

## Summery of Achievements during 2002-2003 Season

### 1 Research Activities

- ❖ The weather station network for AP has been established for improving irrigation management and scheduling. Eleven fully automatic weather satiations were dispatched to the all AP countries and installed under special agreement with ICARDA-APRP. These are located at: Budaiya Garden, Bahrain; National History Museum-Sharjah, Emirates; Al Fujairah, Emirates; Al Wafra Agriculture Area, Kuwait; Kiroon Herritti Salalah, Oman; Agriculture Research Station, Sohar, Oman; Om Alghib, Qatar; National Agriculture and Water Research Center, Riyadh, Saudi Arabia; Al Jouf , Saudi Arabia; Northern Regional Research Station, Yemen; and Livestock Improvement Research Center, Yemen. All of the stations have been connected through telephone lines except the ones in Kuwait; Qatar; and Al Jouf in Saudi Arabian due to some telecommunication difficulty in the location. The necessary equipments for connecting these stations also have been distributed to the NARS. Data are collected in a regular bases and the irrigation management soft wear is under development.



- ❖ Water use efficiency for the production of some vegetable crops under surface and drip irrigation has been studied in Bahrain in three locations. The treatments were included: 100%; 75% and 50% water application. The result clearly showed the advantages of the drip system over the surface irrigation in water saving and yield.
- ❖ In Yemen, the utilization of water dams and reservoirs in the highlands were studied. The study indicated that there are no clear systems for dam management and maintenance after completion of constructions. Similarly there are neither regular records on the amount of annual floods reaching dams nor records on the status of underground water before and after the construction of dams. The production systems in areas where dams were constructed were replaced from spate irrigated to open well irrigated; Areas located in close proximities of the dams are the most benefiting areas. finally the low efficiency of irrigation methods applied at the field level and the high rate of water use from dams do not correspond with the capacity of the dams.
- ❖ Utilization of the indigenous species as alternative forage plants is one of the major themes in the Arabian Peninsula Regional program (APRP). Choosing the alternative forage plants was the main objective in last phase of the APRP.

Seed multiplication of indigenous forage and rangeland plants. During 2003 the above activity was carried in Bahrain, Emirates, Oman, Saudi Arabia and Yemen. Three perennial grasses were collected from Ras Al Bar range area in Bahrain. These were: *Panicum turgidum*, *Pennisetum divisum* and *Lasiurus* sp. The species were propagated by vegetative means for seed multiplication at Hawarat Al Ali Center, Ministry of Municipalities and Agriculture. The grasses were grown in plots of 2.5 m x 21 m, replicated 4 times under drip irrigation. Planting was made in mid November 2002. The growth of the three species during the first three months was poor. They started to grow better in March 2003. Seeds were collected three times during the season. The quantities of seeds obtained were as follows:

*Pennisetum divisum* 4 kg “with husks”;

*Panicum turgidum* 1 ½ kg “with husks”

Unidentified Species 1.0 kg “With husks”

In Emirates the seed multiplication activities during 2002/03 had the following objectives:

1. Maximize seed yield of forage grasses using precision thresher machinery (Kimseed).
2. Removing impurities of seeds by Air Screen Cleaner.
3. Determine of best harvest time

Seeds of *Cenchrus ciliaris*, were harvested during different times of the year in 2003 which were threshed and cleaned. The results indicated that seeds produced in the period January-May



contained the maximum amount of pure seeds (5.3%). Subsequent harvests in the summer contained lower percentages (1.5%) of pure seeds. This is in agreement with previous year (2002), which showed 4.4% of pure seeds for January-May period and 1.4% for June-July. Over 25 kg of pure seeds of *Cenchrus ciliaris* have been collected, sufficient for planting 200 ha.

Seed multiplication of indigenous forage species *Cenchrus ciliaris* L, *Cenchrus ciliaris* and *Lasiurus hirsutus* L were undertaken at Livestock Research Center, Rumais, Oman under sprinkler irrigation system during 2003. Total seed yields collected through repeated harvests were 5.2, 1.2 and 0.8 kg, for the three grasses respectively. It was recorded that the summer season crops produced more seed yield than winter season crops. Problems encountered during seed multiplication from *Cenchrus* species include shattering of seeds from the panicles of earlier tillers. It was difficult to assess the proper time for harvest of panicles of all the tillers. A compromise time has to be decided, because waiting for late panicles to attain maturity results in seed loss from early panicles. Alternatively allow all panicles to reach maturity and fall to the ground, then sweep the floor by suitable brushes or by vacuum machine.

In Al-Jouf area northern of Saudi Arabia shrubs were the main plants focused on. We produced more than 10 tons of native shrubs seeds of more the 40 species.

Seed multiplication of important forage grasses continued through 2003 in the coastal region of Lahaj, Yemen. The amounts of seeds collected are: 4 kilograms for *Cenchrus Ciliaris*; 3 Kilograms of *Dichanthum* spp and one kilogram of *Panicum turgidum*. It was noted that *Panicum turgidum* grown from seeds are weaker than plants established from seedlings. The *Cenchrus Ciliaris* on the other hand was successful weather grown from seeds or seedlings. The *Dichunthum* species was successfully grown from seedlings only. Attempts to germinate *Dichunthum* seeds were not successful so far.

*Adropogon barbanoides*, *Cenchrus ciliaris* and *Pennisetum thunbergii* are the most important range/forage species identified earlier by AREA and being multiplied at the North highland research station-Al-Erreh, Yemen. The seed of these species were originally collected from different rangeland sites in the north highlands. Seed production of these species have now reached 7, 5 and 3 kg for *Pennisetum thunbergii* , *Cenchrus ciliaris* and *Andropogon barbanoides*, respectively

- ❖ Evaluation of indigenous forages and rangeland species Productivity of forage grasses as affected by frequency of harvest and irrigation was studied for a second season in UAE Under drip irrigation, Labeid (*Cenchrus ciliaris* L.) was more productive than Tomam (*Panicum turgidum* Forssk); Da'ay (*Lasiurus scindicus* Henr.); Dakhna (*Choelachyrum piercei* Hochst and Rhodes grass (*Chloris gayana* kunth). Labeid was affected the least of all species when the level of irrigation was reduced by 50% or 75%. It was the highest in water use efficiency, where the amounts of water to produce one kg of dry matter ranged between 0.81 and 1.88 m<sup>3</sup>. The second best was Rhodes grass where the values ranged between 1.18 and 2.13 m<sup>3</sup>. Dhkhna showed poor performance under the conditions of the study, which did not withstand the repeated, clipping.



**Table 1. Total forage production during the second season out of four cuts (t/ha oven dry) under three irrigation treatments.**

Forages	T1 (high)	T2 (medium)	T3 (low)	Mean
Labeid (Cc)	13.86	10.45	5.36	9.89
Dakhna (Cp)	3.83	2.57	1.57	2.66
Rhodes grass (Cg)	12.86	6.41	3.75	7.67
Tomam (Pt)	6.86	5.20	3.49	5.17
Da'ay (Ls)	7.44	3.97	3.11	4.84
Mean	8.96	5.72	3.46	

**Table 2 Amounts of water (m3) per kg dry matter of five forage grasses during different times of the year in 2003 at Dhaid, UAE.**

Date of harvest	Crop age (days)	Labeid	Dakhna	Rhodes grass	Tomam	Da'ay
June-22	32	0.81	2.44	1.18	1.37	1.38
July-28	36	1.64	5.40	1.92	2.85	3.97
September-6	40	1.88	10.95	2.13	3.64	3.82
October-12	36	1.38	6.82	1.80	4.33	3.73

