

AARINENA 14th General Conference

**“Agricultural Research and Innovation: Fostering
Governance and Sharing Models”**

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**Hotel Atlas Asni
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List of Abbreviations

AKIS	Agricultural Knowledge and Information System.
AR & IS	Agricultural Research and Innovation Systems.
AK & TT & E	Agricultural Knowledge & Technology Transfer & Exchange.
E & AS	Extension and Advisory Systems.
FFS	Farmers Field Schools.
INRA	Institut National de la Recherche Agronomique .
IP	Innovation Platforms.
K &TE & T	Knowledge & Technology Exchange & Transfer.
NENA	Near East and North African region.
PES	Pluralistic Extension Systems
PAR & IS	Pluralistic Agricultural Research and Innovation Systems.
R & D	Research and Development.
R & I	Research & Innovations .

Executive summary

Developing countries are facing mounted problems and enormous challenges in most areas of development, and specifically in the agricultural sector. The Near East and North African region (NENA) is no exception. Globalization factors, social characteristics of each and every single country, economic differences, technological aspects, climate change consequences, chronic water shortages, continuous knowledge and science innovations, alongside with financial shortages, are but a few of the many difficulties facing this region. All these factors are hindering sustainable development, including, but not limited to, food security and food safety.

Lack of efficiency in the agricultural sector is dominated in most NENA countries. This is attributed to research efficacy, the low share of research expenditures, the weak design of farmers' oriented extension systems, as well as absent of institutionalized pluralistic systems of research and innovations, in addition to inefficient knowledge and technology exchange and transfer processes.

These matters and many others have urged AARINENA to organize this conference for the purpose of discussing urgent measures to develop the capacity of research and innovation systems of NENA countries for a solid sustainable and inclusive development.

"Agricultural Research and Innovation: Fostering Governance and Sharing Models Given" represent a big challenge for member countries in terms of designing well governed and institutionalized pluralistic systems for Research & Innovations (R&I), parallel with concrete development of efficient processes for Knowledge & Technology Exchange & Transfer as a central key in enhancing the capacity of NENA agriculture, to muddle through current and future challenges of globalization, climate change consequences, as well as fragile knowledge and technology systems.

The conference, after intensive discussions, came up with several recommendations that tackled various crucial issue for NENA countries; identifying farmers' needs as well as those of the society, through participatory approach and needs assessment, and understanding them properly, are of great importance in responding to market demands and meeting their expectations. Using proper funding and generous incentives can encourage knowledge generation and the development of solid innovation systems, which will be more effective if they are developed, validated and disseminated suitably. Agricultural Research and Innovation Systems (AR&IS) must create concrete, solid and iterative relationship and strong ties with interested stakeholders to better cope with the short and the long - term needs and expectations of the end users.

The participants also adopted the strategy that was developed by AARINENA, and urge the countries to use it as a regional platform to develop their national strategy to update and improve their national extension and advisory agricultural system.

Introduction

Today, more than ever before, the agricultural sector in most developing countries is facing enormous challenges due to globalization factors; the explosion of knowledge, science and innovations, world trade agreements, high human pressure on water and soils, food safety, climate change, the negative impact of global warming, water scarcity, influx of millions of refugees, loss of local genetic resources, absent of the concept of real "Green Revolution" in many countries, in addition to the dominated weak farming models, not suitable to small-scale farming systems, are just a few of the many factors affecting the agricultural system.

Agricultural sector in NENA region is no exception. It faces critical problems, mounted difficulties and unprecedented challenges that undermine the region sustainability. Climate change, which affect most world countries, including the whole NENA region, is touching in direct or indirect ways several strategic sectors, such as agriculture, water and irrigation, industry, tourism and food security.

The fact that cannot be denied is that the NENA region is impacted by what is called a syndrome of "Waste of knowledge", which means that investments are wasted on generating not useful knowledge to the end users. Hence, widening the technological gap between developed and developing countries. Such waste could be related to the weak educational system, which concentrates more on academic, not fully applied scientific research. Definitely, this has led to high unemployment and underemployment rates of graduates in different agricultural disciplines. Such academic research has no good final benefits to the end users (Beneficiaries). Weak integration of "imported innovations" into local technical, economic and social contexts of use, is also another reason that hampered any development of innovations.

The existing Agricultural Research and Innovation Systems (AR&IS) must establish active and iterative relationships with all interested stakeholders to meet farmers' long - term needs and expectations. When it comes to technology transfer and exchange processes, it is well known that weak extension systems and technology transfer process in most NENA region had its paramount impact on Agricultural Knowledge & Technology Transfer & Exchange (AK & TT & E). Lack of efficiency in current systems dominated in the NENA region by top down linear models of agricultural extension, and technology transfer has led to laziness in the innovation system. Needless to say that low share of research expenditures has overriding cause for low profile of innovation in most developing countries.

Given all the obstacles, difficulties and challenges, facing agriculture in developing countries in general, and the NENA agriculture in particular, it is apparent that research efficacy, in terms of development of relevant scientific concepts into technological potential applications, is urgently needed. Unquestionably, the design of well governed, farmers' oriented extension systems, as well as institutionalized pluralistic systems of

research and innovations, parallel with the development of efficient knowledge and technology exchange and transfer processes can make a big difference and can play a central role in enhancing the capacity of NENA agriculture.

