

Strategy and Workplan

Protected Agriculture in the Arabian Peninsula: A Strategy and Workplan for Research and Transfer of Technology

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Introduction

Protected agriculture (PA) plays an important role in supplying the region's market with fresh products that cannot be grown otherwise due to the harsh weather and insufficient land and water resources. The demand is for high-quality products. Growers aim for high yields to maximize their profits. The combination of high quality and yield depends on many factors such as management, production techniques, and greenhouse structure and climate control. Some of the major constraints facing the PA industry in the Arabian Peninsula (AP) are human resources and marketing.

The International Center for Agricultural Research in the Dry Areas (ICARDA) is the first research organization to develop a regional research program for the AP region in PA. The PA research is part of ICARDA's wider Arabian Peninsula Regional Program (APRP). The major research themes for PA have been identified and agreed upon by all the county representatives of the AP. These are:

1. Greenhouse structure and covering materials
2. Water-use efficiency
3. Integrated production and protection.

The Strategy

The development of such an important industry requires a strategy to follow, in order to achieve specific goals. The decision of holding the International Workshop on Protected Agriculture for the Arabian Peninsula was part of ICARDA's strategy to identify the problems, constraints and research-and-development priorities. The outcome of this Workshop—highlighted in these proceedings—can be listed under three major issues:

1. Research Activities
2. Regional Networking
3. Human Resources and Training Programs

Research Activities

Research programs for PA should be initiated immediately at the national research-station level with backstopping from regional and international experts in the following activities.

1. Greenhouse Structure and Covering Materials

High light intensity and temperature, combined with high relative humidity, characterizes the climate in the Arabian Peninsula region. The PA structures that are widely used in the region are those that have been developed to suit cool-weather countries with low light intensity. There is a great need to develop a simple greenhouse structure suitable for the region's climate. Greater attention should be given to ventilation and cooling systems.

The development should include the covering materials. Currently, polyethylene sheets are widely used as covering materials. With the existing technology, the industry should be able to develop a new film with selective wavelength transmission and longer life.

Research points:

- Greenhouse structure
- Covering materials
- Ventilation and cooling systems.

2. Water Use Efficiency

Water, both in quality and quantity, is one of the major limiting factors for the development of agriculture in general and PA in particular in the region. Successful production of high-value crops from greenhouses requires good-quality water that in many cases is produced from desalination units at a high cost. Current growing systems and irrigation techniques are detrimental to the water-use efficiency.

High-yielding cucumber with improved water-use efficiency using the tube culture technique



Research points:

- Adaptation of soilless culture techniques
- Improve the efficiency of the drip irrigation system
- Identification of the crop water-requirements
- Automation of irrigation systems.

3. Integrated Production and Protection Management

The greenhouse environment can be characterized as warm and humid with low air velocities. This ideal condition for plants also provides a thriving condition for pests and diseases. Pests and diseases are in competition with the growers since most greenhouse crops are of a high commercial value—any slight damage can result in a significant reduction in the market value. The extensive use of chemicals to control diseases and pests results in complicated problems of resistance build-up, and health and environment hazards. Also, natural enemies have been killed along with the pests (by non-target-specific chemicals). A healthy plant is usually able to withstand pest attack better than a stressed one. This can be achieved by applying other control measures that reduces the use of hazardous chemicals.

The ambitious strategy for integrated production and protection management (IPPM) consists of two workplans.

A. Short-term plan (Immediate)

Identification of the common pests and diseases in the region. This should result in the publication of a color identification handbook in Arabic that will be useful for growers, extension workers and scientists.

Initiation of a series of on-farm experiments and demonstrations of different control techniques and measures, with the aim of preventing or minimizing the use of chemicals.

1. Cultural control

- Planting schedule and crop rotation
- Irrigation and fertilization
- Use of pest- and disease-free seeds and planting materials
- Crop environment factors (temperature, humidity, ventilation).

2. Physical and mechanical control

- Growing media and techniques
- Sterilization (solar, chemical)
- Screens and nets on openings
- Insect traps.

3. Biological control

Use of natural enemies (parasites, predators, pathogens)
Use of resistant cultivars.

