ICARDA at a glance

Who we are

The International Center for Agricultural Research in the Dry Areas (ICARDA) is a global Research for development non-profit organization with a vision of improved livelihoods of the resource-poor in the dry areas of the developing world.

ICARDA promotes sustainable agriculture development in dryland countries through collaborative and responsive research. The Center works closely with the national agricultural research systems, policymakers, local communities, and non-governmental organizations to bring its research outputs to field and deliver impact on the ground – our core strength.

ICARDA in numbers

1) Actively implemented over 180 projects in 2014
2) Works in over 50 countries, with offices in 17 of them
3) Employs around 450 skilled staff from over 44 countries

Our focus in drylands

ICARDA strives for better livelihoods in drylands through a Strategic focus on:

- food and nutrition security
- rural poverty
- water productivity
- land degradation
- sustainable management of natural resources

With cross-cutting priorities of:

- climate change adaptation
- gender equity
- capacity development.

What we do

ICARDA delivers science-based systems solutions that help build resilience and sustainably intensify the productivity of dryland agroecosystems. Its integrated research outputs include new crop varieties; water productivity technologies; **agronomic practices; natural resource management; rangeland and small ruminant production; and socioeconomic and policy analyses and options.**

ICARDA
Science for Better Livelihoods in Dry Areas

International Center for Agricultural Research in the Dry Areas (ICARDA)
Arabian Peninsula Regional Program (APRP)

Improving food security and sustainable natural resources management through enhancing integrated agricultural production systems in the Arabian Peninsula

ANNUAL REPORT 2015

Sponsored by

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ICARDA
Science for Better Livelihoods in Dry Areas

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Public Authority for Agricultural Affairs & Fish Resources, Kuwait
Ministry of Agriculture and Fisheries, Oman
Ministry of Municipality and Environment, Qatar
Ministry of Agriculture, Saudi Arabia
Ministry of Climate Change and Environment, UAE
Agricultural Research & Extension Authority, Yemen

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Arabian Peninsual Regional rogram (APRP)

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Foreword

This is the first annual report of ICARDA Arabian Peninsula Regional Program (APRP) project "Improving food security and sustainable natural resources management through enhancing integrated agricultural production systems in the Arabian Peninsula". ICARDA's APRP serves the seven countries of the Arabian Peninsula (AP) (Bahrain, Kuwait, Qatar, Saudi Arabia, Oman, UAE and Yemen). The program addresses three priority themes:

- I-Water resource management
- II-Rangeland and forages
- III-Protected Agriculture

The present project is aiming to transfer and promote the technology packages which developed during previous projects as a result of collaborative research activities between National Agricultural Research Systems (NARS) of the AP Countries and ICARDA.

ICARDA/APRP is operating from ICARDA regional office in Dubai, UAE; with full support from the Head Quarter. In addition to the technical support from HQ Research programs and Units, three full time internationally recruited scientists are based in Dubai to serve the region. The project started in 2014 with the financial support from the Arab Fund for Economic and Social Development (AFESD), and The International Fund for Agricultural Development (IFAD).

This report is presenting a summary of achievements during the reported period (2014) to include research activities, Capacity Building and Training, Information Technology and Networking and Publications.

The Report developed based on all the technical reports and papers of the NARS scientists presented at the Regional Technical Coordination Meetings (RTCM) held at Bahrain on 6-9 December 2015. All original reports are available with the enclosed CD or from ICARDA-APRP website.

ICARDA-APRP would like to thank the Arab Fund for Economic and Social Development (AFESD), and The International Fund for Agricultural Development (IFAD) for the financial support provided for this project.

Gratitude and appreciation go to the Management and Scientists of the NARS of AP countries for their dedication and hard work during this season and for their support to the program.

Special thanks go to the Ministry of Environment and Water in UAE for hosting ICARDA– APRP office in Dubai.

The support and help of ICARDA Management, Programs, Units and Scientists are also highly appreciated.

Dr. Azaiez Ouled Belgacem

Regional Coordinator

ICARDA-APRP

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Annual Report 2015

1 Introduction

ICARDA's Arabian Peninsula Regional Program (APRP) was launched in 1988 with a goal of developing the agricultural sector and conserving the natural resources and environment through scientific research and technology development. In addition, training and capacity building have received special attention within the APRP. The joint efforts by ICARDA and the National Agricultural Research Systems (NARS) of the Arabian Peninsula countries during the previous projects, resulted in six recommended technology packages that address the major constraints to increasing water use efficiency for the production of high quality cash crops and irrigated forages.