It is worth noting that little research was done to recover from such impacts. Long - lasting solutions, effective and efficient technologies and innovations, that are consistent with sustainable development, must be the priority for agricultural research institutes. Therefore, urgent measures are needed more than ever before. Also, huge investments are imminent to develop the capacity of research and innovation systems of NENA region. which must be on top priorities for sustainable and inclusive development. NENA countries are of vast needs for the development of applied scientific research models, parallel with strengthening and stimulating a solid technological development and a diffusion and transfer delivery systems to farmers and other stakeholders, which are in suit to their needs, expectations and capacities.

Given the various challenges facing the NENA in general, and its agriculture sector in particular, it is indeed clear that not only research efficacy in terms of development of relevant scientific concepts into technological potential applications is required, but also the design of well governed and institutionalized pluralistic systems for Research & Innovations (R&I), as well as the development of efficient processes for K &TE&T are needed urgently. Both are expected to play a central role in enhancing the capacity of NENA agriculture, and coping with current and future challenges of global negative impacts by climate change. The objectives of such exchange are to guarantee that knowledge and technology delivered to farmers and other concerned professions are adequately fitted to their needs, expectations and capacities.

Therefore, The Association of Agricultural Research Institutions in Near East and North Africa (AARINENA) and the Institut National de la Recherche Agronomique (INRA) Morocco joint efforts to organize this conference to promote the exchange of expertise among the experts in NENA region on the future of Extension and Advisory Systems (E & AS) that will respond to the farming community needs.

Delegates of most AARINENA member countries attended the conference, and specifically from Morocco, the host country, Algeria, Libya, Tunisia, Sudan, Saudi Arabia, Yemen, Oman, Jordan, Iraq, Iran, Lebanon, Turkey, Palestinian Authority (PA), representing farmers, research institutes, faculties of agriculture, private sector and other stakeholders. This dialogue also included the experts representing the international and the regional agriculture organizations working in the region such as FAO, ICARDA, CIMMYT, ICBA, and AGENDA.

The Conference Objective

The main objectives of the conference could be summarized in the following technical objectives:

1. Discuss the rationale for the change of paradigms in K&TE &T in NENA region.

The question that needs a quick answer is how can developing countries overcome the obstacles facing local organizations to shift their route from the traditional experience-based paradigm to a new knowledge-based paradigm?

The existing systems in most NENA countries are traditional, not efficient and do not serve the fast shift to modern systems. What is needed today is to shift their system to management of technology and innovation instead of the outdated system of management paradigm of people and facilities, taking into consideration the fact that until now, no unfavorable environment in most developing countries exist. The need is urgent to overcome the thinking patterns of employees within one organization to favor the problem solving type vs. the reactive thinking, not only in academic institutions, but also in the private and the industrial sectors as well. Needless to say, that all businesses at the local, regional and international levels require continuous innovations to sustain their competitive advantage and to stay in the market.

The fact is that knowledge and information in most areas are increasingly produced from their resources, distributed to main users and used collaboratively by all partners. Therefore, having better control over the production and usage of explicit and implicit knowledge and as a result, the paradigm shift or change in the understanding of knowledge management has become a main concern for many countries, including, but not limited to, NENA countries. The information process is simply a result of a communication process, which is called by many researchers as the network, or communication approach to knowledge management. Needless to say that managing the coordination among networks is among the main important aspects of the communication process, which require managing production, enrichment, dissemination, and usage in the network.

2. Present the state of the art modern PAR&IS and AKIS (including the extension services) and the governance frameworks required for their development. Certainly, discussing the different approaches for the design of the adapted modern PAR&IS was of great importance. Based on a thorough discussion, the most effective processes of agricultural knowledge and technology exchange and / or transfer were determined for different categories of farmers and professionals in the NENA region based on their actual needs. Individual or group methods are among the options used.

3. Discuss the role of public, private and civil society organizations in driving research on developing the required innovations and for exchange / transfer knowledge and more efficient technologies to rural farm households. The function and the character of these organizations within a broad agricultural innovation network was put as a

priority, taking into consideration the mounting recognition of market-driven extension systems. In general, practical experiences and success stories at the global, regional and country levels and the factors and enabling conditions required for their sustainable implementation in the NENA region were reviewed.

The fact is that knowledge and information in most areas are increasingly produced from their resources, distributed to main users and used collaboratively by all partners. Therefore, having better control over the production and usage of explicit and implicit knowledge, and as a result, the paradigm shift or change in the understanding of knowledge management has become a main concern for many countries, including, but not limited to, NENA countries. The information process is simply a result of a communication process, which is called by many researchers as the network, or communication approach to knowledge management. Needless to say that managing the coordination among networks is among the main important aspects of the communication process, which require managing production, enrichment, dissemination, and usage in the network.

The interdisciplinary research could be the right solution, where integration of new perspectives and concepts, the collected information about the problem, old and new available data, effective techniques, proper tools, and definitely, the latest theories from as many as possible disciplines, are just a few of the things that must be used. All these will work better, faster, more efficient vs. the traditional approach, where problems are defined, analyzed and solved in sequential steps.

No doubt that the practical experiences and success stories (if any), of each and every participant and /or country, at the global, regional and country levels, were reviewed, studied, analyzed, evaluated and exchanged for the benefits of NENA countries.

