In response to Consultative Group for International Agricultural Research (CGIAR) System Priorities, several International Agricultural Research Centers (IARCs) and their national partners are increasing their attention to horticulture as a high value component of farming systems. There is guarded optimism that farmers may move out of subsistence agriculture into market-led production systems by diversifying their product base with fruits, vegetables and other products. Therefore, governments and development organizations in the Near East and North Africa (NENA) region are keen to tap the market potential of horticultural products as a means of improving the livelihoods of smallholder farmers. To better understand the prospects and constraints, the International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Fund for Agricultural Development (IFAD) organized an Expert Consultation Workshop on The Role of Domestic and Export Marketing of Horticultural Commodities in Poverty Alleviation in the NENA Region. The workshop was held at ICARDA, 13-15 March 2007. There were over 35 participants, representing National Agricultural Research and Extension Systems (NARES), universities and development organizations from Egypt, Jordan, Morocco, Syria, Tunisia and Turkey. In addition to IFAD and ICARDA, participation from international organizations included ARVDC – the World Vegetable Center; the French Centre de Cooperation Internationale en Recherche Agronomique pour le Développement (CIRAD); Food and Agriculture Organization (FAO); and the World Bank (WB). The workshop was opened by Dr Mahmoud Solh, Director General of ICARDA; and Dr Mona Bishay, Director of IFAD’s NENA Division.

ICARDA and IFAD work in synergy within the research for development continuum. Along with National partners, the two organizations are seeking innovative institutional means of serving the rural poor by linking them to markets. ICARDA focuses on research, management, technology generation, policy, and capacity development; its comparative advantages are a regional presence and strong links with NARES partners. IFAD, a development organization, can support large-scale out-scaling of horticulture technologies, leading to major improvements in human nutrition and rural livelihoods. National governments can implement grant projects as well as investment projects through loans if necessary from multilateral banks to build urgently needed rural infrastructure such as efficient irrigation systems, cold chains, export terminals and roads.

Dr Colin Piggin, Director, Diversification and Sustainable Intensification of Production Systems (DSIPS) at ICARDA, summarized the workshop objectives and approach, and the planned structure of presentations, discussions and working groups. The workshop was structured around four themes – (1) assessing market potential and comparative advantage; (2) evaluating constraints; (3) examining success stories to draw lessons; and (4) identifying actions, programs and partnerships to promote smallholder production and marketing. There were 17 presentations and a series of theme-based discussion sessions. The workshop included a field trip to see pomegranate production and processing at a family farm; and olive and vegetable processing and international marketing, with the help of the Syrian Olive Research Department.
Key agreements reached at the workshop:

- The International Society of Horticultural Science (ISHS) is keen to collaborate on publication of the workshop proceedings.
- A strategy document will be produced, based on the workshop deliberations, on opportunities for horticultural development in the NENA region.
- A NENA Horticulture Group will be formed, with the participation of NARS, ICARDA, IFAD, CIRAD, ISHS, FAO, WB, AVRDC – the World Vegetable Center and Bioversity International – IPGRI.

Note on discussion of herbal, medicinal and aromatic plants (HMAPs): Even though fresh and dried culinary herbs could be equally treated as high value vegetable crops, discussion on natural products were postponed for more detailed treatment in a similar Expert Consultation on HMAPs that will also be sponsored by IFAD and ICARDA 10-12 July 2007.

BACKGROUND

Relevant areas of IFAD implementation: IFAD's objective is to assist in creating an enabling environment and to support institutions that may help the poor to diversify their income. IFAD facilitates the development of community groups, grass-roots organizations and local institutions that can empower the poor and address their livelihood needs. The specific intersection of IFAD strategy and focus in the NENA sub-region is on groups that can help to manage themselves through associations. An example relevant to this workshop would be fruit and vegetable crop associations. Women play a key role here, owing to the important role they play in horticultural production and processing.

IFAD promotes and supports research on cash-crop varieties that are resistant to drought, salinity and poor soil conditions. Changing from crops that require large quantities of water to high-value crops that require less such as trees, fruits and vegetables is a high priority. Suitable technology for improving water-use efficiency and applying more on-farm water-saving techniques is also crucial. IFAD supports activities to help farmers invest in their farms such as investing in technologies that save water and reduce production costs in the long term (such as replacing surface irrigation by drip and sprinkler irrigation) and planting fruit trees that are more drought-resistant. There is also awareness that rural roads, electricity, drinking water supply and proper
sanitation are necessary for successful poverty reduction. In collaboration with governments and local communities that contribute in cash or in-kind for continued maintenance, IFAD mobilizes resources from other donors to finance infrastructure investments.