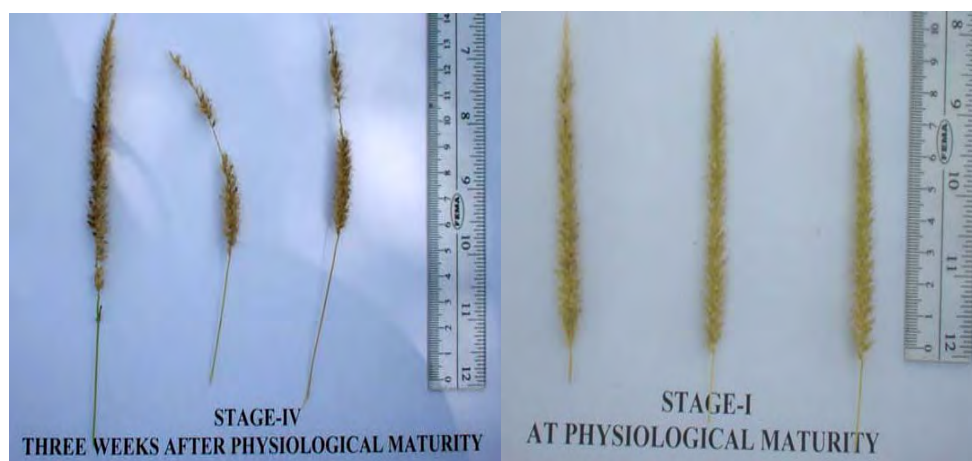
- ❖ Response of Indigenous Rangeland Forage Species to Salinity was studied in Oman on two indigenous rangeland forage species viz. *Cenchrus ciliaris* L. and *Coelachyrum piercii* L. collected under ICARDA- APRP Phase- I. These were investigated for their response to seven levels of irrigation water salinity namely: Control (1 dS m<sup>-1</sup>), 3, 6, 9, 12, 15 and 18 dS m<sup>-1</sup> along with other perennial fodder grasses viz. Rhodes grass (*Chloris gayana* L.cvs. Katambora and Callide) and Buffel grass (*Cenchrus ciliaris* L cv. of Australia). The results from 10 cuts indicated that effects of salinity, species, cuts and their interactions were highly significant (P < 0.01) with respect to all the characters studied. Adverse effect of salinity was evident in each species for the agronomic traits studied. Indigenous rangeland forage species viz. *Cenchrus ciliaris* L. *Coelachyrum piercii* L. and Australian Cenchrus were severely affected by salinity with respect to plant height, green and dry matter weights in subsequent cuts at salinity levels beyond 6 dS m<sup>-1</sup>. Both *Cenchrus* species and *Coelachyrum piercii* L., did not germinate in the salinity levels beyond 9 and 6 dS m<sup>-1</sup>, respectively. Rhodes grass cultivars showed less adverse effect even in progressive cuts particularly in the salinity levels lesser than 9 dS m<sup>-1</sup> for all agronomic traits indicating their distinctive superiority over other two grass species.
- ❖ Effects of plant spacing on forage and seed yield were studied during 2003 at Livestock Research Center, Rumais. Two indigenous rangeland forages viz. *Cenchrus ciliaris* L. (UAE) and *Coelachyrum piercii* L.(UAE) and one exotic forage *Choris gayana* L. were compared. Tow levels of inter-row (50 and 100 cm) and inter plant spacing (25, 50 and 100 cm) were tested. The forages were harvested 8 times. There existed differential expression of the traits such as plant cover, plant height, number of tillers, number of panicles and seed yield (with husk) in the grass species under varying inter-row and inter-plant spacing. Seed yield increased with increased spacing in all grasses. The mean grass seed yield irrespective of species was higher in the fifth and sixth harvests. In almost all the harvests, 100 cm row spacing gave significantly higher yield than 50 cm spacing.
- ❖ APRP has contributed in rehabilitation rangeland in Saudi Arabia by establishing three experiments in Al-Jouf region in the north of the Kingdom. These experiments started during phase I and continue to phase II, which consist of:
  - 1) Transplanting of native shrubs under natural condition with supplementary irrigation. The goal of this experiment was to evaluate re-vegetation of degraded rangeland with native rangeland shrubs. Shrubs survival was more than 95% during the first three years and seeds were produced. Survival, however, drops to less than 50% in year 2001 due to the continuously drought for two years.
  - 2) Comparison of two different methods of rangeland reseeding. The objective was to compare two cultural methods (contour furrowing and pitting) for providing better seedbed and increase

water infiltration and herbage yields. The drought had negative effects on this experiment and reduced survival to less than 1%.

3) Study the water use efficiency of *Medicago sativa* and the native shrub *Atriplex leuoclada*.

Summaries of the results of the three experiments are a) Native range shrubs adapted to low water requirements (a small amount of water at planting time was sufficient to establish range shrubs); b) Species that are naturally distributed in the area adapted better for transplanting; c) Re-vegetation of perennial species on rangeland often requires reseeding; d) The results show that *Medicago sativa* was at the highest productivity with high moisture content.; e) Productivity of *Atriplex* increases while the amount of water decrease until 6 mm depth of water then decreased; f) Productivity of *Medicago sativa* increased with cuts while that of *Atriplex leuoclada* decreased with more cuts.

- ❖ Effects of maturity stages on seed weight and quality was studied on two indigenous rangeland forage species viz. *Cenchrus ciliaris* L. (UAE) and *Coelachyrum piercii* L.(UAE) collected under ICARDA- APRP Phase- I along with *Chloris gayana* L., at two locations namely Livestock Research Center, Rumais (LRC) in the Batinah region and Agriculture Research Station, Jimah (JRS) in the Interior region. Samples of inflorescences of grass species were collected at each of four maturity stages The preliminary results of the ongoing investigations indicate gradual and significant decrease ( $p < 0.05$ ) in seed weight from one physiological maturity stage to another. On the contrary, there was significant increase (improvement) ( $p < 0.05$ ) in germination % of seeds with advanced maturity, followed by a drop in germination % at a later maturity stage.



- ❖ Om-bahara is the only remaining site in Abyan Governor ate, Yemen. The area is now protected for 17 years. A survey conducted during 2003 indicated presence of 62-plant species belonging to 42 genera and 22 families. Most importantly it was noted that the plant density is reduced from 64% in 1988 to 29% this year. This is attributed to soil erosion during rainy seasons from lack of maintenance of embankments. Several proposals were submitted to AREA and the Regional Station management in order to ensure required funds for sustaining these activities. The efforts of APRP are acknowledged in supporting data collection and maintenance of this protected area.
- ❖ Another plant survey was conducted to evaluate plant density and species composition on the newly protected site of Al-Khon, Wadi Hadramout in Yemen. The results indicated big difference in the species composition. In general the palatable plants of Graminae and Leguminosae families are now severely affected by over grazing and the site is dominated by presence of unpalatable species. There is need therefore for collection and seed multiplication of the palatable species for the rehabilitation of the degraded range sites.
- ❖ Collection missions of rangeland forage and medicinal plants were organized in North Oman during the months of March and April 2003. The representative sites of seven regions of Oman viz. Muscat, North Batinah, South Batinah, Interior, Dhahira, Sharqiya and Musandam were visited. The herbaria samples of 60 species, consisting of 16 grasses, 11 forage herb (forbs), 25 shrubs and 8 forage trees were collected. Additionally 31 seed samples of 16 of grass species, 2 herb (forb) species, 10 shrub species and 3 tree species were collected. Collected also are herbaria of 31 different medicinal plants, and seeds for ten species of the medicinal plants. Passport data of

the species collected and indigenous knowledge about those species were compiled from inhabitants of the different areas visited. The Herbaria were stored in cupboards while the seeds were stored under cold storage (Deep Freezers) at Seed and Plant Genetic Resources Lab. Rumais Research Station.

- ❖ The production of high value crops requires a certain quantity and quality of water that is practically impossible to obtain in such a dry region as the Arabian Peninsula. The underground water level has been rapidly declining and become more brackish with higher salt content. Good quality fresh water can only be obtained by using expensive desalination equipment and techniques. Soilless techniques offer a way of improving water-use efficiency and obtaining better water and fertilizer management in crop production. A Soilless production system has been established by ICARDA-APRP in collaboration with the Rumais Agricultural Research Station, Oman. This is part of the Technology Transfer activities of ICARDA-APRP. During the 8 days implementation phase in Oman, ICARDA's scientist and technicians were working together with the Omani scientists and technicians to set up a soilless vertical growing system for the production of cash crops. An agro-economic appraisal was conducted in Kuwait for the soilless growing system to compare the soilless and the traditional soil base system. Results show a major reduction in production cost of the new system by 50-65%. In addition, production per m<sup>2</sup> was doubled, production season was longer, and major saving was achieved in water, fertilizer, and labor with the new system.



