Status and Options for Regional GMOs Detection Platform: A Benchmark for the Region

by

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Foreword

In the Near East and North Africa region, agriculture is a key element of the economy and an important source of employment and most of the countries are committed to implementation of the Global Plan of Action for Conservation and Sustainable use of Plant Genetic Resources for Food and Agriculture for boosting production and development. Despite the initial acceleration, the region is experiencing delays in the adoption of new biotechnologies and in the implementation of national NBFs, mainly due to lack of adequate institutional capacities in the area.

FAO has approved a two year regional project (TCP/RAB/3202) entitled "Strengthening capacities towards the establishment of a regional platform for the detection of genetically modified organisms». The participating countries include Lebanon, Jordon, Sudan, Syria, UAE and Yemen. The aim of this project is to strengthen regional capacities and to enhance regional information exchange and dialogue in biosafety that would lead to the establishment of a regional platform for handling and managing GMO detection and related procedures through increased regional cooperation and standardization of GM detection and analysis procedures within the region.

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Introduction

Agriculture and food production are the main fields of biosafety applications. Since the Cartagena Protocol on Biosafety (CPB) entered into force in 2003, FAO has been providing assistance to countries in building technical, institutional and information sharing capacities for biosafety, towards the safe use of modern biotechnologies and to enhance sustainable agriculture and food production. In the countries, the focus is on building national capacities at the policy and institutional level to implement the CPB and to establish effective linkages among all relevant stakeholders including the Ministries of Agriculture, Environment, Science and Technology, research and technology centers, the private sector and the civil society.

An equal amount of emphasis is placed on strengthening regional dimensions of biosafety capacities and information exchange. Given the commonalities amongst the regions, countries could often adopt a common regional approach on biosafety both in terms of critical mass of technical expertise availability and through increased regional cooperation lead to standardization of GM detection and analysis procedures within the region.

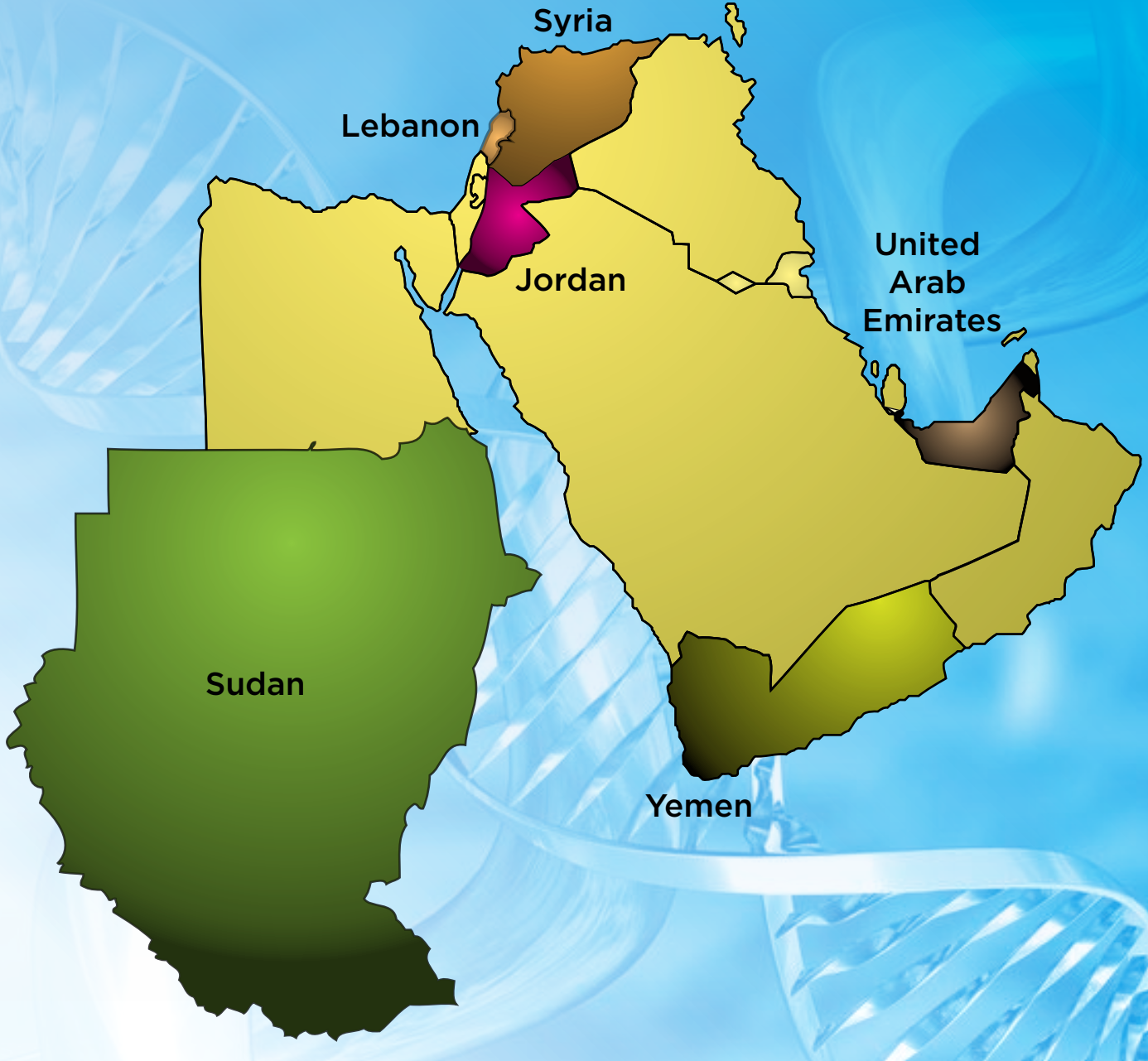
In the Near East and North Africa region, a FAO regional project entitled "Strengthening capacities towards the establishment of a regional platform for the detection of genetically modified organisms»(TCP/RAB/3202) has been ongoing since 2008 with six countries include Lebanon, Jordon, Syria, UAE, Yemen and Sudan. The aim of the project is to strengthen capacities and to enhance regional information exchange and dialogue in biosafety towards the establishment of a regional platform for handling and managing GMO detection and related procedures

