

About APRP, ICARDA and the CGIAR



APRP

Arabian Peninsula Regional Program (APRP) serves the seven countries of the Arabian Peninsula, namely Bahrain, Kuwait, Qatar, Saudi Arabia, Sultanate of Oman, United Arab Emirates, and Republic of Yemen. The Program addresses three priority themes (i) rangelands and forage; (ii) protected agriculture; (iii) water resources management. The three major themes are supported by research in agroecological characterisation and stress physiology. Emphases are also given to institutional strengthening and capacity building, human resource development, information technology and its transfer.

APRP is supported financially by the Arab Fund for Economic and Social Development (AFESD) and the International Fund for Agricultural Development (IFAD) and more recently the OPEC Fund for International Development.



Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is governed by an independent Board of Trustees. Based at Aleppo, Syria, it is one of 16 Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

ICARDA serves the entire developing world for the improvement of lentil, barley and faba bean; all dry-area developing countries for the improvement of on-farm water-use efficiency, rangeland and small-ruminant production; and the Central and West Asia and North Africa region for the improvement of bread and durum wheats, chickpea, and farming systems. ICARDA's research provides global benefits of poverty alleviation through productivity improvements integrated with sustainable natural-resource management practices. ICARDA meets this challenge through research, training, and dissemination of information in partnership with the national agricultural research and development systems.

The results of research are transferred through ICARDA's cooperation with national and regional research institutions, with universities and ministries of agriculture, and through the technical assistance and training that the Center provides. A range of training programs is offered extending from residential courses for groups to advanced research opportunities for individuals. These efforts are supported by seminars, publications, and specialized information services.



The CGIAR is an international group of representatives of donor agencies, eminent agricultural scientists, and institutional administrators from developed and developing countries who guide and support its work. The CGIAR receives support from a wide variety of country and institutional members worldwide. Since its foundation in 1971, it has brought together many of the world's leading scientists and agricultural researchers in a unique South-North partnership to reduce poverty and hunger.

The mission of the CGIAR is to promote sustainable agriculture to alleviate poverty and hunger and achieve food security in developing countries. The CGIAR conducts strategic and applied research, with its products being international public goods, and focuses its research agenda on problem-solving through interdisciplinary programs implemented by one or more of its international centers, in collaboration with a full range of partners. Such programs concentrate on increasing productivity, protecting the environment, saving biodiversity, improving policies, and contributing to strengthening agricultural research in developing countries.

The World Bank, the Food and Agriculture Organization of the United Nations (FAO), and the United Nations Development Programme (UNDP) are cosponsors of the CGIAR. The World Bank provides the CGIAR System with a Secretariat in Washington, DC. A Technical Advisory Committee, with its Secretariat at FAO in Rome, assists the System in the development of its research program.

Achievements of the National Research Programs and ICARDA in the Arabian Peninsula

Extreme aridity and limited renewable water resources characterize the seven Arabian Peninsula (AP) countries of Bahrain, Kuwait, Oman, Qatar, the Kingdom of Saudi Arabia, the United Arab Emirates, and the Republic of Yemen. Rapid economic development in the latter half of this century has resulted in significant changes to the traditional agricultural systems of the AP. Increased production has contributed to economic growth, but has often resulted in the degradation of natural resources. The issue of water resources and their use is fundamental to the sustainable development of the Arabian Peninsula.

Since its establishment in 1977, ICARDA has actively collaborated with the AP countries through technical backstopping in its mandated crops and areas of research (wheat, barley, food legumes, farming systems including natural resource management), exchange of germplasm, and human resource development through training and visiting scientists. In 1988, ICARDA started the development of a special program for the AP countries, with the following emphases:

1. (1988 - 1995) Strengthening Barley and Wheat Research and Training in the Arabian Peninsula

This phase was supported financially by the Arab Fund for Economic and Social Development (AFESD).

The project concentrated primarily on identification of cultivars of ICARDA's mandate crops that were suitable for the environmental constraints encountered in the AP. The most important constraints are the abiotic stresses associated with high temperature, water availability, and salinity. Although this project was aimed primarily at the improvement of wheat and barley production in the AP, it has served an important function in identifying priority needs and current "gaps" in agricultural research.