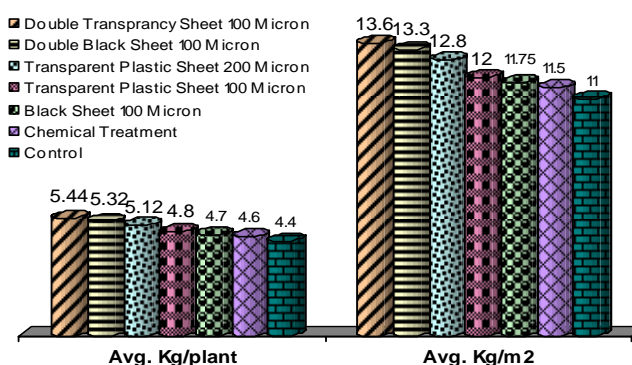
***Researchers and Scientists for Oman and ICARDA working together to setup the soilless vertical growing system in Rumais research station, Oman***

- ❖ Integrated Production and Protection Management (IPPM) is a package of simple techniques and practices to provide greenhouse growers with environment friendly crop protection without relying on hazard agro-chemicals to produce high quality crops. IPPM has been introduced by ICARDA-APRP to the different Research Stations of the AP countries and adopted by growers. The adoption of IPPM in Yemen was highly successful. Only one spray was applied to control the Downy Mildew in addition to mechanical and hot spots control. Using of insect proof netting and hotspots control in IPPM house eliminated aphids, leaf mines and spiders and only one spray was applied to control Aphids as compared to the control greenhouse where 10 sprays were

applied during the season. Using proper soil Solarization technique minimized the infestation of soil borne diseases to 50% as compared to control.

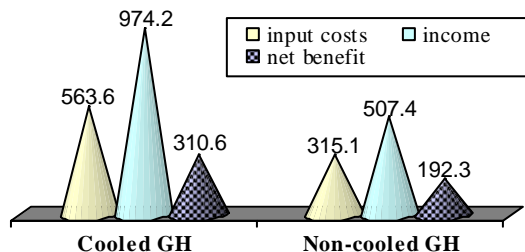
- ❖ The effect of planting time and greenhouse setup on the incidence of major pests of cucumber has been studied in Oman. A comparison of infestation levels of leaf miner on cucumber in three set up of green houses at different planting times indicated that the mean infestation is high in February planting and low in September while planting in June recorded the lowest incidents of infested leaves.
- ❖ Soil Solarization as a part of IPPM can be used effectively to sterilize soil as an alternative to the use of the hazard agro-chemicals. Effect of Soil Solarization has been studied on controlling soil fungi and bacteria by using 5 different cover materials in Kuwait. The study shows that, transparent plastic sheet gave highest cucumber yield and better soil sterilization than chemicals; Chemical and control treatments gave minimum yield and least soil sterilization as compared to transparent plastic sheet treatments. Highest net profit /m2 received from transparent double sheet and transparent 200 micron. Lowest levels of heavy metals were recorded under transparent sheet as compared with other treatments. Treatment covered with black plastic sheet recorded highest level of heavy metals in cucumber fruits.

**Cucumber (kg) Production under greenhouse condition using Soil Solarization (autumn crop) at experimental Area Rabiah**



- ❖ The influence of Heating on production of Cucumber in Green house has been studied in Kuwait. The study shows that using heating system can increase of Cucumber production about by 25%. In order to improve cooling systems performance and cooling efficiency, a study has been conducted in Kuwait. the “Evaluate and compare different type of cooling systems for green house” .Several modifications made to the existing evaporation cooling systems to study and comparison among them in terms of efficiency; climate control; economy ( energy and capital saving); management; suitability for use under brackish water; and the yield of cucumber under soilless conditions. Some of the Measurements showed that lower negative cooling system give the highest cooling efficiency.

**Input costs and net profit analysis of cucumber production in two season**



- ❖ An Agro- Economic Assessment for Production of Cucumber Crop in Cooled and Non-Cooled greenhouse was carried out for two growing season in Oman. Similar study was conducted last season in Qatar. The net profit analysis for the two seasons was higher by %61 with the cooled greenhouse.
- ❖ To elevate farmer’s income in the mountain Terraces of Yemen, cultivation of cash crops in green houses have been introduced to growers by ICARDA-APRP in Collaboration with Agriculture Research and Extension Authority (AREA). Production Systems in Yemeni Terraces depend mainly on seasonal rainfall as major source of irrigation. Terraces are small in size and fragmented in location and landownership. Careful assessment of socioeconomic of these production systems revealed that the only way to increase productivity in these production systems is to diversify income of farmers in these areas by introduction of high value crops with the help of modern techniques for rational use of limited resources in these rigid conditions. The

Protected Agriculture project started 2 years ago with 3 green houses, but the number increased rapidly and now reached 15 green houses. Farmers are very interested the new technique. The Project manages to create additional income for farmers through cultivation of cash crops; introduce new techniques of cultivation and irrigation for rational use of resources; intensify the use of terrace lands through the cultivation of cash crops; and finally create additional jobs for the rural population. In addition, the success of the project, have encouraged the French embassy in Sana'a to support ICARDA-APRP and to fund a new project for establishing of 35 greenhouses at the growers farm in Taiez Terraces in Yemen.



- ❖ In the terraces of Al-Turba area in Yemen, Cucumber was grown in plastic house under IPPM in mid-winter for the second season as on-farm trail to assess the possibility of growing two crops per year.



## 2 Project Development

A number of project proposals were developed by ICARDA-APRP.

- Supporting Rural Development & Food Security in the Terraces of Yemen: Adoption of Sustainable Protected Agriculture Techniques for Production of Cash Crops (Financing approved by the French Government)
- Enhancing the availability of quality seed of important quality seeds of indigenous forage and range plants in the Arabian Peninsula: The establishment of seed technology units (to be submitted to Islamic Development Bank)
- Adoption of protected agriculture techniques in Afghanistan for rural development utilizing marginal lands and less water to produce cash crops.
- Elevating poverty, rural and women development and saving the environment by the adoption of protected agriculture techniques utilizing marginal lands and less water to produce high value crops in Quetta, Pakistan.

### 3 Information Technology and Networking

- ❖ ICARDA – APRP website has been further developed. Most of the APRP Publications and Posters have been up-loaded to the site and now are available for all users. These documents are classified in the following groups: APRP newsletter, Technical Notes, Annual Reports, Proceeding of APRP workshops, Scientific Publication, Posters and General APRP.



([www.icarda.org/aprp](http://www.icarda.org/aprp))

### 4 Meetings, Seminars & Workshops

#### 4.1 APRP Regional Technical Coordination Meeting (RTCM)

- ❖ The Regional Technical Coordination Meeting (RTCM) of APRP was held at ICARDA headquarter, Aleppo, Syria from 7 to 9 December. Over 40 participants, representing Agricultural Research Institutes from Bahrain, Emirates, Kuwait, Oman, Qatar, Saudi Arabia and Yemen attended the meeting. During the 3-days meeting scientists from the different AP countries discussed their research activities and results under the three research themes of APRP (Water Management, Rangeland and Forage Crops, Protected Agriculture). Over 35 research reports and scientific papers were presented in different sessions followed in each case by discussion. The main subject were as followed (for title of presentation see 6.2) :

- Rangelnd: Seed multiplication; Seed threshing and prossceng; Productivity of forage grasses; Irrigated forages; Germplasm collection
- Water Management and Irrigation: Water use efficiancy; Treated waste water; Utilization of dam and water reservirs
- Protected Agriculture: Integrated Production and Protection Management (IPPM); Organic fertilizer; Bio-rational pesticides; Soil solarizatio; Green house (GH) production management; Agro-economic assessment of GH production

Five invited experts from ICARDA, Ain Al Shams and UAE Universities also have been participated and presented the following papers:

- Ahmed Al Masoum, UAEU. Application of IPPM in greenhouse for production of organic produce.
- Ayman F. Abou-Hadid Ain Al Shams University. The utilization of IT for WUE.
- Theib Oweis , ICARDA.Managing water in agriculture under extreme scarcity.
- Eddy De Pauw, Agro climatologist, ICARDA. Agro ecological Characterization Studies in the Arabian Peninsula. Past and Future Needs.
- Murari Singh, ICARDA. On-line Bio computing: A research solution tool. (three participant have recived special triainig course on this subject after the RTCM, see 5-specialized traininig course)



*Prof. Dr. Adel Al Beltagy ICARDA-DG during the inauguration of the Arabian Peninsula Regional Technical Coordination Meeting. Dr. Mohan Saxena ADG-AL (on his right) and Dr. William Erskine ADG-Research (on his left). Dr. Ahmed Moustafa APRP-Regional Coordinator on the left side of the picture.*

Special tour was organized for the participants for different department, laboratories and units at ICARDA. In the final session scientists and researchers from AP countries discussed and finalized their plan of work for the coming season. The plan of work will be submitted to the Regional Steering Committee Meeting (RSCM) in February.