The expected outcomes of the conference

By the end of the conference, and based on the discussions and presentations, the following outcomes were expected:

1. Participants agreed on the needed paradigm shifts in agricultural research and innovation.
2. Knowledge of structure and functioning of ARIS shared and different models are known.
3. Participants of member countries are familiar with the different approaches and operational models and processes for K&TE&T, and how they could fit in the contexts of the NENA region. Also success stories from the region were shared.

4. The main elements for regional framework for development of modern national effective research and innovation systems identified and participants agreed on them.

Points discussed at the conference

The following topics and questions were presented, discussed and evaluated by participants:

1. In the historical context, how developed and developing countries overviewed the innovation system? What are their perspectives? Why the shift from research to innovation in agriculture became an urgent matter in our region? 2.
2. What are the empirical links that exist between new innovation system, productivity and social outcomes?
3. How developing countries will be able to build capabilities and provide motivation measures to the innovation system? How could they overcome the obstacles associated with weak innovation system?
4. What kind of formal and informal alliances and networks exist in the innovation system?
5. To what extent governments should be involved in the generation and promotion of innovation?
6. What traditional approaches to innovation systems policymaking and governance review?

Other topics were raised by participants and discussed during the sessions. The following is a list of the questions:

- * Why does innovation need to be supported?
 - * Why governments in developing countries need to create architectures for innovation?
 - * Why governments need to maintain a sustainable innovation practices while investing in breakthrough innovation?
 - * How could governments and investors increase funds for research, while suffering from high unemployment rate and poverty levels, rocketing prices of energy and lack of food products.
 - * How could they sustain shelves of new technology to fulfill consumers' demands.
 - * Why the private sector is not involved heavily and properly in the innovation process.
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Conference sessions and discussed questions

Due to the broad areas presented in the conference, the discussion was directed by few questions in each session as below:

Session I : The rational for a change of paradigms in knowledge and technology exchange and transfer in NENA region, the following questions were discussed and answered:

- **How to bridge the gap between knowledge generation and technology development?**
- **What are the paths to linking knowledge to market development?**
- **How developing countries react to bridging the gap? What are the means to do so?**

In response to the first question; How to bridge the gap between knowledge generation and technology development?, The following points were mentioned:

- * In most developing countries, there is a big gap between research and development practitioners, and this gap became wider, which really needs urgent measures
- * Effectively bridging the gap between knowledge and technology generation is not an easy matter. Indeed, it is a difficult process, it is simply a long standing problem that require better movements and stronger actions.
- * Make scientists aware of the gap, and allow them to make it smaller by putting more emphasis on the relationship between theory and practice. *
- Strong contacts and effective ties between researchers and academia must be established. *

International development agencies must expand their activities on capacity development and knowledge sharing as a mean to shrink the gap, others suggest expanding their scope beyond the research community.

- * Discussions emphasized the needs to include interested stakeholders such as policy makers and development practitioners in the process of knowledge generation, as a key for this development.
- * Establishing a shared knowledge base, that could benefit both, is also among the suggestions. Such base must be established based on researchers' needs, managers' expectations, practitioners perspectives, trainers potentials and policy makers goals. What is really needed is a strong cooperation and collaboration.
- * It is true that collaboration is limited, but the good point is that many efforts to shrink the gap have been already initiated.

When it comes to answering the question - What are the paths to linking knowledge to

market development?, it was indicated that it is clear that marketing systems are undergoing fast conversion. The traditional marketing channels were replaced by strong links between farmers and most stakeholders, such as processors and retailers. The truth is that when people's incomes increase, for sure, food consumption patterns will be changed. This does not include one product, but applies to most products.

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It was pointed out that linking farmers to markets can include a wide variety of activities, ranging from the very small to the very big. The development of long-term business relationships is more important for both sides, and does not stop at the end of sales process. Such trends exist in most developed countries' markets, where a shift from sales through open markets to direct sales occur. Certainly, linkages and alliances from production to consumption are included.

* It was also stated that extension agents as well as technology transfer specialist have a great responsibility in this regards. Agricultural extension agents in developing countries have great responsibility to link farmers to buyers, simply through arranging meetings, alliances and agreements with small-scale traders, suppliers as well as producers.

The question of quality and safety demands of products was discussed. It was mentioned that based on demographic distribution and income trends of people, most consumers are demanding better quality and safety. If sustainability of a linkage is required, then flexibility is of great importance. Needless to say that farmers must respond swiftly to market changes.

- The truth is that organizations are becoming progressively aware of the urgent need for innovative approaches to effectively respond to clients' demands, as well as any changes in the market place. Indeed, knowledge management is the key to all the tasks, whether small or huge, complex tasks. Today, it is recognized as an integral part of any organizational strategy, aiming at improving their business performance, but, evaluating the final impact of business performance is leaning toward complexity.

The third question of this session tackled the ways developing countries react to bridging the gap, and the means to do that.

* It

was clear from the discussions that in most developing countries, including NENA region, business organizations and firms face a big challenge to develop new competencies through dynamic learning - it is a complex process due to political and economic reasons. Hence, a transition process to science or a new technology, and / or market or regulatory regime is definitely difficult for any organization, whether it is public or private. It is well recognized among such countries, that managing technological change or institutional change has become a major cause of failure.

