

TAMKEEN

Findings Report – Education, Scientific Research & Development and Agriculture Academic Programs in MENA



October 2016

This report is produced by the International Center for Biosaline Agriculture (ICBA) in contribution towards the design and development of the Arab Women Scientists Leadership Program – TAMKEEN.

Analysis of the state of higher education in the region in general, and the state of agriculture programs specifically, has been determined as a key step in the design and development of the TAMKEEN program. This analysis provides insights into potential skill and resource gaps facing scientists in the region, offering ICBA an opportunity to incorporate respective development needs into the design of the TAMKEEN program. Furthermore, it offers ICBA insights into other areas of development that would contribute towards improving the status of scientific research and development in the region in general, and towards improving the status of Arab women scientist in the region specifically.

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1. Introduction

The three oldest and still operational universities in the world are today located in Egypt, Morocco and Iran. *The University of Al-Karaouine* in Fes, Morocco has been awarding degrees since 859 A.D. Alexandria's Ancient Library was more than a repository of books and manuscripts, but rather formed a center of learning and education during the Ptolemaic era attracting scholars and learners from across the Mediterranean region and beyond. *Ibn Khaldoun*, a scholar hailing from the region, discovered fundamental economics some 400 years before Adam Smith and others¹ With the spread of Islam in the Arab region after the seventh century, local religious schools known as *madrasas* spread becoming the main educational institutions not only disseminating knowledge but establishing educational standards that are still visible and applied in current-day universities such as the separation of master's and doctorate programs, tenure and protections for academic freedom² These *madrasas* focused on humanism and scholasticism, followed shortly by the spread of academic institutions in the region focusing on the development of nonreligious sciences such as astronomy, physics, mathematics, medicine, chemistry and geography. *Beit al Hikma* (House of Wisdom) flourished as one such scientific academic institution in Baghdad up until the sixteenth century³

Today, the state of education in this region that was once the cradle of higher education is a far cry from past times. Despite efforts and achievements by Arab countries in the last decade in the field of education – *achievements such as doubling the number of students, doubling the number of higher education institutions, increasing the share of females in higher education considerably, rise in the social demand for higher education, reforms in the fields of admissions and support, the spread of state education institutions into remote areas, establishment of national commissions for accreditation and quality assurance, increased diversity of academic programs offered, increased foreign universities local footprint and increased partnerships of local universities with their foreign counterparts*⁴ the quality of higher education in MENA⁴ ranks among the lowest in the world with no Arab universities featuring among the top 200 universities in the world, and only two or three Arab universities occupying positions among the top 500 universities in the world⁵

The challenges faced by higher education in the Arab World are many, and disparate in their importance and depth. Regional disparities when it comes to educational opportunities are huge, with some countries in the region struggling to provide equal educational opportunities to their citizens, while others – specifically in the Gulf region- offering a rich landscape of educational opportunities among a wide range of local and international public and private universities⁶

The UNESCO 2009 Regional Report on Higher Education Challenges in the Arab world refers to *quality of higher education as the biggest challenge facing the region*. Quality within this context includes several components such as teaching methods, curricula, faculty and research, management-related challenges impacting quality, financing, resource challenges and inter-university regional collaboration⁷

Furthermore, on the scientific research and development side, the region still lags behind developed nations significantly with regards to the percentage of GDP expenditure on Research and Development activities. From the perspective of regional academics and researchers, a plethora of challenges need to be addressed to provide more conducive environments for researchers and scientists in the region to excel and start making significant contributions on a regional and an international level. The challenges include:

- Offering efficient and sustainable funding opportunities for researchers
- Linking socio-economic regional problems to scientific research and development themes
- Establishing mechanisms to allow scientist to achieve impact and recognition for their contributions to solving regional problems

- Improving curriculum in both theory and practice
- Enhance faculty knowledge, skills and teaching methods
- Build stronger soft skill base of scientists and researchers
- Enrich the selection of exchange programs and international collaboration with leading international academic and research institutions
- Raise awareness about the value and impact of scientific research and nurture public interest in the same.

This report summarizes findings on achievement and challenges of higher education in the Arab world in general, obtained through reviewing various resources and data points published by various institutions and scholars on the same. The report also addresses the state of scientific research and development in the region. Additionally, this report also offers findings on the state of higher education in the field of Agriculture and related sciences specifically, by presenting feedback obtained through interviews conducted with Deans of Agriculture and Deans of Graduate Studies at select Arab Universities in the region.

2. Higher Education in the MENA Region: Main Achievements over the last decade

For the purpose of this report, Higher Education refers to University and College level education at the Bachelor, Masters and PhD Degree levels. The MENA region refers to the Middle East and North Africa region, covering countries in the Middle Eastern *Mashriq* and *Maghreb* regions including Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen.

The MENA region reported several achievements that have differed from one country to another depending on the prevailing socio-economic and political conditions. These achievements are mainly centered on⁸

1. Increase in education opportunities
2. Diversification of higher education institutions and increase in their number and geographical spread
3. Initiatives & Innovations

2.1 Increase in Education Opportunities

Overall Growth

The number of students in higher education rose from 2.967 million in 1998/1999 to 7.607 million in 2007/2008, a jump of 256%. Part of this growth is attributed to population growth and the rest (117% growth) is attributed to an increase in social demand for higher education⁹ Figure 1.1 illustrates the overall growth in the number of students in higher education in the MENA region between 1998 and 2008 and Figure 1.2 illustrates the same growth per 100,000 inhabitants over the same period ¹⁰

Figure 1.1: Growth in the number of Students in Higher Education in MENA region (1998-2008)

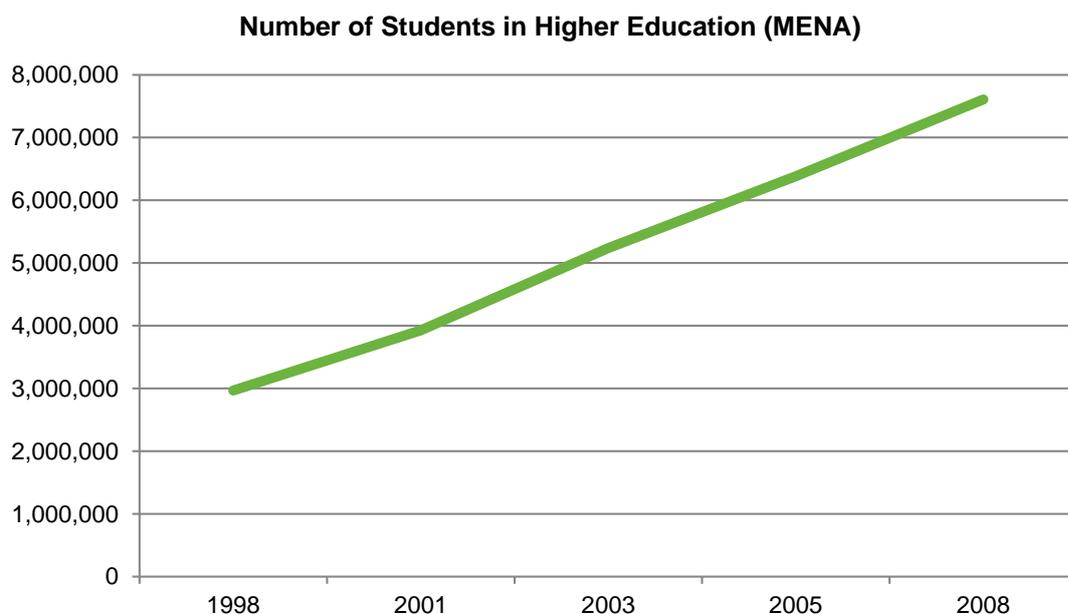
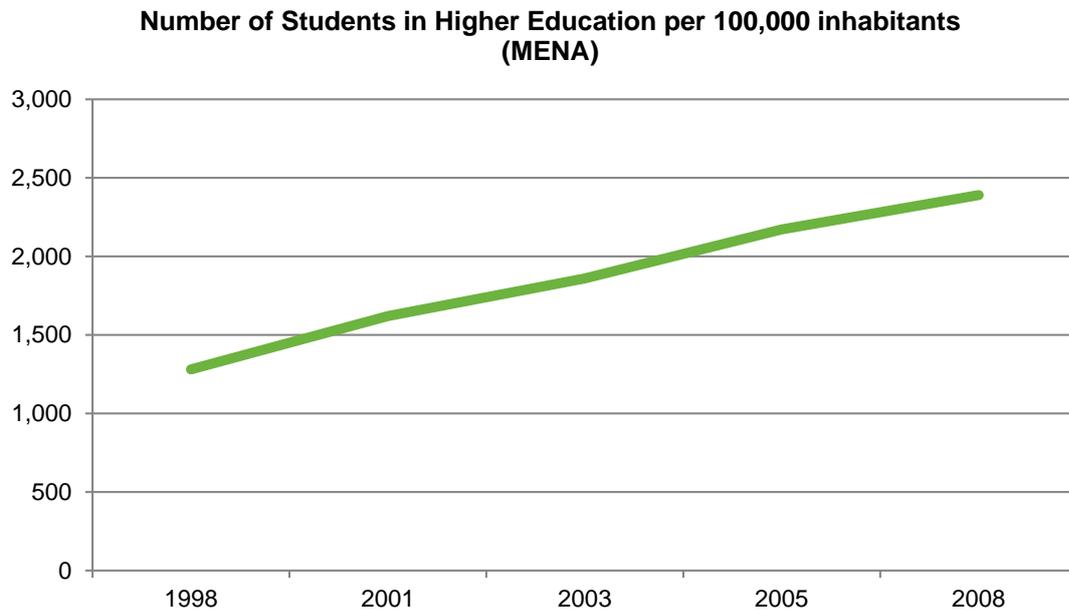


