

Enhancing Agricultural Education in Egypt Through Competitive Mechanism

By

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Abstract

Agricultural education in Egypt, both in secondary and higher education levels, is facing major challenges that were caused by some serious structural imbalances and incongruities such as a declining student enrollment, low quality students and gender imbalance, skewed ratio of students to professors, curricula not relevant to job market, stagnation of college's mission and objectives, programs and curricula not in step with advances in science and technology world-wide. These imbalances that need to be tackled are discussed. This paper aims at demonstrating the current situation of agricultural higher education in Egypt, the role of Higher Education Enhancement Project Fund (HEEPF) as part of a comprehensive reform strategy in developing higher agricultural education and future strategic vision for higher education in this field. It presents how the HEEPF funded projects focused on the enhancement of three major areas of educational development namely; 1) curriculum development and course content, (2) appropriate learning environment and physical resources, and (3) human resources development i.e., upgrading faculty educational qualifications. It discusses outcomes and outputs of the HEEPF funded projects in the agriculture sector focusing on the above major areas of educational developments. It also shows the significant contribution made by such competitive projects and the need for their continuity and sustainability.

1. Background and Problems

The Colleges of Agriculture in Egypt are facing some major challenges requiring new educational strategies, innovative leadership and institutional reforms that take into account the current trends and factors that influence agricultural and rural development. Due to the declining job opportunities of agricultural graduates, student demand on agricultural education has been decreasing rapidly in recent years as evidenced by the dwindling student enrollment suffered by all colleges of agriculture in the country. Moreover, there is a marked change of student body gender in favor of female students, a substantial increase of female students in a job market that is not very receptive to hiring females to work in farming. In light of these changes, one of the serious challenges the colleges are currently facing is the skewed ratio of students to professors. While enrollment of students dwindled rapidly, the number of teaching staff was inflating, creating an odd situation where the ratio of faculty members to students is almost 1:3 in some colleges during 2004-05 academic year [14], a situation that requires urgent corrective actions.

On the other hand the colleges' programs and curricula have not been in step with the recent advances and trends in science and technology and do not meet the job requirement in the new agricultural private sector. This situation calls for an innovative restructuring initiative to deal with these challenges. It is thus important that the college revise its mission and modernize its educational programs to be in step with the new trends and advances in science and technology as well as meeting the needs of the changing job market in Egypt. The new educational programs need to respond to public concern over issues such as food safety, nutrition, environmental protection and sustainability of natural resources. Agricultural education needs to become more market-driven i.e. curricula need to be redirected to address the labor market demands locally, regionally and internationally. New curricular reorientation will need to incorporate both the new role of market-oriented agriculture as well as issues of direct relevance to food security and rural poverty in Egypt.

In short, the identified structural imbalances and incongruities in agricultural colleges are: the dwindling student enrollment, low quality students and gender imbalance, skewed ratio of students to professors, curricula not relevant to job market, stagnation of college's mission and objectives, programs and curricula not in step with advances in science and technology world-wide.

The above mentioned structural imbalances and incongruities are typical in almost all colleges of agriculture in Egypt resulting in a general decline in agricultural education. This decline could have long lasting effect on agriculture which is an important production sector in Egypt. It is an established fact that food security and its relationship to sustainable agricultural and rural development are important developmental issues in Egypt. While there are many complex factors that influence sustainable development and food security, it is clear that agricultural education plays an important role in preparing farmers, researchers, educators, extension staff, and members of agri-businesses to make productive contributions. We may state that changes and adaptations are required in Egypt's agricultural research and educational institutions in order for them to more effectively contribute to improved food security and safety, sustainable agricultural production, better management of natural resources, protection of the environment and finally effective and equitable rural development. This paper describes some attempts made by the HEEPF to address the above-mentioned challenges and develop innovative ways to correct the structural imbalances and incongruities that were identified in agricultural education in Egypt.

2. Agriculture Education among Other Specializations

Egyptian society has become increasingly knowledge-based so that higher learning and research now act as essential components of cultural, socio-economic and environmentally sustainable development of its individuals and communities. Generally speaking, higher education itself is confronted therefore with difficult challenges and must proceed to the most radical change and renewal it has ever been required to undertake, so that our society can surpass mere economic considerations and move towards brighter future.

Problems and challenges in Egyptian higher education system were analyzed in the World Bank's Higher Education Enhancement Project, which is a part of a comprehensive reform

strategy for higher education in Egypt. The reform agenda was influenced by the National Conference on Higher Education, held in February 2000, and aimed to address Egypt's need to upgrade educational quality in the university sector.