Most firms and business organizations develop a comprehensive theoretical framework, which is considered a valuable tool for exploring the firms' technological learning processes' level used in knowledge generation. Definitely, technological learning and innovation going side by side, as an essential component for economic growth and development. At the same time, they are considered as major determinants to long-term improvements in income and living standards. If firms have to establish a favorable environment for creative research, they must change their approach towards the growth of Research and Development (R&D) as well as publication, hence, understanding their importance. It is worth noting that in order for developing countries to analyze the learning process, it must include an examination of their institutional environment.

- Participants described the situation in the following; It was mentioned that it is sad to see two different pictures; while advanced economies' technological progress includes generation of new knowledge that could be applied to productive activity, the situation is different in developing countries, where technological progress is strongly influenced by their capacities to access, adapt and diffuse technological knowledge generated abroad.

For these reasons, it can be said that the implications for trade and development of the technology gap between developed and developing countries and the question of how to promote transfer and diffusion of technology had been discussed for so many years. Unless developing countries realize that urgent measures must be adopted, and specifically in research and development, and generous funds be wisely provided to technology transfer and technology share and technology generation, then the future of research could be seen nationwide. If publication of research is fully adopted and encouraged, then, the gap will shrink for sure.

Session II : Modern pluralistic agricultural systems for research and innovation

On the global situation of technology and knowledge generation and exchange transfer in NENA region and AARINENA strategy, the following questions were raised, discussed and answered:

	#	How
to bridge the gap between knowledge generation and technology development?	#	
How developing countries react to bridging the gap. What are the means to do so?	#	
What are the paths to linking knowledge channels to market development?		

Clearly, knowledge development and financial support are becoming tighter in most developing nations. This could be attributed to the fact that government

agencies are withdrawing themselves from the arena. Several points were raised by the participants, they include the following:

- * Can the private sector handle the whole issue alone?
- * What should be the real government's role in Pluralistic Extension Systems **(PES)**?
- * Why most developing countries adopted the single extension system, even though the pluralistic outweigh the single system in many ways?
- * Does a pluralistic extension systems used in developing countries are similar in their functions?

Session II, included two presentations,

- Modern pluralistic agricultural research & innovation systems: Aims, architecture and governance frameworks.
- The case of seeds and plant system in Tunisia: Actors and evolution of the regulatory framework.

The session included the largest number of questions due to the importance of the subjects presented to member countries. A list of the questions seen below show the variety of topics they tackled.

Questions:

- The gap between developed technologies and their release and dissemination is becoming wider. Is the public sector the only partner to blame for that?
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Questions raised from the floor for the two papers:

- How do we develop our research programs?
- Are NENA countries follow the top –down approach?
- Do they conduct research on station trials?
- What is the role of research institutes in technology transfer?
- Are the research institutes follow the participatory approach?
- Does the Innovation Platforms (IP) in transferring the technologies is used widely in NENA countries?
- In developing new varieties, are local varieties are used?
- What are the main challenges in establishing the IPs?
- How the government and private sector provide the farmer with the needed technologies?
- What is the final impact of the research?
- Are the researchers blamed only for the impacts?
- Will the researchers be responsible for the whole impacts?

- Are the curriculums taught at universities contributing to solving agricultural problems?

Answers:

- ❖ To develop a research program, we follow the basic research, prototype, piloting and scaling up.
- ❖ Both local and improved varieties are used in the breeding programs.
- ❖ The quality of the research is the responsibility of the researchers.
- ❖ We are responsible for the output and not the outcome, the outcome is the responsibility of many actors.
- ❖ Seed multiplication in Tunisia was done by many private sectors.
- ❖ IPs is a concept to bring different actors together, farmers, NGOs, private sectors, government institutions.
- ❖ IPs is one that can solve the issue of the accountability, all are responsible in generating of knowledge (sharing the responsibility).

Questions raised and their answers by the floor:

- Why most developing countries adopted the single extension system, even though the pluralistic outweigh the single system in many ways?
- Does the pluralistic extension system has similar approach used in NENA countries?

Answers:

• Regarding the one single extension system used in most developing countries, it was pointed out that most developing countries adopted the single extension system, even though the pluralistic outweigh the single system in many ways. It should be noted that the main factor that determine the use of any approach is the social conditions of the country as well as lack of, and/or existence of proper training. Certainly, there is no one size fits all program or approach. It is well known that each country has its own characteristics. Among the main differences between countries is the issue of social structure of each and every single country. Other environmental factors such as social equity, political structure, political commitment to eradicate poverty, existence and/or lack of transparency, internal and external debts, existence of technical assistance and many others. Definitely, the single extension system is easier, and can work close to the farmers. It is preferred by most developing countries due to its simplicity.

- Classic linear systems are not functioning well. What is needed is different ways to deal with the new complex nature.
- Extension is a function related to the knowledge transfer, it is not the only related to the research and innovation.

- It is important to have interaction between different actors. Currently the actors are competent rather than complimentary.
- The pluralistic needs more capacities or logistics.
- To develop the pluralistic approach, responsiveness of each country at national level must be addressed.
- Single extension system will not solve all issues like financing and marketing.
- In using different extension systems, farmers will not be considered as an end users, they should be involved from the beginning.
- The load of impact is not only on the researcher, we need to involve other parts to the value chain.
- Innovation system could help put all the actors together.
- There is an issue of lack of approach mechanism and issues. It is not about blaming, interactions are more important.
- State polices enable research outputs to be turned to innovation.
- In pluralistic approach, different actors should work in a complementary way, no win – win thinking. We are not reactive to changes and not all farmers are at the same thinking.
- People nowadays used e. Agriculture and not extension system.