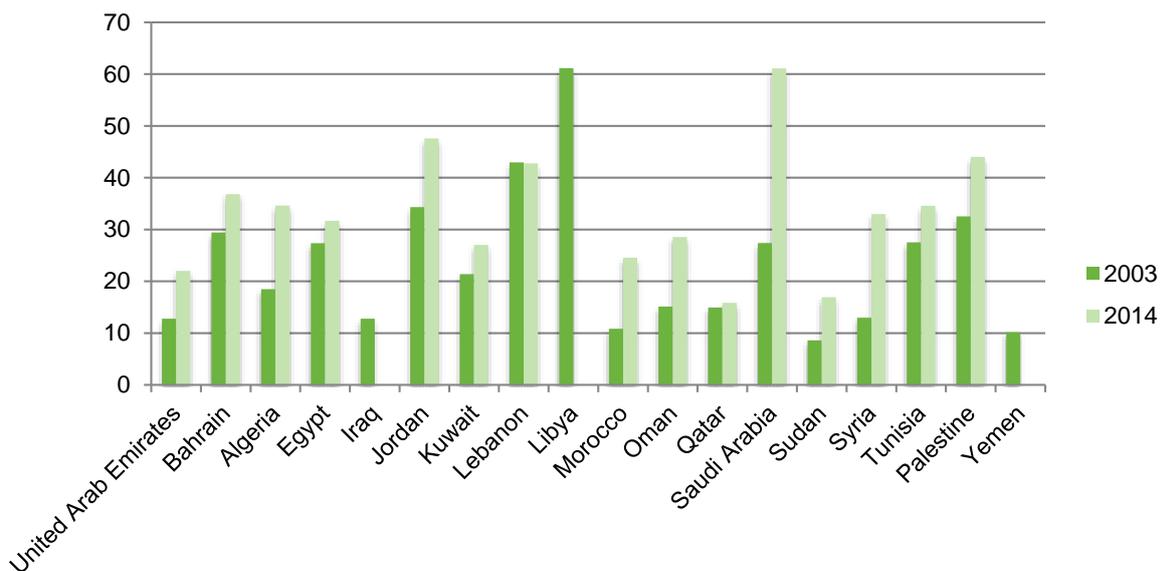
Figure 1.2: Growth in the number of Students in Higher Education per 100,000 inhabitants in MENA region (1998-2008)



Regional Disparities

There are considerable regional disparities in terms of access to higher education arising from many factors including: economic conditions, population density, size of rural areas, historical advantages in higher education and political stability. To demonstrate these regional disparities, Figure 1.3 reflects the Gross Enrollment Ratio in higher education –expressed as a percentage of the total population of the five-year age group following on from secondary school leaving - across select MENA countries between the period of 2003 to 2014 according to World Bank Data.

Figure 1.3: Gross Enrollment Ratio in Higher Education (MENA)

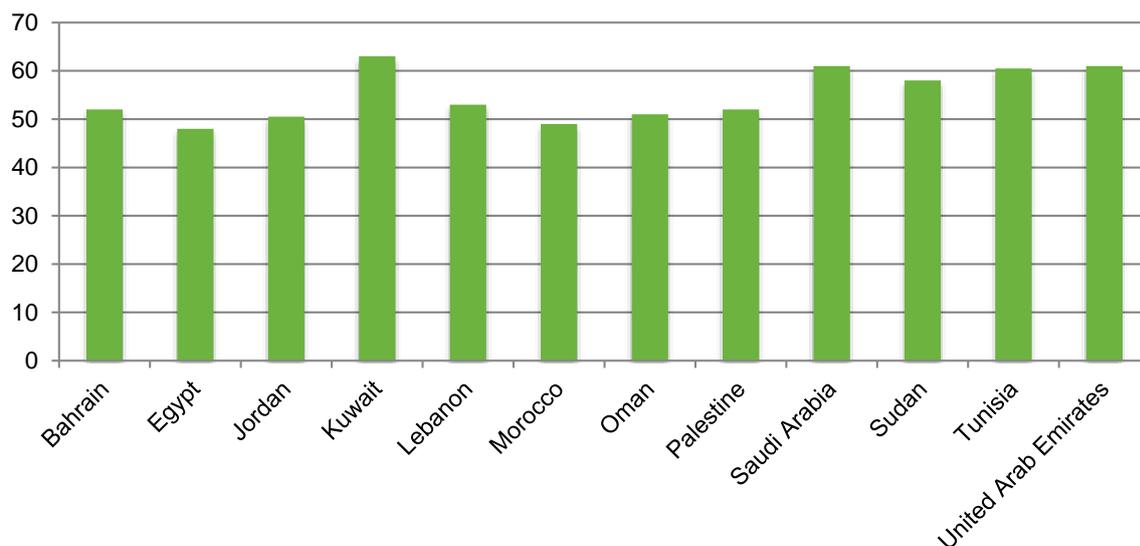


Note: Data not available on Enrollment Ratios for the year 2014 for Iraq, Libya and Yemen. Also note that a high ratio may reflect a substantial number of overage students enrolled because of repetition or late entry rather than a successful education system.

Increase in the share of females in higher education

Overall, the share of females in higher education in MENA countries reached 50% in 2008. This rate exceeded 60% in Tunisia, UAE, Saudi Arabia and Kuwait and the Gender Parity Index overall in the MENA countries across this indicator rose from 0.86 in 1998 to 1 in 2008, i.e. total gender parity in higher education achieved. The Gender Parity Index have risen over 1 in some MENA countries (for example in Bahrain, Jordan and United Arab Emirates) reflecting disparity favoring females in these countries. Figure 1.4 reflects the 2008 percentage of females out to total enrolled students in higher education.

Figure 1.4: Percentage of Females out of Total Enrolled Students in Higher Education in select MENA region countries (2008)



Note: Data not available for Algeria, Iraq, Libya, Syria and Yemen

2.2 Diversification of Higher Education Institutions and increase in their number and geographical spread

The number of active universities in the MENA region has more than doubled between the period 1998 to 2008 and stands today at a total of 389 universities. This number exponentially increases to 1,139 if we include higher educational institutes in general including community colleges and teacher-training institutes. Public universities account for 51% of total universities in the MENA region with the remainder share belonging to non-public universities. The share of universities among public and non-public sector varies greatly across countries in the region reaching as high as 80% share of non-public universities in some countries (UAE, Bahrain, Lebanon, Palestine and Qatar) to below 20% or almost zero in other countries (Algeria, Morocco, Libya and Iraq)¹¹

In Focus: The GCC Academic Revolution, excerpt from The Politics of Higher Education in the Middle East: Problems and Prospects, By Vincent Romani (2009)

“The continuous Arab academic expansion in the Gulf over the last decade reflects ambitions beyond the region. It is taking place in the wider context of the opening of a globalized market of higher education throughout the world, of which GCC countries intend to claim more than their share. And by founding world-class, top-ranking universities, Gulf political leaders seek not just to close the “development gap” in their countries; they explicitly intend to reverse the balance of knowledge between the West and the Middle East. Their aim is to change the Arab academe from a site for knowledge *reception* to one of knowledge *production*.

One important pattern characterizing the current academic boom is a dual process of *privatization* amidst *globalization*. Two-thirds (around 70) of the new universities founded in the Arab Middle East since 1993 are private, and more and more (at least 50) of them are branches of Western, mostly American, universities. (In 2008 even the most state-centered country, Saudi Arabia, whose government runs eight public universities, accepted the founding on its soil of two private universities and of numerous new private colleges.) And inevitably, more and more non-citizen staff and faculty will have to be recruited to sustain this institutional blossoming. Indeed, the idea of the Gulf becoming a new major academic player is beginning to spread throughout the Arab world, attracting faculty, students, and researchers from within the region and beyond.

Three places of especially flourishing academic activity are Qatar, the UAE, and Saudi Arabia. Each of these countries, however, has followed a distinct pattern of academic development. In Qatar, funding is mainly governmental, through the Qatar Foundation: Since 2003, Qatar’s Education City has welcomed at least 8 universities (6 American, 2 Australian), and more are to come. Qatari funding tends to cover the bulk of the construction costs, but foreign universities remain private institutions.

In the UAE, Dubai International Academic City, established in 2007 as part of Knowledge Village (a free trade zone), now houses 32 branches of foreign universities from all over the world. Financial responsibility is more symmetrical, as these branches are expected to cover their own costs in what is designed as a co-investment operation.

In Saudi Arabia, the King Abdullah University of Science and Technology opened in September 2009. Its \$10 billion endowment makes this university the sixth richest in the world.