2. (1995 - 2000) Strengthening Agricultural Research and Human Resource Development in the Arabian Peninsula

The Phase was financially supported by the Arab Fund for Economic and social Development (AFESD) and the International Fund for Agricultural development (IFAD).

Goal: Increased food security in the Arabian Peninsula, achieved through increased productivity of field crops and livestock based on optimization of water use efficiency, conservation of natural vegetation, prevention of soil degradation and desertification, and strengthened cooperation among the participating countries and with concerned regional and international organizations.

The major problems facing the region, on which ICARDA can have an impact, are: scarcity of renewable water combined with inefficient use of water; degradation of the large areas of rangeland existing in the region and resulting desertification; and the need to develop a protected agriculture industry that efficiently generates high quality high-value produce with reduced environmental and product contamination by agricultural chemicals.

During this project, the program expanded its scope to encompass the three themes of Rangelands, Water, and Protected Agriculture, in response to the collective priorities determined by the seven countries of the Arabian Peninsula. In addition, the area of agro-ecological characterization was also emphasized as it has a great impact on all three themes.

In 1997, the ICARDA Office of the Arabian Peninsula Regional Program (APRP) was established. The office originally started with a senior scientist acting as regional coordinator, and was strengthened further in mid 1998 with the recruitment of the Protected Agriculture and the Water/Irrigation specialists. In May 2001, a rangeland specialist was appointed. With this team of scientists in place more rapid progress could be made in meeting the objectives of the three main research themes of: (i) on-farm water use and irrigation management, (ii) rangeland, irrigated forages and livestock and (iii) protected agriculture.

3. (2000 -2003) Sustainable Management of Natural Resources and Improvement of Major Production Systems of the Arabian Peninsula

The project was financially supported by the Arab Fund for Economic and social Development (AFESD), the International Fund for Agricultural development (IFAD) and The OPEC Fund for International Development.

Goal: The development of more productive and sustainable rangeland and irrigated production systems, including protected agriculture, through the more efficient use of the natural resources of the Arabian Peninsula, in particular water, energy and indigenous plant species.

Despite the many constraints that faced the program, in particular limited financial resources, ICARDA has made considerable progress in addressing the problems facing the region. There have been many successes and accomplishments, achieved primarily through strengthening the capabilities of the NARS, including both technical and human resources.

Achievements

Technical

Across the region, ICARDA has emphasized sound research experiments and techniques. The importance of good experimental design, and the need to make accurate measurements of the parameters involved, was incorporated into all experiments.

From inception to 1995

- ❖ During the period of 1988-1994, the Regional Program provided countries of the region with more than 700 sets of international and regional cereal, legume and forage nurseries for evaluation under the prevailing biotic and a biotic stress. These nurseries were developed to meet the specific needs of each country.
- ❖ Testing and evaluation of this germplasm resulted in the release of seven improved barley cultivars (two in Qatar, one in Saudi Arabia, two in Sultanate of Oman and two in the Republic of Yemen), nine improved bread wheat cultivars (one in UAE, one in Qatar, two in the Sultanate of Oman and five in the Republic of Yemen), two improved durum wheat cultivars (one in UAE and one in Saudi Arabia) and one chickpea cultivar released in the Sultanate of Oman.
- ❖ Based on requests from national programs, several consultancy missions were made to, among others, the Republic of Yemen, the Sultanate of Oman, the Kingdom of Saudi Arabia, and Bahrain. Members of these missions included scientists from ICARDA, and experts from Egypt, Sudan, Jordan and developed countries.
- ❖ After the 1990/91 Gulf crisis, and upon request from Kuwait, the wheat, barley, chickpea, lentil and faba bean germplasm that was lost was replaced by ICARDA. Combined analysis (two seasons and two locations) for the wheat and barley trials grown at Al-Abdally and Al-Wafra in Kuwait in the 1988/89 and 1989/90 seasons was also carried with assistance from ICARDA.
- ❖ Based on a request from the University of Kuwait, special wheat and barley nurseries of germplasm adapted to drought and heat stresses were provided in order to initiate a graduate research program at the university.
- ❖ Upon a request from Bahrain, wheat and barley cultivars and germplasm tolerant to salinity and heat including Sakha 8 and Sakha 9, as well as one barley variety tolerant to salinity, were provided in May 1994.