The main outputs of the project are to

1. Enhanced regional collaboration in GMO detection among the participating countries , in particular among national laboratories in order to harmonize their practices and certification schemes based on common standards and good practices.
2. Training package a including an information exchange forum make available for the project training activities as well as for future in-house training courses.
3. Increased capacities of technical staff of the participating countries in GMO detection technologies
4. An agreement prepared for the establishment of the 'regional platform for GMO detection in the region' among the participating countries

Within this project one of the tasks is to prepare a Comparative analysis of the current practices in use in the six participating countries and identification of options for standardization. The aim of this document is to present the Status of GMO detection in these countries, identify the gaps, needs and options for strengthening the Regional approach towards establishing a GMO detection Platform for the region.

Chapter I
Agricultural Sector in the Arab Countries



Chapter I: Agricultural Sector in the Arab Countries

The total area of the Arab countries is around 14061.46.2 square kilometer, representing 10.8 % of the world area. The agricultural land area in 2004 was around 69.6 million hectares which represent 5.0% of the world agriculture area. The water resources are in general limited and represent only 1% of the world water resources.

The population of the Arab countries was 309 million in 2004 which represent 4.84 % of the world population and expected to reach 431 million in 2020. The increase rate is 2.31% (for the 1990-2004 period) which is double the world rate.

Arab countries exports value in 2004 was 396.5 billion US$ which represent 4.36% of the world total export, while the imports value for the same year was 243.1 billion, which represent 2.6% of the world imports. This indicates that the contribution of the Arab countries in the world trade is around 3.4%.

1.1. Agricultural sector's contribution to GDP

The contribution of agriculture sector to GDP is usually taken as an indicator of the importance of the agriculture sector in relevance to other sectors in the country. We should notice, however, that as the contributions of other sectors increase and those of the agriculture sector stay constant, then the percentage of agriculture sector contribution to GDP will decrease, which, in fact, does not mean that its importance is declining.

Contribution of agricultural sector to GDP varied significantly among Arab countries and ranged from 63.07% for Somalia to 0.35% for Kuwait, with an average over the Arab countries of 6.80%. However, there are countries with strong agriculture sectors, this is judged by their gross agricultural products (GAP) values and the contribution of the agriculture sector to the national GDP, and these are: Algeria, Egypt, Iraq, Morocco, Saudi Arabia, Sudan, Syria, Tunisia, and Yemen. These countries have also good agricultural resources and also high populations. The contribution of the agriculture sector to the GDP in these countries ranged from 3.32 % for Saudi Arabia to 35.37% for Sudan, with an average of 9.30%. It is interesting to notice that the contribution of agriculture to GDP in Saudi Arabia is relatively small (3.32%), but agriculture sector is very important sector in comparison to other Arab countries; the GAP in this country is ranked second after Egypt whereas the GDP is about three times greater than Egypt. This is due to the high income that being generated from oil exports as we indicated earlier.

