



Food and Agriculture  
Organization of the  
United Nations

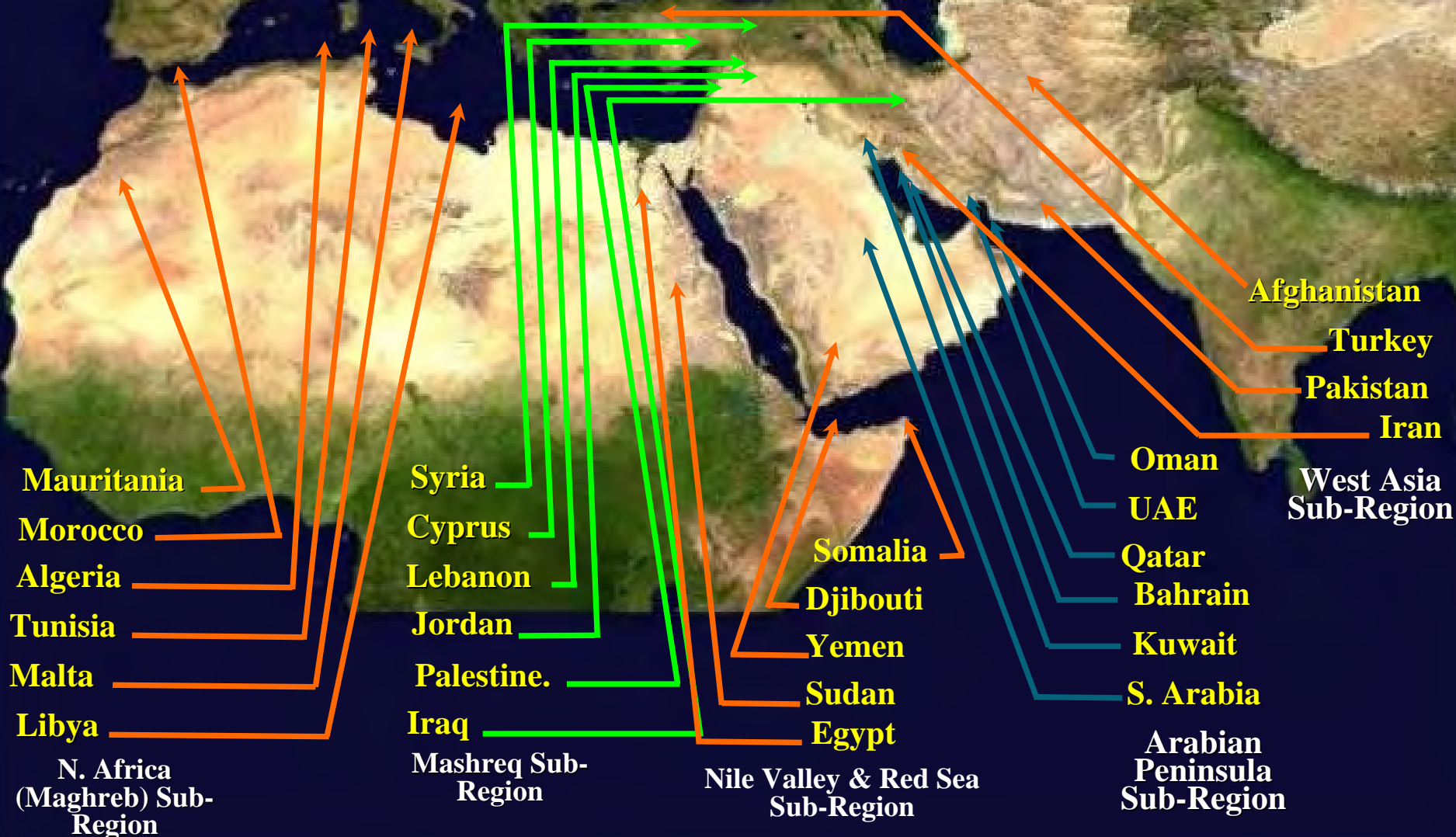
*for a world without hunger*

## West Asia and North Africa (WANA) Region

**“Strengths, Weakness, Opportunities and Threats (SWOT) in the field of modern agricultural biotechnology in WANA: to face the challenges of food insecurity and climate change”.**

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# AARINENA 5 Sub-Regions



## *West Asia and North Africa (WANA) Region*

- **The WANA region is the origin of many vital food crops such as wheat, barley and lentils for the World.**
- **In ancient times, the WANA region was the bread basket of various empires.**
- **This region is now a major net importer of food!!**