The present project titled, "Improving food security and sustainable natural resources management through enhancing integrated agricultural production systems in the Arabian Peninsula" is funded by the Arab Fund for Economic and Social Development (AFESD), and the International Fund for Agriculture Development (IFAD). It began in January 2014 and attempts to ensure the sustainability of APRP achievements and efficient technology packages transferred using the experience and knowledge, which has been accumulated and built up during the previous projects as well as introducing new technology packages to answer the region latest challenges and priorities. This project consists of three major components:

1. Introduction and Adoption of Technology Packages,
2. Problem-solving Research and Impact Assessment,
3. Capacity Building and Institutional Strengthening.

The present document highlights ICARDA and NARS joint activities and achievements during the period from January to December 2015.

2 Introduction and adoption of technology packages

The achievements of ICARDA in the Arab Peninsula (AP) are demonstrated by the useful technology packages developed by APRP in rangeland rehabilitation, irrigated forages, on-farm water management, and protected agriculture. The technology packages will have positive impacts on the welfare of poor farmers in the region, and on the management of natural resources, and the environment.

During the current project inception workshop it was agreed to out-scale four major technology packages, namely

- Indigenous forage species with high water use efficiency and spineless cactus
- Rehabilitation of rangeland through appropriate management techniques, water harvesting, re-seeding and grazing along with monitoring techniques
- Soilless and Integrated Production and Protection Management (IPPM) under protected agriculture;
- Establish demonstration sites for feed block production.

Table 1 presents the number of target (T) and achieved (A) pilot sites for APRP targeted technologies during the reporting period.

Table 1 - Project technology transfer target (T) and Achievements (A) in AP countries during 2015

Targeted technology packages	Bahrain		UAE		Kuwait		Oman		Qatar		S. Arabia		Yemen		Total	
	T	A	T	A	T	A	T	A	T	A	T	A	T	A	T	A
Promote an integrated production system for indigenous forage species with high water use efficiency and spineless cactus to farmers			1	2	1	-	5	5	2	14	2	2	7	6	18	29
Rehabilitation of rangeland through appropriate management techniques, water harvesting, re-seeding and grazing along with monitoring techniques (sites)					1	1					1	2	2	0	4	3
Introduction and adaption of soilless and IPPM packages to NARES and pilot growers	4	2	2	2	2	1	5	7	2	2	2	2	2	3	19	19
Establish demonstration sites for feed block production			1	1			1	-	1		1		2		6	1

2.1 Promote an integrated production system for indigenous forage species with high water use efficiency and spineless cactus to farmers

In **Oman**, the total number of growers adopting Buffel grass increased by 4 and reached 36 pilot growers. The production records show that from 2008 to Dec 2015 the annual average yield for these growers is approximately 19.5 ton/ha/year where it reach a maximum of 23.1 and minimum of 16.2 ton/ha/year. Furthermore, 1,200 Pamphlets have been published and distributed to the farming community on cultivation practices (GAP) of *Cenchrus ciliaris* for fodder production and two posters on *Cenchrus ciliaris* were displayed at agricultural offices throughout the year.

In **Qatar**, the number of growers adopting Buffel grass has increased by 11 growers. The average size of plots in each farm is about 2,000 m^2. Maximum production achieved was 70 ton/ha green matter by Buffel grass variety Bilola. The number of new farms adopting cactus in Qatar reached 3 farms which increases the total number of growers' adopting cactus in Qatar to 7.

Figure 1 - Buffel grass field and harvesting practice in Qatar

Figure 2 - Feeding animals with spineless cactus in Qatar

Figure 3 - Spineless cactus fruits in Qatar

In **Yemen**, one local grower - Mr. Mubarak Gibran - adopted Buffel grass through farmer to farmer extension systems. The extension agents later provided the farmer with some technical backstopping. In spite of exposure to drought as a result of the outbreak of the war in late March 2015, the preliminary results showed that the green fodder yield obtained from Buffel Grass (*Cenchrus ciliaris)* at the first cut reached 25 ton/ha with water use efficiency of 11.905 kg /m^3.