These three patterns of academic reform are either mostly market-driven (like in Dubai), or mostly state-driven (like in Saudi Arabia). And just as market-oriented reforms have certain advantages (for example, greater elasticity and adaptability), they are at the same time susceptible to some weaknesses including economic pressures and financial crises.”

2.3 Initiatives and Innovations

1. Countries in the Arab region have undertaken various initiatives targeted at increasing educational opportunities, improving the quality of education and improving technological management at higher education institutions levels. These initiatives include¹²
 - 1) Establishing new types of universities in the form of branches of foreign universities and partnership and cooperation agreements with foreign universities
 - 2) Establishing new types of faculties and programs in the form of faculty training programs, capacity building programs for specific segments of the society (for e.g. entrepreneurs, rural women, etc.) and establishing doctoral higher institutes to coordinate research plans
 - 3) Creating Information Communications Technology (ICT) Systems
 - 4) Establishing university networks and databases in the forms of higher education networks that link all higher educational institutions within a given country, linking with the Euro-Mediterranean Network of Education & Research and the creation of E-libraries and unified library management systems
 - 5) Initiatives aimed at boosting the quality of higher education such as the Fund for Quality Development (Palestine), Hussein Fund for Creativity and Excellence (Jordan) and University Observatories (Tunisia and Morocco)
 - 6) Establishing new systems for admission, instruction and evaluating outcomes
 - 7) Initiatives aimed at supporting research such the Scientific Research Commission established in UAE in 2008 that regulates scientific research activities at higher education institutions and that funds individual and national research projects in priority areas.

2.4 Conclusion – Main Achievements

Despite achievements in increasing the number of students at higher education levels and achieving gender parity in education in many Arab countries, tangible achievements at improving quality of higher education, universities' social responsibility, improved administration, management and governance at higher education institutes and improved financing remain weak. Additionally, legislative activity aimed at modifying or amending higher education laws and systems remain very limited, rendering these as relatively old or work in progress. Moreover, despite the plethora of proposals and ideas addressing forms of Arab cooperation at the higher education level, concrete steps towards creating a unified Arab space for higher education are largely missing, limiting steps concerning the creation of unified quality assurance systems, degree recognition, exchange programs, networks and databases.¹³

3. Higher Education in the MENA Region: Challenges

Despite the many achievements and initiatives that Arab countries have recorded within higher education, the region still faces many complex challenges. These challenges vary and are more severe in some countries versus others. Disparity in challenges is also noted and is different among public and non-public universities, with public universities in the region facing more severe forms of such challenges. These challenges are centered on the following areas ¹⁴

1. Sufficient, equal, equitable, diverse and graduate level educational opportunities
2. Quality higher education
3. Instilling of a social responsibility culture among students in higher education institutions
4. Efficient and effective management, quality control and governance mechanisms of higher education institutions
5. Low rates of expenditures on university education and difficulty securing sources of financing
6. Political instability, conflicts, occupation and refugee crisis putting a strain on all resources including educational resources
7. Social Issues and challenges related to brain drain and unemployment among youth

In Focus: Reforming Higher Education in the Middle East, Philip G. Altbach (2015)

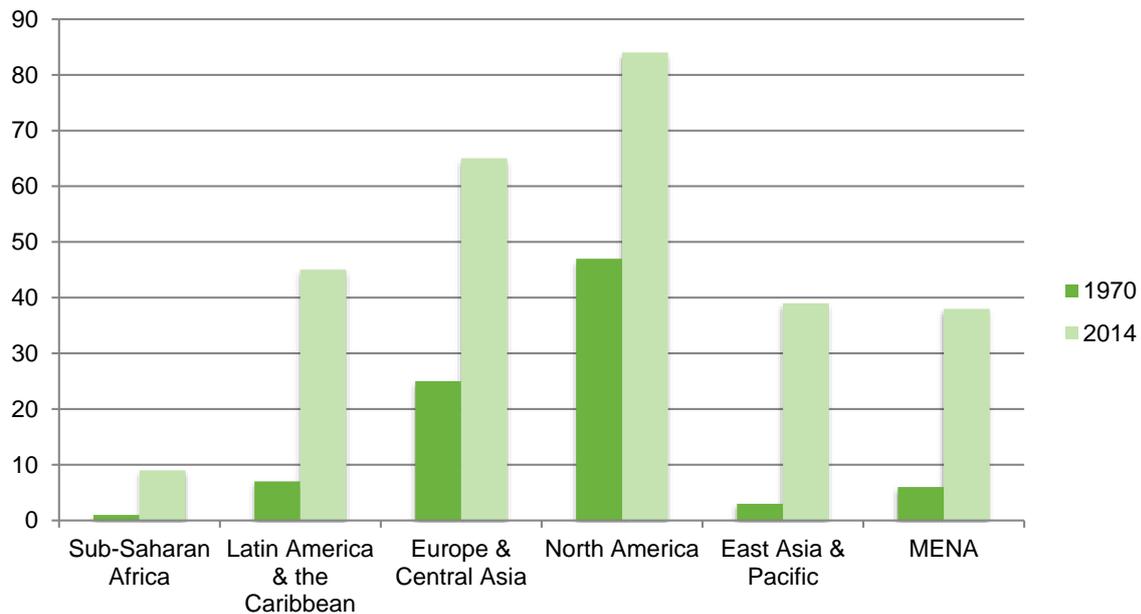
“Among the rallying cries of the youthful revolutionary movements in the Middle East is a demand to reform higher education. The complaints are numerous and well founded. They include political interference at many levels, overcrowded classrooms, an inefficient and unresponsive administration, a decline in quality at all levels, an irrelevant curriculum, under-qualified professors and perhaps most significantly – degrees that do not lead to jobs.”

3.1 Challenges related to Access to Educational Opportunities

Unsatisfactory Enrollment in Higher Education

Despite the gains in the growth of number of students enrolled in higher education across the region, the MENA region is still ranked fourth out of the 6 reported regions in terms of Gross Enrollment Ratio (GER) in tertiary education as of 2014.¹⁵ Figure 2.1 reflects the Gross Enrollment Ratio in higher education –expressed as a percentage of the total population of the five-year age group following on from secondary school leaving.- across 6 world region between the period of 1970 and 2014 according to World Bank Data.

Figure 2.1: Gross Enrollment Ratio in Higher Education as a percentage of total populations of the five-year age group following on from secondary school leaving (1970 and 2014) – World Regions



Lack of balance in enrollment across specialization

Almost 65% of students in the region enrolled in higher education pursue humanities and social sciences with less than 30% pursuing pure and applied sciences. *Enrollment in Agriculture studies in the region was the second lowest field of study after services management in 2008*.⁶

Figure 2.2: Distribution of Students in MENA region in Higher Education by broad Fields of Study

Enrollment Percentage by broad Fields of Study

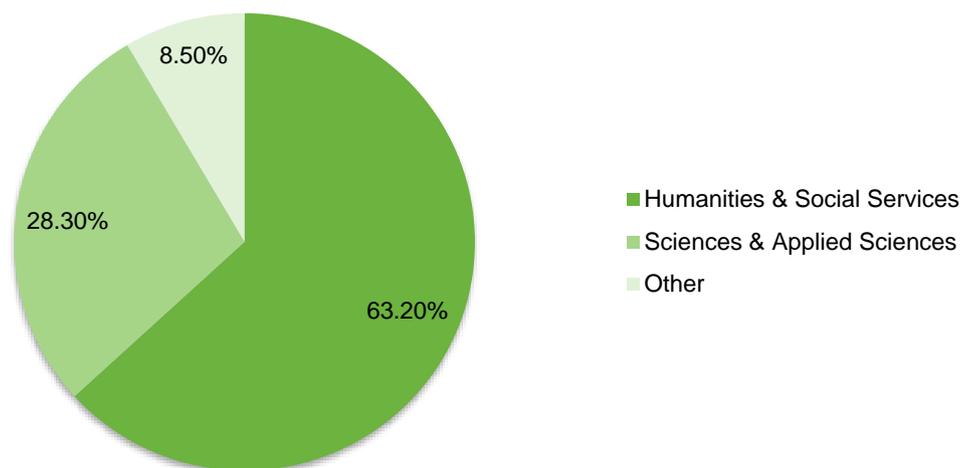
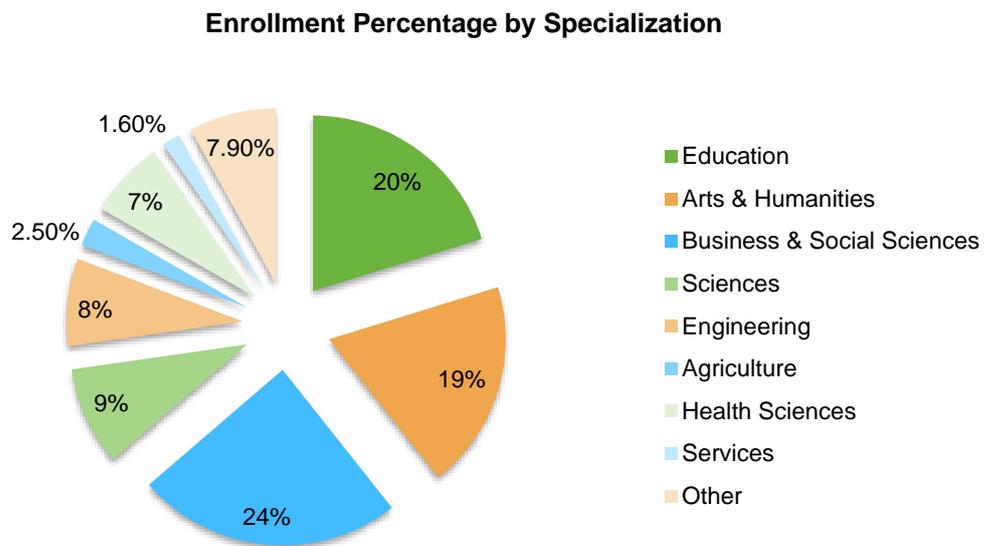