Question (4): Knowledge development and financial assets are becoming tighter. Due to the fact that government agencies are withdrawing themselves from the arena. Can the private sector handle the whole issue alone?

Answers:

- The private sector cannot do that, because many actors are involved
- How can we help countries that are willing to take the pluralistic approach.
- Government has to be ready and capable to adopt.
- Assessing innovation system should include the enabling environment.

The discussion started with the definition of pluralism and how it serves the farmers' community and the benefits they gain. It was also mentioned that pluralism urges for strong cooperation and collaboration and sometimes partnerships between the private and the public sectors. Most civil society organizations of the private sector play a central role and considered as determinants of the pluralistic system. Both, form an important coalition of interests, which serve the farmers' community and other stakeholders. In general, every organization, whether for profit and non-profit, farmers' associations as well as NGO's share a common market orientation, benefits and responsibilities.

It is important to note that in this system, there are different functions and various providers of services, ranging from farm education practices, through information (technology) transfer to farm management and training, and ending with final consultations.

Participants stated that in a pluralistic extension system, arrangement must be made by the government in order to organize national and regional platforms and workshops to identify the real and major stakeholders, as well as the best ways to organize the various extension activities and providers of every services.

Farmers of NENA region is no different, they also enjoy many benefits of pluralism. Among the benefits that farmers enjoy is a solid access to a broadened options of services, hence, having a value-added quality of services. The truth is that farmers don't see a limited role of governmental extension activities within the context of pluralistic delivery system, but the governmental role simply changes in form of extension delivery. In other words, it does not diminish. Public extension system, as the driver of agricultural education and extension, has been responsible for the fulfillment of all extension activities since its establishment. Needless to say, that a demand-driven extension services is a central component of the pluralistic system. No doubt that the role of the private sector is of paramount importance too. In technicality, it has a key role in guaranteeing the effectiveness improvement of the education and extension services through dissemination of technical knowledge and modern skills to farmers.

It was affirmed by member countries representatives that many NENA countries have high rates of unemployment and poverty. They indicated that some of the objectives of the advisory systems target eliminating poverty and social inequalities, guaranteeing food security and the sustainable use of natural resources. Therefore, extension agents must have access to smallholders and women farmers, who can make a difference in food security contribution, who are characterized by poor conditions. When it comes to government's role in the system, it is clear that it has a central role in promoting stronger linkages among various institutions, strengthening and coordinating relevant institutions of both sectors, the public and the private sectors, as well as formulation of strategies

Session III : Effective approaches and processes of agricultural knowledge & technology exchange & transfer for providing farmers and professionals in the NENA Region with the required technologies and knowledge.

This session contains several questions and concerns regarding the topic, and specifically the effective approaches used in NENA countries. The following list of questions is what participants of the conference tried to answer:

- * What are the dominant types for organizing E&TK&T in the region?
- * What are the roles of farmers and professionals in the current processes?
- * Do these processes meet the needs and expectations of farmers?
- * Does NENA countries have the right actors / organizations to design efficient processes for transfer / exchange of K&I? Are there success cases of structured processes?

When answering these questions, participants of member countries agreed that technology transfer, represent one of the main components of the innovation system, where different strategies of communication and active interaction are used for the purpose of boosting production, through the use of technological solutions. On the other hand, knowledge exchange is an interactive process, where dialog takes place to enable the adoption of technological solutions. It involves an exchange process between scientific knowledge and the traditional (implicit) knowledge. This approach- the interactive approach allows both knowledge and technologies developed abroad to be interpreted and adapted.

It was stated that only through the support of both, the public and private organizations, technology transfer and knowledge exchange are possible to be facilitated. Unquestionably, such alliances could be strengthen through coordination and partnership between agricultural research institutes, extension education and marketing cooperatives at the state and municipal levels.

It was agreed that the concept of Agricultural Knowledge and Information System (AKIS) is very important and a suitable framework for analyzing agricultural innovation diffusion processes. The three major factors of the famous triangular institutional arrangement consist of research, education, and extension. Certainly, farmers, due to their importance to the three partners, are placed at the center of the triangle. The truth is that the three factors and their principal functions are of great importance to the innovation process, they still not enough for the existence of a complex system of innovation-oriented institutional arrangements.

Participants mentioned that The AKIS is simply considered an ongoing process of institutional development and technical change, which have strong and constant interaction among all stakeholders. Such process must include a vibrant institutional changes from cooperative to market-oriented production, which can make all the difference in the innovation processes. Certainly, not all the newly introduced innovations compatible with local conditions. The point that needs attention here is that, although many can make significant increase in agricultural productivity, many have proven to be inappropriate for local conditions and practices and might have a negative impact on the technical, environmental, socio-economic, and other factors. Another point was added in this regards concerning the barriers, where barriers to

change must be stopped, something like not feeling the need to change. This is very serious obstacle in addition to the lack of time to make the change.