*APRP RTCM participants during their visit to the Laboratories and GRU at ICARDA-HQ*

Participants acknowledged ICARDA activities in the Arabian Peninsula. The participants also acknowledged the financial support for APRP by Arab Fund for Economic and Social Development (AFESD), International Fund for Agricultural Development (IEAD) and OPEC fund (OPEC).



*A group photo for the participants of APRP-RTCM 7-9 December, 2003*

#### 4.2 Regional and International Meetings, Conferences, Seminars and Workshops

❖ ICARDA-APRP organized a number of seminars and workshops in colobortion of NARS in the region, which are as follows:

- ***Participatory Breeding for Stressful Environments*** on June 28, 2003 MAF, UAE. Dr. Salvatore Ceccarelli, ICARDA-Plant Breeder presented the seminar. The seminar was opened by Mr. Abdullah Abdul Aziz, Assistant under secretary for agricultural affaires, MAF Over twenty scientists, researchers and extension officers from the Ministry, ICBA, Arid Ideas/Higher Colleges of Technology attended. A question and answer session followed the seminar.



- ***Highlight of the ICARDA activities in the Arabian Peninsula, with special emphasis on Saudi Arabia*** has been presented by Dr. Ahmed Moustafa and Dr. Ahmed Osman as a joint seminar during their visit to Saudi Arabia (29 June-2 July, 03). The seminar was held at the Ministry of Agriculture, Riyadh and attended by over 30 researchers and senior scientists from the Ministry. The visit also included a joint meeting with saudi scientist participating in APRP activities and working at Al Jouf and Riyadh research centers. The visit ended with a final meeting with the Deputy Minister (H.E. Dr. Abdulla Al Obeid) and his deputies on prospects of strengthening Saudi/APRP collaboration on research and human resource development.



***Dr. Ahmed Osman with a group of Saudi researchers inspecting a field of forages research activities in Riyadh***

- ***Information Technology and its affect on improving water use efficiency*** on 13 July 2003,MAF UAE. The seminar was presented by Dr. Ian McCann, irrigation and water management specialist, University of Delaware, USA. The seminar was attended by more than 25 researchers and scientists from the ministries, municipalities, universities and other agricultural institutes in the UAE.



- ***Integrated Pest Management (IPM)*** on 31 August 2003 MAF, UAE. A group of scientists from Vermont University, USA, ICARDA and MAF, UAE delivered presentations on scientific topics related to IPM. The names of the lecturers and the titles of their presentations are shown below:

Prof. Bruce Parker, Professors of entomology, University of Vermont, USA;  
*The use of entomopathogenic fungi in IPM-how they work and how they can be used.*  
 Prof. Margaret Skinner, Professors of entomology, University of Vermont, USA.  
*Glasshouse IPM: progress with biological control and what growers need.*

Dr. Mustapha El Bouhssini, Entomologist, ICARDA  
*IPM of cereal and legume pests in CWANA.*

Eng. Ahmed Shahbandar, Farm Management Specialist, ICARDA  
*Pesticides and Fertilizers use in protected agriculture.*

Dr. Faisal Ibrahim, IPM Specialist MAF, UAE  
*Present and Future Implementation of IPM in United Arab Emirates*

More than 40 researchers and scientists from the ministry, municipalities, universities and other agricultural institutes participated in the workshop  
 Further collaboration between ICARDA, University of Vermont and MAF was discussed on the seconded day meeting. Mr. Abdullah Al Amiri, Director of plant protection, MAF, Dr. Ahmed Al Masoum, United Arab Emirates University and Dr. Ismaeil Ali Al Hosani, Abu Dhabi Municipality, UAE participated in this meeting along with visiting scientists from University of Vermont and ICARDA. Representatives from different agricultural regions and scientists from MAF were also presented.

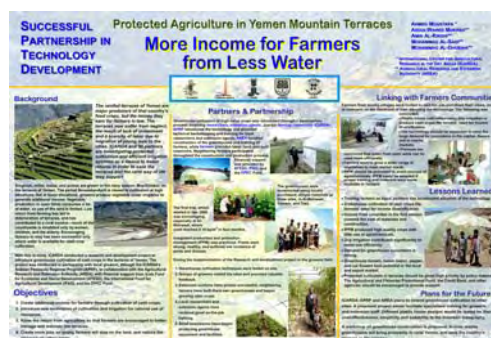


- **ICARDA activities in Arabian Peninsula** Presented by Dr. Ahmed Moustafa and Dr. Ahmed Osman as joint seminar on 16 December, during their visit to Ras Al Khaima Research Station, Northern Region, UAE. Over 25 researchers and scientists from the northern and central region attended the seminar. The seminar was followed by discussions and a tour, visiting fields and laboratories in the research station. The visit ended by agreement with Mr. Abdullah Sultan Director of Northern Agricultural Region and Mr. Saeid Al Baggam, Head of Research and Director of Ras Al Khaima Research Station on collaborative research work to be carried on forages and protected agriculture during the coming season



❖ ICARDA-APRP sponsored several scientists from the Arabian Peninsula countries to attend different international seminars and conferences:

- **During the GFAR Meeting (Global Forum for Agricultural Research) held in Dakar, Senegal during 22-24 May, 03**, APRP sponsored Dr. Abdul Wahed Mukred, Vice Chairman of Agricultural Research & Extension Authority – AREA, and APRP National Coordinator Yemen, to participate in the meeting. Dr. Mukred presented a poster on Protected Agriculture in Yemen Mountain Terraces, which was developed jointly by ICARDA-APRP and AREA. The poster “More income for farmers from less water”, was selected



as the best poster presentation on successful partnerships in agricultural research for developmen and awarded a plaque of recognition. More. than 400 researchers, research administrators, farmers, private sector and donor organizations attended. the theme for the meeting was “linking research and rural innovation to sustainable development”.

- ***During 7th International Conference on Development of Dry Lands (14-17 Sep., Tehran, Iran)*** APRP sponsored 4 scientists as follow:

***Dr. Abdul Wahed Mukred***, Vice Chairman of Agricultural Research & Extension Authority – AREA, Yemen, presented a paper titled: Introduction of Protected Agriculture into Mountain Terraces of Yemen

***Ms Salwa Al Oraifan***, GS, Agricultural Experiments and Research, Kuwait, presented a joint poster with Dr. Ahmed T. Moustafa on Agro-Economic assessment of hydroponics production system in the Arabian Peninsula: Sustainable system of cash crops from less water

***Dr. Ahmed Al Bakry***, Director of Agriculture Production Research Center, Oman participated by a joint poster with Dr. Ahmed T. Moustafa on Development of soil-less growing techniques for production of high quality cash crops with less water in the Arabian Peninsula

***Dr. Ali Al Karbotly***, Plant Production Research Center, Oman presented a poster on Molecular Breeding of Date Palm in Sultanate of Oman.

- ❖ ICARDA-APRP participated on several regional and international conferences, meeting and seminars:

- ***“Tissue culture: its current use and future prospects for agriculture investments in the Arab world”*** organized by the Arab Authority for Agricultural Investment and Development (AAID) in collaboration with the Ministry of Agriculture and Fisheries (MOF) and the United Arab Emirates University 14-16 January, 2003 at Hiton, Al-Ain. The workshop was all focused on Date Palms and was attended by over 50 scientists from several Arab countries (Egypt, Emirates, Iraq, Jordan, Morocco, Qatar, Saudi Arabia, Sudan and Tunis). More than twenty technical presentations on the use of tissue culture were presented. Dr. Ahmed Osman represented ICARDA-APRP and participated in the discussions.