- The Gross Domestic Product GDP of the Arab countries in current prices has scored a noticeable take off during the year 2006 to grow to US$ 1.274 billion against 1.084 billion during 2005, with a rate of increase of 17.4%.
- The Arab countries have realized real high rates of growth in the GDP which surpassed a rate of 6% during the year 2006 compared to 5.4 % in 2005. These rates are regarded as better than the growth rates of the developed countries group which has registered 3.1% and less than what was realized by the highly developing countries which have recorded a growth rate of 7.9%.
- The average per capita income at the current prices has increased in the Arab countries from approximately US$ 3613 per person in 2005 to approximately US$ 4156 in 2006, thus realizing a rate of increase of 15%.
- The structure of GDP shows a continuous rise in the relative importance of the extracting industry sector compared to the rest of the sectors, whereas the share of the same in the GDP has increased from 38.5% in 2005 to 40.2% in 2006.
- The services sector comes in second level in terms of the relative importance in the GDP for the Arab countries (22.5%) followed by the manufacturing industry sector (15.6%) and the agricultural sector (7.5%).

1.2. Key factors affecting agricultural investment in Arab countries

- **Policy:** Agricultural development and civil society buy-in/ participation in the policy process are significant.
- **Location:** By its central Mediterranean, Asian and African position, its vigor and growth and its preferential treaties with numerous partner countries, Arab countries offers access to numerous markets for companies that desire to develop their activities.
- **Size of the market:** Arab world has a relatively large population (more than 340 million habitants) with sufficiently strong purchasing power that serve as huge consumer market as incentives for investments.
- **Resources:** Arab countries have huge raw materials (natural resource) base, serve as incentive for low factor-cost investment.
- **Infrastructure:** Access to power, transportation (multi-modal), communication and social welfare (healthcare and education facilities) are in order.
- **Human resources competitiveness:** Highly skilled staff at competitive prices.
- **Investment incentives:** Most of the Arab countries have adopted a numerous incentives, in the form of tax exemption, investment bonuses, no-cost infrastructure, and assumption of employer's share of social costs.

- **Simplified procedures: In most Arab countries, the procedures to start a company are done at a one-stop window that gathers all the concerned administrations.**
- **Regulation: This is improving, especially as institutions are strengthened at an on-going basis.**

1.3. Major agricultural imported commodities:

The imported quantities of agricultural commodities by Arab countries are very large (Table 1); almost all food commodities are imported with wheat barley and maize at the top of the list from the plant commodities, and sheep, goats and cattle from the animals. If we consider the imports of cereals by country, which are the most important food and feed commodities. The Arab countries imports of cereal represents 16.32% of the world imports.

Table (1): Arab countries imports (in 2003) of the major plant and animal commodities

Commodity Plant Commodity	Quantities (tones)	% of the world imports
Wheat	18877147	17.46
Barley	5974545	27.79
Maize	10800724	12.08
Rice	3142120	12.41
Dates	109129	21.57
Banana	14328208	3.76
Fibers (cotton)	129839	1.43
Animal Commodities		
Cattle (Head)	233453	5.85
Sheep (Head)	662686	64.28
Goats	1012063	39.99
Camels	53670	99.99

Source: FAO-AOAD.2005. Selected indicators of food and agriculture for Arab States 2000-2004. AOAD. Khartoum, Sudan.

Public investment is critical for funding agricultural Research and Development (R&D) because it represents 94% of the agricultural R&D in developing countries. Whereas growth in public sector spending in agriculture increased in the 1960s and 1970s, it has slowed down significantly in the last 25 years in developing countries, including the Arab countries. Thus, it is both timely and appropriate to consider a significant public sector investment in biotechnology, particularly crop biotechnology, which is more advanced than biotechnology applications in livestock.

Biotechnology provides an excellent opportunity for the Arab countries to improve and sustain their agriculture productivity and to overcome the major problems that agriculture is facing. In addition, the Arab region is very rich in biodiversity and harbor important genes that biotechnology could use and benefit from.

On the other hand, the most important economical crops in the Arab countries have low productivity due to their susceptibility to major diseases and pests, and to their crop varieties that have low yield and lack the tolerance to the major abiotic stresses such as drought, heat, and salinity. Biotechnology provide answers for most of these problems; biotech (GM) crops substantially increase productivity, reduce the use of chemicals, and increase farmers' revenues.