Again in Yemen and in order to improve productivity and diversify animal feed sources through the introduction of indigenous plant species, Butterfly pea (*Clitoria ternatea*) has been introduced to five selected pilot growers. The estimated area is about half a hectare each. The average yield which was obtained per cutting is 6.45 - 7.40 tons/ha with application of 1-2 irrigations for a period of 35-60 days. The water productivity ranged between 2.91.5 kg/m^3 and 5.471 kg/m^3.

Figure 4 - Butterfly pea (*Clitoria ternatea*) was introduced to five selected pilot growers in Yemen

2.2 Rehabilitation of rangeland through appropriate management techniques, water harvesting, re-seeding, grazing along with monitoring techniques

Rehabilitation of rangeland activities were conducted in **Kuwait**, **Saudi Arabia**, and **Yemen**. More detailed reporting on this activity is presented under adaptive research activities.

In the **Kingdom of Saudi Arabia** (KSA), 9 ha of rangeland were selected in two pilot farms where indigenous plant species were planted under different water harvesting techniques and designs. In addition, water harvesting and supplementary irrigation for 2 ha of rangeland at one pilot farm were planted with six fodder crop species and supplied with drip irrigation system.

Figure 5 - indigenous plant species were planted under different water harvesting techniques at two pilot farms in Saudi Arabia

2.3 Introduction and adaption of soilless and IPPM packages to NARES and pilot growers

In **Bahrain**, soilless production systems were introduced to two new pilot farms. One of the growers began to expand this technology package to other greenhouses at the farm following the success of hydroponics from the last season.

Figure 6 - Field day on soilless production system in Bahrain

Figure 7 - Cherry tomato in hydroponics in Bahrain

In the **United Arab Emirates** (UAE), two new pilot growers adapted the soilless and IPPM technology packages. The adaptive research activities have resulted in improved production of cucumber when perlite is used inside pots compare when the canals completely fill with the perlite. This approach was evaluated in the same greenhouse with the same management practices over two seasons. Production increased by 13% with less media which reduced the cost of production.

Similarly the productivity of cucumber inside net houses and cooled GH were studied in UAE during the two cropping seasons. The results are presented in the graph below.

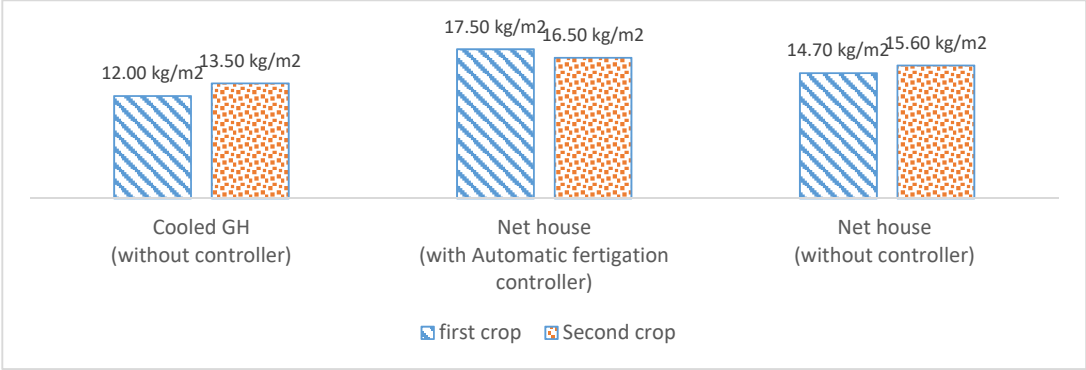


Figure 8 - Comparing the cucumber yield under net house and cooled greenhouse over two seasons in UAE.

Figure 9 - Cucumber planted in soilless production system, UAE

In **Oman**, seven (7) new pilot growers adopted the soilless and IPPM packages under protected agriculture. All growers used closed production systems for cucumber crops. Water productivity levels of 92kg/m^3 were achieved under these production conditions.

In **Qatar**, two new pilot growers adopted the soilless production system in their farms. Both farms are using gravel media for the production of tomato and cucumber. The production records have not been posted for 2015. However, the farmers adopted this technology package before and are producing encouraging results. The following Figure shows water and land productivity of tomato in a private farm in Qatar.