Dairy farming, tree-crop production, agro-processing, marketing of agricultural inputs and commodities, small-scale repair shops, manufacturing, handicrafts are all activities that contribute to income diversification for the rural poor. Capacity building and technical/vocational training to support such activities are key elements in IFAD's programs.

ICARDA’s Expansion into the High Value Crops (HVC) Sector: Work on horticultural crops was envisaged long ago in the Skilbeck Report\(^1\) -- one of ICARDA’s founding documents. The following statement is as relevant today as it was 34 years ago:

> At present, for example, considering the scarcity and value of water, the high cost of its development, and the multiple goals of national policies, it is arguable that cereals, mainly wheat, often occupy too large a proportion of most existing cropping patterns to achieve satisfactory returns. Despite the importance of wheat as a major food staple, the potential for increased yield, resulting from improved varieties and its suitability as a rotation crop, a shift to more profitable industrial or other high value cash crops, such as fruits, vegetables, or intensive forage/livestock systems, is required to justify the use of expensive water. In addition the irrigated areas offer the major possibility for developing agro-based industries and thus creating new job opportunities within and in relation to the agricultural sector. In Egypt, Sudan, and more recently developed projects in some other countries, this trend is already evident. (Skilbeck Report, 1973, p.13, paragraph 55)

ICARDA’s approach is compatible with expansion of options for improving water-use efficiency and livelihoods for the poor in dry Mediterranean areas. It also links to the CGIAR Science Council priority 3A: Increasing income from fruit and vegetables. The work is both research and development orientated and produces International Public Goods (IPGs) of knowledge and technologies which are widely applicable across countries sharing similar dry environments.

Horticulture is a significant contributor to livelihoods in dryland farming systems in Central and West Asia and North Africa. Major species – many indigenous – are fruit and nuts (olive, grape, pomegranate, fig, almond, pistachio, walnut, dates, other stone fruits (plum, apricot, cherry), citrus and vegetables (beans, peas, cowpeas, garlic, onion, tomato, eggplant, pepper, melons, and cucumber). Many of these have been farmed in the region for thousands of years. They provide income and diversification options and pathways out of poverty, with studies showing higher benefit/cost ratios for olive, almond, pistachio, mint, oregano, cumin, anise, and onion than for lentil, barley and wheat.

Over the last 10 years, ICARDA has established programs on many of these crops, funded from restricted grants, especially through its regional programs in the Arabian Peninsula, North Africa and Central Asia and the Caucasus, including (a) protected vegetables in Yemen, Pakistan and Afghanistan; (b) mint in Morocco and Afghanistan; (c) dates in the Gulf countries; (d) olives in Syria and Pakistan; (e) figs in Egypt and (f) HMAPs in Tunisia, Jordan, Lebanon, Palestine and Syria. Many HMAPs are indigenous in the local region, and due to their over-harvesting in the wild, domestification and cultivation can help with conservation of this plant biodiversity. They have demonstrated potential to provide much higher incomes per unit of input than commodity crops and use available labor, especially for women and the rural poor.

A survey and report commissioned by the Board of Trustees of ICARDA, published in 2004², suggested the focus of research and development should be in the following key topic areas for high value crops identified by stakeholders:

1. Water-use efficiency (rationalization of irrigation water utilization, irrigation practices, water saving strategies)
2. Harvesting issues (timing of harvests, using maturity indices, tools and equipment) for high quality and long shelf life
3. Temperature management (shade during harvest and handling, pre-cooling, cooling and cold storage, refrigerated transport)
4. Food safety issues (fresh handling, processing and marketing)
5. Cost and benefits of adopting new practices

It was recommended that crops common to dry areas and crops that have high economic potential listed below should be given the highest consideration:

- Greenhouse vegetables: tomatoes, cucumbers, eggplant, hot and sweet peppers
- Field vegetable crops: faba beans, green beans, onions, garlic
- Fruits: dates, pomegranate, olives, figs, jujube
- Nuts: pistachios, almonds
- Fresh and dried culinary herbs (selected for the region)
- Medicinal plants and aromatic herbs (selected for the region)

Recent activity and expansion plans for horticulture include:

- Collaborative links formed with various groups with horticultural expertise including AVRDC – the World Vegetable Center and the University of California, Davis under the Global Horticultural Initiative (www.globalhort.org), including agreement with the World Vegetable Center for joint scientist appointments in horticultural economics and extension.
- Participation with (a) AVRDC – the World Vegetable Center, CGIAR Centers and other partners on development of a Challenge Program on High Value Fruit and Vegetables and (b) the Fruit and Vegetable Initiative supported by FAO and the World Health Organization (WHO).
- Next steps (2006-10): identify priority constraints and interventions; develop proposals for funding; and implement agreed projects from core or restricted-funding.

