Agricultural Biotechnologies in Developing Countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change (ABDC-10)

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by Osama A. Momtaz & Ahmad Abdulkader
in collaboration with Alex Percy-Smith[1]

Introduction

This issue paper, submitted to ABDC-10, discusses the current status and perspectives of biotechnology research and development in West Asia and North Africa (WANA) region. It highlights the Strengths, Weaknesses, Opportunities and Threats (SWOT) related to generation, adaptation and adoption of appropriate biotechnologies for the region and discusses regional priority action plans in terms of strategies and policies options, institutional and human resources. Further, it gives useful information to policy makers and other stakeholders in agricultural fields including researchers, farmers and the media.

The paper intends to provoke discussions during the conference, the results of which will point the way forward in the process of:

- Strengthening capacities in the WANA region and enhancement of regional information exchange and dialogue in different interdisciplinary scientific strategies that will lead to the establishment of a regional platform for developing priority actions for agricultural biotechnology in West Asia and North Africa (WANA) in turn addressing the challenges of food insecurity and climate change.
- Addressing strategy and policy options, the institutional research framework and the capacity strengthening framework for the region as well as establishing a network for agricultural biotechnology.

Declining agricultural production in the developing countries (DCs) accompanied with a rapidly increasing population poses challenges to food security which are compounded by climate change. Biotechnologies have been used in various ways to contribute to overcoming these problems by developing crops that are high yielding, resistant to pests and diseases, with high nutritional content and tolerant to biotic and abiotic stresses. However, in most DCs, there are no concerted efforts to harness modern biotechnology research capacity to address national priorities.

Biotechnology provides a promising opportunity for countries in the WANA region to improve and sustain their agriculture productivity and to overcome the major biotic and abiotic stresses that face agriculture sustainability. However, the WANA region is experiencing delays in the adoption of modern biotechnologies. Nevertheless, many WANA

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countries are exploring the potential application of agricultural biotechnology to provide solutions to national issues such as food security, environmental remediation, sustainable agricultural productivity and food supply. At the same time there are concerns that the technology might pose a risk to biodiversity, human health, as well as social and economic impacts and threaten the region's rich biodiversity and valuable genetic resources that harbour important genes. In fact these may provide valuable assets from which biotechnology may benefit.

Strategy and Policy options

There is a need for policy initiatives to accelerate investment in generation of innovative public and private biotechnology solutions as well as adoption by the farming communities and supporting industries. These policies should include the registration and approval of GM crops and funding and infrastructure support for public-private partnership programs in 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.

Identifying the particular applications of biotechnology that should have the highest priority for development and implementation in DCs could be facilitated by a **transparent and open decision making process** that involves farmers, scientists and other stakeholders. Devising such a process might not be simple, could differ from country to country and will take time to implement. Different modes of communication to reach the diversity of stakeholders, including smallholder farmers and rural communities in remote areas, are likely to require some creativity and will not always work perfectly, as lessons in industrialized countries reveal. Nevertheless, one objective of the decision-making process is to ensure that the "right" decisions are being made, meaning that it is important for the process to help define criteria for **prioritizing biotechnology applications** (especially given scarce resources and competing societal priorities) and that specific requirements of the application make the most sense for the farmer or consumer. The participation of stakeholder groups will help to ensure that the technologies pursued are those that are most **appropriate and affordable** and will generate a return on research and development investment. The second goal of having such a process is to build confidence among citizens and stakeholders, so they can feel that decisions have been made in an open manner with the benefit of relevant input. Moreover, when that process includes a scientifically-based biosafety review, the benefits and risks of technologies can be publicly aired and the citizens will have **greater confidence in the safety** of the proposed technology for human health and the environment.