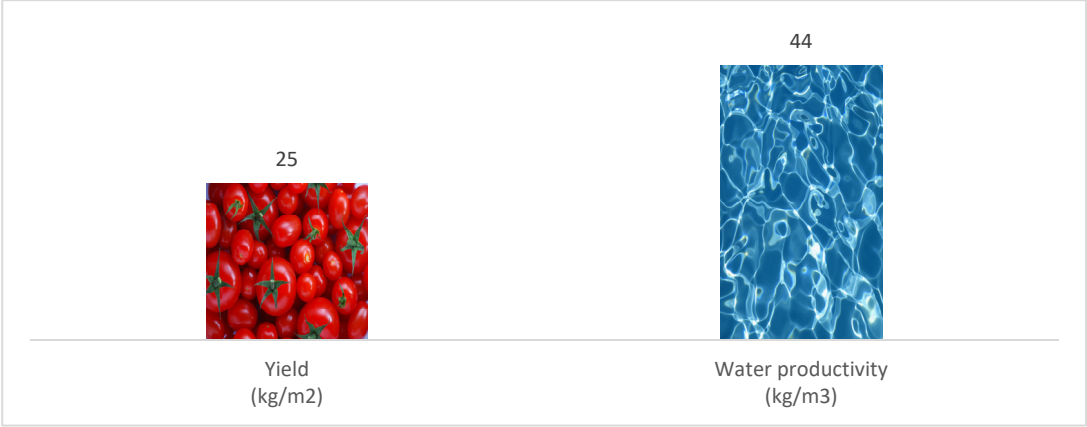


Figure 10 - Water and land productivity of tomato in Qatar at farmer's field during 2014-2015 growing season using soilless closed system with perlite

In **Kuwait**, the number of pilot growers adopting the soilless production system increased by one, but construction and preparation has started for a further 4 growers to adopt this technology.

In **Saudi Arabia**, two new private farms have been developed during the reporting period. Both sites were planted by cucumber seeds. Perlite bags are being used in one of the site instead of pots.

Figure 11 – Soilless system production using perlite bags in a grower's farm in Saudi Arabia

In **Yemen**, the soilless production system was adopted in a private farm approximately 95 km from Sana'a. The production was managed by growers with technical support of NARS researchers who were trained previously by ICARDA. The production records provided by growers and comparison with other greenhouses in the farm using only IPPM indicating the following:

- Water productivity in soilless system was higher by more than 3 times;
- Yield (kg/m^2) of cucumber is 34% higher in soilless system;
- Cost of production in soilless is 28% lower compare to IPPM which is mostly due to lower costs in soil sterilization, irrigation, pesticide and labors. The depreciation cost of growing canals was included in this calculation. However, the capital cost for growing canals is still high.
- Net income in soilless is more than 240% higher than soil production system with IPPM.

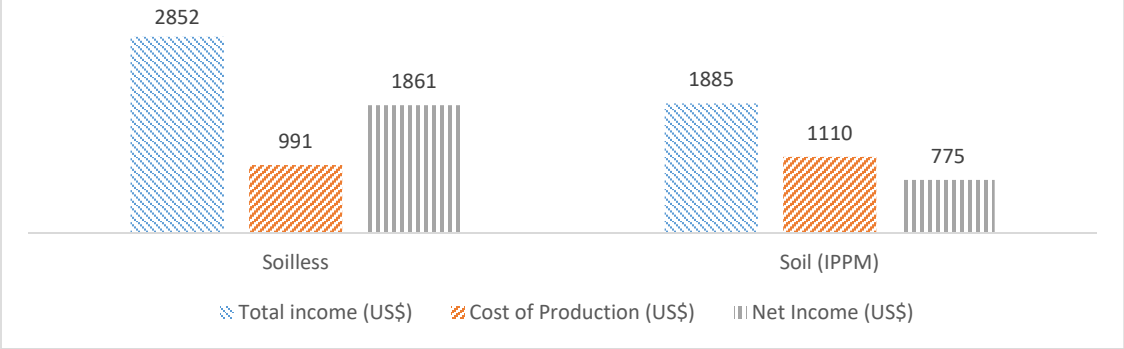


Figure 12 - Comparison of Income, cost of production and net income of cucumber crop in soil (IPPM) and soilless system in Yemen during 2014-2015 growing season (greenhouse size 408m^2)

Figure 13 - Soilless production system at farmer field in Yemen.