As an example of relevant expertise for high-priority horticultural species, ICARDA is able to provide services for genetic characterization. This has been/is being done on fingerprinting of date palm, olives, and pistachios at ICARDA and, for fig virus diagnosis, in collaboration with the Government of Egypt, Ministry of Agriculture, Agricultural Genetic Engineering Research Institute.

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WORKSHOP OBJECTIVES

The workshop reflected on present status and progress in domestic and export marketing of horticultural products and to inform and support strategic vision and directions in promoting these commodities in the NENA region. More specifically the regional workshop aimed to achieve the following objectives:

1. To elucidate the (a) domestic and export potential of horticultural products (that can contribute to poverty reduction of smallholders) and (b) to identify countries with comparative advantage in the region;
2. To identify and discuss (a) opportunities and constraints/barriers in producing and exporting horticultural products and (b) propose solutions;
3. To examine some success stories, including types of partnerships, to derive lessons learned in the domestic and export marketing of horticultural products from countries within and outside the region; and
4. To identify actions, partnerships and programs necessary for promoting domestic and export marketing of horticultural products in the region.

The workshop used presentations, dialogue, field-trips, break out sessions and plenary question and answer sessions to arrive at a host of findings, synthesized briefly below. This report cannot be comprehensive given the scope of the meeting and the desire for a concise document but should point participants, their organizations and the organizers in the right direction for further work.

POTENTIAL HIGH VALUE CROPS DISCUSSED IN THE WORKSHOP

<table>
<thead>
<tr>
<th>Country</th>
<th>High Value Crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morocco</td>
<td>Tomatoes, Strawberries, Cantaloupe, Banana</td>
</tr>
<tr>
<td>Tunisia</td>
<td>Dates, Pomegranates, Olives, Potatoes, Tomatoes, Apples, Grapes</td>
</tr>
<tr>
<td>Egypt</td>
<td>Broad Beans, Green Beans, Okra, Figs</td>
</tr>
<tr>
<td>WBG</td>
<td>Strawberries, Eggplant, Bell Pepper, Citrus, Ornamental Plants, Cut Flowers</td>
</tr>
<tr>
<td>Iraq</td>
<td>Dates</td>
</tr>
<tr>
<td>Jordan</td>
<td>Tomatoes, Eggplants, Peppers, Charentais Melon, Okra, Green Beans, Strawberries, Dates, Chili Peppers Herbs, Medicinal and Aromatic Plants</td>
</tr>
<tr>
<td>Syria</td>
<td>Olives and Olive Oil, Pears, Apples, Plums, Apricots, Pistachios</td>
</tr>
<tr>
<td>Turkey</td>
<td>Pistachios, Almonds, Fresh Fruits (e.g. Grapes, Figs, Cherries, Apricots)</td>
</tr>
<tr>
<td>Iraq</td>
<td>Dates</td>
</tr>
<tr>
<td>Iran</td>
<td>Dates, Pistachios</td>
</tr>
</tbody>
</table>

SYNTHESIS OF RESULTS

The main rationale for focusing on fruits and vegetables

- Fruits and vegetable production usually needs more labor input compared to other crops, so horticulture contributes to poverty reduction by providing employment and wages to laborers
- High economic returns per unit of land can be generated, thus the production of fruits and vegetables has a comparative advantage under conditions with scarce arable land
Horticultural commodities contribute to the livelihood of a major part of dry-area communities, involved directly or indirectly in the production-processing-marketing chain.
Fruit and vegetable intake meets human micronutrient requirements in the developing world
Perishable products experience problems that can be addressed with appropriate public investments in research, infrastructure, and institution building
Domestic and export demand for fruits and vegetables creates new opportunities for poor farmers in the developing world, but assistance is needed in adapting policies, institutions, and infrastructure to take advantage of these trends