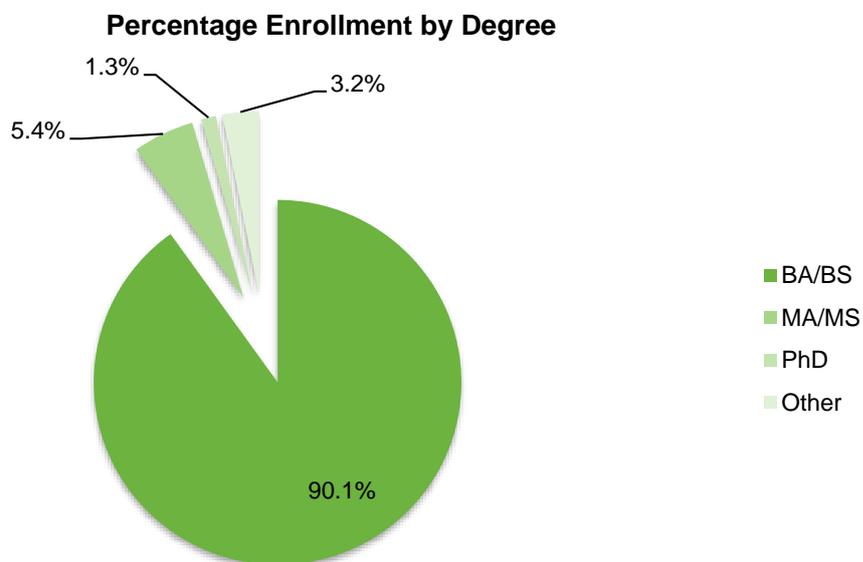
Figure 2.3: Distributions of Students in Higher Education in MENA region by Specialization



Small Size of Graduate Studies

Master’s degree students made only 5.4% of the total number of higher education students enrolled in 2008 in the MENA region. Doctoral students made up only 1.3%.¹⁷

Figure 2.4: Distribution of Students in Higher Education by Degree in MENA region (2008)



Non-state sector limited contribution to education opportunities

Despite the growth of the non-state sector higher education institutes, these institutions are not able to absorb more than 11% of total student enrollment and drops to 10% at Masters and Doctoral degree levels.¹⁸

3.2 Quality of Higher Education

There are many challenges pertaining to the quality of higher education in the region. These challenges include:¹⁹

- 1) Many students with declining availability and quality of educational resources.
- 2) Weak skills of students that stretches as far back as pre-university level, reflecting weaker English skills, and weakness in learning and thinking skills.
- 3) Weak quality of programs and curriculum that covers many aspects including: curriculum not reflecting scientific and technical progress, faculty skill and knowledge shortcoming and lack of sufficient professional development and university pedagogy.
- 4) Weak match between student's specialization and the needs of the labor market.
- 5) Absence of institutional assessment and weak quality assurance procedures.
- 6) Weak Research structures and culture manifesting in various forms including:
 - a. Fewer research requirements at graduate level.
 - b. Weak links between research projects and national socio-economic development plans.
 - c. Weak research culture among public and private sector institutions.
 - d. Lack of access to modern equipment, books, resources and means of publication.
 - e. Weak contact with regional and international science institutions.
 - f. Weak financing and expenditure on research.
 - g. Lack of clear guidelines for managing and accessing research.
 - h. Lack of support for research, consulting and participation in conferences by some higher education institutions.
 - i. High number of teaching hours for academic faculty.
 - j. Emigration of qualified, educated people abroad.
 - k. Failure to provide an enabling environment and build researchers' capacities.

In Focus: The Paradox of higher education in MENA, Shanta Devarajan (2016)

"Employers in the region complain that university graduates lack the skills needed to work in the global marketplace. These graduates lack "soft skills", including creativity and teamwork, partly because their education and training has emphasized memorization and rote learning. About 40% of university graduates in MENA are unemployed; the labor participation of women, most of whom are better educated than the men, is the lowest in the world."

In Focus: Education in the Middle East and North Africa, World Bank (2014)

“Evidence points to a pervasive mismatch between the skills required by the job market and those taught in schools. Surveyed employers report that only about one third of new graduates are ready for the workplace. The region invests little in pre-and in-service training as a whole; yet, of those that do, more than half add that they must address this lack of work-readiness by providing training. Students are as aware as employers of this skills mismatch: when interviewed, only one third believed that they were adequately prepared to enter the workforce.”

4. Scientific Research in the MENA region

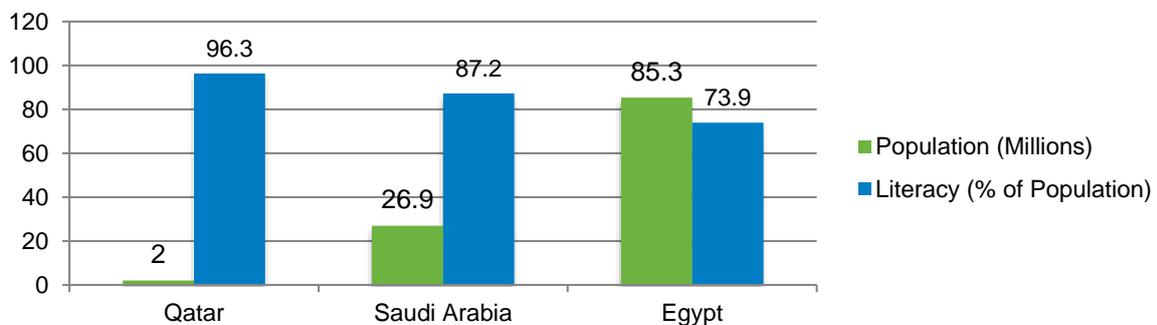
The MENA region is rich in human and natural resources, but many of its countries need a cultural and scientific transformation to reach worldwide recognition in education, research and economic productivity.

4.1 Expenditure on Research & Development (R&D) as a percentage of GDP

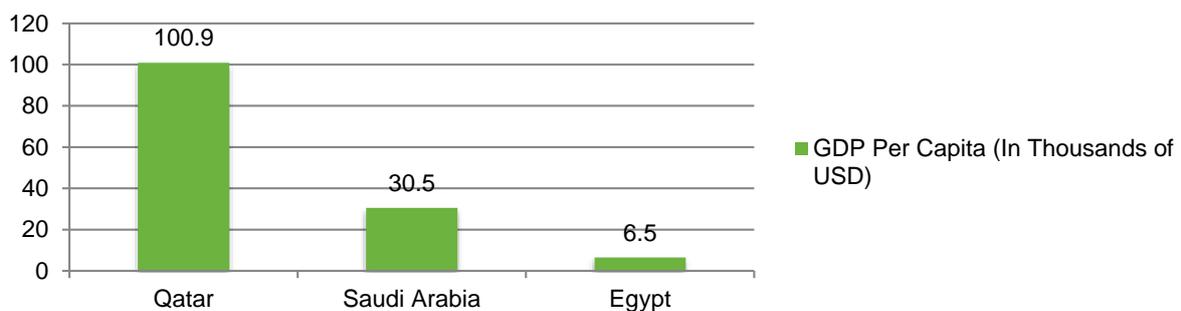
The state of education and science in the region lags behind international standards as demonstrated earlier and the data in Figure 3.1 are reflective of MENA realities: GDP expenditure on R&D in the region lags significantly behind international standards. Egypt's spending on the same amounts to 0.4% of the GDP, compared for example with South Korea that reaches 4%. Despite this, the Gulf is leading the region in percentage of GDP expenditure on education, reviving hope for a successful science renaissance ²⁰

Figure 3.1 Demographic and economic statistics for Qatar, Saudi Arabia and Egypt

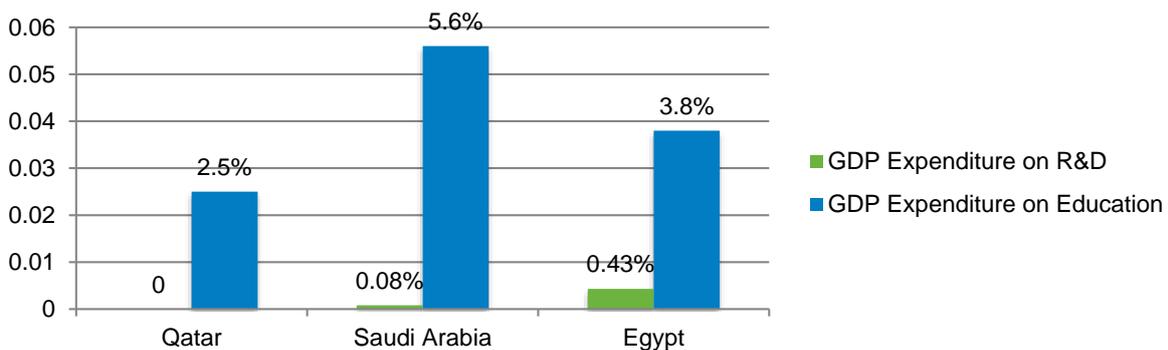
a. Population & Literacy



b. GDP per Capita



c. Percentage of GDP Expenditure on R&D and Education



Notes: a. Total and literate population. Percentages of literate people with respect to total population numbers are also shown. b. GDP per capita. c. Expenditure per capita in R&D and education. R&D (black labels) and education (green labels) expenditure in percentage GDP are indicated. Population refers to 2013. Literacy rate: Qatar (2010), Saudi Arabia (2011), Egypt (2012). Percentage GDP expenditure on R&D: Qatar (N.A.), Saudi Arabia (2009), Egypt (2011). Percentage GDP expenditure on education: Qatar (2008), Saudi Arabia (2008), Egypt (2008) Raw data for a comparison among countries for exactly the same time periods are not available.

