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RESEARCH ACTIVITIES IN THE FIRST TWO CYCLES OF BIOSYSTEMS ENGINEERING UNIVERSITY STUDIES IN MALTA

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Abstract

The University of Malta is harmonising all programme offer to be compliant with the Bologna process which envisages the establishment of the European Higher Education Area by 2010. Research activities at the University of Malta date back to the seventies and were mainly carried out by the Department of Physiology and Biochemistry of the Faculty of Medicine. Following accession within the European Union, significant investment has been committed to structure and support research, in particular in areas that provide value-added to the country's economy. Consequently; thematic, project-based funding prevails over bottom-up, open-ended research programmes and measures, giving priority to academia-industry collaboration.

1. Introduction

The University of Malta is the highest teaching institution of the State by which it is mainly financed. Over the past few years, the University has reviewed its structures in order to be in line with the Bologna process which envisages the establishment of the European Higher Education Area by 2010. The process has been promoted across the university and faculties have been requested to harmonise their courses. This has been completed for all courses with the exception of medicine and dentistry. The general perception is that the medical course in Malta is a professional one and given the skills and competences that graduates must possess, the two cycle system is generally not perceived as being an appropriate one to implement at present. In the meantime however, the medical curriculum is under review [1]. Conscious of its public role, the University is open to all those who have the requisite qualifications and strives to create courses which are relevant and timely in response to the needs of the country.

The Institute of Agriculture was established in February 1993 with the primary aim to offer study programmes at the tertiary level in agriculture to counteract the severe limitation of qualified technicians in the field. Since its launching, some 300 students have graduated from the various programmes and are today contributing to the development of the local agricultural sector. Currently the Institute of Agriculture offers the Diploma in Agriculture and a B.Sc. degree in Agro ecosystem management, the latter in cooperation with the University of Perugia.

Capital expenditure and staff cost absorb most of the government funding, with just a small percentage allocated for research. The research agendas of faculties and



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institutes are drawn up by the corresponding departments according to their needs and research interests and these are submitted for approval to the university's research funding committee. This system is currently under reform as evident in the last collective agreement for university staff that places strong emphasis on research. The document 'Realising a Thriving Maltese Biotechnology Industry by 2015' [2] states that biotechnology has been identified as one of the areas for further national investment in terms of research and innovation. Nonetheless, while the University offers degrees in life sciences there are currently no study programs in biotechnology [3]. However, in order to meet the current demand for professionals in the area of agricultural Biosystems technology the Institute of Agriculture will be launching a Masters Degree program in October 2011.

2. Research related activities in the 1st Cycle

The research carried out at the Institute of Agriculture did not have a real structured framework and support, nor did it have a precise focus on subject matter. The bulk of the research consisted mainly of students' dissertations focusing on issues of local agricultural relevance. Participation in the EU funded (FP5, 6 & 7, and Interreg) has focused mainly in areas of environmental sustainability, including soil, water, atmosphere and the environment. These projects were also instrumental in introducing the institute to the regional network of research institutions. Whether projects are supported through E.U funds or local resources, efforts are made to recruit students on the various projects and they are encouraged to integrate with the ongoing research community. Given the short time allocation allowable within the 3 year period dedicated to the 1st cycle, students rarely have enough time to undertake profound studies. Nonetheless, the experience still whets the appetite of promising students and stimulates them to pursue the 2nd cycle to deepen their understanding. However, despite the fact that a number of projects were carried out, only a handful had strong Agricultural- or Biosystems Engineering component.

3. Research related activities in the 2nd Cycle

In general, Maltese graduates are aware of the latest research and technology, training laboratories are well equipped and co-operation with private industry is gaining ground to steer the relevance of education in meeting industry needs. Research activities in biotechnology at the University of Malta date back to the seventies and were mainly carried out by the Department of Physiology and Biochemistry of the Faculty of Medicine. Although research has a relatively long history, its funding was never structured nor followed an organised framework, but tended to depend heavily on the personal contacts and ambitions of the main research scientist to secure support from funding agencies. The involvement of 2nd cycle students in these projects was however minimal.