Participants pointed out that, like all other processes, innovation face various challenges, which became more complex with time, hence, all stakeholders involved in the process must pay close attention to the institutional barriers and try to avoid their negative impact. NENA countries are no exception, they must address all the challenges wisely, and must involve all the relevant partners in the innovation process. The research community, farmers, rural communities as well as policy-makers in NENA region must work hand in hand to share their views about what make the innovation better in this new context. NENA farmers must face the challenge about how to be active partners. Farmers do not represent the one-side of the innovation process, which is the receiver's side in the framework of top-down innovation system, but the partners' side in the real meaning.

It was indicated that the real challenge lies on how the innovation will fit into business, marketing and society use, not in the technical aspects. In many cases lack of trust among small farmers can be a real challenge, hence, hampering the social processes needed for cooperation.

When answering the question regarding meeting the needs and expectations of farmers, it was explained that in order to meet such expectations, farmers must learn to be active partners, and researchers must learn to be facilitators. In fact, all stakeholders, including innovators, must consider cooperation as the first step toward sharing the benefits. They must ignore the win-lose concept, but considering the win-win aspects, where all the partners may win from sharing the knowledge and innovation benefits.

On the other hand, it is believed that researchers see themselves as the producers of knowledge. Farmers in this regards, must see themselves as co-producers of knowledge. Only this new perspective can serve the innovation process better. Participants described the three main columns of innovation as the institutional learning system, knowledge exchange as well as the policy and/or decision makers.

Based on the discussion above, it is clear that knowledge generation, knowledge share and knowledge transfer require certain conditions that must exist for a successful innovation process. The NENA countries as well as most developing countries lack a solid base for the three requirements. The truth is that most NENA countries lack a knowledge generation system that is based on farmers' demands. Weak knowledge share system and a fair knowledge transfer system are dominant. The bottom line is that all the three major components of the innovation system do not exist properly. What we have is a broken system that needs urgent measures.

Session IV: The role of public, private and civil society organizations in driving research developing the required innovations and for exchanging / transferring more efficiently technologies and knowledge to rural farm households

- How to identify farmers / professionals needs and expectations?
- How to validate inventions or prototypes with farmers / professionals,
- How to develop rural enterprises in marginal areas?

For the purpose of answering these questions, participants involved in fruitful discussion environment. During the discussions, participants focused on answering the questions prepared in advance for the session.

- With regards to identifying farmers' / professionals' needs and expectations, the following key points were brought to participants' attention:
 - Skill-up - system thinking- evaluation, evaluation step-by-step, leadership skills
 - How to skill up the skills.
 - Conservation agriculture needs educated farmers.
 - Identify the needs through a special process.
 - New guidelines and platforms are needed, and all the actors must be involved.
 - The best strategies are those which involve both stakeholders in participatory methods during the process.
- When answering the question : How to validate inventions or prototypes with farmers / professionals, participants mentioned that the most important issue regarding agricultural interventions and innovations is that they could result in resolving practical problems of farmers and enhancing their livelihoods. For this purpose, innovations must be developed , analyzed, and finally validated with close collaboration and participation of farmers in their local content and real farms.
 - Some holistic methods such as Farmers Field Schools (FFS) can be useful in this regard
 - Among the key points are : Market-driven, change of thinking, thinking about events, local content, capacity building, capacity development.
- Regarding the question: How to develop rural enterprises in marginal areas?
Participants indicated that small farmers in marginal areas encounter various limitations and challenges that can be classified into two main categories, namely personal and environmental.
 - In the first domain, relevant education is the best strategy for investment and empowerment of individuals. From this standpoint, government prepare individuals for assuming responsibilities to launch their small enterprises by providing them with appropriate education. Some courses associated with enterprises with entrepreneurship, marketing, processing etc., can be very critical.

- The second, government must create a suitable environment and provide essential infrastructures to support and develop local enterprises.

It was also indicated that most farmers, when they keen for high levels of production of better quality food and safe products, they must comply with preserving the natural resources. No doubt that this could be achieved through complying with viable agricultural practices to compete at the local and regional markets. The challenges are many, among which is the price volatility in a globalization economy, as well as the decline rate of productivity, in addition to high input prices and environmental impacts and those related to water and soil

Regarding the point of validating inventions or prototypes with farmers / professionals, it is well known, participants said, that independent inventors will keep working on innovations, and contributing to the system, simply by inventing new ones, or working on existing products to improve them. Despite the increased efforts by individuals and innovation-supporting institutions, the public innovation policies never allocated special funds to innovation - supporting programs, never appreciated efforts of innovators, neither benefited them, although, acknowledgment could be enough for some inventors. The private sector took the lead for so many years, gaining the huge financial and reputational benefits.

In most developing countries, the situation is no different, where governments rarely stood beside inventors, encouraged them, gave them incentives or even appreciated their efforts. The truth is that in most developing countries, including NENA region, independent production is still relevant, due to absent of technological development, low investments in research, development and innovation and lack of any incentive programs or policies.

The fact that cannot be denied is that there is a long way from invention to innovation, time consuming, tough and not rewarding for the inventor, and unsurprisingly, full with huge difficulties, mounted challenges and rare opportunities, not forgetting solid knowledge acquisition.

Inventions pass through a long way, from theory to creativity and innovation. What is important here is how they reach farmers? and what kind of farmers are the first adopters of technology or any kind of inventions? How farmers know if an invention works for them, and what if not, which farmers will sacrifice the huge amounts of money paid for the invention.