Public Awareness & Acceptance of Biotechnology

Public acceptance of biotechnology products, especially transgenic crops and genetically modified (GM) food, is a major threat to the adoption of plant biotechnology. Public awareness programs and campaigns should target the public in terms of the benefits of biotechnology products. Recognizing the need to enhance efforts to sensitize different groups of stakeholders on biotechnology and related biosafety issues, the governments should initiate means to raise public awareness aiming at empowering the public to make informed decisions on the use of biotechnology and its products through a participatory awareness creation process. Such an initiative can help in demystifying biotechnology through provision of

accurate information and undertaking communication campaigns aimed at enhancing public understanding of the technology.

The media play a major role as sources of biotechnology information and will be useful avenues for disseminating additional information. Outreach activities can be mainly through workshops, media, exhibitions, conferences, seminars, internet, focus-group discussions, open forums, publications and round table discussions.

Funding for Biotechnology Research and Development (R&D)

Biotechnology R&D in WANA countries is largely within the public sector and funded from public sources. There is some additional support from donor agencies and the private sector. Some governments have funded the formulation and enforcement of regulations and guidelines on biotechnology and biosafety. The United Nations Environment Programme - Global Environment Facility (UNEP-GEF) has also provided substantial support to the NBFs to assist in the development of a national biosafety frameworks in most WANA countries. Bilateral and multilateral donors as well as some private foundations should also provide substantial funding for R&D activities.

Development of National Biotechnology Policy

In most WANA countries, there are no operational National Biotechnology Development Policy nor strategies which commits the government to give priority attention to provision of relevant infrastructure, legal framework, facilities and other resources for rapid and safe development and application of biotechnology in industry, agriculture, food, environment and health. In addition, there is a lack of sustainability and long term planning within the biotechnology sector.

Through the policy, the government should exploit the opportunity to be committed to partner with national and international development agencies to popularize biotechnology by addressing concerns surrounding the technology through sustained information, education and communications campaigns.

A National Biotechnology Policy should have as objectives:

- To prioritize, promote, fund and coordinate research in basic and applied sciences in biotechnology;
- To promote sustainable industrial development for production of biotechnology-derived products;
- To create enabling administrative and legal frameworks for biotechnology development and commercialization;
- To support capacity building and form partnerships to advance the technology for socio-economic development.

The approval and adoption of such a policy will clear the way for fast-tracking enactment of biosafety and biotechnology laws to enable the respective country to be compliant with international instruments governing development and trade in biotechnology products.

Finally, a common regional approach should be adopted that will promote the harmonization of GMO detection practices and skills in order to re-position the region in the global biosafety scenario in terms of critical mass of technical expertise available in the area, a system of harmonized testing methodologies and mutual acceptance of GMOs and related products and the attraction for investments and funding.

Regional harmonization efforts are hampered by national or regional resistance of stakeholders. At regional level, different detection methodologies, protocols, standards and certification schemes imply an un-harmonized biosafety scenario which complicates substantially trade relations. Finally, at international level, the lack of control of seeds imports and uncontrolled release of GMOs to the environment (with related potential risks for the health and the environment itself), pose obstacles to commercial relations with key partners like the EU.

The policy-makers in WANA countries are faced with several interdependent challenges that will have to be addressed simultaneously, if those countries are to realize the full benefits of biotechnology. For example, many major crops grown in the developing world and the limitations of those crops, are different from those that have been the focus of genetic engineering efforts in the industrialized world, so **shifting the focus of biotechnology to meet the specific agricultural needs of WANA countries farmers** would be a first step.

The following questions are relevant to be tackled in general:

- What opportunities exist for biotechnology to contribute toward improving agricultural productivity, expanding markets, and stimulating employment and income generation in WANA 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?

Institutional resources

Institutional strengthening must be given a high priority in order to develop a critical mass in terms of laboratory infrastructures and facilities as well as enable use and exchange of regional collaborative research. A high priority should also be given to strengthening national agricultural research systems and their capacity to carry out research and disseminate results and information both nationally and within the region. However, it would be of considerable value to map existing institutional resources within the region.