From 1996 to 1999

- ❖ Under typical farmer management, water use efficiency can be low because of poor irrigation management, resulting in excess water application and lower

production per unit of water. In the AP, the area of irrigated forages is large and production usually continues throughout the year. This is especially important for water resources because during the long hot summer period crop water use is high. The total annual water requirement of perennial forages is therefore very high, resulting in very large volumes of water being applied to maintain full forage production.



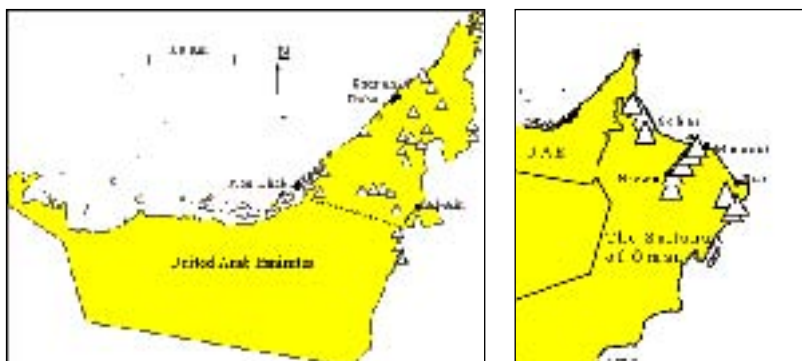
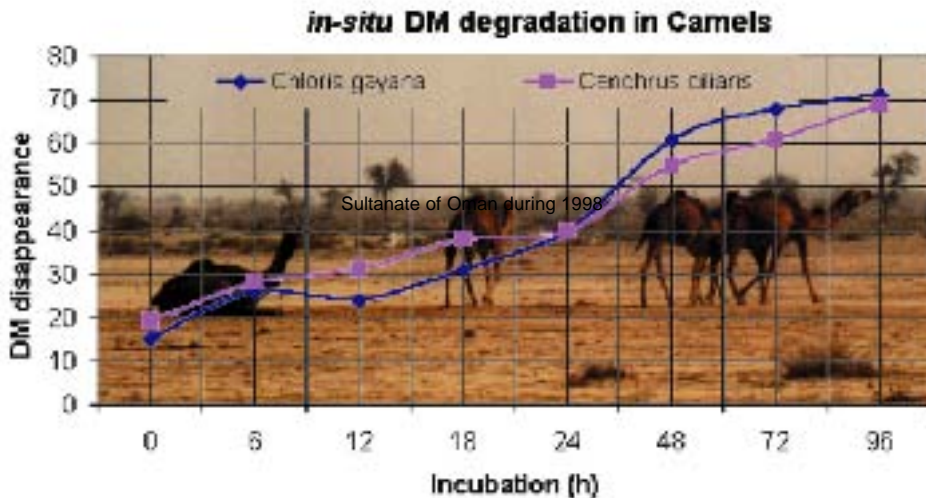
Experiments were established at various locations to measure water use efficiency (dry matter production per unit of applied water) of conventional forage species in UAE, Oman, and Yemen. Alfalfa and Rhodes Grass are important species in most of the region, while in Yemen sorghum and cowpea are also important. Results showed that, under good management practices, one cubic meter of water could produce about 1.7 kg alfalfa dry matter, and about 2 to 2.4 kg of Rhodes Grass dry matter. Also evaluated were mixtures of alfalfa and Rhodes Grass, in varying proportions.

- ❖ An automated weather station was installed in Sharjah, UAE, to introduce and demonstrate the concept of meteorologically based estimates of crop water requirements for use in improved irrigation scheduling.
- ❖ A potential solution to water and rangeland problems is developing production and rehabilitation systems based on indigenous species, because they are already well adapted to the environmental conditions of the region. Water use for irrigated forage may be reduced, compared to conventional forage species, by applying less than full irrigation. Conventional species are likely to suffer significantly as the result of reductions in irrigation, whereas indigenous species are more tolerant. Rangeland and forage germplasm of grasses, shrubs, and trees was collected at various locations in the UAE and Oman. Indigenous knowledge of these species was also collected from the local inhabitants who were familiar with them and their properties. From the species collected, a total of 27 (including 10 grasses and 15 shrubs/trees) were identified as high priority according to various screening criteria. Furthermore, 5 of the grass species were evaluated for nutritive quality, and were found to be at least as good as Rhodes Grass.
- ❖ Collection missions were held in 1998, and priority species were collected in United Arab Emirates and Sultanate of Oman. As a result of these missions, a total of 114 accessions were collected in United Arab Emirates and 68 in the Sultanate of Oman. This material is being stored in gene banks within the region and at ICARDA HQ.