- ***“Emiratisation in Natural Resources Management”*** symposium, organized by Higher Colleges of Technology in collaboration with Arid Ideas at Al Ain Men’s College on 26 May 2003. Nearly 25 participants from different government, regional and international organizations attended. The main discussions were focusing on experiences of selected government agencies on natural resources management, prospects for human resources development and the introduction of a new training program for technicians on natural resources management, including Environmental Resources, Water and Farm Management. Dr. Ahmed Osman and Arash Nejatian (ICARDA-APRP) represented ICARDA in the symposium. Beside the round table meetings ICARDA representatives presented the latest publications and posters from ICARDA on related subjects. At the end of the meetings some of the publications were donated to the college library



- ***Sixth Asia and Pacific Regional Meeting of UNCCD Focal Points*** hosted by The United Arab Emirates Fedral Environmental Agency the on 7-9 June 2003.
- ***The Second Asia Ministerial Conference followed this on UNCCD Implementation.*** Dr Ahmed Moustafa, ICARDA-APRP Regional Coordinator and Dr. Theib Oweis, water management/supplemental irrigation specialist represented ICARDA.

- **ICARDA/Yemen Annual Coordination Meeting** was held in Dhamar, Yemen on 8 Sep. followed by Management Committee meeting on 9th Sep. 2003. National scientists presented their joint activities with ICARDA under the two regional programs, NVRSRP and APRP. Dr. Ahmed T. Moustafa represented APRP in the two meetings
- **“None traditional methods for production and improvement of agricultural crops”** organized by scientific and cultural relation section, Academy of scientific research and technology, Ministry of state for scientific research held in Cairo, Egypt during 1-3 December 2003. Dr. Moustafa presented a paper on soilless culture.
- ❖ The ICARDA presentation day was held on 26 May 2003 in Aleppo. Several senior delegations from the Arabian Peninsula attended (Kuwait; Kingdom of Saudi Arabia; Oman and Qatar). Mr. Abdul Rahman Al Ajami, chairman development projects group Company. headed Kuwait delegation. H.E. Dr. Abdullah Al Obaid, Deputy Minister for Agricultural Research, Ministry of Agriculture, headed the Saudi delegation. H. E. Mr. Khalfan Al-Naibi, Under Secretary, Ministry of Agriculture and Fisheries headed Oman delegation. Mr. Mohamed F. Al-Feehani, Assistant Under Secretary, Ministry of Municipal Affairs and Agriculture headed the delegation from Qatar. Dr. Ahmed Moustafa APRP regional coordinator presented APRP activities during presentation day and participated in the meetings held between AP delegations and ICARDA management.

## 5 Capacity Building and Training

- ❖ An on –the-job Training Course on green house management was organized (June-August, 03) by APRP in collaboration with the Arab Qatari Agriculture Production Company (AQAPC) for two Yemeni researchers from the Ministry of Agriculture & Irrigation. The trainees spent two months in the modern farm of AQAPC in Qatar. More activities of this sort are scheduled for Yemeni researchers in the near future.
- ❖ Three Trainees from Bahrain have been trained on On-line Bio computing after RTCM in Aleppo from 9 – 10 December 2003. The subject is recently developed by ICARDA to serve researchers and scientists of the NARS on statistical analysis by direct links with ICARDA biometricians through the internet.
- ❖ During the year 2003, 21 trainees from Arabian Peninsula countries have participated on ICARDA different training programs. Some of these programs are including: Management of Water Resources and Improvement of Water-use Efficiency in the Dry Areas (5 May-12 June 2003) held in ICARDA-HQ; Scientific Writing and Data Presentation (8-12 June 2003) held in ICARDA-HQ; DNA Molecular Marker Techniques for Crop Improvement (07-18 September 2003) held in ICARDA-HQ; Electronic Document Management and the Use of Web AGRIS Tools for Database Management on the Web (30 Nov.-16 Dec. 2003) held in ICARDA-HQ; Regional Training Workshop on Participatory Research Methods and Community Approach and Characterization(29 April - 6 May 2003) held in Cairo, Egypt; Utilization of Expert Systems in Agricultural Research and Production (11-22 October 2003) held in CIAES, Cairo, Egypt .

## 6 Publications

### 6.1 APRP General Articles, Reports and Posters

- ❖ ICARDA-APRP, 2003. Development of soilless growing techniques (hydroponics) in the Arabian Peninsula: More crop per drop (Poster). Dubai, UAE.
- ❖ ICARDA-APRP, 2003. Protected Agriculture in Yemen Mountain Terraces: More income for farmers from less water (Poster). Dubai, UAE.
- ❖ ICARDA-APRP, 2003. Successful partnership in developing indigenous forage production systems that use less water in the Arabian Peninsula (Poster). Dubai, UAE.
- ❖ ICARDA-APRP, 2003. Sustainable Management of Natural Resources and Improvement of Major Production System of the Arabian Peninsula (Annual Report 2001/2002 season) Dubai, UAE.
- ❖ Integration of improved forages and their role in the supplementation of natural rnage vegetation - A conference paper to the VIIth International Rangeland Congress Durban, South Africa (Authors B.C. Pengelly – CSIRO, Australia; J.P. Muir, Texas, USA; A.E. Osman, ICARDA-APRP; UAE and J.D. Berdahl, North Dakota, USA).

## 6.2 Paper Presented at Conferences and Workshops

- ❖ Ahmed E. Osman and Abdullah M. Al Hajoj (2003) Arabian Peninsula Rangeland Status and prospects for development. In Proceedings of the VII International Conference on Development of Dry Lands, Tehran, Iran 14-17 September 2003.
- ❖ Ahmed E. Osman, J.M Peacock, M.E. Ferguson, I.R. McCann, Abdul Karim Ashour, Ahmad Awad Al-Karim, Rashid K. Al- Shariqi, Ali Saleh, Galeb Al Hadrami, R. Karnik, Saleem K. Nadaf, Safaa Mohamed Al-Farsi, Mohamed Ali Hassan, Abdullah Al Hajoj, 2003. Successful partnership in developing indigenous forage production systems that use less water in the Arabian Peninsula (Poster) Presented at the Seventh International Conference on Development of Dry Lands, Tehran 14-17 September 2003.
- ❖ Abdullah Al Shanqiti, Ahmed T. Moustafa & Ian MacCan, 2003. Development of information technology system for agriculture and natural recourse development in the Arabian Peninsula. In Proceedings of the VII International Conference on Development of Dry Lands, Tehran, Iran 14-17 September 2003.
- ❖ Salwa Al-Oraifan & Ahmed T. Moustafa 2003. Agro-Economic assessment of hydroponics production system in the Arabian Peninsula: Sustainable system of cash crops from less water (Poster). Presented at the Seventh International Conference on Development of Dry Lands, Tehran 14-17 September 2003.
- ❖ Ahmed T. Moustafa, Ahmed Al Bakry, Muthir Al Rawahi, Abdul Rahman Al Mohammadi and Rashed Ahmed, 2003. Development of soil-less growing techniques for production of high quality cash crops with less water in the Arabian Peninsula (Poster). Presented at the Seventh International Conference on Development of Dry Lands, Tehran 14-17 September 2003.
- ❖ Ahmed T. Moustafa, 2003. "Development of soilless systems for the production of high value crops in dry areas". presented at Untraditional methods for production and improvement of agricultural crops conference, Cairo, Egypt 1st to 3rd December 2003

## 6.3 Consultants Presentation and Reports

- ❖ Ahmed Al Masoum, UAEU, 2003, Application of IPPM in greenhouse for production of organic produce. presented at APRP-RTCM Aleppo 7-9 December 2003.
- ❖ Ayman F. Abou-Hadid Ain Al Shams University ,2003. The utilization of IT for water use efficiency, presented at APRP-RTCM Aleppo 7-9 December 2003.
- ❖ Eddy De Pauw, Agro climatologist, ICARDA, 2003. Agro ecological Characterization Studies in the Arabian Peninsula. Past and Future Needs, presented at APRP-RTCM Aleppo 7-9 December 2003.
- ❖ Murari Singh, ICARDA, 2003, On-line Bio computing: A research solution tool. presented at APRP-RTCM Aleppo 7-9 December 2003
- ❖ Theib Oweis , ICARDA, 2003.Managing water in agriculture under extreme scarcity. presented at APRP-RTCM Aleppo 7-9 December 2003.