4.2 Scientific Impact – Publication & Citation Indicators

In general, publication and citation indicators show some encouraging trends for the region over the past decade (see Figure 3.2). However, the impact of scientific research in the MENA region still pales to that of the West and it is natural to ask why MENA scientists have, as a group, underperformed compared with their colleagues in the West, or with those rising in the East (see Figure 3.3). The reasons are numerous. In the MENA region they include the illiteracy pile-up during colonization, the poor governance and imposed deprivation of free-thinking over the past half century, and the continued deterioration of core education owing to the ineffective policies of handling a large student population ²¹

Figure 3.2: Number of citable documents published per year in select MENA countries (in thousands) – 2004 and 2014 according to Scimago Journal Rank

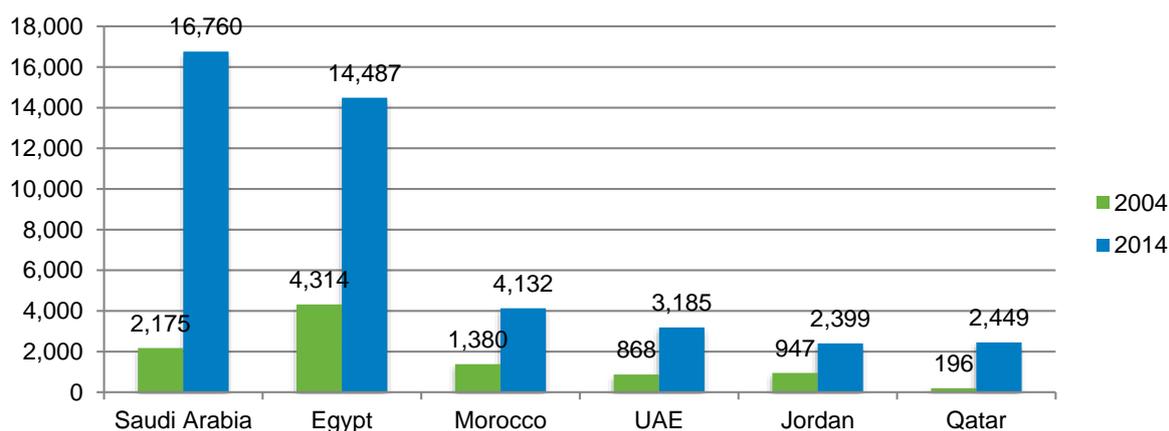
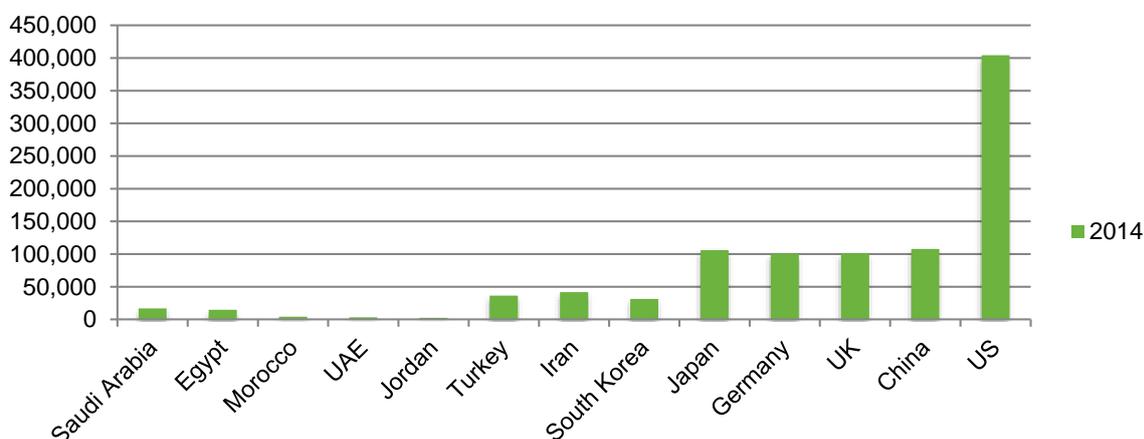


Figure 3.3: Citable documents published in 2014 – Select World Countries (in thousands), data from Scimago Journal Rank



4.3 Regional Initiatives

We offer here below an overview of three centers that are trying to lift the region up in terms of standards of education and scientific research and development.

From Qatar, the Qatar Foundation is focusing on bridging the gap in education standards through transferring Western established university systems offering cutting-edge education curricula to students of the region. This has manifested in the presence of many reputable schools that are sponsored by the Qatar Foundation, and these include Carnegie Mellon University for degrees in computer or biological sciences, Weill Cornell College for medical degrees and Georgetown University for degrees in international affairs or international economics²²

Saudi Arabia is providing a different structure that may make scientific impact by different means at the graduate level. King Abdullah University of Science and Technology (KAUST) in Saudi Arabia is another institution in the region that focuses on research and development. More than US\$10 billion has been committed to KAUST. Most of the staff and administration are brought in from outside the Kingdom. Research output is already being produced, in diverse and important areas, with new opportunities. KAUST's publication count almost doubled between 2010 (214 papers), its first fully operational year, and 2011 (412 papers). According to the 2015-2016 QS world university ranking, KAUST ranked as the first in the world in citations per faculty, which is a measure of research impact. Challenges though remain as to how to disseminate this new science culture throughout the country and beyond the premises of KAUST, and how to secure continuity and sustainability of the initiative through engaging local Saudi nationals ²³

The Zweis City of Science and Technology is another initiative from Egypt. The City comprises three interactive substructures: the university, the research institutes and the technology pyramid, designed to enable world-class education, scientific research and industrial impact. The goal is to build a modern science base with an advanced industry sector.²⁴

4.4 Research Output

The research investment (R&D spend compared to GDP) – as noted earlier – and research capacity (researcher numbers compared to population) of the 57 member states of the Organization of Islamic Conference (OIC) are running at just one-quarter of the world averages according to the Journal Nature and the Royal Society of London's recent report²⁵

However, the Royal Society also pointed to a changing future in its report's titled "A new golden age" as a result of the rate of investment and growth in research in these countries, which is showing signs of dynamism seen in other countries such as Brazil and China. As noted earlier in Figure 3.2, some countries in the region show steep growth rates in terms of the publication of citable documents with Qatar growing its share of citable documents published by more than ten folds between the ten-year period of 2004 to 2014. Saudi Arabia citable document publication has grown by over a seven times multiple while countries such as the United Arab Emirates and Morocco have almost tripled their share of citable documents published. Such trends offer a positive outlook for the region's growth outlook in the research and development sector but also necessitate addressing challenges to ensure sustainable investment and growth in R&D in the region.

4.5 Research Focus

Research concentration – measured as the global share of research output in a specific field – shows common focus trends in the region. Overall, Egypt, Jordan, and Saudi Arabia show a common focus in the fields of engineering, agricultural sciences, chemistry, pharmacology, materials science and mathematics, roughly in that order. Egypt exhibits a focus in physical sciences, with the exception of its largest share in pharmacology. Jordan's largest world share is in environmental sciences and ecology. Saudi Arabia top field in world share is mathematics²⁶Figure 3.4 outlines select MENA countries percentage share of global research outputs.