## *WANA Region (cont.)*

**The region has several development problems, among them, poverty, lack of gainful livelihoods, shortage of water, droughts and desertification, and conflicts.**

**The region has not emphasized, taking an overview, agricultural development and developing capacities in agricultural research.**

**This has long term implications for the region's food security and civil security of Europe, West and Central Asia, the Arabian Peninsula and North Africa.**



# **AARINENA MISSION**

- **To contribute to the enhancement of agricultural and rural development in the WANA region through fostering agricultural research and technology development.**
- **To promote the exchange of scientific and technical experience and information.**
- **To strengthen collaboration within and outside the region to achieve greater degree of self-reliance in food and agriculture.**

# Networks

- **Recent advances in biotechnology applications provide good opportunities for immediate benefits to the WANA region. The applications made in the region include the development of micro-propagation systems for many plant species.**
- **Most of the commercial applications in modern biotechnology advances have occurred in developed countries.**
- **Much of the expertise is concentrated in the commercial private sector, thereby restricting developing countries' access to patented technology.**

## *Networks (cont.)*

- **In order to strengthen research partnership in the Region, AARINENA has established 7 regional research networks for Date-Palm, Cotton, Olive, Medicinal & Aromatic Plants, Water Use Efficiency, Agricultural Biotechnology and Plant Genetic Resources.**
- **These networks are contributing to the generation of information, training, extension and inter-regional research and development programs in the WANA region and with other Regional Networks such as APAARI -APCoAB & INCANA**

# Geographical Distribution of AARINENA Networks



# AARINENA's

## Regional Agricultural Biotechnology Network

[www.rabnena.net](http://www.rabnena.net)

- AARINENA / GFAR / FAO / ICARDA / ARC expert consultation, December 2007, Cairo, Egypt.
- 18 Agriculture Biotechnology experts from 14 countries of the region and AARINENA, ICARDA, FAO and GFAR experts attended the consultation.

**Location:** AGERI / ARC – Egypt. Secretariat ([www.rabnena.net](http://www.rabnena.net))  
**Network Secretary:** Prof. Dr. Osama A. Momtaz / AGERI, Egypt.  
**Network Board Chair:** Dr. Yousef Al-Shayji / KISR, Kuwait.

## *Four Working Groups have been formed:*

<b>Working Group</b>	<b>Task</b>	<b>Location</b>
<b>WG1</b>	<b>Omics and Molecular Markers Technology</b>	<b>ABRII – Iran</b>
<b>WG2</b>	<b>Gene transfer, Expression and Regulation</b>	<b>SFAX – Tunisia</b>
<b>WG3</b>	<b>Bio-safety, Intellectual Property Rights (IPR)</b>	<b>GCSAR – Syria</b>
<b>WG4</b>	<b>Bioinformatics and Knowledge Management</b>	<b>AGERI – Egypt</b>

## *Current Status of Biotechnology Application in WANA Region*

<b>Biotech application</b>	<b>Countries</b>
Tissue culture applications Micro-propagation	Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Morocco, Syria, Tunisia, Turkey, United Arab Emirates
Doubled haploids	Algeria, Iran, Morocco, Sudan, Syria, Tunisia
Cell cultures	Egypt, Morocco, Tunisia, United Arab Emirates
Molecular breeding	Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Morocco, Syria, Tunisia, Turkey
Genetic Engineering	Egypt, Iran, Morocco, Syria, Tunisia, Turkey
Genomics	Egypt, Iran, Syria, Tunisia, Turkey,
Proteomics	Egypt, Iran,

## *Status (cont.)*

- **Along the gradient of biotechnology tissue culture and micro-propagation techniques are commonly used In WANA Region**
- **Molecular marker techniques are widely used, but not yet effectively**
- **Genetic engineering is increasingly finding a wider application**
- **More upstream technologies (genomics, proteomics etc) are restricted to a few institutes**
- **With a more widespread research but also beginning of commercialization of GMOs their effect on biodiversity needs to be investigated in order to explore ways to maintain and protect biodiversity**

# SWOT Analysis of Biotechnology in WANA Region

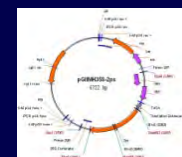
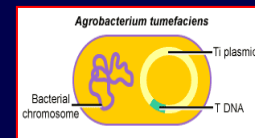
## 1. Strengths of Biotechnology in WANA Region