Figure 14 - Field day in Yemen, local government officials visit the greenhouse

Furthermore, two growers adopted the IPPM technology package in Yemen. The production records indicate that the production was the same in IPPM and control greenhouse. However, in the control GH growers had to spray 29 times compared to three times in IPPM. As a result the cost of production was significantly lower in IPPM where growers managed to obtain 21% higher net benefit.

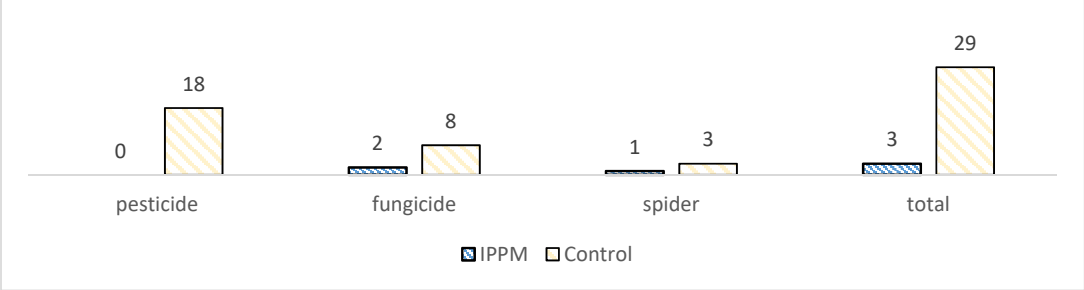


Figure 15- Number of agro-chemical sprays IPPM and Control GH in Yemen 2015

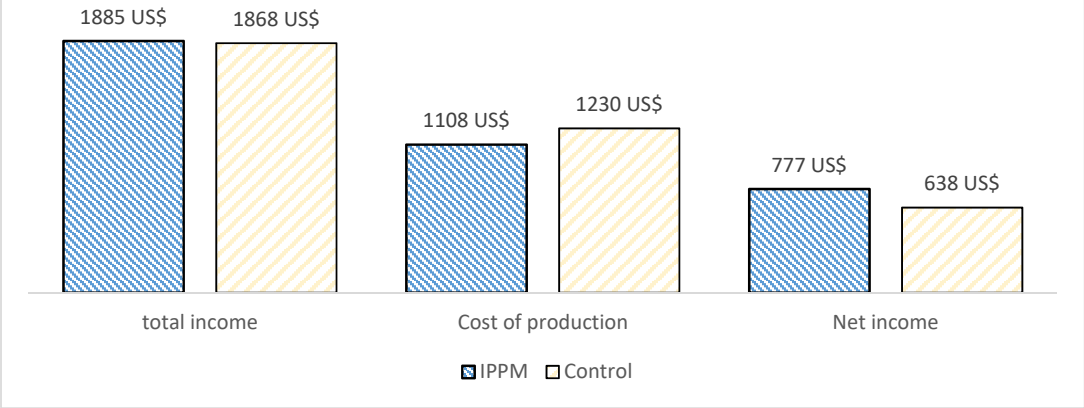


Figure 16 - Comparison of total income, cost of production and net income for cucumber under IPPM and conventional production system under protected agriculture in Yemen 2015

2.4 Establish demonstration sites for feed block production

In **UAE**, one feed block unit was established at Al Dhaid Agricultural Research Center as a joint collaboration with the Ministry of Environment and Water. Different formulas for feed blocks production from locally available materials that include Buffel grass, date palm residues, spineless cactus, and quinoa were evaluated.

Figure 17 - Feed block production in UAE

In **Oman**, after the establishment of the feed block unit in the Agricultural Research Center, more than 8000 Feed Blocks have been produced and distributed among growers as of November 2015.