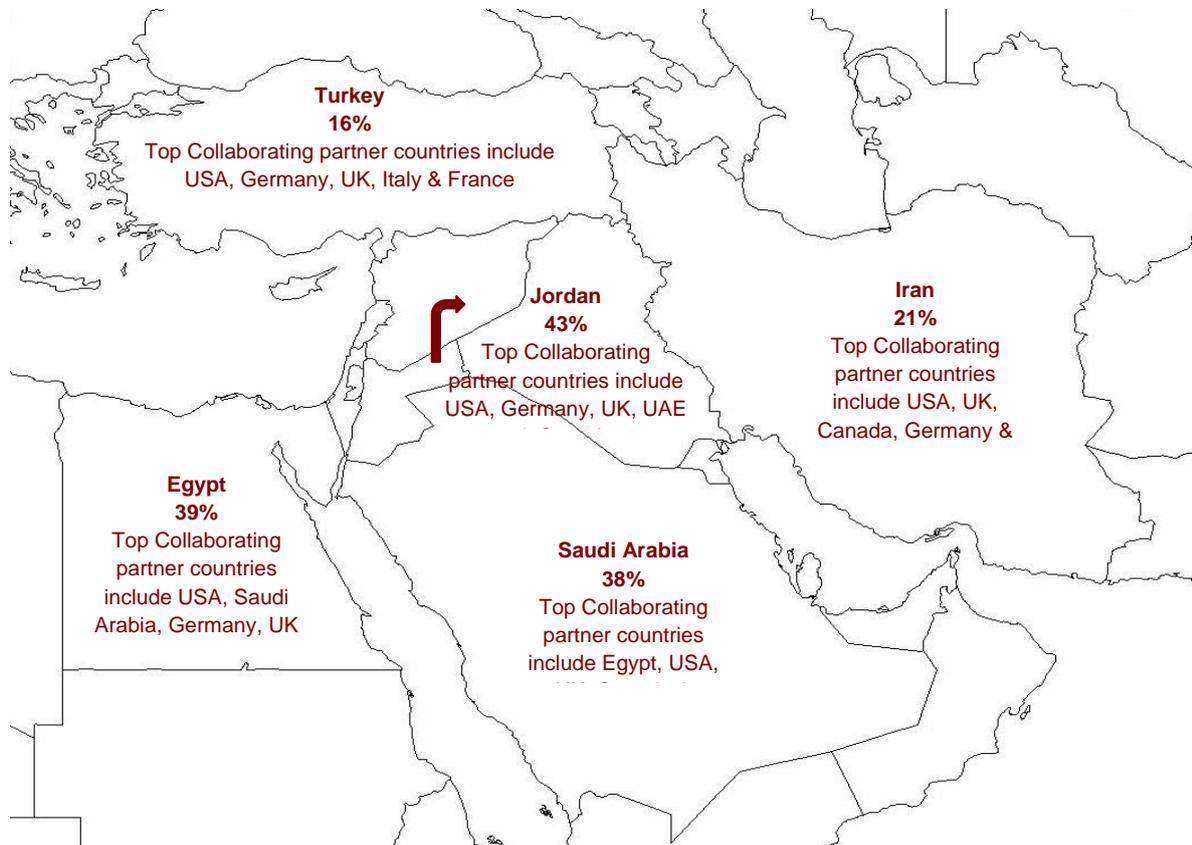
Figure 3.4: Global share of research output (% world papers) for Egypt, Saudi Arabia and Jordan by field²⁷

Egypt		Saudi Arabia		Jordan	
Field	Percent	Field	Percent	Field	Percent
Pharmacy	0.71	Mathematics	0.32	Environment	0.16
Materials Sciences	0.66	Engineering	0.31	Engineering	0.15
Chemistry	0.64	Medicine	0.26	Agriculture	0.15
Engineering	0.57	Pharmacy	0.22	Mathematics	0.13
Agriculture	0.48	Materials Sciences	0.19	Pharmacy	0.12
Physics	0.40	Geosciences	0.16	Chemistry	0.11
Microbiology	0.35	Chemistry	0.15	Computer Sciences	0.11
Geosciences	0.34	Computer Sciences	0.15	Geosciences	0.10
Plant & Animal Sciences	0.32	Physics	0.14	Plant & Animal Sciences	0.09
Mathematics	0.31	Microbiology	0.13	Medicine	0.07
All Fields	0.36	All Fields	0.17	All Fields	0.08

4.6 Research Collaboration

The expanding network of research collaboration has become a predominant feature of the global research base. Nations increasingly draw on one another's expertise and share costs and resources by working together, enabling the sharing and exploration of new knowledge²⁸Overall in the region, there is a lower level of collaboration that is generally true elsewhere. However, countries such as Egypt, Jordan and Saudi Arabia are relatively frequent research collaborators with around 40% of their domestic output having one or more co-authors from another country, and usually, another country in the region is among the more frequent partners.²⁹There remains however much potential to expand collaborative partnerships, which would further enhance the current growth trends and might also be an effective mechanism is enabling the less research intensive areas of the region to develop in partnership with more mature neighbors.³⁰Form the list of countries reviewed, Jordan appears to be the most collaborative nation while Egypt holds a pivotal role in liking within the region as well into Europe, North Africa and to the USA and Japan. For all countries, the UK and Germany are also frequent partners, reflecting both the attractiveness of their domestic research quality and their substantial capacity for internationally collaborative research partnerships³¹

Figure 3.5: Top collaborating partners for countries: The numbers in each country refer to the percentage of national output that has an international co-author³⁴Figures for Turkey and Iran are provided for comparative purposes.



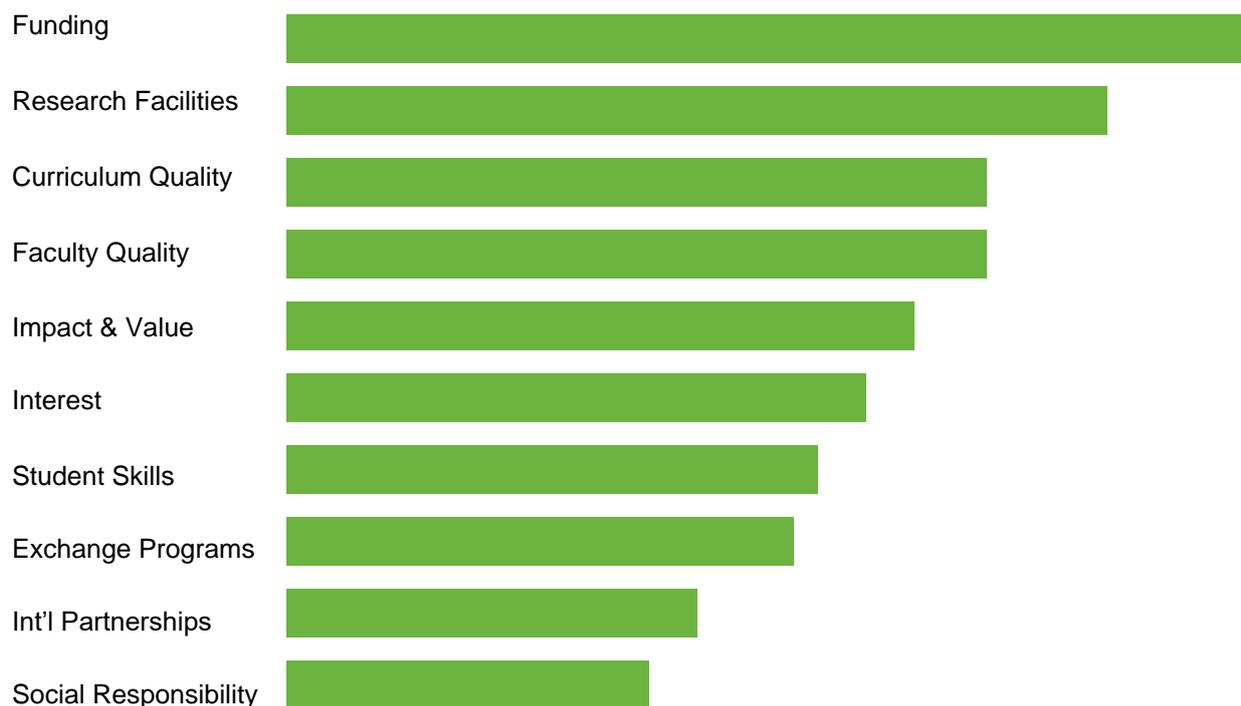
5. Agriculture Academic Programs in MENA

5.1 Topics covered for qualitative assessment

The following section covers qualitative feedback that was captured through interviews conducted for the purpose of this report with a number of prominent academics and researchers within the field of agriculture in the region. A number of topics were discussed with interviewees including:

- 1) Funding and Financing available for scientific research and development activities
- 2) Student interest in Agriculture studies reflected through enrollment figures in higher education programs
- 3) Student Quality metrics including assessment of the skills standards of students – such as English language skills, critical thinking, critical learning, communication and leadership skills
- 4) Curriculum Quality Metrics including assessment of the quality of programs & curriculum on offer vis-à-vis scientific and technical progress
- 5) Faculty Quality Metrics including assessment of the quality of faculty in terms of university teaching methods, international experience and exposure and professional development
- 6) Research Structure and Culture Metrics including assessment of the state of facilities and resources available to research students, local scientific research culture, links between research programs and country socio-economic development plans, partnerships with regional and international scientists and science institutions and financing and expenditure on research
- 7) Social Responsibility including assessment of student contact with the community, embodiments of values of citizenship and collaboration and transfer of knowledge between students and communities

5.2 Ranking of Top Challenges facing agriculture programs in the MENA region – In Descending Order as reported by interviewees



5.3 Agriculture Programs MENA: Challenges & Opportunities

In-Focus: American University of Beirut

Lebanon, Beirut

Data reflecting 2016/2017 academic year:

Total Student Enrollment: 7015

Total Graduate Program Enrollment: 1650

B.Sc. Agriculture Program Enrollment: 80

B.Sc. Agribusiness Program Enrollment: 54

Total Agriculture Undergraduate Program Enrollment: 134

Total Agriculture Graduate Program Enrollment: 26 (1.5% of Grad Program Enrolment)

Gender Breakdown in M.Sc. in Agriculture: 67% Males, 33% Females

Gender Breakdown in M.Sc. in Agricultural Economics: 60% Females, 40% Males

Gender Breakdown in M.Sc. in Rural Community Development: 78% Females, 22% Males

Growth / Decline Trends:

New Student Undergraduate Enrollment in Agriculture between 2006 & 2016: (63%) decline

New Student Graduate Enrollment in Agriculture between 2006 & 2016: 40% growth

Total Student Undergraduate Enrollment in Agriculture between 2006 & 2016: 0.75% growth

Total Student Graduate Enrollment in Agriculture between 2006 & 2016: 18.75% decline



Funding

Lack of sufficient funding through research grants has been reported across the board as a major challenge derailing research and development efforts within the agriculture field in the region. This challenge however surpasses funding as a stand-alone challenge and links closely to other challenges such as identifying socio-economic problems, developing research themes across these problems, identifying deliverables and providing funding to create sustainable solutions.