Relevant Topics Discussed

Small holder productivity and quality
Cost/benefit framework that will guide research and development
Inventory the under-utilized crops with promise for market expansion
New crop sequencing and rotations within traditional agro-ecological systems
Economic analysis for domestic and export market expansion for small farmers
Product differentiation and marketing
Organic agriculture packages including certification, provision of organic seed and compost, market analysis, post-harvest handling
Widely available and standardized information systems in NENA
Integrated germplasm conservation, evaluation, multiplication and seed distribution
Simplified, cost effective and quick food safety indicators that meet trade standards
Contract farming pros and cons, including effect on extension systems and proposals for reinvention of the role that can be played by agents
Policy/institutional reviews focused on bottleneck problems and issues
National standards for good agricultural practice certification
Inclusion of horticultural commodities in free-trade agreements
Promotion campaigns based on agricultural-economic targeting in major markets
GAP certification provided at reasonable cost
Testing labs at national or regional level

Key Comparative Advantages in the Region

Proximity to the European Union (EU) and Gulf Cooperation Council (GCC) markets, implying low shipping cost and speed of delivery
High benefit/cost ratios for investment in high value fruit and vegetable crops
Labor availability at low cost for product processing and differentiation
Plant genetic resource diversity and indigenous knowledge of uses
Products already in local markets – need labeling, certificates and expanded marketability
Geographic identities have rich histories that can be grafted to products
Organic production is a de facto condition in many low input systems
Availability of high value native crops possessing high water-use efficiency
Potential for integration of high value crops into existing subsistence farming systems
Favorable agro-climatic conditions to grow high value products from September though May (in the northern hemisphere) which coincide with non-productive climatic conditions in Europe
Vicinity to and source of products for important markets: Out of season fruits and vegetables have a market niche in the EU and Russia. The GCC is a good market destination for summer crops and high quality products. The USA, Japan and Australia are fueling the growing global international market for dried products and spices.

Domestic and regional markets: Participants felt that domestic and regional markets were largely under-exploited. This applies specifically to indigenous produce that could be better managed and organized throughout the chain of production and marketing. Nowhere is this more obvious than in the traditional “wet” markets where very high losses take place due to poor physical handling and lack of attention to temperature control. These crops are often well adapted to farming systems and possess low water use efficiency combined with short crop life cycles to avoid late-season drought. Already sold in local souks, many of these domestic products could easily expand or reach new consumers in supermarkets and tourist hotels though creative, attractive labeling and marketing.

Premium for organic production: Consumer demand for food safety provides a premium for organic production of fruits, vegetables and natural products for all of the above marketing destinations. Although the terms "organic", "ecological" or "biological" have developed in Europe and North America to distinguish organic from conventional agriculture, many low-input traditional agriculture systems in other parts of the world are also de facto organic systems. The advantages for NENA countries are obvious because of the prevalence of virgin lands not yet treated with any chemicals or manufactured fertilizers. To unlock the potential governments must put in place simple procedures and testing to prove the land is certifiably "organic.” Examples of organic agriculture are widespread in the region, including both food and fiber, such as organic cotton production in Syria.

Contributions to poverty reduction: The possibilities of drying products naturally or using improved solar drying technologies provides post-harvest methods to preserve product value and create new products through differentiation (e.g. chopped and dried vegetables and fruits for soups or trail mixes) within isolated locations that are not quickly and easily connected to markets -- the case for many parts of the NENA region. Exploitation of these approaches in remote locations will contribute significantly to the reduction of poverty.

Quality standards: Systems for quality standards such as EurepGAP [Euro-Retailer Produce Association (EUREP) Good Agriculture Practices (GAP)] are creating unanticipated improvements in quality of life for poor communities, as sanitary requirements for food products means sanitary requirements for people preparing the food – bring education with a purpose to many rural communities. The same principle is playing out in Upper Egypt where producer needs for skilled labor is feeding back through community councils to affect programming of courses in vocational schools. Where once there was rote education in subjects irrelevant to finding a job, there are now skills being taught that are sought after by new companies and cooperatives involved in the production and marketing chain for export of high value fruits and vegetables.

Job security: Once these required skills and requirements are introduced, it is in the best interest of an employer to maintain well-trained staff. The higher skills needed to meet higher standards bring better job security and higher wages. As with farmers learning how to cooperate in aggregating product to meet volume requirements of supermarkets; employees are learning to collectively bargain for better employment conditions.

Expansion of high value crop inventories: In general, the high value crops will bring higher returns than commodity crops; however, there are higher risks, costs, and technology.
requirements, most of which can be addressed with better organization, management and teamwork along the production and marketing chain. A comprehensive description of potential opportunities and constraints for high value crops in each country is needed to inform all stakeholders.