Figure 18 – in Oman, more than 8000 Feed Blocks has been produced and distributed among growers until November 2015

3 Problem solving research

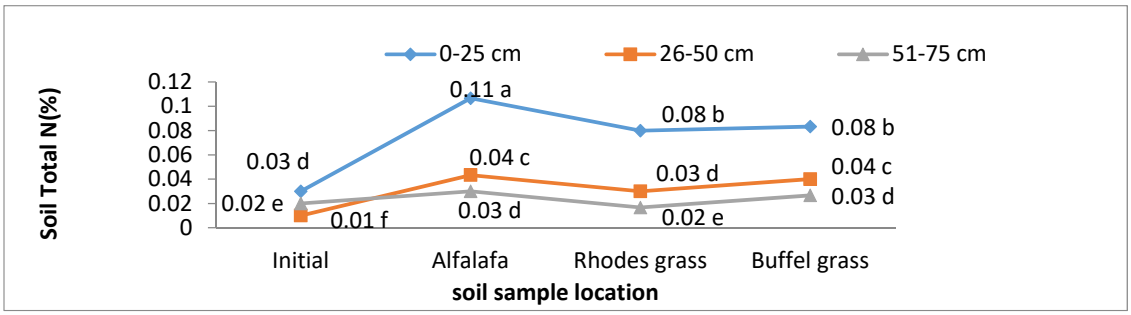
To answer the pilot growers' constraints as well as enhance and further develop technologies which are targeted by the project, ICARDA scientists in collaboration with NARS researchers carried out a number of adaptive research activities either at research stations or at pilot growers' farms. Table 2 highlights the research activities jointly carried out by ICARDA-APRP and NARS during 2015.

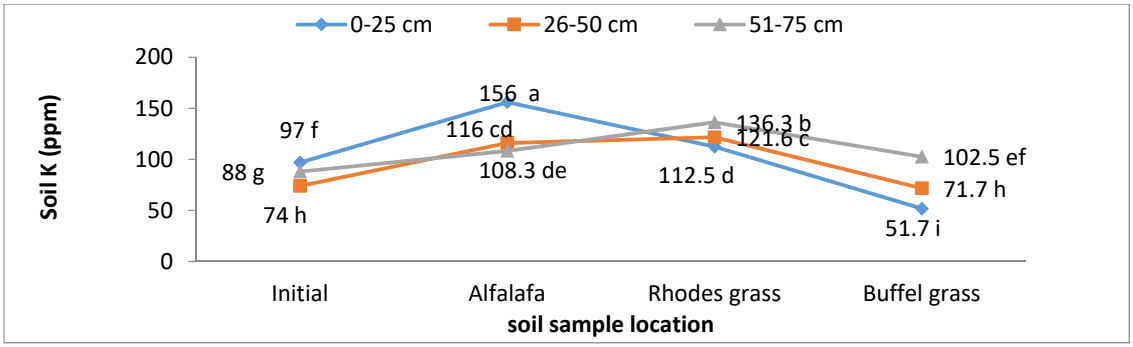
Table 2 - Research activities jointly carried out by ICARDA-APRP and NARS during 2015, based on the work plan.

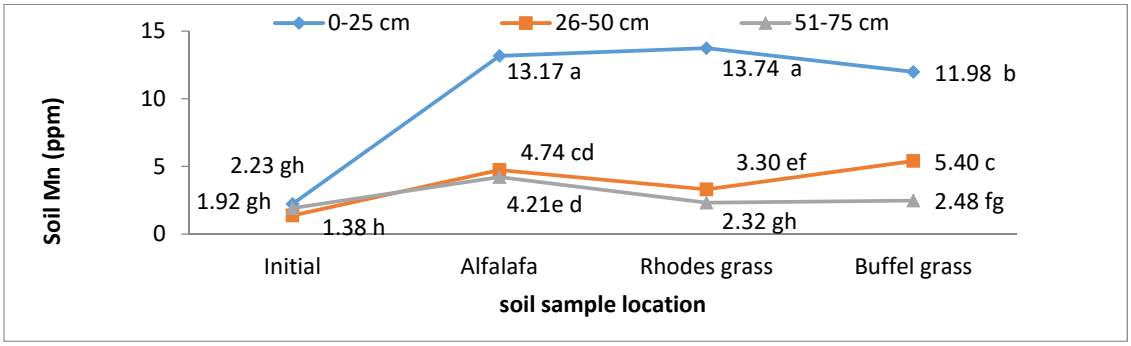
Adaptive research activities	Countries
Safely utilize and improve efficiency of Treated Waste Water (TWW) for irrigation the forages (soil, water & plant sample analysis)	Bahrain, UAE, Oman
Develop animal feed calendar using indigenous forage species, spineless cactus, and alternative feed resources	Oman, Yemen
Study the availability of agricultural and agro-industry by-products	All Countries
Develop participatory management and rehabilitation techniques of degraded rangeland	Saudi Arabia, Yemen
Monitoring and assessment of rangeland condition in selected sites within AP countries using new technology	Kuwait
Enhance water use efficiency through further development of soilless production systems	All countries