Agricultural higher education sector faces a number of challenges including: (1) low quality and relevance at the university and middle technical levels; and (2) limited sustainability of publicly financed enrollments [15]. The problem of financially unsustainable enrollments is related to its dramatic increase in university education. There has been a substantial increase in the number of university graduates since 1982 till 2000, [13]. Similar trend continued till the present time. This growth of students' population in Egypt poses a serious problem in financing higher education.

The agricultural education in Egypt comprises technical schools, higher institutes and colleges. At the present time, the number of universities is expanding as a necessity for socio-economic and cultural development. Egypt has 18 public universities including Al-Azhar and 16 private universities. Also the number of faculties and institutes was increased from 146 in 1981/82 to 266 in 1999/2000 in an estimated increase rate of 82%, [13] and reached 294 in 2004/2005 (101% increase) [14]. Among these, there are 16 faculties of agriculture, in addition to 2 more faculties affiliated to Alexandria University with a total of 18 faculties of Agriculture nation-wide. Private universities being profit-making institutions concentrated their efforts on those colleges that are in demand by the public such as medicine and engineering and stayed away from agricultural education which is currently in the lowest position in the list of students' preference.

At each faculty of agriculture there are several scientific departments reaching 18 major departments at Cairo University. These departments include: Agricultural botany, Agricultural zoology and nematology, Biochemistry, Genetics, Agricultural microbiology, Agricultural economics- Agricultural sociology and extension, Food Sciences, Dairy sciences- Agricultural mechanics, Soils, Animal science, Crops science (Agronomy), Pomology, Ornamentals, Vegetables, Economic entomology and Plant Pathology [4].

3. Challenges Confronting Agricultural Education in Egypt

The Agricultural Education Group of the Food and Agriculture Organization (FAO) of the United Nations pointed to the failure of agricultural education and training in many developing countries to adapt to a changing world and presented a thoughtful analysis of the issues [5].

The number of students joining the higher agricultural education has relatively been declining in the past few years relative to total number of university students [14], Fig. 1. The average number of students enrolled fluctuated from year to year reaching 1475 student per year (average of 10 universities) which represents 1.8 % of total number of students enrolled in a given university. On the other hand, at the university level in general, the number of teaching staff was increased from 10,544 members in 1981/82 to 30,486 members in 1999/2000 (189%). Then the number of teaching staff assistants has increased from 14,959 members in 1981/82 to 18,885 members in 1999/2000 (26%) [13]. Accordingly, it was found that the ratio of faculty members : students in colleges of

agriculture decreased to as low as 1:3, respectively [14]. Including the assisting staff would decrease the ratio even lower. Lately, students' specialities became market-oriented, and the number of graduating students shifted towards only three departments, namely; animal science, food science and horticulture [3], Fig. 2.

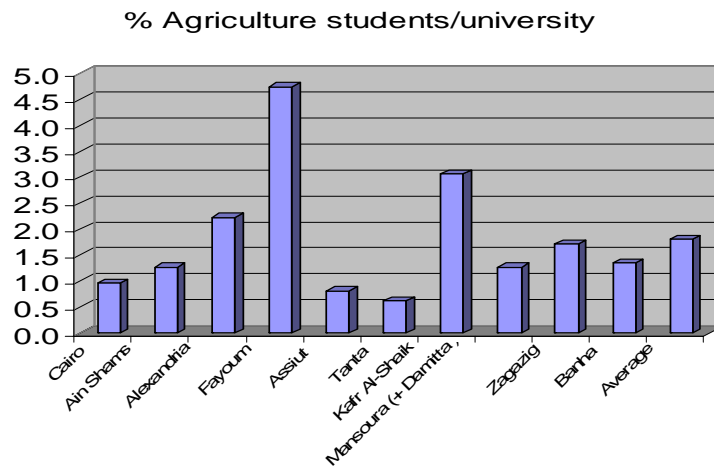


Figure (1) Agricultural students percentages relative to total university students in (2004-05) academic year in some representative Egyptian universities.