## 6.4 NARS Presentation at Aleppo RTC Meeting 7-9 December 03

- ❖ Isam Mustafa Razaq, Hussain Jawad Al-Laith Bahrain. Water use efficiency on the production of OKRA under surface and drip irrigation
- ❖ Ahmed Ibrahim Alyas Bahrain. Research Activities in Kingdom of Bahrain Seed Multiplication of rangeland species
- ❖ Isam Mustafa Razaq Bahrain.The use of different dose of organic fertilizer on the production of Tomato (Mont Carlo)
- ❖ Ahmad Al Saad, Sadiq Isa Mansoor Hussain, Bahrain. Studying the Effect of Covering Date Palm Bunch with Different Materials on the Quality & Quantity of the Fruit Khalas Variety
- ❖ Mohamed Makkawi; Ahmed Osman and Rashed Ahmed Ali Emirates. Threshing and processing of indigenous species Problems and Solutions
- ❖ Ahmed E.Osman and Mahdi Al Tamimi Emirates. Productivity of forage grasses as affected by frequency of harvest and irrigation in UAE.

- ❖ A. Alshankiti, A. Alhamdan, A. Habib, Asadullah Alajmi Saudi Arabia. ,A Progress Report on Water Use Efficiency of Four Indigenous Forage Grasses In Comparison With Exotic Forage Species for Year 2003
- ❖ Abdullah Al-Hajoj Saudi Arabia. Research Activities of the 2003/2003 Season in Al-Jouf Area, Kingdom of Saudi Arabia
- ❖ Maher Al Hunaidi; Mohammad Fadel; Mohammad Riad; Etemad Al Saeed; Amal Abdul Kareem; Othman Al Shiekh;.Hanan M Al-Jumaa; Naiema Al-Mishwat Kuwait.Integrated Production and Protection Management IPPM Program For Cucumber Crop Under Greenhouse Condition For The Season 2002/2003 in Kuwait
- ❖ Mohamed Jamal; Mohamed Al Harbi; Jamal Fuad; Nabil Al Mourisgd Kuwait..Influence of Green House Heating on Production of Vegatable Crops
- ❖ Saleem K Nadaf, Safaa M. Al-Farsi and Saleh A. Al-Hinai Oman. Germplasm Collection of rangeland forage and medicinal plant species in North Oman
- ❖ Saleem K Nadaf, Safaa M. Al-Farsi and Saleh A. Al-Hinai Oman. ,Differential Response of Indigenous Rangeland Forage Species to Salinity Imposed from germination stage
- ❖ Saleem K Nadaf, Safaa M. Al-Farsi and Saleh A. Al-Hinai Oman. Bulk and Basic Seed Multiplication of Indigenous Forage Species UNDER APRP-Phase-II 2.3.2
- ❖ Saleem K Nadaf, Safaa M. Al-Farsi and Saleh A. Al-Hinai Oman. Effect of Inter-row and Inter-plant Spacing on Seed Yield and its related Traits of Indigenous Rangeland and Forage Grass Species grown under Drips
- ❖ Saleem K Nadaf, Safaa M. Al-Farsi, Saleh A. Al-Hinai, Masoud H. Al-Adawy and Rashid S. Al-Hinai Oman. Effect of Maturity Stage on Seed Weight per se and Seed Quality in Indigenous Rangeland and Forage Grass Species
- ❖ Adel Mohamed Saleh Al-Yahri , Horticulture Researcher, MMAA, Qatar. Use Solarization to produce tomato and cucumber crops
- ❖ Ali Zaid N. Al-Dosari Qatar) ,Causes and cure of seed dormancy in selected native forage plants
- ❖ Saleem K Nadaf, Safaa M. Al-Farsi and Saleh A. Al-Hinai Oman.Morphological Characterization of Two Rangeland Grass Species
- ❖ Syed Ali Razvi, Najma Mahmood Al-Zadjali, Rashid Al-Shidi; And Yousuf Mohammed Al-Raeesi Oman. Effect of Time of Plantings and Set up Of Green Houses on the Incidence of Certain Major Pests of Cucumber
- ❖ Syed Ali Razvi, Najma Mahmood Al-Zadjali, Rashid Al-Shidi and Yousuf Mohammed Al-Raeesi Oman. Relationship between whitefly catches on yellow sticky traps and the actual adult whitefly population on cucumber leaves under green house conditions with cooling system
- ❖ Syed Ali Razvi, Najma Mahmood Al-Zadjali, Rashid Al-Shidi and Yousuf Mohammed Al-Raeesi Oman.Efficacy of Certain Bio-Rational Pesticides for the Control of Aphid on Cucumber Grown In Soil with Polythenemulch in Green House with Non-Cooling System
- ❖ Syed Ali Razvi, Najma Mahmood Al-Zadjali, Rashid Al-Shidi, Yousuf Mohammed Al-Raeesi, Ibtihal Juma Al-Raeesi and Ahmed Mohammed Al-Mantheri. Oman. Evaluation of Certain Tomato Cultivars Grown In Green House under Hydroponic System against Pests and Diseases
- ❖ Muthir.S.Al Rawahy, Fatma S. Al Raisy, Salim M. Al Makhmary, Said M. Al Adawy and Ahmed .K Al Shidy Oman. Agro- Economic Assessment for Production of Cucumber Crop in Cooling and Non-Cooling greenhouse
- ❖ Muthir.S.Al Rawahy, Fatma S. Al Raisy, Salim M. Al Makhmary, Said M. Al Adawy and Ahmed .K Al Shidy Oman.Evaluation Of Growing Tomato Lycopersicum Esculantum. In Soil-Less Techniques Closed System) Under Cooled Greenhouse
- ❖ Muthir.S.Al Rawahy, Fatma S. Al Raisy, Salim M. AlMakhmary, Said M. Al Adawy and Ahmed .K Al Shidy Oman. Evaluation of growing Cucumber in Soil-less Culture (sand media) under cooled greenhouse
- ❖ Khader Atroosh, Mohamed Alnaboos, Abdul Azeez Haider Yemen.Assessment of the Utilization of Water Dams and Reservoirs in the Highlands of Yemen

- ❖ Hadi, M. Shoubaihi; Mustafa H.A. Sattar; Gamal A. Al-Naqeeb Yemen. Assessment of impact of utilization of Treated Waste water on Soil and Environment at Al-Sha'ab Treatment facility in Aden
- ❖ Alkader Ahmed Gumhuria Yemen. Study Evaluation of Seed Multiplication of Important Forage Grasses in Coastal Zone
- ❖ Abdulla Maghram, Mohamed Hasan Yaqub Yemen. Technical Report on Ombahara Protected Area in Abyan
- ❖ Ahmed Salem Bataher Yemen. Survey of Plant Cover in Al-Khon Protected Area in Wadi Hadramout
- ❖ Ali Abbdul malek; Mohammed Gamel; Hamdy Al azazy Yemen.Evaluation and multiplication seed of three rang grasses in North highland
- ❖ Abdul Hakeem Dubaie, Abdul Rab Kadasi, Mohamed Dhubhani Yemen. Integrated Production and Protection Management in Cucumber Cultivation under Plastic Houses in the Terraces in winter Season
- ❖ Khaled Al-Kirshi, Taher Mahyoub, Khairi Al-Abyadh And Saleh Magaleh Yemen. Growing of Cash Crops in Green Houses in Mild Winters Conditions of the Southern Uplands of Yemen
- ❖ Amin AL Kirshi , Naji AL-Ragih , Abdo Abdullah Al-thoris Yemen. Dissemination of Integrated Production and Protection Management Technique of cucumber pests in protected agriculture under farmer's conditions in Dhamar

## Workplan for 2002/2003 season

The Work Plan for the 2002-2003 seasons is based on:

- The major themes and activities listed in the APRP Phase II document “Sustainable Management of Natural Resources and Improvement of Major Production Systems of the Arabian Peninsula”
- The conclusions drawn from the presentations and the discussion at the RTCM held in Sana’a Yemen from 28 Sep. to 2 Oct 2002
- The output of the Brain Storming Meeting held on the 2nd of October with full participation of all 7 AP countries in Sana’a Yemen.
- The comments of the Regional Steering Committee members during their meeting on the 3rd of October in Sana’a Yemen

The following are the Objectives, Outputs and Activities for each of APRP components on 2002-03.