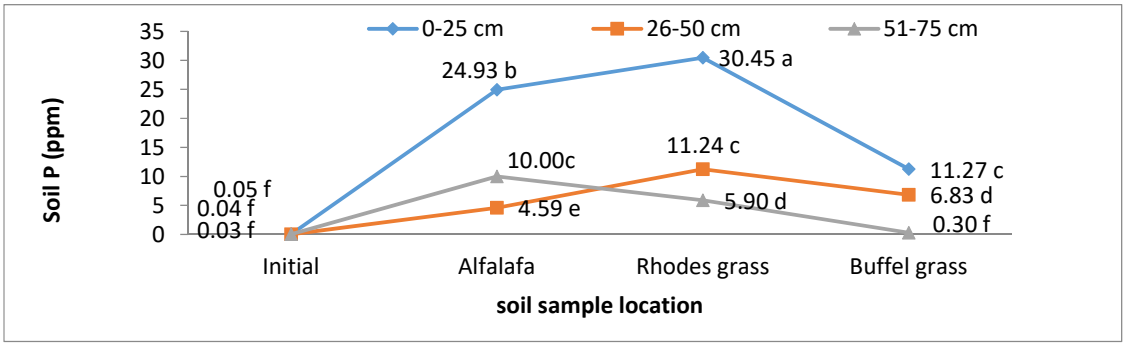
3.1 Safely utilize and improve efficiency of TWW for irrigation the forages (soil, water and plant sample analysis)

In **UAE**, in order to investigate the effect of recycled wastewater effluent on soil chemical properties and heavy metal uptake of selected forages, an experiment was undertaken at Dhaid Research Station, UAE during 2014-2015. Alfalfa, Rhodes and Buffel grass were irrigated using recycled wastewater and grown in a randomized complete block design with four replications. Four composite soil samples from three random spots for three soil layers (0-25, 26-50 and 51-75 cm) were collected from the experimental site before the start of the study and after 21 months from planting date to assess the status of macro and heavy elements in the soil, and in forages tissues and measure yields. Chemical analysis included soil nutrients and wastewater parameters (EC, Na, Ca, Mg, OM, P and K) and heavy metals (Cu, Pb, Zn, Ni, Cr, Co, Fe, Hg). Recycled wastewater irrigation significantly increased soil chemical properties especially in the surface layer (0-25 cm) and crop nutrient content. Results suggest that Sharjah effluent is suitable to be used for irrigation forages as its quality conforms to international standards for wastewater irrigation except Na and Cl. After 21 months of irrigation using recycled wastewater irrigation the soil salinity EC increased in the soil profile by 223, 418 and 299% for soils grown with Buffel, Rhodes and alfalfa crops, respectively, in comparison to soil salinity before planting date. The highest total dry weight yield from 14 cuts during the study period was recorded for Buffel grass (91.04 ton ha^{-1}) followed by Rhodes (74.46 ton ha^{-1}) and Alfalfa (13.63 ton ha^{-1}). Irrigation with wastewater has shown significant increases in zinc, iron and molybdenum in soil and copper and iron in the plant tissues; however, the concentration of all elements in soil and plants were lower than toxicity thresholds except iron and Ni (source of Ni was soil and irrigation water) in the plant tissues. ICARDA recommends regular monitoring of recycled wastewater and soils and appropriate management is required to mitigate the negative impacts of sodium and salts accumulations through leaching of these salts from the soil.