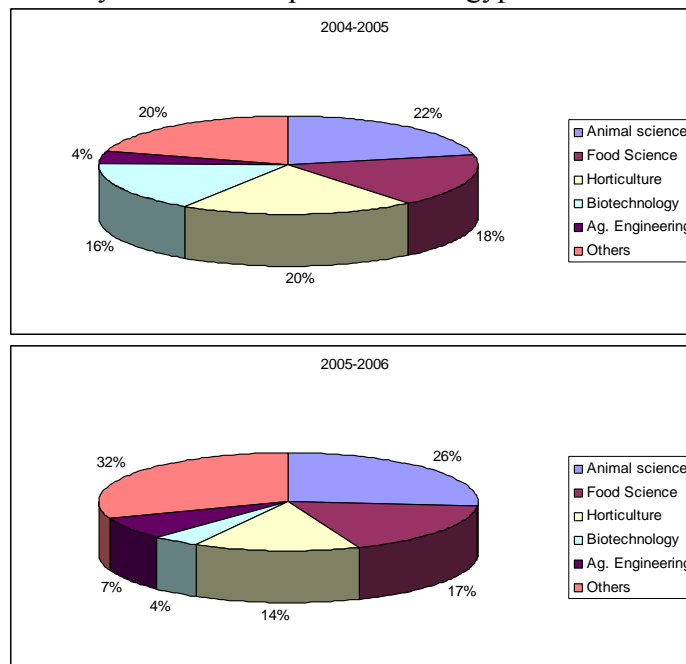


Figure (2) Number of students in some specialities at the faculty of agriculture, Cairo University in the academic years of 2004/2005 and 2005/2006 [3]

Moreover, the quality of students graduating has significantly decreased. According to the skill gap analysis performed by the Agricultural Exports and Rural Income project”, AERI [2] (funded by USAID), the stakeholders were suffering from the lack of skilled agricultural graduates. Consequently the graduates could not secure jobs related to their

education, because they lack major skills required by the agricultural businesses. In another survey for the employment rate of the faculty of agriculture graduates (a sample of 30% of graduates during 2001-2003), it was found that unemployment reached 79% and those who were employed were not necessarily in the field of agriculture (SWOT analysis i.e. Analysis of Strengths, Weaknesses, Opportunities and Threats, [4], See Table 1). Moreover, academic programs deployed in teaching, both in agricultural technical school, institutes or higher education were in dire need for improvement and updating to cope with market newly-emerging requirements. Also, building the capacities of faculty and staff members was a must, as they were the pillars to improve the curriculum. There is a continuing need to re-invent and reform to remain current, relevant and effective. We need to be both global and local in all that we do in agricultural education [1].

Table (1) Main points of strengths and weaknesses in the self-study of the Faculty of Agriculture, Cairo University, 2003

Item	Strength	Weakness
Faculty Staff	Ratio of faculty staff :students is good	Number of internationally qualified staff is low (30.1% of faculty members)
		Faculty- assistant staff ratio is not balanced (74 % faculty: 26 % assistant staff) and among the faculty members 62% are full professors
		Hiring staff in not according to actual need
		Working conditions for faculty members in not conducive
Students	There are programs to care for excellent students	Quality of enrolled students is low and there is no criteria for admission
	Lecture room and library provide good learning/study environment	Academic advising is weak
	Course registration/deletion is easy and clear	There is no employment follow up unit for graduates at the Faculty
	Graduate students have the skills critical thinking the problem solving (according to some stake holders survey)	Graduated students do not have practical skills needed in the market
		Unemployment rate among graduates is high.
Curriculum	Academic programs for undergraduate is variable with 26 majors (in 18 departments)	Teaching focuses on theoretical part and not practical skills
	There is a new program for academic excellence to increase competition among students.	
	Applying credit hour system	
	1720 courses per year are available	
Physical resources	Lecture rooms and laboratories are in a good conditions and well equipped	Budget for renovation of laboratories and equipment is decided centrally and not according to needs
	Availability of up-to date modern library with internet connection	
	The abundance of computers and data show devices	

According to FAO [6], the population working in the field of agriculture in developing countries increased slowly from 38.59 % (in 1950) to 43.38 (in 2000) with an average of 42%. It is expected that the population working in the field of agriculture will reach 44.44% in the year 2010 (see figure 3). This clearly implies the importance of secondary and higher education in the field of agriculture and how the development of this area can significantly affect the society.