### 1. Agro ecological Characterization

**Objective 1** Improved targeting of research and technology transfer, land use planning, and environmental management based on the characterization of the specific potentials and constraints of the diverse agro ecologies and associated land use systems of the Arabian Peninsula

**Output 1.1** **Regional assessment of a biotic stresses and crop water requirements through agro-climatic mapping and agroecological zoning for biodiversity conservation, rangeland management and rehabilitation, and targeting of technology transfer**

### 2. Management and Utilization of Different Sources of Irrigation Water

**Objective 2** Improved water use efficiency and optimal utilization of available water resources in open field irrigated production systems.

**Output 2.1** **Recommendations for appropriate irrigation, soil and crop management that promote efficient use of water, economic net benefits to water users and yield security and stability.**

#### Activities:

2.1.1. Establishment of weather station network including programs for direct reading from the stations for the estimation of the crop water requirement.

<b>Participating Countries</b>	All countries
<b>ICARDA Scientist(s)</b>	Asadullah Al-Ajmi.
<b>Contact Scientists</b>	<b>Bahrain:</b> Hussain Allaith <b>Emirates:</b> Mussab Rasheed (Sharjah), Abdullah Al Aboudi (Fujeerah) <b>Kuwait:</b> Hani Hajeya <b>Oman:</b> Mahmoud Al Rashidi (Rumais) and Anwar Bait Fadhil (Salalah) <b>Qatar:</b> Hassan Abu Sukar <b>Saudi Arabia:</b> A. Alshankiti, Hani Alrashed <b>Yemen:</b> Mohamed Abdel Wasie

2.1.2. Assess through questionnaires the current water use from the earth dams and water reservoirs in Yemen High lands, to determine constraints and problems facing the operation and maintenance of these dams.

<b>Participating Countries</b>	Yemen
<b>ICARDA Scientist(s)</b>	Asadullah Al-Ajmi.
<b>Contact Scientist(s)</b>	Adnan Qirshi, Gameel Sallam

**Output 2.2 Evaluation of the water use efficiency of different crops.**Activities:

## 2.2.1. Monitoring soil water depletion under different forages using TDR

<b>Participating Countries</b>	Emirates, Oman, Saudi Arabia
<b>ICARDA Scientist(s)</b>	Asadullah Al-Ajmi, Ahmed Osman
<b>Contact Scientists</b>	<b>Emirates:</b> Mahdi Tamimi, Ibrahim Al-Zerooni, <b>Saudi Arabia:</b> Abdullah Al-Shankiti, Abdullah Al-Hajoj, A. Al Habib <b>Oman:</b> Hamdan Al-Wahaibi, Saleem K. Nadaf.

**Output 2.3 Evaluation of methods to use alternative water resources such as brackish water and treated wastewater.**Activities:

## 2.2.2. Assessment of impact of utilization of treated wastewater on soil and environment at Al Sha'ab treatment facility in Aden.

<b>Participating Countries</b>	Yemen
<b>ICARDA Scientist(s)</b>	Asadullah Al-Ajmi
<b>Contact Scientists</b>	Hadi Shobaihi, Mustafa Sattar, Gamal Al-Nageeb

**3. Rangelands/Forage/Livestock Systems**

**Objective 3** Development of integrated range/forage/livestock systems and management practices for rangeland rehabilitation

**Output 3.1 Collections of germplasm of indigenous and exotic forage and rangeland species with identified attributes and potential for utilization (a) in rangeland restoration or rehabilitation, and (b) as alternative forage crops**

Activities:

## 3.1.1. Collection of germplasm of priority indigenous rangeland species and indigenous technical knowledge concerning their attributes

<b>Participating Countries</b>	Oman, Saudi Arabia
<b>ICARDA Scientist(s)</b>	Ahmed Osman,
<b>Contact Scientists</b>	<b>Oman:</b> Saleem K. Nadaf <b>Saudi Arabia:</b> Abdullah Al-Hajoj

**Output 3.2 Evaluation of Germplasm of indigenous and exotic forage and rangeland species with identified attributes and potential for utilization (a) in rangeland restoration or rehabilitation, and (b) as alternative forage crops**

Activities:

## 3.2.1. Assessment of biomass productivity, salt tolerance, heat tolerance, drought tolerance and water use efficiency of priority indigenous range and forage species

<b>Participating Countries</b>	Emirates, Oman, Qatar, Saudi Arabia
<b>ICARDA Scientist(s)</b>	Ahmed Osman, Asadulla Al Ajmi
<b>Contact Scientists</b>	<b>Emirates:</b> Mahdi Tamimi, Ibrahim Al Zarouni <b>Oman:</b> Saleem K. Nadaf, Hamdan Al Wahaibi <b>Qatar :</b> Mohamed Ali Hassan <b>Saudi Arabia:</b> Abdullah Al-Shankiti, Abdullah Al-Hajoj, A. Al Habib

### Output 3.3 Technical options for forage seed production in different agroecological zones and under different production systems

#### Activities:

#### 3.3.1. Bulk seed production; processing and storage

<b>Participating Countries</b>	Bahrain, Emirates, Oman, Saudi Arabia, Yemen
<b>ICARDA Scientist(s)</b>	Ahmed Osman
<b>Contact Scientists</b>	<b>Bahrain:</b> Ahmed Al Yas, Isam M. Abdul-Razaq <b>Emirates:</b> Mahdi Tamimi, Mohamed Makawi <b>Oman:</b> Saleem Nadaf <b>Saudi Arabia:</b> Abdullah Al-Hajoj <b>Yemen:</b> Ali Abdulmalek, Gamhouria Ahmed

#### 3.3.2. Review the rules and regulations governing seed exchange between countries (All countries)

### Output 3.4 Technical options for the restoration and rehabilitation of degraded rangelands in different agroecologies

#### Activities:

#### 3.4.1. Evaluation of indigenous and exotic multipurpose fodder shrubs and trees

#### 3.4.2. Evaluation of different sowing and planting methods for establishing range vegetation

#### 3.4.3. Re-vegetation (rehabilitation) of degraded community grazing areas

<b>Participating Countries</b>	Saudi Arabia, Yemen
<b>ICARDA Scientist(s)</b>	Ahmed Osman
<b>Contact Scientists</b>	<b>Saudi Arabia:</b> Abdullah Al-Hajoj (Al-Jouf) <b>Yemen:</b> Ali Abdulmalek (Walan), Abdulla Magram (Ombahara, Abien), Ahmed Bataher (Seiyum)

## 4. Protected Agriculture

**Objective 4** Development of more efficient and sustainable protected agriculture production systems.

**Output 4.1 Simple greenhouse structures and covering materials suitable for the region's climate, with more efficient ventilation and cooling system.**

#### Activities:

#### 4.1.1. Improvement of greenhouse ventilation and cooling system through new design & modifications

<b>Participating Countries</b>	Bahrain
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa, Thermo Dynamic Specialist
<b>Contact Scientists</b>	Isam Mustafa, Ahmed Siddig, Mohamed Ali Bouhmaid

#### 4.1.2. Evaluating and comparing different types of cooling systems in greenhouses in Kuwait

#### 4.1.3. The effect of heating on growth and yield of cucumber crop under greenhouse conditions

<b>Participating Countries</b>	Kuwait
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa, Pro. Christian Van. Zabeltitz
<b>Contact Scientists</b>	Mohammad Jamal, Mohammad AL-Harbi, Jamal Fouad

#### 4.1.4. Adaptation of greenhouse production techniques in the Mountain Terraces of Yemen for production of different cash crops.