Establishing laboratory practices (procedures, techniques/ methods for sampling, detection, identification and quantification of GMOs or derived products) will guide the development of standardized procedures within the region and facilitate the establishment of agreements across other regions

Weaknesses which should be strengthened include:

- Lack of national infrastructure in most of WANA countries**.**
- Lack of standardized procedures for the management of GMOs at various ports of entry;
- Lack of trained staff in biotechnology and GMOs detection and monitoring;
- Lack of equipment and containment facilities; and
- Lack of technical information or access to information in Arabic as a preferred language**.**
- Lack of appropriate research environment and brain drainage.
- Inadequate institutional collaboration and consultation in biotechnology resulted in dilution of the human resources.

Human Resources

One of the most effective ways that developing countries can exploit, take control of and capture the benefits of biotechnology, is to **build national and local scientific expertise and capacity**. When that capacity exists, a source of independent scientific advice is available to decision-makers and to national negotiators involved in international discussions on trade, biotechnology, intellectual property rights, and other issues. National scientific expertise and capacity are necessary for a robust and independent evaluation of the biosafety of novel GE products proposed to be introduced**.**

Through an increased research and extension capacity, there is an opportunity that locally-generated biotechnology innovations and applications may be developed. Building **partnerships between private and public sectors nationally and with the region** would help developing countries take ownership of biotechnology applications. Such partnerships succeed when there is a clear understanding of the roles of the respective partners, so that the benefits that come from the partnership are shared by all parties.

One of the most challenging matters for increased access to biotechnologies is the human capacity building and qualified personnel capable of carrying out biotechnology research. Weaknesses to be strengthened include:

- Lack of full technical expertise in modern biotechnology;
- Shortage of highly trained manpower: the human resources are scattered in different universities, departments and centres. Scientists at universities are busy most of the time with research related to their promotion. There is no critical mass of scientists in the different lines of sciences and technology such as molecular biology, breeding, ecology, risk assessment and management;
- Limited institutional capacity for training in biotechnology: lack of high technological equipment;
- Training relevant officers and technical staff at national level in GMO detection;
- Developing a training package in GMO detection, including an information exchange forum to be made available for the project training activities as well as for future in-house training courses;

Priorities for a Regional Action Plan

To capitalise on the gains already made globally in biotechnology R&D and in order to realize the benefits from safe application and responsible use of biotechnology in the WANA region, the following must be implemented:

1. The enactment of **legislation** in all WANA countries.
2. **National priorities** for agricultural biotechnology applications particularly those that benefit the smallholder farmers need to be more clearly defined and targeted. This should be done in consultation with all stakeholders.
3. Enhancement of **public awareness** of all aspects of biotechnology and biosafety. This requires innovative approaches to captivate and sustain public interest. Education curriculum developers should be engaged to ensure that biotechnology is incorporated in the education system for early exposure of students. This will ensure the development of citizens with the ability to critically evaluate technology from a knowledge view point. In addition, awareness creation of the general public should highlight the role of technology in issues that affect them, including food security, employment creation, ability to trade with other countries, potential detrimental effects on human/livestock health, the environment and contributions towards general welfare.

4. Capacity strengthening and capacity retention should be intensified. A **critical mass of scientists** to manage national biotechnology priority R&D programs needs to be clearly defined. Strategies for achieving this critical mass should be developed and appropriate incentives introduced to attract and retain staff. In addition, investment is needed in scientific infrastructure and equipment for biotechnology research to enable suitably trained manpower to fully utilize their skills for innovation.
5. **Strengthen institutions** that have a proven track record of excellence in the delivery of technological innovations.
6. There is a need to identify mechanisms for sustainable **funding of priority biotechnology programs.**
7. Establish and sustain **institutional linkages** to maximize the use of a critical mass of scientists and to facilitate the sharing of laboratory facilities, equipment, expenses and information.
8. **Review institutional inventories, capacities and mandates** to enable rationalization of public sector institutions involved in biotechnology R&D. This will ensure focusing of limited resources on priority programmes for efficient delivery of selected technologies.