- Steady increase in the recognition of the role of Biotech.
- Increase in number of functional labs. and research staff.
- Many WANA countries have nucleus of basic infrastructure and trained personnel for tissue culture, molecular biology in plants, animals and Biomedicine.
- Tissue culture and Molecular markers are the main application and are already in widespread use across the region.
- Some AARINENA countries also have capacities for producing GM crops (Egypt, Iran, Turkey....). Genetic engineering is increasingly finding a wider application.
- Regional network : AARINENA Regional Agricultural Biotechnology Network based at AGERI-Egypt.
- **FAO Regional Project – TCP/RAB/3202** Strengthening capacities towards the establishment of a regional platform for the detection of genetically modified organisms".
- <http://rabnena.net/FrontEnd/BestPractice/BestPractices.aspx?lang=EN> and
- <http://www.rabnena.net/FrontEnd/BestPractice/BestPracticeDetails.aspx?Id=40> <=EN



## 2. Weaknesses of Biotechnology in WANA Region

- A broad public debate has not taken place.
- Potential impact on nature and the environment.
- Lack of full technical expertise and trained staff in different modern biotechnology applications.
- Lack of functioning biosafety systems and standardized procedures for the management of GMOs at various ports of entry.
- More upstream technologies (genomics, proteomics, GE, etc) are restricted to a few institutes.
- Lack of funding, national commitment, political will, good governance, wise policies, appropriate infrastructure and investment.



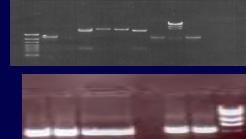
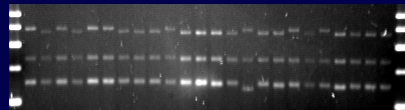
### 3. Threats / Challenges of Biotech. in WANA Region

- **Absence of national strategies addressing the use and integration of biotechnology in the agricultural sector.**
- **The lack of cooperation, dialogue among stakeholders (academia, research, industry, private sector and government).**
- **Absence of biosafety legislations and insufficient attractive Investment Laws.**
- **The deficiency of human skills.**
- **Important local crops and smallholder farmer problems not addressed.**
- **Tools for technology transfer inadequate and often inaccessible.**
- **Limited national funding and investments / mostly overseas.**
- **Inadequate infrastructure and supporting facilities**
- **Limited added-value**



## 4. Opportunities / National and Regional Perspectives

- Integrating the best outputs of Plant Biotechnology (**tissue culture, drought and salinity tolerant crops, biopesticides and biofertilizers, MAS, Food, Medical and Environmental Biotechnology, Research Materials and Tools..**)



- Improvement of crops for biotic and abiotic stress using conventional and biotechnological methods (drought tolerance..).
- MAS for the crops of the poor
- Enhancing incomes through agricultural diversification and added-value.
- Providing support for capacity building in agri. Biotech. addressing in particular GMO production and risk assessment.
- Use of transformation technology and genetic engineering to incorporate genes of interest into major crops (wheat, legumes,...).
- Ensuring the judicious and wise use of modern biotechnology in order not to jeopardize the environment and human health.
- Engineering new traits in elite cultivars.
- Understanding societies' expectations and international regulations on handling GMOs .

## Concluding Remarks

- Biotechnology could support solving constraints of agricultural production in the Region; but requires high investments and should therefore:
  - complement existing conventional technologies,
  - be demand-driven,
  - used only when it offers a comparative advantage;
- Priority setting should involve all stakeholders and consider national development policies and market opportunities.
- Identification of needs
- We have to make use of **ALL** options to increase food production in a sustainable way, including tissue culture and genetic engineering!
- We have to evaluate the consequences of **ALL** our decisions, including the worst case that we do not apply genetic engineering **/NGO-accountability/**.
- Priority of Enabling Environment for Investment in Agricultural Biotechnology in the region (**Policy and investment environment, Strong collaboration between public and private sectors, target products, marketing....**)
- Ethical Issues related to Use of GMOs, Risk assessment, Regulation, Communication are to be considered.



# *SWOT Analysis of Livestock Biotechnology (WANA region)*

## **STRENGTHS**

- Biotechnology is the fastest-growing industry.
- Some of the biotechnology products are used to improve animal production & productivity (feed additives, vaccines, etc).
- Availability of trained & skilled human resources.
- Political commitment (many countries in WANA region have the biosafety protocol).
- Establishment of CGIAR centers, NARS, Universities.
- Presence of information sharing structure (FAO, ILRI, ICARDA).
- Development of strategy for the establishment of biotechnology in WANA region.

## WEAKNESSES

- Limited R & D programs on modern livestock biotechnology.
- Lack of policies on livestock biotechnology & biosafety at regional level.
- Lack of focus (livestock species) and continuity.
- Underutilization of the available biotechnology facilities.
- Lack of specialized livestock biotechnology laboratory.
- Commercialization issues.
- Limited application of modern livestock technologies.
- Lack of sustainable funding.
- Absence of a regional technical cooperation network.