<b>Participating Countries</b>	Yemen
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	Hassan AL- Kholany, Hakeem Al-Dubaie, Khaled AL - kirshi, Extension Agent

## 4.1.5. Agro economic assessment of production of major vegetable crops in cooled and none-cooled greenhouses

<b>Participating Countries</b>	Oman
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	Muthir Al Rawahy

**Output 4.2 Improved irrigation systems for increased water use efficiency, and adapted soil-less cultivation systems and techniques.***Activities:*

## 4.2.1. Water use efficiency of vegetable crops in green house

<b>Participating Countries</b>	Bahrain, Qatar
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa and Irrigation Specialist
<b>Contact Scientists</b>	<b>Bahrain:</b> Mohamed Tawfeeg, Ebrahiem Jaffar <b>Qatar:</b> : Hamdy El-Downey, Hamad El-Anzy, Khalid Amer

## 4.2.2. Agro-economic comparison between organic and traditional production of cucumber in green house

<b>Participating Countries</b>	Bahrain
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	Ahmed Saad, Ali Habieb

## 4.2.3. Vertical hydroponics system for the production of strawberries.

<b>Participating Countries</b>	Kuwait, Oman
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	<b>Kuwait:</b> Mona-ALRashid, Mohammad Jamal, Sobhi AL Attar <b>Oman:</b> Muthir Al Rawahy

## 4.2.4. Adaptation of soilless growing techniques (open and closed system) for the production of vegetable crops with different media

<b>Participating Countries</b>	Bahrain, Emirates, Oman, Yemen
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	<b>Bahrain:</b> Saeed Sulman, Ahmed habieb <b>Emirates:</b> Rashid Ahmed Al-Hantubi, Basel F.A. Mubark <b>Oman:</b> Muthir Al Rawahy <b>Yemen:</b> Amin AlKirshi , Nadheer Ibrahim, Mohmmmed .AL-Saadi

**Output 4.3 Improved integrated production and protection (IPP) management practices that ensure strong healthy plants with adequate protection from pests and diseases, using safe control practices with minimal use of chemicals.***Activities:*

## 4.3.1. Implementation of Integrated Production and Protection Management (IPPM) program in research station and farms

<b>Participating Countries</b>	Kuwait, Yemen
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	<b>Kuwait:</b> Faisal Al Sediqi, Maher Al hunaidi, Mohammad Fadel, Mohammad Riad, Etemad Al Saeed, AmalAbdulkareem, Naser Ramadan, Osman Shiekh <b>Yemen:</b> Abdul Hakeem AL Dubai, Mohmmmed .AL-Saadi, Wajeh AL- Mtwekl, Abdul wahed AL adeeb, (Extention Agent)

## 4.3.2. Effect of a bio-control package using parasitoids, predators and biorational pesticides for the control of whiteflies, leaf miner, aphids, mites on tomato grown under hydroponic system

## 4.3.3. Efficacy of certain bio-control agents and bio-rational pesticides for the control major pests and diseases on cucumber under soil less culture in plastic house

4.3.4. Effect of certain bio-control package for the control of the pests of cucumber (aphids, whitefly, leaf miner and mites) and diseases, grown in two plastic houses, one with and the other without cooling system

<b>Participating Countries</b>	Oman
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	Yousuf Al-Raeesy, Syed Ali Razvi, Bashir, Rashid Al-Shidi, Najma Mahmood Al-Zadjali and Ahmed Al-Mandari.

4.3.5. Soil Solarization under protected agriculture on farmers fields and under research station condition

<b>Participating Countries</b>	Kuwait, Qatar, Yemen
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa
<b>Contact Scientists</b>	<b>Kuwait:</b> Amal Abdulkareem <b>Qatar:</b> Hamdy El-Doweny, Hamad El-Anzy, Khalid Amer <b>Yemen:</b> Abdulhakem Dubui, Extension Agent

**Output 4.4 Information technology & networking. Regional networking mechanism that maximizes the collaboration among researchers, scientists and extension staff in various countries and exchange of knowledge, information and expertise regionally and internationally.**

*Activities:* See 5.2

## 5. Capacity Building and Institutional Strengthening

**Objective 5:** Strengthened national institutional and human resource capacity and enhanced technology transfer.

**Output 5.1 Enhanced capabilities of national scientists and exchange of information and experiences on problems of common interest through regional networking.**

*Activities:*

5.1.1. Establishment of Seed Technology Units in Sultanate of Oman

5.1.2. Establishment of Seed Technology Units in Kingdom of Saudi Arabia

5.1.3. Compliting the Weather Stations Network in The Arabian Peninsula

**Output 5.2 Sustainable research management, technology transfer and delivery systems**

5.2.1. ICARDA – APRP in Country Technical Coordination Meeting (TCM)

Title	Location	Date	Organizer	Coordinator
ICARDA/Bahrain TCM	Bahrain	May 4	APRP and MMAA	Jaffar Habib, A. Moustafa and A. Osman
ICARDA/Kuwait TCM	Kuwait	May 12	APRP and PAAAFR	Khalid J. Al- Masbahi , A. Moustafa and A. Osman
ICARDA/Oman TCM	Muscat	May 18	APRP and MAF	A. Al Harthy, A.Moustafa, A. Osman, and A. Ajmi
ICARDA/Qatar TCM	Doha	May 6	APRP and MMAA	A. Al Mahmoud, A.Moustafa, A. Osman, and A. Ajmi
ICARDA/ Saudi Arabia TCM	Riyadh	May 21	APRP and MAW	M. Al Mazroe, A.Moustafa, A. Osman and A. Ajmi
ICARDA/EMIRATES TCM	Dubai	June 3 <sup>rd</sup>	APRP and MAF	A. Aboudi, A.Moustafa, A. Osman and A. Ajmi
ICARDA-APRP/Yemen TCM	Sana'a	May 27	APRP and AREA	Hadi Shobaihi, A. Moustafa, A. Osman, and A. Ajmi

## 5.2.2. Conferences, Meeting and Workshops

Title	Location	Duration & Date	Organizer	Coordinators
Regional Technical Coordination Meetings	Aleppo	15-17 Jun 2003	ICARDA APRP	APRP Team
Regional Steering Committee Meetings	Aleppo	19 Jun 2003	ICARDA APRP	APRP Team
Bio Technology Workshop	Kuwait	Mar-April (tentative)	ICARDA APRP	A. T. Moustafa and Consultants

## 5.2.3. Regional Training Programs

Title	Location	Duration & Date	Organizer	ICARDA Scientists
Greenhouse Management and Soilless Culture	Oman or Qatar	Mar-Apr (tentative)	ICARDA APRP	A. T. Moustafa and Consultant
Hortivars and Expert System	Al-Ain UAE	Jan 18-22 (pending FAO approval)	FAO ICARDA	A. T. Moustafa and Wilfred Baudoin

**Output 5.3 Information dissemination to the end-users**Activities:

5.3.1. Maintaining and updating of “APRP Web Site” ([www.icarda.org/aprp](http://www.icarda.org/aprp)) to exchange experience and transfer available technologies between the countries of the region.

5.3.2. Seminars and workshops in different AP Countries

5.3.3. Development of database and artificial intelligence on different aspects of Protected Agriculture and Water Management in the Arabian Peninsula to be available to the end users in the Arabian Peninsula

- Expert information systems for greenhouse crops and date (use of CLAES expert systems, Egypt)
- Climate data logging for crop management and disease forecasting (use of CLAC system from Egypt)
- Keep record of the horticulture variety performance information (use of FAO Hortivars database).

<b>Participating Countries</b>	All countries
<b>ICARDA Scientist(s)</b>	Ahmed Moustafa, Asadullah Al-Ajmi and consultants from CLAES and CLAC
<b>Contact Scientists</b>	APRP IT Committee

5.3.4. Develop simple color manuals and technical publications

- Improved irrigation scheduling in the Arabian Peninsula through on-line near real time weather data
- Indigenous buffel grass maximizes forage yield and saves water in AP
- Seed production of indigenous forages in AP
- Restoration and management of degraded range in Yemen
- Integrated Production and Protection Management (IPPM)