**Public-private partnerships (PPP):** In the 1970s, 70 percent of resource flows from the USA to the developing world were from official development assistance and 30 percent were private. Today, 85 percent of resource flows from the USA to the developing world are private and 15 percent are public. These changes in flows reflect the emergence of the private for-profit sector and the non-governmental sector as significant participants in the development process. PPPs further research and development objectives by combining public resources and capabilities of other prominent actors such as the private sector, NGOs and Community Based Organizations (CBOs). For example, a company is eager to buy fruits and vegetables but they must be delivered at the right times in the right quantity and quality. NGOs and CBOs can help build farmer associations to teach good agricultural practices and aggregate product from groups of farmers; public money can be used to build roads or training centers; and the company buys the product – using its marketing expertise to guide these goods through international channels.

**Contract farming and the changing role of extension:** Contract farming is becoming more commonplace because of the “supermarket revolution”. In some contract farming instances, the private sector will provide most of the agronomic information in place of extension agents. Extension systems can be redesigned in a complementary way to contribute fully within the HVC systems proposed for NENA. Extension agents can play the honest broker and service provider, for example: (a) making sure contracts are fair, (b) validating that accreditations and certification procedures are legitimate; (c) monitoring use of chemicals, (d) collection of local weather data, (e) dissemination of current market data or (f) holding field days to demonstrate good agricultural practices, post-harvest processing or business develop services. In isolated rural areas where contract farming is not a common practice, extension agents have the full spectrum of responsibilities.

**Diversification at the country level – specialization at the farm, village or eco-system level:** New market channels demand exacting quality and standardization, which also requires high levels of labor – pushing agribusinesses into zones with low labor costs. This multivariate problem has a solution in the form of specialized production zones in low wage countries with ecosystems matched to crop requirements. Increasingly, entire areas will convert to a specialized crop, such as lavender in the Middle Atlas of Morocco, to capture economies of scale, concentrate production and to simplify transport logistics. This is also happening in specialized production areas of Tunisia where whole villages are growing special varieties with a particular market niche, exploiting the rich biodiversity of numerous high value crops in the region.

**Key Constraints in Producing and Exporting in the Region**

- Macro and trade policy, regulatory framework and legal environment
- Uncertainty on how to access markets
- Infrastructure (roads, electricity, water, sanitation) and transport facilities undeveloped
- Shortage of capital, and lack of credit, particularly to cover start-up investments
- Specialized input supplies needed for innovative technologies missing or of low quality
- Insufficient technical knowledge, extension services and training
- Poor coordination and collaboration among community, public sector and private sector
• Critical business and entrepreneurial skills undeveloped
• Market information unavailable, including prices, trends and projections
• Illiteracy among most of the small growers
• Little attention paid to post-harvest processing, food safety and quality standards
• Poor human safety related to misuse and handling of chemicals
• Poor storage facilities and product handling
• Lack of trust between growers and exporters
• Dynamism (over and under supply) leads to volatility of market prices
• Lack of farmer associations, organizational capacity and know-how
• Low awareness and knowledge of the agents along the value chain (handlers, retailers, etc.). Education is essential to raise public awareness that will translate into enforcement of sanitary and phyto-sanitary regulations in the post harvest and retail sector.

Aggregate institutional actions: NARES institutional actions and donor-sponsored projects in the countries of NENA are by and large fragmented – rarely aggregating to address a more integrated objective that impacts poverty. A new approach is necessary for each partner to contribute within the bounds of their comparative advantage while adding to nationally led frameworks that provide continuity and course-correction in the long-term desire to achieve a developmental goal.

Need for information, communication technology and knowledge management: If producers knew that prices were higher in the next town or country – they would sum their input, harvest, processing, and transport costs, with a deduction for losses, fees and taxes – and make the most profitable decision. Imagine trying to do business without a market information system to present the choices; an extension system that could explain the regulations; a record keeping system to track costs, profits or loss; or roads and transport systems to get product to market. Description of these production and marketing chains can determine what works and what doesn’t – allowing stakeholders to discuss the problem, propose solutions and divide responsibilities to profitably link farmers to markets.

Inconsistency of standards: There are too many standards, they are too complicated and demand different things. An international public good would be to disentangle and harmonize this multiplicity of standards. The current situation adds considerably to costs because no single standard is universally acceptable, forcing a duplication of certification. Standards that are too stringent can also be misused or perceived to be used for protectionist purposes.