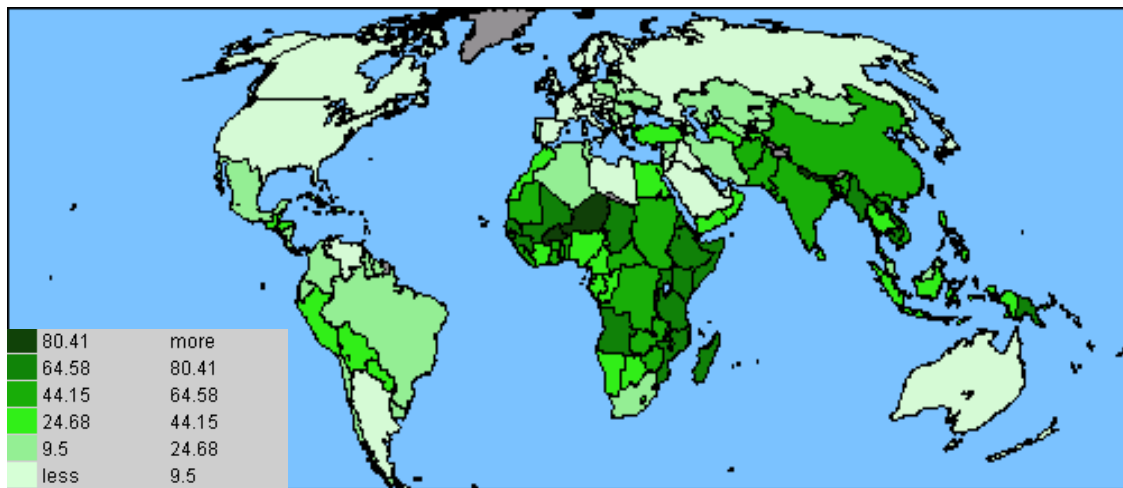


Figure (3) Agricultural population as percentage of total (%) expected in 2010
Source: FAO 1997b [6]

4. Initiatives to Enhance Agriculture Higher Education in Egypt

Like other countries, Egypt has realized that education is the main key to achieving progress and that promoting education is the main gate to the New World map with all its requirements. Therefore, the Egyptian government considered education as one of its top priorities and looked upon it as a national security issue. It, also, started to plan and implement new educational strategies, which are based on carefully, planned decrees and decisions as well as principles and bases to be followed by executive practical plans [13].

Accordingly, initiatives to improve higher education in all fields, and particularly in the field of agriculture, became a must. One of these initiatives was carried out by a sub-project of Agriculture Export and Rural Income, AERI [2] to improve the capacities of teachers at the agricultural technical schools around the country. The project trained over 3000 teachers on the active learning strategies which can improve the educational process and subsequently produce skilled graduates who would meet the market requirements in the field of agriculture. Also, among the dedicated activities of the project was the attempt to improve learning atmosphere at schools by providing overhead projectors and well-prepared educational transparencies to 50 agricultural technical schools around the country [2].

Another initiative was carried out by The Higher Education Enhancement Project Fund (HEEPF) as a part of the early mentioned loan agreement [16], between the Arab Republic of Egypt and International Bank for Reconstruction and Development (IBRD), to support and finance priority areas of the strategic plan of the higher Education Enhancement

Project (HEEP). HEEP Priority considerations also included: Faculty/Staff and Leadership Development Project (FLDP), Information and Communication Technology Project (ICTP), Quality Assurance and Accreditation Project (QAAP), Faculty of Education Project (FOEP), and Egyptian Technical Colleges Project (ETCP).

HEEPF goals were to tackle the above challenges mentioned in the World Bank report so as to support improvements in the quality, relevance & efficiency of higher education at Egyptian public universities and higher education institutions. HEEPf financed 160 projects across the country, from which 17 projects (10.6 %) were in the field of agriculture and 2 at the botany department (Faculty of science), distributed across the country (see Fig.4). The total fund for these projects reached about 1.5 million US dollars in four cycles of requesting proposal from HEEPf during 2004-2007 periods (See appendix 1). The sum represented 11.5% of total budget for HEEPf (13 million dollars). The number of funded projects varied significantly among universities ranging from no projects at all in some university (ex, Assuit University, not listed) to 7 projects as in Alexandria University, Figure (3). This is because funding projects was merely based on competitiveness. Al Menoufyia University was the second in rank with 3 HEEPf projects in agriculture.