- ❖ An experiment was initiated in UAE to produce the three species (*Cenchrus ciliaris*, *Coelachyrum piercei*, and *Lasiurus scindicus*), which showed the best potential to fit into an irrigated production system, based on a number of criteria. The species were subjected to a gradient of irrigation rate, from full to almost zero. Seeds were also harvested from the plots for future use in an expanded research and seed production program.

The choice of collecting these species was based on the information compiled from local farmers, herders and scientists in those countries. A list of high priority species was then developed which will be the guide for seed multiplication of the indigenous forage species in each of the two countries.

- ❖ Apart from assessing the indigenous forages for their water use efficiency, these forages were assessed for their nutritive value in comparison with the exotic forages i.e. Rhodes grass.



Location of collection of sites in the United Arab Emirates and

- ❖ An assessment of the status of Protected Agriculture Research and development in the Arabian Peninsula was completed and the review published. These findings and a subsequent research strategy were presented at an International Workshop on PA in Qatar in 1998. The proceedings have been published.
- ❖ The extensive use of chemicals to control diseases and pests in greenhouses results in complex problems of resistance build-up, and health and environmental hazards. Crop protection can be achieved by using control measures other than relying mainly on pesticides, thereby reducing the use of hazardous chemicals. These control measures are part of an Integrated Production and Protection Management program (IPPM). IPPM was implemented in all the Arabian Peninsula (AP) Countries by both research stations and private growers.
- ❖ Soilless growing technique was introduced in Oman and UAE using simple growing channels constructed with locally available materials, for the production of tomato, cucumber, pepper, and lettuce crops. The economics of this technique was compared with conventional soil-based growing techniques.
- ❖ Soilless culture systems were developed in Qatar for the production of tomato, cucumber, melon, and strawberries. An agro-economic assessment of the production of peppers in soil and soilless culture was initiated and results are available.



- ❖ A new simple greenhouse design was developed and constructed in Bahrain. This oval shaped structure provides extra crop protection and the ability to inject additional CO₂ economically. It also provides an improved cooling system and a facility to recover fresh water from the enclosed area.
- ❖ An agro-economic assessment of year-round production of cucumber in cooled plastic houses and seasonal production in non-cooled plastic houses was carried out in Kuwait and Qatar.

- ❖ In UAE and Oman, an automatic irrigation and fertigation system was installed and hands-on training was provided. This has improved the overall management and control of irrigation and fertigation in the greenhouses at the research stations. In Oman, a two-year experiment was completed on cucumber fertigation in cooled plastic houses, with the results presented at the Regional Coordination meeting.

From 2000 to date

- ❖ Development of the APRP Home page as part of the ICARDA Web Site on the Internet. This useful medium maximizes collaboration among researchers, scientists, and extension staff in the AP countries and facilitates the exchange of knowledge, information, and expertise, both regionally and internationally.



- ❖ An automated weather station network is being established to provide near real time meteorological information for use in irrigation scheduling and management. The network will initially consist of 10 stations linked by telephone to a central computer that will download the data daily, process it so that it is easy to use for the end users, and make it available through an internet site. Near-real-time irrigation scheduling is an example of how such a system can be used.



- ❖ Development of Information Technology Systems for Agriculture and Natural Resources Development in the Arabian Peninsula. An initial version of an expert system for Protected Agriculture production of vegetable crops has been completed. Work is continuing on development of the expert systems and their integration with the weather information network. The information will be accessed through the Internet.

- ❖ Preliminary information is now available on the response of two of the priority indigenous species to reduced irrigation. Information such as this is necessary to develop computer models that can compare water use under different production scenarios.