It was agreed that increasing attention has been given to creativity, invention and innovation, simply because of their importance to economic dynamics and high economic returns. Farmers, specially smallholders, lack the courage and enthusiasm as well as the financial resources to adopt a new technology, a new variety of seeds, a new device or a new species. The problem is that they fear to lose all what they have. It was mentioned that only rich farmers are capable to go through the high risk

of adoption. Therefore, they always wait for several months, and maybe years, to try the new invention. They look for 100 percent success from neighbors.

Small farmers will endorse the new innovation only through international companies and assistant programs, and/or through international projects. Participants described the efforts of ICARDA, for an example, to validate many innovation systems in agriculture. It is believed that ICARDA's efforts have been continuous to introduce the latest technologies in agriculture. Smallholders have tried many new systems, thanks to ICARDA, and the results were fabulous.

But the question that needs an answer is how to accommodate such systems to farmers in remote areas, who technically are very poor, and located far away from the center of development? According to participants, it is believed that the best solution for such a problem is through conducting intensive workshops for such poor farmers. Providing incentives for few farmers to attend workshops can be a good thing to do. Probably, farmers' training farmers is the best solution. Training of Trainers (TOT) also can work faster. Generally speaking, the selection of creative farmer/s, who have outstanding communication skills, vanguards, and modest, who have the willing to help neighbors can be a good choice.

Based on the questions and answers, it can be stated that almost everything around us was globalized, and as a result, the discrepancy between developing and developed nations and between high-income and disadvantaged clusters had become wider due to unsuccessful implementation of social and economic development policies and strategies, hence, inequitable distribution of resources.

The absent of possibilities to move forward into an era of social justice was due to lack of cooperation and solidarity between these countries. Decision makers must understand that globalization became a fact, not a policy option, which could bring remarkable benefits to developing countries. Unfortunately, not all developing countries are able to take advantage of such benefits to the same degree.

Probably, among the main reasons behind that is the existence of long rotted historic patterns of discrimination, and specifically among some vulnerable groups, including women. Real and serious policies, as well as adoption and implementation of effective measures are urgently needed by most nations, such as promoting highly effective education, strong involvement of the private sector development, as well as free flow of information, promoting social development, in addition to reducing poverty, are just a few of the required multidimensional approach by all countries, which will allow them to take advantage of any opportunities of economic globalization. In other words, it is strongly believed that investment in social capital will be paid off.

Among the main reasons that stand as the greatest obstacle to social, economic as well as political development in most developing countries is poverty. In addition

to that, lack of technical assistance, training and labor opportunities are also of great importance. Definitely, serious, cooperative, and conducive international environment are also urgently needed.

With regards to the question who to blame, participants stated that industrialized countries are the main cause of most problems which exist in developing countries. Huge debts made most poor countries sink more in social and economic difficulties, severe exploitation of natural resources in most developing countries by the industrialized nations, and forbidden advanced training are also a big cause of poor social and economic development. However, poor countries are not exempted from the blame. Many leaders of these countries have surrounded themselves with corrupted people, who made no efforts to developments. Lack of credibility of such governments, dictatorship, lack of transparency, and many others made things even worst.

The global context of AARINENA agriculture

It is well known that most world countries, and specifically developing countries, face enormous challenges in agriculture, industry, technology, environment, as well as personnel development and training. No doubt that the NENA region is no exception. Severe environmental problems became a big challenge for these countries, including, but not limited to, water scarcity, and hence, water security, soil security, in terms of availability of arable lands, threat of soil erosion as well as lack of soil organic matter in most lands. All these factors and many others, became a huge threat to food security in the region. Serious lack of genetic resources' security, including animal and vegetal genetic resources due to genetic losses, erosion and improper human activities are also big problems for the sustainability of agricultural productivity.

The fundamental challenges of NENA agriculture also include the increasing development of agricultural technology and practices, which cannot be integrated (absorbed) on time. Global threats also include climate change and their serious negative impacts, such as temperature increase, seasons shifts, rainfalls quantitative and qualitative variations, parallel with frequency of extreme events and emerging pests and diseases. The most serious impact could be the significant decrease in annual precipitations, hence, most cropped NENA areas fall in zones of highest vulnerabilities. It is obvious that the role and functions of agriculture is central to human progress, ranging from feeding people and providing accessible healthy food for all, to preserving environment, through securing territorial safety and guaranteeing socio-economic and cultural services. Therefore, solutions to these problems and many others, must include certain measures, specifically innovations, organisation and methodologies for collective actions, socio-economic factors,

exchange and transfer process, as well as relevant policies for both, the public and private sectors. The truth is that knowledge and innovation are the two main drivers of the modern societies and economies, through which the degree of development of most nations is measured, to a certain extent, by indicators of the knowledge economy, and the performances of the NENA region in terms of innovation. The low capacity to turn out knowledge into innovation in most NENA countries is obvious, they are still dominantly imported and not enough integrated into the local or regional economies and contexts. Other factors that contributed to low capacity is attributed to low capacity of the universities to produce applied knowledge, and the capacity to turn out the produced knowledge into innovation.