Traceability: EurepGAP aims to increase consumer confidence by establishing criteria for food safety and traceability. The norms also address some environmental practices (e.g. integrated pest management) and prerequisites to protect workers’ health. EurepGAP is also aimed at harmonization of requirements for food hygiene and for Maximum Residue Limits (MRLs) for pesticides in food. This harmonization effort has only partly been successful, considering that not all retailers are involved and that the standards refer to existing governmental regulations, which are not the same across Europe.

Analytical services and capabilities: Whether for testing of soils for organic certification, examining products for MRLs or for routine soil or plant testing for optimum fertilizer application, there is much room for improvement in provision of services. In the developed world, analytical services have been shifting from public to private sector providers and this evolution should be carefully examined for its applicability in the NENA region. Training is
greatly needed, both to educate a new generation of technicians and to build adequate national capacity for public servants already working in the horticulture sector.

**Business development services (BDS):** National programs of NENA are just starting to mainstream BDS. Donors are increasingly aware of the need for record keeping, accounting and financial planning. In a fruit based program for example, BDS could focus on: (1) product assembly and grading services (supply contracts, forward and backward linkages, broker schemes); (2) quality assurance services (production issues related to crop husbandry skills such as extension services, post-harvest handling, certification, MRLs, traceability); (3) access to material inputs (agro-chemicals and seed varieties); (4) business skills; (5) Appropriate technology (irrigation and processing); (6) establishment of labels and other promotional information (domestic and export); (7) research and development (local adapted varieties, processing, and consumer preference for new products); and/or (8) financial brokering (equipment for processing or transport).

**Transparency:** National policies should root out rent seeking behavior of bureaucracies that keep a few dollars in the hands of officials instead of unlocking many more jobs by simplifying these processes and eliminating the corruption. Much of the process can be automated and made more transparent through e-government initiatives that shed light on the rules and makes transactions available on-line as a part of the public record.

**RECOMMENDATIONS**

**Build associations:** HVC associations are recommended to organize farmers into geographic clusters that can aggregate products and provide collective bargaining. The NENA region faces a huge challenge in developing a new model that differs from politically oriented cooperatives prevalent throughout the region. Without associations that can sidestep these old structures and bad habits, the future will not lead to success in the HVC sector.

**Create a HVC Group:** It was agreed to develop a HVC Group including farmers, NARES, NGOs, CBOs, private sector and IARCs that will share information and provide the nuclei for research and organization of developmental issues within communities. The group can gather standardized information from members to share, compare and analyze how similar issues are treated in each country with a view of providing standardized approaches. Formal meetings and a means of communicating results to stakeholders will concentrate the group on issues of priority interest, such as evaluation of market trends in individual countries, regionally and globally. Such a group could inform discussion, for example, on how to provide GAP certification at reasonable cost, using labs at national or regional level. A solution will require discussion and may require rewriting the guidelines for safe, sustainable and responsible horticulture in NENA, by the stakeholders themselves, to fully reflect real concerns in the context of the region and still be compatible with external market requirements.

**Link to the FAO Regional Working Group on Greenhouse Crop Production in the Mediterranean Region:** Technical subgroups are already responding to major thematic challenges/areas of work such as irrigation, fertigation and soil-less culture; greenhouse design, covering materials and climate control; integrated production and protection management; production economics, quality requirements and crop diversification, including organic horticulture.
Seek out Public-Private Partnerships: This is a critical issue. Little success will be achieved without the knowledge of the private sector partner, who is already immersed in the logistics of buying and selling HVCs. Through joint work and dialogue, the private sector can elect to work with small farmers in win-win relationships but farmers must meet the product quality, quantity and delivery criteria as defined by the private sector buyer.

Use contract farming: Increasingly, contract farming is being introduced when the private sector wants a very tight control over production inputs, practices and harvest management. In essence, this means delivery of all seeds, inputs and protocols to deliver a standardized product at a particular time. The farmer provides only the land and labor. This system has tremendous potential simply because farmers like to know they have a known buyer and selling price for their products. Participants noted different needs of farmers who are already organized (ready to move to contract farming and link with value chain) versus individual farmers who are not prepared (never under contract and unorganized) who need NGO or other assistance for awareness raising, mobilization etc.

Support rural financial institutions: It was recommended to increase support to self-sufficient and sustainable community-based rural financial institutions, using pilot approaches to ensure the viability of any full-scale program before it is launched. To the extent possible, development and design of schemes should involve the participation of stakeholders from the start and to build up the capacity of local institutions to take over the management and monitoring of microfinance schemes once projects have closed. Programs should seek out experienced local and international NGOs and private organizations that are specialized in facilitating the development of these services for the poor and that can help in training, TA and capacity-building.