- ❖ With priority species identified, a necessary step is to obtain large quantities of seeds from these species and lay the grounds for mechanized seed multiplication. In the period February-April 2001, bulk seed samples of *Cenchrus ciliaris*, *Coelachyrum piercei* and *Lasiurus scindicus* were collected from a natural reserve in the United Arab Emirates. The material has provided an opportunity to test seed scarification and cleaning equipment.
- ❖ Seed multiplication was started in both United Arab Emirates and Sultanate of Oman. In UAE, two locations, each of 5 hectares, were laid out in two Research Stations for seed multiplication of the indigenous forage species. The three grasses are already established in both research stations and seeds are being collected. Enough seeds are now available to plant up to 100 hectares.
- ❖ Terrace farming in Yemen has always been associated with rainfall and water harvesting from the watersheds surrounding the terraces. ICARDA, through APRP, has started an R&D project in Yemen to introduce cultivation of cash crops in greenhouses in the mountain terraces. The main objectives of this project are to: (a) create additional income for farmers through the cultivation of cash crops at those times of year when the terraces are not producing field crops. (b) Introduce new techniques of cultivation and irrigation for the rational use of resources, (c) Intensify the use of terrace lands through the cultivation of cash crops in winter, (d) Raise the economic returns from farming the terraces, leading to better management and maintenance of these terraces, and (e) Create additional jobs for the rural population, thereby encouraging farmers to settle in rural areas and reduce the pressure on urban centers.
- ❖ The Integrated Production and Protection Management Program is being further developed and implemented by growers in the different AP countries.

- ❖ Solar Solarization techniques were developed and simplified for growers, and a technical booklet has been published. The techniques have been implemented in research stations and private farms with excellent results without any hazardous chemicals being used.
- ❖ The development of the Expert System for crop protection (cucumber) is underway, and an initial version will be available under the APRP Home Page for researchers, extension staff and growers to use and evaluate.
- ❖ Development of the Information Technology System for Irrigation & Fertigation of GH crops is also underway. Researchers, extension staff and growers from the AP countries can access the APRP Home Page to tailor the irrigation and fertigation programs for their specific crop production situation.

Capacity building

A very important part of ICARDA's work in the AP has always been to help build technical and human resource capabilities so that the National Agricultural Research Systems can sustain the progress needed to solve the problems of the AP. ICARDA's activities have included training programs, workshops, and meetings as well as the provision of technical equipment.

ICARDA-APRP has trained to date more than 450 individuals from the Arabian Peninsula Countries of which 340 from the GCC countries. A full list of the training courses and participants from GCC countries is attached.

Combating Desertification

Since 2000, ICARDA has contributed to the UN Convention to Combat Desertification in the Thematic Network on Water Resources (TN1) of the sub regional activity program (SRAP) in West Asia, which includes all the GCC countries. ICARDA is also involved in Thematic Network dealing with Vegetation Cover (TN2). It is currently developing an inventory study on water resources in West Asia along with a pilot project on combating desertification in rangeland areas, salinity affected regions and mountainous areas in Oman, Lebanon, and Yemen.

Other CGIAR Centers Involved in the Arabian Peninsula

With its geographical, regional, and global mandates, ICARDA is the only CGIAR center in the region (Central and West Asia and North Africa -CWANA). ICARDA is playing a major role in strengthening agricultural research, technology transfer, and capacity building, including human resource development, in the GCC countries. Other CGIAR centers have some involvement in the region through/with ICARDA including:

- ❖ CIMMYT in wheat,
- ❖ ICRISAT in sorghum and millet
- ❖ IPGRI in germplasm conservation

**Training Participants from GCC Countries Participated in the Various
Training Courses Conducted By/Through ICARADA
1987 - Sep. 2001**