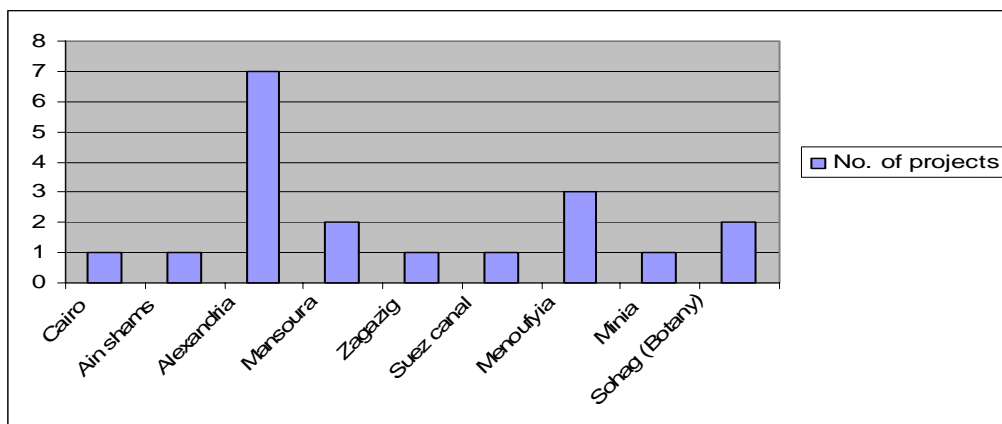


Figure (4) Number of HEEPf funded projects at Egyptian Universities in the field of agriculture

5. HEEPf Sub-projects for Higher Education Enhancement in Agriculture

In general, most of the HEEPf funded projects worked around producing a long life self-learning market-oriented agricultural graduate who can meet local, regional and global markets requirements. This objective could be achieved through: (1) develop of an effective curriculum and course content to meet the dynamic market needs, (2) maintain appropriate learning environment and physical resources, and (3) promote faculty members' educational qualifications, ethical conduct and commitment.

The land and water management project at the Faculty of Agriculture in Alexandria University (see appendix 1) is a typical example of a HEEPf project aiming at enhancing academic excellence and relevance of a major undergraduate program in agriculture, i.e., land and water resources management. The project objectives were to be achieved through

a participatory, consultative and multidisciplinary process that involved all relevant stakeholders including students, professors, private sector potential employers for the development of new undergraduate programs, curricula and courses that are in step with the new trends and advances in science and technology, meet the needs of the changing job market in Egypt, promote staff development, efficient use and enhancement of educational resources particularly in information technology, and finally generating new opportunities for collaboration with the private sector to provide on-the-job training and future job opportunities for the program graduates and increase job opportunities for its graduates. All projects have conducted a thorough assessment of local and regional development needs and job market requirements as well as an assessment of the science and technology gap between current program and what is being offered by like-minded institutions worldwide. It goes without saying that it was important for the institutions through this effort to develop and articulate their new vision, mission, objectives and focus for educational program.

In most projects, several areas for enhancing higher education in agriculture were included; improving curricula in both under and post graduate levels, establishing laboratories and teaching environment, E-learning and simulation laboratories, communication and information technology, specialized and interdisciplinary centers, training and capacity building and collaboration protocols and sustainability.

The areas and mechanisms of development in one of the projects at the Department of agricultural engineering, Alexandria University through the HEEPF funded project are summarized in Fig. (5). The project focused on the three corners of the educational process (curriculum, human and physical resources) starting by assessment and evaluation of market needs and applying the appropriate teaching and learning methodology along with improving learning environments.

6. HEEPF Contribution to Academic Development in Agriculture

The funded projects in Agriculture successfully developed 77 courses in the under and post graduate levels, representing 17% of total 453 courses developed in all academic fields [7]. In addition, several new diplomas at the post graduate level were established. For example one of the projects in Alexandria University worked in curriculum development for both under and post graduate levels at the department of agricultural engineering and upgraded the following undergraduate courses; Renewable energy for non-engineering majors and Energy for and from Agriculture. Graduate courses such as: Solar thermal, Wind energy and its agricultural applications and Biomass energy were upgraded. At Cairo University's faculty of agriculture, the biotechnology program was well developed. Similarly, at Minia University, courses of botany and agricultural zoology were reconstructed (See appendix 2 for detailed undergraduate courses). A new diploma for dealing with environmental pollution was established at University of Alexandria (Damanhor branch). This diploma developed 10 courses in the field of water pollution. In addition, at Sohag, University, department of Botany, 11 related courses were also upgraded in both printed text and E-learning format [9].

E- learning is considered a natural development for the distance learning programs which started with correspondence learning then multimedia and then the use of video-audio conferences and finally learning that depends on the internet or E- learning. Among the 77 courses developed in agriculture using power point Microsoft tools, 22 of these used Learning Content Management System in E-learning format [9].