Support micro-enterprise development: It was clear that complementary non-farm rural activities should be developed to diversify the rural income sources, including activities such as dairy farming, tree-crop production, agro-processing, marketing of agricultural inputs and commodities, small-scale repair shops, manufacturing, etc.

Prioritize horticultural education, training and extension: Horticulture is very knowledge intensive and dynamic. Short-term growth and long-term viability are critically dependent on access to technical knowledge, the ability to adapt that knowledge to local conditions and the flexibility to develop new production systems as market conditions change. Lack of human, institutional, and research capacity inhibits innovation, technology adoption, and the development of solutions to address key constraints. The development of participatory methodologies and effective education and extension networks, involving public, private, and civic sector collaboration, will strengthen the technical capacity of horticultural producers and improve the efficiency of current production and marketing systems.

- **Agricultural Universities:** In our global food system, courses and faculty need to move into the 21st century and become more market-driven. To get jobs in the private sector and to be a part of this emerging food system, graduates need critical thinking, problem-solving and decision-making skills, regardless of whether they are in technical or managerial positions. Courses and curricula need to be up-dated.

- **Vocational Agriculture and Technical Education in Secondary Schools:** This level of education needs strengthening through local schools and via distance education. Young farmers should have a minimum of 9 years vocational education in agriculture and farm leaders need 12 years of secondary education. With this capacity, the farming
community can move quickly in getting organized into groups, seeking markets and securing the latest technology.

- **Agricultural Extension**: Nearly all agricultural extension workers were trained for a supply-driven extension system designed for cereal and oilseed crops. They know very little about market development, high value crops or organizing farmers into groups and linking them to supply chains. By organizing farmers into groups then link these groups to markets it will: (a) achieve economies of scale; (b) strengthen the position of farmers in dealing with traders and processors; and (c) organize rural women, first into specialized horticulture groups and then into farmer associations, putting more food on the table and in getting more girls into schools.

**Address key policies**: It will be important to carry out studies that demonstrate the economic benefits that are likely to result from a change in policies. For example, it will be hard to change use of styrofoam packing crates to uniform plastic ones unless the government is convinced of the benefits. These studies need to factor in the economic consequences of long-term environmental degradation. Examples of important policy considerations include regulatory systems for horticultural standards; clarification and application of intellectual property rights agreements; secure land tenure and credit markets for small producers and agribusinesses; water use systems; and post-harvest and food safety protocols.

**Follow-up existing project efforts**: IFAD funds ICARDA to undertake commodity chain analysis for selected vegetables and fruits with comparative advantages and potentials to benefit the smallholder farmers in the NENA region. Case study analyses will be carried out in Egypt and Morocco. The study is expected to give strategic directions for government and private sector support to the sector, to inform and guide investment opportunities and project development possibilities, and to support policy dialogue for improving the sector.

**CONCLUSIONS**

**Generic research challenges that could be incorporated into future proposals**:

- a. Making biological control more economically attractive to apply: improvement and innovation in mass production of natural enemies, quality control, storage, shipment and release methods
- b. Adopting non-chemical methods of pest control; also for insect vectors of virus diseases
- c. Control of soil-borne diseases without methyl bromide fumigation
- d. Encouraging specialized seedling production: developing quality management systems; reducing the cost of seedlings grafted on resistant rootstocks
- e. Designing/using appropriate greenhouses - cost and energy efficiency, reconciling plant growth goals with those of pest and disease management
- f. Incorporating soil-less cultivation: better water use efficiency, avoiding soil fumigation or soil salinity problems
- g. Working with importers to make their quality and safety plans compatible with the reality of smallholder producers in NENA region
- h. Exploiting NENA comparative advantages in matching crops with ecologies, e.g. especially for earliness that translates into a window of marketing opportunity
- i. Lengthening season of production and enhancing quality are producer goals
- j. Defending against phyto-sanitary issues that can disrupt trade (fruit fly, citrus canker)
- k. Reducing post-harvest losses is a huge issue (upwards of 50% losses reported)
- l. Understanding the biological and environmental factors involved in product deterioration: training and know-how essential
m. Extending the cold chain at low cost – removing field heat as fast as possible
n. Sorting and grading of highly perishable produce (e.g. tomatoes or table grapes) immediately after harvest – fundamental for fresh product quality
o. Piloting of on-farm packinghouses
p. Capacity building for skilled operators needed at critical points along the value chain
q. Understanding who bears the costs of post-harvest losses and deterioration and who would bear the costs of improvements – could help to target efforts to motivate improvement, capacity building and infrastructure