	Title of the Training Course	Country						TOTAL
		Bahrain	Qatar	Oman	Saudi Arabia	UAE	Kuwait	
1	A Cereal Diseases: Diagnosis and Scoring			1				1
2	Agroclimatic Analysis in Semi Arid Areas WMO/ICARDA Training Workshop			1				1
3	Alternative Feed Resources and Small Ruminants Management in Low Rainfall Areas of the WANA				1			1
4	Application of Biotechnology in Legume Improvement						1	1
5	Automated Library Management and Modern Information Technologies (Short term)		1	1				2
6	Automated Library Management and Modern Information Technology (Headquarter course)		1	1				2
7	Biometrical methods and related computing in crop improvement					2		2
8	Biometrical methods in agricultural research					1		1
9	Breeding Methodology of Food and Feed Legume			1				1
10	Cereal Disease Methodologies			1	1			2
11	Cereal Improvement Program			1				1
12	Cereal Improvement Program. (Long Term Program)			3	5	1		9
13	Cereal Improvement Program. (Short)			1				1
14	Cereal virology (individual non-degree)					1		1
15	Computer (individual non degree)			1				1
16	Computer Application in Agricultural Research	1	7		2			10
17	Data Analysis, Presentation and Scientific Writing	2	11	3	1	2	1	20
18	Data management and analysis using Genstat -Individual Non Degree				1			1
19	Diagnosis of Plant Viruses			1				1
20	DNA Molecular Marker Techniques for Crop Improvement					2		2
21	DNA Molecular Marker Techniques for Germplasm Evaluation and Crop				1	1		2
22	Economic Analysis and Evaluation of Environmental Factors in Planning Development	2					1	3
23	Experimental Designs and Trial Management			10				10
24	Experimental Station Operation Management		1	3	1	3	1	9
25	Farm Resources Management Program (individual non degree)			1				1
26	Farm Resource Management Program (long term)			1	2		1	4
27	Farm Survey Methodology			14				14
28	Food Legume Improvement Program			1				1
29	Food-Legumes Program			1				1
30	Forage and Pasture Seed Production		1	1	1	2		5
31	Genetic Resources Conservation			1				1
32	Genetic Resources Unit			1				1
	Cont ...							

ICARDA in the Arabian Peninsula: Accomplishments

	Title of the Training Course	Country						TOTAL
		Bahrain	Qatar	Oman	Saudi Arabia	UAE	Kuwait	
33	Germplasm Collection and Maintenance	2	2	2	1	2	2	11
34	Germplasm Program-Individual degree (PhD)					1		
35	Human Resource Development on Biodiversity Conservation			1	1	1	1	4
36	Identification, Diagnosis and Control of Wheat and Barley Diseases				40			40
37	Improving on farm Water Use Efficiency		1					1
38	Improving Water use Efficiency in Agriculture			2	2			4
39	Individual Non-degree- Computer application in agric. Research					1		1
40	Insect control in Food Legumes and Cereal Crops					1		1
41	Insect Taxonomy and IPM of Insect Pests	1		17	1	1	1	21
42	Integrated Management of Greenhouses	1	8	2		2	4	17
43	Irrigation and Fertigation (short term - KSA)	2	2	2	4	2	1	13
45	Library/CODIS (short term)			4				4
46	Methodologies relating to germplasm exploration and collection		1					1
47	Morphological Variety Description and Variety Maintenance			3				3
48	Pasture, Forage and Livestock Program Long term)	1		1	3	1		6
49	Insect Taxonomy and IPM of Insect Pests (Oman)			5			1	6
50	Plant Genetic Resources Documentation & Information Management			1				1
51	Regional Seed Certification (short term - Jordan)		1					1
52	Research on Effective Use of Fertilizer						1	1
53	Scientific Writing and Data Presentation		1					1
54	Seed Bank Management			1				1
55	Seed Health Testing					1		1
56	Seed processing (Individual non-degree)						1	1
57	Seed Processing and Storage (Headquarter Training course)						1	1
58	Seed Production (headquarter)				2			2
59	Seed Production and Technology (short term - Oman)	2		15	1	2		20
60	Soil Tillage and Seedbed Preparation; Pest Control and Safety; and Irrigation (Short term - Qatar)		13					13
61	Solarization & Integrated Management of Greenhouses	2	2	9	1	2	3	19
62	Statistical and Experimental Design, Analysis and Reporting			19				19
63	Techniques of Cereal Improvement (long term)			1				1
64	Training on purification & detection Viruses				2			2
65	Use of GIS/RS in Agriculture Resource Management				1			1
67	Utilization of Expert Systems in Agricultural Research and Production		2	1	1	2		6
68	Water Harvesting Concepts and Techniques for the Arid and Semi (short term - Jordan)			2				2
69	WAVA referee seed testing workshop (short term - Jordan)		1				1	
	TOTAL	16	55	140	75	34	21	340