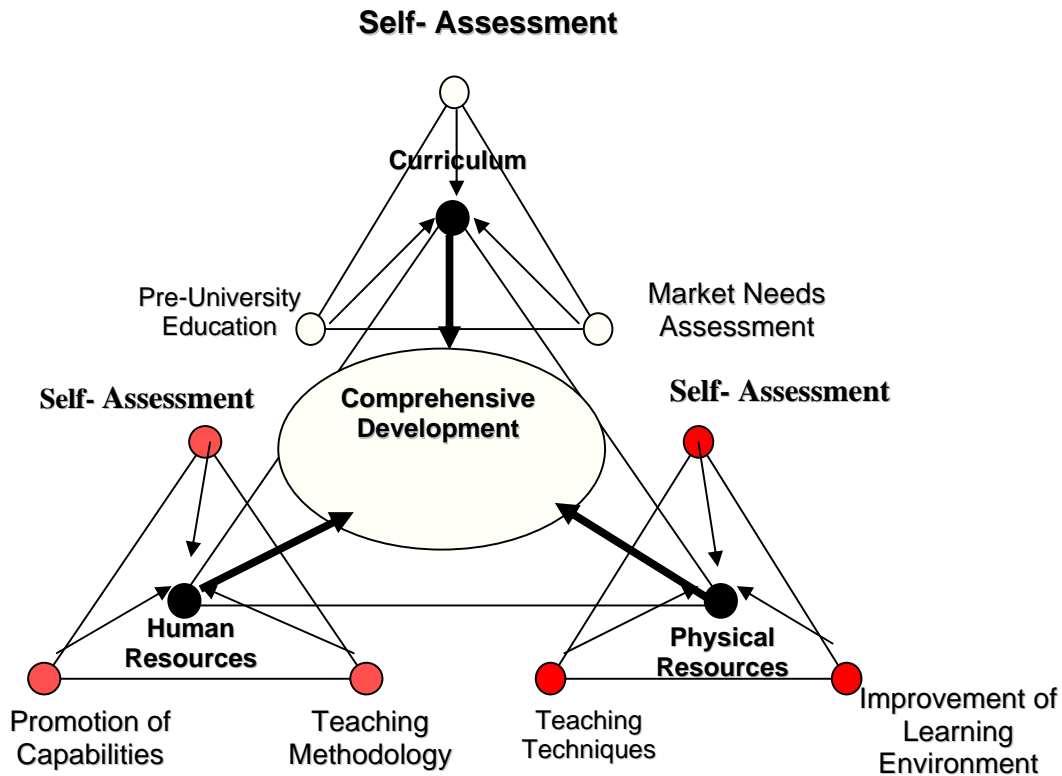


Figure (5) A schematic presentation of areas and mechanisms of higher education development at the Faculty of Agriculture, Alexandria University

7. HEEPF Contribution to Development of Human Resources

The second major component of educational enhancement is capacity building and training. 17 training programs were established in different fields of agriculture through the HEEPF funded projects. Several projects adopted training on applying modern technologies, use of multimedia and internet in teaching and preparation of educational materials in electronic format, using simulation models in chemistry, or training on E-learning and data base preparation [10]. At the single project at Cairo University, mutual visits between project managers and evaluators from Germany and USA were conducted. At Minia University, staff training was conducting on preparation of education materials in electronic format, anatomy slides, use of digital microscope and Aver vision cameras. It is also worth mentioning that several projects intended to develop students' presentation and communication skills through graduation project (as in Department of Botany, Sohag University).

8. HEEPF Contribution to Development of Learning Environment and Physical Resources

The establishment/ renovation of specialized centers, laboratories and acquiring soft ware were among the methods used in developing the learning environment in HEEPF funded projects in the field of agriculture [10]. Two centers for the agricultural applications of renewable energy and one center for biotechnology were established at the Faculty of Agriculture, Alexandria University and Cairo University, respectively. At Minia university, a center for preparation of educational materials was established as an output of the project. Dairy science laboratory, food nutrition at University of Alexandria (Damanhor) and Mansoura, respectively, were among the laboratories that were renovated. Several new softwares were procured such as Chem office, CACHE Ws pro and Chemistry 4 D-Draw office for chemistry simulation model. Electronic data base on agriculture economics was also established at Menoufyia University.

9. Integration and Collaboration among Funded Projects

The idea of integration and collaboration among HEEPF projects was achieved through funded projects in agriculture and veterinary medicine. The first conference for projects integration was held at Alexandria University in April 2006. During the conference criteria of measuring the success were set, which included number of beneficiaries before and after integration, evolving new products, better sustainability, improved education/teaching quality, and enhanced capacity building.