“We are challenged in lack of funding for scientific research much like the rest of the region. However, this extends to include restrictions and lack of flexibility on how to use such funds even when they are secured. There is a lot of bureaucracy and red tape surrounding funding and despite proposed changes surrounding governance structures in this area in Tunisia, the road is still a long one. In Tunisia today for example, there is no government funding provided for equipment purchase and we therefore have to look elsewhere for equipment funding.”

Dr. Thouraya Souissi

Head of Pedagogical Department
IRESA, Tunisia

Interdisciplinary Research Grants

The need to work across disciplines has been identified as a crucial factor in creating sustainable solutions to current problems. This therefore requires the creation and structuring of funding mechanisms that encourages interdisciplinary collaboration, something that is currently missing at a larger scale in the region.

“At AUB, we recognized a while ago that interdisciplinary research is crucial to arrive at a state where the research conducted is impactful, relevant and sustainable. Despite efforts to raise awareness on the same, we saw little interdisciplinary research collaboration. This completely changed once we introduced research grants that would only apply if interdisciplinary work formed the core of proposed research work.”

Dr. Nahla Hwalla

Dean, Faculty of Agriculture & Food Sciences
AUB, Lebanon

Entrepreneurial Activity based research funding

Nurturing innovation and creativity among researchers was also reported as a key element in raising the status of scientific research and development in the region. This creativity and innovation however doesn't only apply to researchers, but extends to include innovation on traditionally structured research grants. This includes thinking of alternative ways to allow young scientists to access opportunities for research and development, including tapping into entrepreneurial ideas and models that could result in better research results.

“We need to think outside the box. Young people want to make a difference, they want to innovate and contribute, and sometimes perhaps outside the boundaries of a lab or a forest. Offering some a small piece of land for these young people to manage and develop could potentially offer us some interesting solutions to persistent problems that lab-based scientists are less exposed to.”

Dr. Nahla Hwalla

Dean, Faculty of Agriculture & Food Sciences
AUB, Lebanon

Private Sector Funding & Misunderstanding of Research

“There is a severe lack of funding for research and development activities, specifically from the private sector which in our region is looked upon as a huge driver of such activities in the absence of governments' lack of commitment to funding. There is also a general lack of understanding that research and development is a long-term commitment; funding offered today is expected to reap

returns instantly, which defies the very nature of research and development. Furthermore, we focus obsessively on linking research to solving problems when we need to focus on the sustainability of research in an attempt to create a research culture in the region to start off with.”

Dr. Mohammed Shtaya
Dean of Graduate Studies
Al Najah University, Palestine

In-Focus: Agriculture Programs Landscape - Tunisia

National Institution for Agricultural Higher Education & Research (IRESA), 2016

Total Higher Education Agriculture Institutions: 11

Total Students enrolled in Agriculture Programs: 5000

Total Students enrolled in Agriculture Engineering Programs: 500

Female Percentage in Agriculture Engineering Programs: 65% women

Total Students enrolled in Masters Programs: 200

Total Students enrolled in PhD Programs: 50

Female Percentage in Agriculture Undergraduate Programs: 70% Female

Female Percentage in Agriculture Graduate Programs: 80% Females



Research Facilities & Technology Standards

Despite reporting challenges concerning current research facilities and technology available for use among researchers in Levant region, this challenge extends beyond latest technology and facility availability to include at a broader challenge concerning the level of competence among local resources on operating equipment and understanding the wide range of use of technology and equipment in ways that can deepen learning and expand impact.

“Sometimes, the problem is not that we don’t have the latest equipment or technology to conduct research at international standards. Sometimes, the problem lies with the lack of right skills needed to use this available technology. This is where we see a big opportunity for cross-sector collaboration, and specifically the private sector, where we can organize collective industry funds to train users on correct and wide use of technology and equipment.”

Dr. Nahla Hwalla
Dean, Faculty of Agriculture & Food Sciences
AUB, Lebanon

Curriculum & Faculty Quality

The standard of curriculum and faculty varies across countries in the Levant region. The American University of Beirut (Lebanon) and Al Najah University (Palestine) for example reported curriculum that matches international standards in respective fields. Both reported strong faculty standing in terms of qualifications and exposure to participation in international conferences and keeping up with the latest advancements within their respective fields.

Discussions with Cairo University (Egypt) reveal a challenge within this area, mainly on the need to raise the curriculum standards to match international standards and latest technological advances. Furthermore, there seems to be a heavy focus on theory versus building practical skills.

“Our curriculum as it stands today lends more focus to theory and less to technical skills. This is posing a challenge to our graduates in finding job opportunities, which is why we are currently

reviewing curriculum in an attempt to increase the technical and practical aspects. However, we also face another challenge in that our theoretical content also still doesn't reflect latest theoretical advances in the field. Our main impediment with regards to faculty development is in finding sufficient funding to help them upgrade their skills. We understand that even if we reviewed our curriculum to reflect the latest advances in both theory and practice in the field, competent faculty is as critical, if not more critical, in reflecting upgraded curriculum to students. We need to think outside the box here, we need initiatives that look at attracting cutting-edge conferences on scientific research and development here within our region."

Dr. Hany El Shemy

Dean, Faculty of Agriculture
Cairo University, Egypt

"To combat this challenge, we are devising a train the trainer program in Tunisia targeting faculty at a national level to help share learning and best practice among faculty members. We need more regional collaboration here. There is a lot that can be done, and a little organization can go a long way, but someone needs to start doing it."

Dr. Thouraya Souissi

Head of Pedagogical Department
IRESA, Tunisia

Impact of Research and Recognition for researchers

Recognition for scientists contributions to solving the region's problems is a common challenge that in the opinion of key academics and researchers interviewed poses a great challenge in encouraging more scientists in the region to enter and innovate within the space. The reasons for this are numerous including the lack of appreciation of the scientific research and development culture in the region overall, but that extends to and includes a lack of link between socio-economic problems in the region and scientific research and development goals and objectives.

"There is little recognition for scientists in our region. We need to tie government policies to existing problems and commission scientists to solve these problems under an overall national agenda. We see limited strategic planning that is linked to scientific research which obviously impacts the value of scientific research produced in the region."

Dr. Hany El Shemy

Dean, Faculty of Agriculture
Cairo University, Egypt

"The problem is the severe lack of organization when it comes to coordinating scientific research and development activities in the region. The European Union example in this regard is best practice: The EU publishes themes that are closely linked to problems the EU is facing and they channel funding across these themes to tackle these problems. In our region, we have no channels through which common problem identification, deliverable identification and matching funding takes place. Our researchers focus on Western problems not local challenges because they are seeking to make an impact and seeking to get their work published and made relevant."

Dr. Nahla Hwalla

Dean, Faculty of Agriculture & Food Sciences
AUB, Lebanon

Interest in Agriculture among student population

Declining interest in the field of agricultural sciences studies is another challenge that varies across countries in the region. The American University of Beirut reports a considerable decline in new students enrolling for undergraduate agriculture program whereas Cairo University reports an

increase in enrollments outside natural increases derived from population growth. Programs that mix agricultural and business studies are gaining popularity in the form of Agribusiness programs that focus on business and soft skills geared towards agriculture business management.

Overall, this could be attributed to the lack of interest and investment in agriculture related fields across sectors and the general lack of awareness among the public on the importance of agriculture as a field and as a means of living and sustainability.

However, even in the cases where enrollment figures are high, for example Tunisia, the situation doesn't necessarily reflect an interest in the field, but rather a reflection of an admissions system that doesn't filter students according to their interest but based on their grades. Moreover, graduate education can be an escape from unemployment for many, and a way for individuals to "park" themselves in periods of unemployment.

"We have a general lack of awareness on the benefits of rural living and the importance of agriculture to our core existence. If farmers themselves are viewing their rural lives as a curse rather than as a blessing, we are in serious trouble. We need to raise awareness and reignite interest in agriculture as a path towards clean healthy living and as a way to economically prosper and thrive."