Needless to say that AARINENA main mission consisted of fostering agricultural research development, encouraging agricultural knowledge / innovation economy in the NENA region, promoting the exchange of agricultural, technical and scientific information, strengthening cooperation and establishing strong ties with member countries as well as with international bodies.

Based on the mentioned factors, AARINENA must adopt urgent measures to speed the process of innovation in most member countries. For an example, climate change negative impacts have touched most countries, and the worst is expected to come. The sustainable adaptation and/or transformation of production systems to climate change critical scenarios are expected within 20-30 years. Therefore, mitigation measures must be introduced, taught and adopted. The need is also urgent to overcome the excessive pressure on natural resources, and specifically water, ecosystems and genetic resources. Today, more than ever before, the future of nations' economies, industries, healthcare, education and other key human activities is profoundly affected by the effectiveness of what is called the innovation process and the role of organizations in-charge of technology generation, dissemination and adaptation

New strategy for AARINENA

Since its establishment in 1985, AARINENA has been working with the same strategy, but due to certain factors on the national, regional and international levels, AARINENA found that most of the components in its strategy became outdated and need to be changed. So what are the factors influencing such change, and what is needed today? What cause the urgent need for such change, and why it wasn't initiated earlier? What actions needed to do the change, and who are the regional or international bodies that will help in this process?

No doubt that many things have changed on the international arena. Significant changes took place in our environment, agriculture, technologies, industries and many aspects of our life. All these and many others represent a serious challenge to AARINENA that must be dealt with. The globalization process, for an example, affected every single country in the world and became highly competitive in terms

of thousands of innovations, where scientific and technological advances in all fields took place. Things did not stop here, but also significant organisational and methodological progress in management of R&I touched every aspect of our life too. It is also important to note that increasing the role of inclusive systemic, multidisciplinary and increased role of interdisciplinary approaches to produce the most relevant innovations to solve technical and societal complex issues are of great importance.

AARINENA core principles

- Equitable access to knowledge and decision making especially to smallholder farmers.
- Gender and youth empowerment.
- Strengthening the capacity of education, research and innovation architecture.
- Open research & innovation systems.
- Knowledge sharing and open access to knowledge
- Partnerships and collective actions.
- Professionalism and continued communication.
- Subsidiary, and Transparency.

Five strategic goals

- Establish a global platform for knowledge exchange and dissemination amongst partners.
- Support and enhance multi-stakeholders partnership over collective dialogue and actions.
- Facilitate and cooperate education and capacity strengthening of various partners.
- Contribute to advancing rural women and youth and small holder farmers along the agricultural value chains
- Strengthening the architecture of AARINENA to enable the Forum for Agricultural Research in Africa (FARA) to reform and realize its reviewed mission, goals and expected outcomes and impact.

Conclusions

- The conference directed more attention to AARINENA's community, as well as NENA members involved in the applied research systems, innovations and knowledge and technology and/or exchange and transfer system. Obviously, personnel development, extension experts and advisory services, farmers, NGOs, young professionals and agro-industry representatives are of great importance as components of any future development system.

- AARINENA is embarking on a new era to confirm itself as the hub for agricultural stakeholders of the NENA region which strive to jointly strengthen and transform agricultural research and innovation, to effectively address challenges and realize together a sustainable inclusive and prosperous future for the region. In this respect, AARINENA has developed the new strategy for 2019-2030 and asserted its role as a unique network of representative multi-stakeholder partners that promotes and facilitates state of the art transformational solutions that enable agricultural research and innovation systems to address more effectively critical and pressing issues.

- Several presentations described policy analyses of innovations in extension programs. It was pointed out that there is an urgent need for the advancement of agricultural extension science in NENA countries, which is considered the main component of the innovation system, due to existence of few approaches in which extension development goes hand in hand with scientific development. Traditional models of extension must be replaced with current ones, since the traditional theory of knowledge transfer or knowledge dissemination do not serve the new vision of extension education and cannot hold anymore due to their outdated practices.

- AARINENA focuses on establishing a knowledge platform to facilitate knowledge exchange and production, promote partnerships among stakeholders and strengthen their individual and organizational capacities and AARINENA own capacities to address current and future challenges. In all its work, AARINENA is especially focused on improving income and livelihood of rural women, youth and small holder farmers, and making rural areas more attractive to the rural population.

- AARINENA ensures the effective implementation of its strategy through a solid action plan and through a complimentary communication strategy, a partnership strategy and a monitoring, evaluation and learning system. The targeted impact is to find solutions to regional challenges of food scarcity and climate change through generating competitive regional research and publications, enhanced capacities of research and education systems, moving along the value chains to improve livelihood of marginalized communities and effective multi-stakeholder partnerships and collective actions.

Recommendations

At the end of the conference, participants agreed on the following points, which apply to almost all NENA region.

- Encourage local innovation systems, through funding, incentives, encouragement, etc.
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- Needs must be identified properly to respond to the market demands, and farmers' needs - needs of the farmer himself and those of the society are of great importance.
 - Responding to markets demands is of great value.
 - Meeting farmers' expectations make all the difference in the process of innovation.
 - Technical and scientific content, as well as new technology, new innovation, new knowledge generation, must be developed, validated and disseminated.
 - Needs assessment must be implemented on the ground in order to identify real farmers needs and wants. Highly trained specialists must performed it.
 - Participatory approach must be used frequently to assess needs of farmers, markets and the community
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