1.4. FAO biotechnology programs

FAO's strategy concentrate on activities such as the collection and dissemination of information, monitoring and advice, facilitation of access to new technologies, provision of a forum for reviewing trends, development of appropriate guidelines and codes promoting the environmentally sound and equitable application of advance biotechnologies, assistance to developing countries in identifying biotechnology needs and priorities, strengthening of their capabilities and assessment of socio-economic impacts. The FAO is promoting international, inter-laboratory co-operative research through networking, where it assists in establishing several specialized regional networks, and support workshops and training activities in the area of biotechnology.

1.5. The three generations of biotech applications

Agricultural biotechnology has the potential for enormous impacts on crop and livestock productivity, the environment, and sustainability and on the lives of poor smallholders and consumers.

1.5.1. Tissue culture & molecular diagnostics - The first generation

The first generation of biotech applications features plant tissue culture for the production of disease and virus-free propagules, molecular diagnostics for crops and livestock diseases and embryo transfer for livestock. Tissue culture has been successful in many countries for propagation of bananas, multipurpose trees, date palms and is particularly suited for vegetative propagated crops. The further development of improved high value disease-free date palms from tissue culture in the Middle East should be carefully assessed in view of continuing and rapid improvements in the technology. In the continents of Africa, Asia and Latin America tissue culture of bananas has been very successful and easily and cost effectively implemented. Disease-free

sweet potatoes have been grown on 500,000 hectares in Shangdong Province in China with productivity benefits of up to 40%. In terms of biotech diagnostics the render pest virus in cattle has been successfully detected and eradicated using an effective biotech-based diagnostic for the virus.

1.5.2. Molecular markers and genomics – The second generation

In plants, molecular markers are used to effectively track certain traits (for example disease resistance) of value in crop improvement programs – this allows "speeding of the breeding" in crop improvement programs. Accordingly "marker assisted selection (MAS)" of improved conventional varieties of crops can expedite the development and deployment of improved varieties at the farm level. MAS has been successfully used in crops ranging from maize, rice and wheat to vegetable and fruit crops. In India, MAS has been used to develop varieties of pearl millet resistant to the fungal disease caused by downy mildew. In the Philippines it is effectively deployed to develop resistance to bacterial blight of rice. MAS can also be used to breed livestock that are tolerant to African sleeping sickness. Initially the costs of these markers were high but now they are modestly priced and can be used cost-effectively in conventional crop and livestock breeding programs in developing countries.

1.5.3. Genetically modified (GM) crops/biotech crops – The third generation

Genetically modified (GM) crops, also called transgenic or biotech crops result from transferring one or more genes from a different species (of crops, or bacteria, or viruses, or other organisms) to enhance the characteristics of the crop undergoing improvement.

1.6. Biotechnology constraints and challenges

There is no doubt that agricultural biotechnology has opened up new possibilities, particularly in crop and livestock development. However, there are major challenges that need to be addressed and tackled especially in the developing countries, in order for these countries to maximize their benefits from biotechnology in solving the urgent problems of food supply, protecting the environment, and reducing poverty. The main constraints and challenges that need consideration and actions are in the followings:

1.6.1. Clear biotechnology agenda and supporting policies

There is a need for Arab countries to develop clear and time-bound national agenda for biotechnology research and development (R&D) and commercialization. This could be achieved by linking science and technology with industry, and having both well tuned to market demands.

Similarly, there is a need for policy initiatives to accelerate investments by technology holders and adoption by the farming communities. These policies include the registration and approval of GM crops and funding and infrastructure support for public-private partnership programs in plant biotechnology, and other related areas. The supporting policies should also provide the framework for research and business institutions, and outline the trade and investment guidelines for the newly emerging biotech sector, which should be in agreement with the international guidelines, including the necessary biosafety measures and tests for new or introduced genetically modified crops.

1.6.2. Intellectual property rights (IPRs)

Patenting and IPR are promoting privatization of scientific research in agricultural biotechnology, and might increase the gap of biotechnology know-how and its applications between developing and industrial countries. Most Arab countries, especially those joined the World Trade Organization (WTO) develop their IPR policies and regulation which suppose to cover those of the biotechnology products.

Significant achievements have been made on IPR protection for genetic engineering in general and for plant biotechnology particularly in the developed countries. However, problems and challenges are emerging with the implementation of IPR policies and regulations. Areas that need attention particularly in the developing countries include: Public awareness on IPR, capacity building on IPR protection, implementation on IPR protection, and enforcement of laws and regulations related to IPR.

1.6.3. Biosafety regulations

The cost of biosafety regulations some times are a major cause in slowing down the progress that is expected from biotechnology. It is estimated that in the United States, the cost of obtaining regulatory approval of a new transgenic crop variety can be as much as $30 million. In such events there is a greater need to find synergies, including through the regional approach that will reduce costs by using mutually accepted procedures..