• Impact of Structural Funds:

The first short programming period 2004-2006 had research and innovation related measures account for about 7.6% of the total share of structural funds, including allocations to research-oriented projects, education infrastructures and innovation related measures. The second programming period 2007-2013 has so far secured



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just over €89m for research and innovation. In addition, €3.5m have been allocated to Research and Development grants and another €20m to target human resource development, mainly through skills building programmes and post-graduate training.

• **Infrastructural capacity building**

Circa €47m have been earmarked for infrastructural capacity building and upgrading of science, engineering and biotechnology laboratories. Additional resources have been deployed to support research projects in areas of strategic importance namely manufacturing services, biotechnology and alternative energy sources.

• **Human capacity building**

Human resource development through scholarship schemes is also being supported by structural funds: €3m have been allocated for a bursary scheme for post-doctoral researchers working at the University of Malta (involving two-way mobility of researchers); an additional €10m supports a new STEPS (Strategic Educational Pathways Scholarships) scholarship for M.Sc. and Ph.D. studies in areas of strategic importance. At another level of the education chain, a science popularisation project will be implemented to attract more students into science based careers.

• **Institutional funding support**

The funding channelled to the ministries and higher education institutions is that allocated as part of the ministry's budget to cover operational costs as well as any research activities. Each ministry operates a yearly budget that is approved by the national parliament. The ministries with most direct relevance to Research and Development activity include that responsible for Resources and Rural Affairs that also maintains responsibility for climate change policy, alternative energy sources, science and technology, fisheries, oil exploration and that responsible for Education under whose auspice fall the responsibility of the university and all other higher education institutions. The research budget is not pre-defined with the bulk going to university and the vocational [College for Arts, Science and Technology](#) (MCAST). Additionally public funds dedicated to research include investments that run on an annual budgetary cycle, namely the [National Research and Innovation Funding Programme](#), the [Euro-Mediterranean Technology Initiative](#) (Euro-MedITI), [Eureka](#) Participation as well as national funds earmarked to co-finance research measures under the Cohesion Policy. The intention is to focus public investments in areas that provide value-added to the country's economy. Consequently; thematic, project-based funding prevails over bottom-up, open-ended research programmes and measures, giving priority to academia-industry collaboration. So far the highest expenditure was in the field of social sciences, followed by the agricultural sciences.

• **[Euro-Mediterranean Technology Initiative](#)**

The Euro-MedITI Initiative is a technology and innovation platform in the Mediterranean set up in 2007 with the aims to support development, customisation and transfer of innovating technologies in sectors that have a special relevance to the Euro-Mediterranean Region. This is a business venture between the government of Malta through the Malta Council for Science and Technology and the



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University of Malta, Malta Enterprise, the Federation of Industry and the international partners Fraunhofer, VTT Technical Research Centre and Henry Tudor. The initiative is intended to evolve as a partnership or joint venture with the government of Malta acting as a facilitator among the partners involved in collaborative research projects, training and capacity building and networking. The initiative is initially focussing on innovation technology development and transfer in four main technology sectors: Water and Environment, Sustainable Energy, ICTs and Marine that are relevant to the Mediterranean, though it will open to encompass new technology cluster areas.

• **Eureka**

Since the launch of Eureka in 2006, €350k were committed to leverage over €1.2m worth of local research and development in enterprise. To date, two companies are participating in the full Eureka programme.

• **Project-based funding**

Public funding is being directed to support projects of national interest and that can provide a value-added to the economy, shifting the focus from basic towards applied research with prospects for commercialization. The first project that commenced is in the field of oenology and investigates local grape varieties, their cultivation and harvesting procedures. The project is being implemented by the Viticulture and Oenology Unit within the [Agricultural Services & Rural Development Division](#) together with the [Institute of Agriculture](#).

Through the National Research and Innovation Funding Programme, funds are provided on a competitive basis for Research and Development projects with a potential for near-to-market applications. Two important criteria for project selection are for these to include university-industry collaboration and address the four priority sectors identified in the National Strategic Research and Innovation Plan: Energy and Environment, ICT, Health-Biotech and High-Value Added Manufacturing Services. The programme aims to promote top-down, mission-oriented research.

• **ICT**

Malta aspires to become a regional centre of excellence in ICT. Public as well as structural funds are being deployed for infrastructural capacity building (new ICT faculty with €13m structural funding over 2008-2011), as well as skills building in the higher education sector.