Academic areas of integration among projects included exchange of developed course materials (text and E-learning), holding workshops and training programs for staff among other activities (Fig. 6). One of the successful examples was the exchange of developed simulation experiments in physics (total of 60 experiments) among two projects in Suez Canal and Sohag University. At Alexandria University, a unit at the Faculty of Agriculture at Shatbi was established to coordinate amongst the projects and initiate a special-type unit from outcomes of all projects within.

10. HEEPF Contribution to Sustainability of Projects in Agricultural

HEEPF was the first to introduce the concept of projects sustainability after their handing over and end of funding. HEEPF projects were able to sustain their activities through setting special units to generate income such as establishing a center for Practical and E-Learning Program for the Agricultural Applications of renewable energy at Alexandria University, setting a unit for producing educational materials at Minia University, and signing collaboration protocol with other organizations in the public sectors. A good example was obvious in the collaboration with PECO (private company) to train soil department students at University of Alexandria [12].

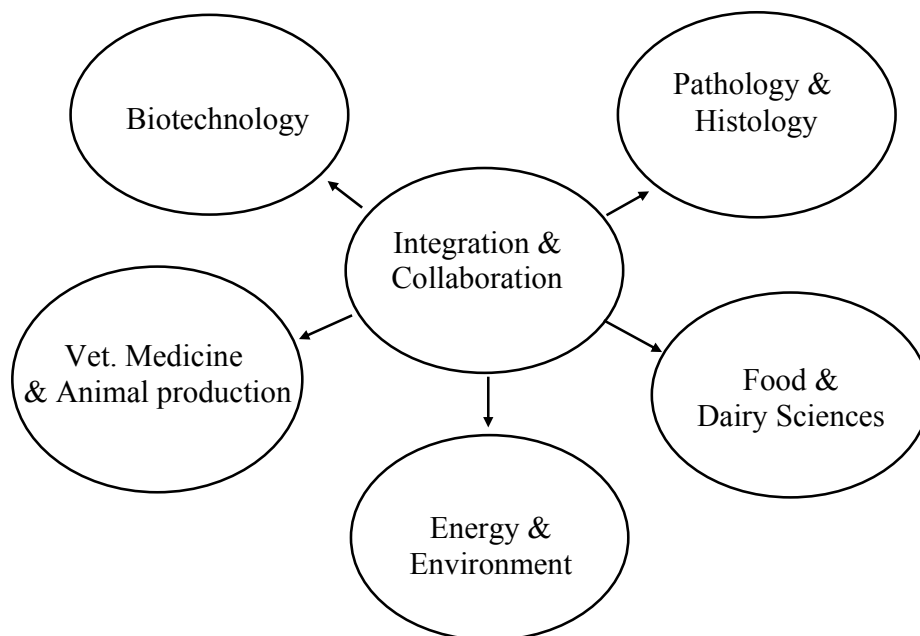


Figure (6) Integration and collaboration among HEEPF projects in agriculture and veterinary medicine

11. Outcomes of HEEPF Agricultural Projects

In addition to all the outputs from the HEEPF sub projects stated above, the major outcome of HEEPF subprojects were to enhance the learning-teaching environment, introduce the new technology in teaching, and raise the level of awareness about the importance of agriculture education among faculty members. Also the support for newly emerging specializations as in molecular biology and biotechnology at Cairo University was among the noticeable outcomes. Introducing the concept of team working, integration and sustainability of projects after ending of funds are considered as major outcomes of HEEPF work.

12. Future Strategic Vision for Higher Education

The first phase of HEEPF projects resulted in a wide array of experiences that could be exploited for future strategic planning. Outputs of the first phase should be maximized through integration and collaboration among projects. Future strategic vision should focus on ; making outcomes available to other similar departments, expanding E-learning to become part of the educational system, establishing graduates- follow up units and develop programs for distinguished students, use of credit hour systems, improving the administrative system, establishing center of excellence, establishing collaboration protocols with foreign universities and the private sector, upgrading the universities infrastructure and modernizing laboratories, establishing connection between education and research projects, improve student training and focus on students skills that meet the market requirements.

13. Conclusion

Higher education in agriculture suffers from the narrow view of its role in the societies it serves and global change processes through which it could exercise considerably greater leadership. But this shortcoming is curable. Higher education in agriculture will play a key role in either achieving or failing to achieve the goals agreed upon by the world community. HEEPF project has successfully provided the means to change and sustain agricultural higher education in quality, relevance and efficiency leading to provide better skillful graduate in accordance with the market requirements. Therefore, it is highly recommended that such competitive projects for enhancing higher education to continue in order to secure better curricula, human and physical resources that help producing competitive graduates at the national, regional and international levels to attain back the leadership in agriculture.