4. Chemical control

Use of selective chemicals with low hazard
Use of detergents
Use of insect pheromones.

B. Long-term plan

Establish a central regional biological laboratory to identify the native natural enemies
Establish a strategic plan to be adopted in the region
Develop a training program and advisory materials
Carry out/initiate routine screening for resistant cultivars for the commonly grown crops
Carry out/initiate routine screening for the most effective and least hazardous chemicals.

Regional Networking

There is great similarity in the climate conditions, available natural resources and social structure among the Arabian Peninsula countries. As a result, PA problems—including the type of structure and covering materials, irrigation and fertigation, production forecasting, pests and diseases, and marketing—are similar across the region. Networking is an efficient and economical way of sharing and exchanging the available information and experiences to tackle problems of common interest.

Networking can be developed in many forms:

1. Sharing of information among the AP countries, including:
 - An APRP Newsletter
 - Exchange of existing documents
 - Establishment of a database on crop and cultivar performance
 - Training information
 - Calendar of PA events in APRP and world-wide
 - A PA section on an APRP HomePage on the Internet, including most of the above.
2. Establishing a Protected Agriculture Working Group for the Arabian Peninsula.
3. Establishing a Regional Technical PA Advisory Committee.

Human Resources and Training Programs

Development of human resources is one of the most important activities of the APRP. It has been made clear by all country representatives in the Workshop that the lack of trained personnel is a major constraint to the development of the PA industry in the region.

The following are the some of the training courses to be designed for the PA research and extension personnel in the region:

- Greenhouse management
- Integrated production and protection
- Soilless culture
- Growing techniques and methods
- Fertigation and nutrient solution formulation
- Growing room—principles, design and management.

Implementation

The implementation of this workplan should be carried-out under the coordination of the APRP by the PA Specialist. Research activities should be executed within the AP countries subject to their requirements, existing problems and constraints, and availability of research facilities and equipment. Research with cooling systems is most valuable for Kuwait and Qatar, while growing systems, irrigation and fertigation are important for Yemen.

Recommendations from this workplan qualifying for immediate implementation have been put forward to the Regional Steering Committee of the APRP in the form of a one-year workplan for the 1998/99 season. The major part of this strategy and the related workplans will be implemented in the new phase of the APRP, which is due to start by June 1999.

Summary of Discussion

Most of the short-term IPPM activities suggested in the workplan have already been conducted in some of the countries. In fact, some of the countries are far ahead of others. For example, the identification of common diseases and pests has already been done in Oman; the UAE has done a lot of research on solarization and recommendations are available; Oman has done some work on natural enemies (biological-control agents), with good results; for crop water-requirements, Oman uses the FAO CropWat data, either directly or modified to the environment of the country. What is really required from the APRP is **coordination**, and the fostering of collaboration, integration and information exchange among the AP countries, i.e. networking. In fact, the establishment of a PA network is a primary goal of the APRP PA project, and it has already highlighted the need for information sharing among the various PA players **within countries** as well as among the countries. However, there is still concern that a network should start small and grow, rather than start big and die from lack of resources.

The APRP is already in the process of establishing AP-wide databases on agro-ecological characterization and climate, research workers, on-going and completed research, and published results. These databases will be extensive and require management. FAO has developed several database systems (programs) which could be shared with APRP; in addition, FAO has several relevant datasets available on the Internet.

This compilation of data identifies where there are gaps in our knowledge. For example, the FAO may be able to access worldwide data on crop water-requirements in relation to climate, but is the follow-up information on irrigation management for each combination available? Pest problems may be identified quantitatively, but not qualitatively; biological-control agents may be identified, but their efficacy under the specific conditions may have to be investigated to determine the best formulation.

None of the countries has centralized seedling nurseries for PA. The private sector in Yemen has recently started to produce seedlings for PA. Both Oman and the UAE have centralized nurseries for fruit trees, but not for PA vegetables; Kuwait is close to setting up a centralized nursery for ornamental plants for landscape-greenery planting. There are advantages and disadvantages to centralized seedling production—buying seedlings can be cheaper for the growers because of the losses involved when growing from seed; however, UAE growers have experienced no difficulty in rearing PA crops from seed, and maximize the season by having their own nurseries.