Challenge Program (CP): The workshop gave validity to the need to find additional resources and the CP may provide a framework to organize around an immediate funding opportunity. The CGIAR Science Council (SC) has included “High Value Fruits and Vegetables” concept note as one of the three finalists for drafting of CP pre-proposals. The SC will use the following criteria to assess all forthcoming pre-proposals:

- Quality of Science
- Stakeholder Involvement and CGIAR Partnerships
- Alignment with CGIAR System Priority research
- Relevance to Millennium Development Goals and CGIAR international public goods approach
- Magnitude and Evidence of Financial and Resource Support

Design future work around contract farming: The workshop brought to light the significant comparative advantage of Turkey in contract farming for vegetables, fruit, cut flowers and potatoes. It would be a good strategy to incorporate the lessons learned into any project design as it would develop the private sector linkage and co-financing. Companies contract small farmers to produce raw material for canning, pickling, drying, deep-freezing and minimal processing of vegetables (tomatoes, pepper, beans, pea, okra, artichoke, cucumber (pickling), eggplant, cauliflower, carrot, brussel sprouts, mushroom, squash, broad bean, broccoli, onion, spinach, asparagus and leek).

Advantages include:

a. Experience with vertical integration
b. Link farmers to export and domestic markets
c. Expose farmers to new varieties
d. Deliver contractor-recommended inputs e.g. seeds and seedlings, some not available in local markets
e. Adopt proven technical know-how e.g. plant density, fertilization, pest management
f. Transfer of technology e.g. new machinery
g. Adopt and adapt new innovations
h. Support research e.g. more than 100 research projects at M.Sc. and Ph.D. level were completed
i. Learn and implement real traceability systems
j. Lower cost of inspection and certification in a contracted group
k. Evolve from standard to organic production as ‘projects’ under the contract (dried fruits, nuts, HMAPs and pulses)
l. Experience with legal frameworks that protected the interest of farmers and contractors.
m. “Trial and error experience” of farmers that broke away from contracts to form their own cooperatives
**Coordinated research and development**: Of the presentations given at the workshop one stands out as a model for emulation. The WB Horticulture Export Promotion and Technology Transfer Project (HEPTT) is a good model to emulate from Jordan because it integrates many of the issues discussed in the workshop in a relevant way to most participating countries. The reality is that international donors like IFAD and the WB will need to work on a large scale with nations and subcontract some of the research functions to specialized institutions such as those represented at this workshop.

The development objective of HEPTT is to assist the GOJ to improve horticultural export marketing by pilot testing: (a) a system of out grower farming between large and small/medium scale farmers in order to achieve “critical mass” or “bulk volumes” demanded by the target markets and improve the income of participating farmers; and (b) building of the technological capacity of farmers, especially the out growers, to improve husbandry practices and their produce quality to satisfy the requirements of target markets. Project technicians are recruited from existing public research institutions, including the National Center for Agricultural Research and Technology Transfer (NCARTT) – a close partner of ICARDA. The project covers priority areas such as EurepGAP, IPM, post-harvest technology, soil management, irrigation/water management, and some are crop specialists focused on crops such as table grapes, tomatoes (cherry and standard varieties), strawberries, organic produce, exotic vegetables (okra, etc.), and flowers (carnations, roses). In addition to an induction course from high-caliber subject matter specialists, the staff get their technical know-how to transfer to participating farmers from technologies coming out of NCARTT and related research institutions; from the technical information coming out of the market intelligence efforts of the Agricultural Export Promotion Department at the Jordan Export Development and Commercial Centers Corporation which will show where gaps in the market exist or where a competitor can be displaced with a higher quality Jordanian product; and from the technologies coming from the successful large farmers.

**Facing a sobering challenge**: This workshop and the up-coming workshop dealing with HMAPs in the NENA region are useful steps in addressing these four major challenges:

- Employment: *Already facing unemployment rates that are the highest in the world, NENA has the greatest challenge of any region in the need to create employment opportunities.*
- Income and trade diversification: *It will be very difficult for NENA countries to find sources of sustained growth as oil, aid, and worker remittances combined are unlikely to generate adequate employment and incomes in years to come.*
- Water: *The region’s per capita supply stands at only one-third of its 1960 level and water availability is expected to halve over the next 30 years.*
- Spatial inequality: *Poverty is predominantly in rural areas, with 60 to 70 percent of the poor in many countries living in rural areas.*