Dr. Nahla Hwalla

Dean, Faculty of Agriculture & Food Sciences
AUB, Lebanon

"Declining enrollment numbers in agriculture and related disciplines is a simple equation. Job opportunities and growth prospects drive educational preferences. If we want to increase interest in agriculture, we need to drive our jobs and growth there."

Dr. Mohammed Shtaya

Dean of Graduate Studies
Al Najah University, Palestine

"Perhaps the challenges here facing the Gulf region are somewhat different than the rest of the region. We have the latest facilities and equipment, our curriculum and faculty reflect high standards that can compete at the level of international standards; however we face a major challenge when it comes to interest in studying agriculture. We see more interest in traditional sciences such as medicine, however there is a clear lack of interest in agriculture perhaps because of lack of awareness among the general public of how advances in the field can impact their local communities. There is also a general perception among graduates concerning a lack of ability to make a meaningful impact. Re-generating interest in agriculture has to be a top to bottom approach: governments need to show interest in order for the public to follow suit"

Dr. Malabika Roy Pathak

Assistant Professor, Biotechnology
Arabian Gulf University, Bahrain

"Our Enrollment figures in agriculture are high both at undergraduate and graduate levels, specifically among females. This however doesn't necessarily reflect interest, as a lot of graduates don't work in agriculture post their graduation. This is more a reflection an admissions system that filters students in the higher education landscape according to grades not according to their interest. A good number of students at the graduate level as well do not necessarily enroll out of interest for the field of study or scientific research; that may very well reflect their inability to find jobs and a choice of studying versus doing nothing."

Dr. Thouraya Souissi

Head of Pedagogical Department
IRESA, Tunisia

Student Skills

The level of student skills –for example English Language Skills, Critical Thinking, Critical Learning and Leadership Skills, varies across countries in the region, however it remains a considerable challenge in areas such as personal branding, innovative thinking, scientific proposal writing and cross-cultural communication to name a few.

“We have a big need for workshops that target the development of soft skills of our students including English language skills and fostering innovative thinking. Our researchers typically rely heavily on past research, pick a topic within this part research and publish new research expanding further on such older topics. This demonstrates a general lack of innovative thinking and a lack of ability to apply skills to expand understanding of local challenges and structuring new solutions around it.”

Dr. Hany El Shemy

Dean, Faculty of Agriculture
Cairo University, Egypt

“Our researchers lack skills in branding and presenting themselves to international organizations and publications, not only so they may fully paint the right picture of their experiences and backgrounds, but to also be able to identify, network and reach out to relevant institutions. Beyond that, there is also a need to develop cross-cultural communication skills among our researchers as they communicate across cultures with other institutions, to help them understand cultural nuances surrounding communication.”

Dr. Mohammed Shtaya

Dean of Graduate Studies
Al Najah University, Palestine

“In Tunisia, student skills are a huge challenge not only in the agriculture programs but across all programs; it’s an issue that needs to be addressed at the national level. Communication, entrepreneurship, leadership skills and “employable” skills need to be developed among students across the board. If we are to focus solely at skills needed by our researchers these range from: Independent thinking, scientific writing at the level of international publications, ability to take initiative and “sales skills” that help researchers position and sell their research.”

Dr. Thouraya Souissi

Head of Pedagogical Department
IRESA, Tunisia

Exchange Programs & International Partnerships

Almost all academics and researchers interviewed for this report agreed on the overwhelming need to establish international exchange programs and partnerships with international research and academic institutions and organizations as a mean to both improve the overall state of scientific research and development in general, and to improve the skills of scientists and researchers in the region. Exchange programs provide not only international exposure and networks, but also provide opportunities to raise the level of skills of faculty and students alike and encourage best practice sharing and transfer of learning. Almost all institutions interviewed for this report have multiple established international collaborations and partnerships, however all report a need to increase both the number of such partnerships and the degree of collaboration. Exchange programs reported however were much more limited, providing a lower chance for students to gain international exposure and access to wider networks.

Social Responsibility

“At the end of day, we are conducting research that can be translated at the local level, and than can benefit our local communities. In the field of agriculture in Algeria today, we face a huge challenge in

transferring knowledge acquired in laboratories to farmers. Equipping researchers with both the skills on how to do that, and the awareness of their social responsibilities towards the communities they serve is critical to bridge this gap here. Establishing mechanisms to help alleviate this challenge is critical, but instilling this sense of social responsibility among our researchers is equally critical as it ensures that even in the absence of sufficient mechanisms, there is a drive, a motivation and a sense of responsibility to make this transfer of knowledge happen.”

Dr. Halima Benbouza

Director, Biotechnology Research Center
Constantine, Algeria

6. Concluding Remarks

The MENA region faces considerable challenges to its education and research and development sectors. The challenges range from the political, socio-economic all the way to quality challenges impacting curriculum, faculty, systems and infrastructure and student skills. Legacy education systems built around memorization and focus on theory versus practical application have produced scores of entrants to the labor market who are not job-ready and are perhaps even less ready to assume jobs within the scientific research and development field that requires creative problem solving and critical thinking skills.

Within the scientific research and development sector, the MENA region still has a long way to go in comparison to more successful models within the wider MENA region – for example Turkey and Iran – and an even longer path towards catching up with more developed nations in the West and their accomplishments within the field. Challenges impacting the growth of the research and development sector in the MENA region include a weak research and development culture generally, a lack of deep awareness of the impact of research and development on the growth of economies and well-being of communities, weak funding and investment in research and development initiatives and a weak curriculum, faculty and student quality that eventually impacts not only the quantity, but also the quality of research produced from the region.

Despite the considerable challenges noted above, this report has captured several opportunities that present the region with a catalyst for future growth in the field of scientific research and development. The region is witnessing an increased focus by governments towards investments in education, evident through several countries' higher allocation of GDP investment towards education initiatives. The same is happening with regards to GDP investment in research and development, albeit to a lesser degree. Additionally, several countries in the MENA region have shown considerable growth in the number of citable scientific documents published and the MENA region's share of the world output of scientific publication is indeed increasing.

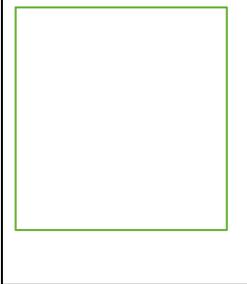
Two emerging trends in addition to the above noted opportunities present a specific opportunity for ICBA in relation to its capacity building objectives within the field of agriculture in the region. Most countries in the MENA region have reached – and some have exceeded – the Gender Parity Index in education, meaning that females are increasingly accessing education opportunities and gaining higher degrees. Additionally, and despite reported low numbers of student enrollment in agriculture studies at the post secondary education levels, scientific publications in the agriculture, environment and geosciences fields feature among the top five fields of scientific output in the three most prolific countries in the MENA region – Saudi Arabia, Egypt and Jordan – indicating a need to address challenges in these fields that lend themselves naturally to countries in the region due to realities of food and water challenges coupled with population growth.

The above presents a valuable opportunity for ICBA to develop and launch a comprehensive capacity building program with an aim to both grow the science and soft skills of female scientists in the region – an issue that this report among others confirm as a major challenge facing scientists and researchers in the region in general - and to raise awareness across the region on the impact of scientific research and development in general, and in the field of agriculture specifically.

ICBA additionally stands to exert considerable impact on the cycle of growth and reform taking place across the region within the education and research and development sector through training and developing scientists and researchers to increase both the quantity and quality of research output produced by the MENA region.

The MENA region is definitely on the cusp of a development wave and its most pressing challenge will be to identify and activate initiatives and measures to ensure both growth and sustainability of this envisioned development that is starting to take shape. ICBA is well positioned to play a pioneering role in both aiding growth and creating sustainable mechanisms to drive this growth for the region for the years ahead.

7. Interviewees

	<p>Al Fares, Heba (Dr.) Head of Plant Protection and Production Department Al-Najah National University, Palestine</p> <p>Ph.D. in Horticulture & Crop Science</p>
	<p>Benbouza, Halima (Dr.) Director, Biotechnology Research Center Constantine, Algeria</p> <p>Ph.D. Agrobitech</p>
	<p>El-Shemy, Hany (Dr.) Dean, Faculty of Agriculture Cairo University, Egypt</p> <p>Ph.D. Agriculture & Genetics Engineering, PhD Biochemistry</p>
	<p>Hwalla, Nahla (Dr.) Dean, Faculty of Agriculture & Food Sciences American University of Beirut, Lebanon</p> <p>Ph.D. Basic Medical Sciences</p>
	<p>Pathak, Malabika R. (Dr.) Assistant Professor, Biotechnology Arabian Gulf University, Bahrain</p> <p>Ph.D. Plant Biotechnology & Molecular Biology</p>
	<p>Shtaya, Mohammed (Dr.) Dean, Graduate Studies Al-Najah National University, Palestine</p>

	<p>Souissi, Thouraya (Dr.) Head of Pedagogical Department IRESA, Tunisia</p>
	<p>Triffa, Youssef (Dr.) Head of Agronomy and Biotechnology Department INAT, Tunisia</p>

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