates in engineering. The Institute of Agriculture plans to propose and produce professional Agriculture Engineering courses at Masters Level that conform to expected European standards and which therefore merit international recognition and accreditation from FEANI. The Master of Agriculture Engineering degree is designed for those wishing to pursue a professional degree in Agriculture at the Masters level as their educational objective. It will prepare students for a proactive role in addressing and responding to personal, professional, and societal problems and challenges in agriculture and food systems. Individuals will enrol in the program for a variety of reasons: career advancement, professional development, personal interests.

The General Regulations for University Postgraduate Awards, 2007 make the following allowances:

- a) Professional Master's degree obtained on successful completion of a Programme of Study that builds upon a first cycle professional degree in the same area of study and intended to develop further profession-related skills and knowledge, normally in an area of specialisation, and usually designated as Master of (subject); and
- b) Conversion Master's degree obtained on successful completion of a Programme of Study that, whilst necessitating the broad academic preparation of a suitable first cycle degree, does not build upon a specific body of knowledge obtained in any particular first cycle degree course, designated as Master of (subject).

Furthermore, the regulations permit students to be admitted into a Preparatory Programme and they shall become eligible to join the appropriate Master's course on completion of the Preparatory Programme.

The preparatory course will have 30 ECTS consisting of the following study units:

- 1) Maltese Agricultural Production Systems.
- 2) Anatomy and Physiology of Maltese Agricultural Crops.
- 3) Anatomy and Physiology of Farm Animals.
- 4) Soil Science and Nutrient Budgets.
- 5) Understanding Agro – Environmental Systems.

Professional Engineering Status.

In Malta there are two main professional engineering organisations. The Engineering Board advises Government on the issue of the title “ING” and the Chamber of Engineers that is officially recognised by Government as representing the Engineering Profession in Malta and is the Maltese member of FEANI. Graduates in Agricultural Engineering will have to establish their identity and recognition within these organisations.

The Workplace / Career Path

Job opportunities for Agriculture Engineers will certainly be available in the implementation of the Maltese Rural Development Plan. Potential employers are those entities that will be involved in the execution of the Rural Development Plan and the rural society at large. The formation of Farm Advisory Services as stipulated in the recent Rural Development Plan, is an ideal employer of such graduates who will be responsible to carry out holistic farm analysis and cross compliance studies. The Ministry responsible for agriculture would also recruit a substantial amount of experts to implement its regulatory role. The financial component, whether it's the Paying Agency or any other financial institutions such as banks, will need to take on Agriculture Engineers as consultants. Finally the rural society will need the services

of free lance Agriculture Engineers to put together an application and to ultimately execute the project.

So far

This proposed degree programme is currently just a concept. The potential to run it exists and the capacity to organise it is already present at the University of Malta. Societal needs should dictate which of the specialisations should eventually be given precedence, should the course be offered.

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University Studies of Agricultural Engineering in Europe (USAEE) Thematic Network

website location:- <http://www.eurageng.net/usace-tn.htm>