• **Manufacturing Sector**

A manufacturing platform is being set up that will see the drafting of a research strategy and the implementation of three research projects for the manufacturing sector over 2009-2010. The research activities will address critical aspects affecting the competitiveness and viability of local industry, namely energy efficiency, exploitation of ICT to improve competitiveness, and innovation in manufacturing.

• **Biotechnology**

The development of a biotechnology park and research and development centre is a new €11m worth project co-financed through structural funds that will be open to



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both research and business activities in this sector. Ideally positioned in San Gwann, within walking distance of the University of Malta and Mater Dei Hospital, the Life Sciences Centre or BioTechnology Park will be a zone dedicated to research and innovation, which will be administered by the Malta Enterprise. A scheme to attract Maltese talents who have succeeded in research and development abroad to return to Malta will run along the establishment of the Park. This is part of the government's strategy to grow the Maltese research and innovation sector and its commitment towards the creation of a dynamic high value-added, technology intensive, knowledge based economy, in line with Vision 2015.

The Life Sciences Centre will create a focal point in a proposed Bio-Technology Park spanning over 30,000m², enabling a synergistic community, connecting university students, researchers, lecturers, hospital professional staff and industry to interact and establish new technology and research based firms. The Life Sciences Centre will favour an 'Open Innovation' policy, providing a fertile ground for companies to collaborate with universities and SMEs, significantly enhancing the chances of success of start-ups and spin-out companies, effectively bridging the translation of research from the laboratory to the economy, creating new job and investment opportunities.

• **International Science and Technology Agreements:**

Malta has signed agreements on scientific and technological cooperation with EU and non-EU countries that encourage the undertaking of joint research projects. Amongst these are the Science and Technology cooperation agreement with Saudi Arabia (signed in February 2007) and the agreement in the fields of medical services and public health and ICTs signed with Tunisia. No funds for research are earmarked under the EEA/Norway and Swiss funds. The Vth Italo-Maltese Financial Protocol allocates scholarships for Maltese students to undertake studies in Italy.

• **Master of Science (Biosystems Engineering)**

The Masters program will be a taught and research orientated degree and will be open to students holding a first degree in chemistry, biology, pharmacy, agriculture and engineering. The objective of the Masters Degree program is to train students in two main but separate disciplines. These include crop production engineering and soil and waste management. The program consists of a core study-units section and the two specialised units referred to above. Most of the core units are compulsory although in some exceptions students could be exempted from taking some of the units.

The program of studies is spread over a period of two years where the first year comprises the teaching phase and the final year will include both teaching and research. The research project will be an integral part of the course. It is envisaged that the expenses related to the students' research projects associated with the course will be covered by the students' fees; however some of the projects may also be funded by the European Union under the various funding programs referred to earlier in this document, or by local support.



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• **Research Project**

The research project comprises a substantial part of the degree program and students will devote most of the second year towards its undertaking. This will eventually lead to the submission of a dissertation. It is the intention of the Institute that the projects are carried out in cooperation with local industry or other institutions operating in the relevant field. Institutions such as Wasteserve Malta Ltd will be an ideal candidate for taking on board students working in the areas of solid waste management and wastewater treatment. Local agricultural producers such as vineyards and the food industry will also benefit from joint research programs in crop genetics and plant propagation.

It is expected that this Masters program will increase cooperation with various government departments and departments within the University of Malta itself. The Plant Propagation Research Centre within the Ministry for Rural Affairs and the Environment and the Biotechnology Laboratory within the University of Malta will be involved in a number of joint projects having plant molecular genetics, plant genetic engineering and plant propagation as a theme.

4. Rare Knowledge

Given the particularities with regards to geography, environment and natural resource availability, the Maltese have over time generated a strong understanding of their geophysical reality and have developed and evolved techniques on how to thrive under such harsh conditions. Three main areas that are of utmost importance can be listed as being: soil conservation, water management and technology and techniques utilised in constructing buildings to accommodate human dwellings but also livestock housing.

Unfortunately the ease of application of modern materials and technology has totally ignored and put aside the rich local knowledge on how to co exist under Maltese conditions very often with negligible carbon footprint. Basic knowledge is being replaced and put to the side, very soon to be forgotten. Research efforts are required to document this rare knowledge and preserve this knowhow for future reference.

References:

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[3] Europbio and Venture Valuation (2009); Biotechnology Report: Malta.