## OPPORTUNITIES

- Livestock sector is becoming increasingly important in WANA region
- Availability of new research tools such as biotechnology.
- The availability of the first report on the “State of the World’s Animal Genetic Resources” including the WANA region.
- High commitment from regional governments & donors to support indigenous AnGRs improvement and conservation projects.
- Availability of trained manpower.
- Current research priorities of the CGIAR centers (sustaining agriculture biodiversity for future generation & producing more & better food at lower cost through genetic improvements).

## THREATS

- Brain drain, senior trained & skilled professionals are moved to management positions.
- Lack of networking among livestock scientists.
- Private sectors are much less attracted on livestock biotechnology business.
- Consumers concern regarding livestock biotechnology products.

# Current livestock research activities at CGIAR centers and NARS in WANA region

<b>Jordan</b>	<ul style="list-style-type: none"><li>• Veterinary medicine and animal production: Uses of hormones sponges, PCR, ...</li></ul>
<b>Iran</b>	<ul style="list-style-type: none"><li>• Production of traditional and recombinant vaccines and serums for livestock &amp; poultry</li></ul>
<b>ILRI</b>	<ul style="list-style-type: none"><li>• Development of molecular probes for disease diagnosis in livestock and product safety</li></ul>
<b>Kuwait</b>	<ul style="list-style-type: none"><li>• Application of embryo transfer techniques. Development of DNA fingerprinting techniques for marine species, and development of molecular probes for disease diagnosis in livestock</li></ul>
<b>Saudi Arabia</b>	<ul style="list-style-type: none"><li>• Molecular Classification of Saudi Arabian camel based on RAPD techniques</li></ul>
<b>ILRI</b>	<ul style="list-style-type: none"><li>• Improving animal genetic resources characterization</li></ul>
<b>ILRI</b>	<ul style="list-style-type: none"><li>• Improving farm animal genetic resources</li></ul>
<b>FAO member developing co.</b>	<ul style="list-style-type: none"><li>• Biotechnology-related policies, regulations, etc on animal genetic resources</li></ul>
<b>Egypt</b>	<ul style="list-style-type: none"><li>• Production of immunological diagnostic kits, Screening for organisms that have a potential biotechnological application, and Animal and human cell culture on veterinary applications</li></ul>
<b>Lebanon</b>	<ul style="list-style-type: none"><li>• Diagnosis of animal diseases (using RT-PCR)</li></ul>
<b>Cyprus</b>	<ul style="list-style-type: none"><li>• Genetic analysis of blood samples to select genotypes resistant to scrapie disease, genetic, and resistance of the olive fruit fly, <i>Bactrocera oleae</i> Gmelin to organophosphate, ....</li></ul>
<b>Morocco</b>	<ul style="list-style-type: none"><li>• Immunological diagnostic</li></ul>
<b>Sudan</b>	<ul style="list-style-type: none"><li>• Production of vaccines , Artificial insemination to improve the genetic make up and productivity, Embryo transfer (ET) in bovine, and diagnosis of viral and parasitic diseases</li></ul>
<b>Syria</b>	<ul style="list-style-type: none"><li>• Embryo transfer, diagnosis of animal diseases, production of animal vaccines, fingerprinting of Alawasi local sheep, and animal and human cell culture</li></ul>
<b>Ethiopia</b>	<ul style="list-style-type: none"><li>• Phenotypic and molecular characterization of Ethiopian cattle, small ruminants, ....</li></ul>
<b>ICARDA</b>	<ul style="list-style-type: none"><li>• Small ruminant characterization in CWANA region</li></ul>

# Summary

- ❖ **Biotechnology could support solving constraints of Livestock production and health.**
- ❖ **The development of biotechnologies for**
  - ✓ **Animal breeding,**
  - ✓ **Reproduction and**
  - ✓ **Molecular genetics**
- **advanced markedly and**
- **have the potential to increase reproductive efficiency and health of AnGRs.**
- **Advances: Artificial insemination, In vitro fertilization, Sexing embryos & multiple ovulation followed by embryo transfer (MOET)**
  - ✓ **have already had a major impact on livestock improvement in developed countries,**
  - ✓ **which can be directly adopted for developing countries such as WANA region.**
- ❖ **In developing countries, biotechnological applications to livestock need to be**
  - ✓ **suitable for animal owners who are resource-poor**

***THANK YOU***