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APPENDICES

Appendix (1): List of HEEPF funded projects in the field of agriculture

Department	University	Project title	Fund X 1000 \$
Agricultural Engineering	Alexandria	Development of a Comprehensive Program of Higher Education in Agricultural Engineering	122.3
	Alexandria	Development of Agricultural Engineering Lab Course for the Agricultural Application of Solar Energy	42.4
	Alexandria	Development of a Center and Practical & E-Learning Program for the Agricultural Applications of Renewable Energy	69
Biotechnology & genetics	Cairo	Improvement of the Agricultural B.Sc. Biotechnology Program	187.5
Land and water management	Alexandria	Enhancing Academic Excellence & Relevance of the Undergraduate Program in Land & Water Resource Management at Alex. Univ.	129.5
Agronomy	Mansura	Improving Learning Programs in Plant Production at the Faculty of Agriculture and bring them to international Standards	83.3
	Suez Canal	Developing Courses of Plant Breeding Branch and Biological Statistics	69.8
Food Science	Menoufyia	Developing the skills of small projects in nutrition' manufacturing for Al.Menoufiya governorate youths	32
Botany	Sohag	Experimental Science and Technology education Program (Faculty of Science, Botany)	112.5
	Sohag	Development of the Existing Genetics Education (Faculty of Science, Botany)	96
	Alexandria	Establishment of a Diploma for Environmental Pollution of Agricultural Ecosystems at Alexandria University	51.36
Botany & Agriculture zoology	Minia	Improvement of Curricula and Teaching of Anatomy & Agricultural Zoology of Undergraduates of Minia University	123
Agriculture Economics	Menoufyia	Agriculture Economics Research Information System	91

Chemistry	Zagazig	Computer Molecular Modeling in Chemistry Education	81
Animal Science	Alexandria	Application of Recent Techniques in Animal Reproduction	30
	A. Shams	Enhancing & improving Animal production science teaching for undergraduates at Faculty of Agriculture	36
Dairy science	Alexandria	Enhancement & Development the Method of Education in Dairy Science & Technology Department	36
Different Departments	Mansura	Developing Applied Agricultural Courses to Increase the Capabilities of Graduates to Meet Markets Needs	40
	Menoufyia	Improving Teaching Methodology of Some Practical Courses Through Field Application in Different Rural Areas	65
Total			1497.66

Appendix (2): A list of courseware in the field of agriculture

Department	Course title	Department	Course title
Horticulture	Garden plant reproduction	Agriculture Engineering	Introduction to new energy Wind energy Solar energy systems
	Ornamental plant production Ever green fruit trees Defoliating fruit trees		
Botany	Plant nutrition	Soils	Soils nature Soils réclamation Soils maintenance Soil fertility & fertilizers Soils morphology, biological masses, hydrauphobic Introduction to soil pollution Principles of agro-ecosystems Fundamentals of soil science Properties of colloids Hydraulics Soil genesis classification Soils reclamation, irrigation and drainage Soil Physics
	Plant anatomy		
	Cells & applications		
	Plant physiology		
	General entomology		
	Introduction to all pollution		
	Introduction to water pollution		
	Environmental toxicology		
	Biochemical and biological effect of air pollution		
	Diagnosis of air pollution		
	Environmental management		
	Practical general microbiology		
	Soil microbiology		

Agronomy	Grain & legume crop Production of sugar & untraditional crop Fiber & oil crops Fodder & pasture crops Biological statistics Fundamentals of plant growth Improving self-pollinated crops Improving cross-pollinated crops Designing & analyzing agricultural experiments		Soils, water, fertilizer, and plants analysis Principles of geographic information system (GIS) & remote sensing Soil chemistry Soil as a medium for plant growth Soil fertility and its management Irrigation and drainage of agricultural soils Practical soils reclamation.
Animal Science	Poultry production (practical) Poultry nutrition (practical)	Plant Pathology	Plant disease control (Fundamentals) Fruit pathology. Physiological plant pathology Bacterial plant pathology Plant anatomy
Dairy science	Dairy microbiology Milk microbiology (practical)		
Agriculture Extension	Methods of extension Principles of agricultural extension Extension systems	Chemistry	Practical organic chemistry Practical bio-chemistry