Since biosafety regulations are not fully operational in most developing countries, there is a an added challenge on how to increase applications of biotechnology while keeping costs of regulations at bay.

Arab countries, however, face a number of challenges, including low levels of awareness about the Cartagena Protocol and a lack of necessary human, institutional and technological capacities. There is an urgent need for countries and organizations, in a position to do so, to provide additional financial and technical assistance and facilitate access and transfer of technology to enable Arab countries promote awareness and build their capacities.

There is a need in the Arab countries to Issue and approve national legislations regarding the GMOs and ways to handle them in terms of: their importations to the country, trading, GMOs variety release regulations at the national level and their monitoring and evaluation procedures, biosafety measures for health and environment for the crops and their products, and biosafety regulations for the importation and testing of transgenic crops, with regulations for field tests.

1.6.4. Public acceptance

Public acceptance of biotechnology products, especially transgenic crops and genetically modified (GM) food, is a major constraint to the adoption of plant biotechnology in the region. Public awareness programs and campaigns should be organized to educate the public on the benefits of biotechnology products.

1.6.5. Capacity building

One of the most challenging matters for the biotechnology implementation is the human building capacity and qualified personnel capable of handling and carrying out biotechnology research and applications.

1.7. Conclusions

Plant biotechnology offers an unprecedented opportunity to address some of the world's most serious issues, including hunger, poverty and disease. This is because biotechnology can circumvent the species barriers that prevent useful traits being introduced into plants by conventional breeding. By transferring genes from bacteria, fungi, animals and sexually-incompatible plants into our food crops and medicinal plants, it is possible to improve their agronomic traits and provide them with additional metabolic abilities.

Genetic engineering and biotechnology provide good opportunities for the investment and improvement of food security and food production in the Arab countries, however, it has it is own challenges that need to be considered by the Center.

The following questions are relevant to be asked not only as related to Arab countries, but also for the developing countries in general:

- What opportunities exist for biotechnology to contribute toward improving agricultural productivity, expanding markets, and stimulating employment and income generation in Arab countries, and what are the constraints that limit capturing these opportunities and in using biotechnologies approaches?
- What challenges do these countries face in realizing these opportunities and in mitigating the risks associated with the use of biotechnology?

Considering the important challenges that encounter the agricultural sector and its sustainability in the Arab countries, it seems that the new biotech crops applications offers enormous potential benefits in the second decade of commercialization,2006 –2015, in terms of meeting increased food, feed and fibre demands in the Arab World and contributing to more prosperity for both producers and consumers. Of particular importance are the genes for drought tolerance that are under development in both the private and public sector. The genes for drought tolerance are genes that very few farmers in the world can afford to be without and this is particularly true for the rainfed dryland areas that typify much of the land in the Arab countries for which ICARDA (International Center for Research in the Dry Areas) has a regional mandate, and where biotech research is undertaken on drought tolerance. The first commercial variety with drought tolerance is expected to be drought tolerant maize in the US in 2011. The drought genes have already been introduced into several crops and early field tests are underway; for example, drought tolerant wheat is being field-tested in Australia.

In this regards it is evident that the decision to invest in agricultural biotechnology is timely and appropriate and is of great strategic importance at a time when the new technologies can contribute to:

- an increased sustainable supply of the most affordable and nutritious supply of food, feed and fibre, which is critical for facilitating prosperity for both producers and consumers in the Arab States;
- sustainable crop production in the dry-land areas to alleviate poverty of the rural poor who are farmers and the rural landless who are dependent on agriculture for their lively hoods
- Speeding the crop breeding that will mitigate the new challenges associated with climate change when droughts will become more severe and prevalent, temperature changes will be more variable, and when agriculture which produces up to 30% of greenhouse gases, must be part of solution rather than part of the problem.

On the another hand, investment opportunities in biotechnology in the region are highly needed and required a strong partnership and alliance between the public and private sectors which have a visible and potential strategy to boost the adoption, investment and industrialization of biotechnology and their products for better sustainable agriculture and economy, healthy, safe, and sufficient food and feed, and safe environment.

In order for the region to be able to invest in biotechnology, certain requirements are needed:

- Outstanding centers which are run by good scientific personnel and very well equipped with all necessary facilities and instruments.
- Identification of the important products and their needs and demands with availability of investment environment.
- Developing a strategic research platform.
- Strong collaboration between public and private sectors.
- Good marketing strategy.
- An enabling policy and investment environment that will enhance and encourage the investment in this field.