Total N%	a–f, P < 0.05, LSD=0.005	K	a–i, P < 0.05, LSD=8.1
Mn	a–h, P < 0.05, LSD = 1.04	P	a–f, P < 0.05,LSD=1.23

Figure 19 - Nutrient accumulation in soil profile planted with different forages in comparisons to the initial conditions

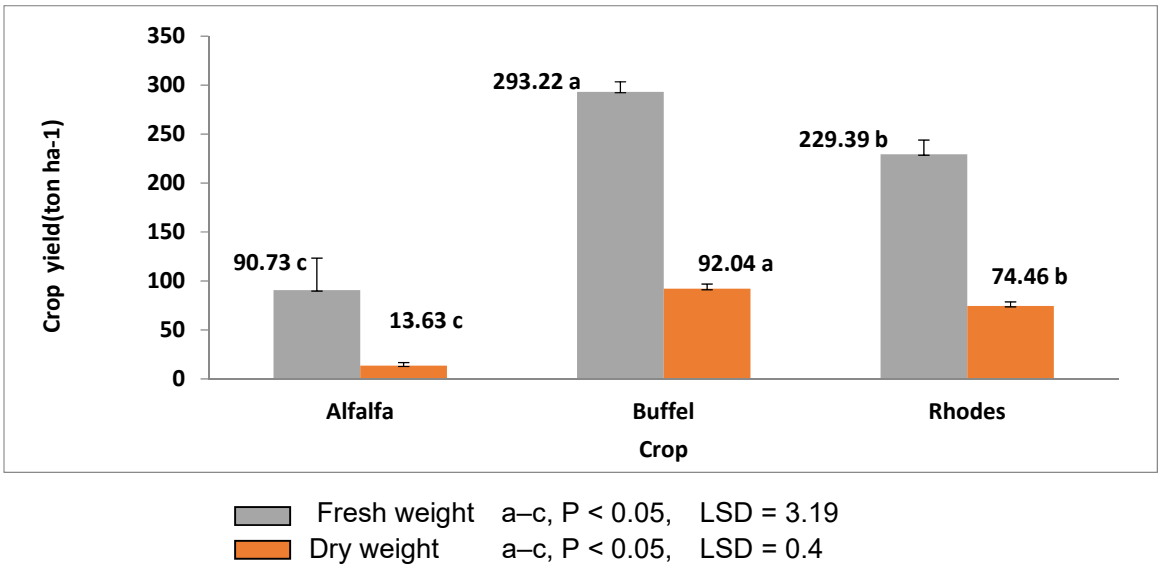


Figure 20 - Total fresh and dry yield weight for different forage crops irrigated with recycled wastewater during 2014-2015 growing seasons.

Figure 21 - Soil and crop sampling and recording of yields

In **Bahrain**, soil samples are being collected at sites where there has been long term use of TWW to assess changes in key elements associated with the irrigation of these marginal quality waters.

In **Oman**, an experimental design was prepared on the effect of using TWW on forages yield, heavy metal accumulation in crop tissues and soil chemical properties. The study will start after ensuring the availability of a fresh water resource (the control treatment) at the experimental site at the Agricultural Research Station. Literature regarding the use of treated wastewater from previous studies has been collected and a review report is under preparation.

3.2 Develop animal feed calendar using indigenous forage species, spineless cactus, and alternative feed resources

After the Feed Blocks units had been installed in Oman, different feed formulations were evaluated for hardness and compactness of the feed blocks. Palpability also was tested using number of animals at the research station.

Finally two formulates for medium hardness and high compactness were selected to be produced at scale. These formulations are comprised of 95% local ingredients.

Table 3 - : Feed blocks formulations produced and tested for Hardness and Compactness

Ingredients	Formula1	Formula 2
Dates not suitable for human consumption	25%	25%
Dry Sardine Fish	8%	7%
Wheat Bran	34%	37%
Whole barley Grains	5%	5%
Dibis	5%	5%
Urea	4%	4%
CaSo4(Plaster of Paris Gypsum)	2%	5%
Bentonite Clay	6%	7%
Quick Lime	6%	0%
Minerals & Vitamins Premix	0.2%	0.2%
Salt	4.8%	4.8%

3.3 Study the availability of agricultural and agro-industrial by-products

Questionnaires to collect relevant data have been developed (Annex 1), pre-tested and sent to all AP countries which are still being completed.

3.4 Develop participatory management and rehabilitation techniques of degraded rangeland

In Saudi Arabia, ICARDA experts in collaboration with KSA NARES selected five hectares at Bita Research Station in September 2015 in order to implement the proposed water harvesting trial to study performance of six native rangeland plants under three water harvesting techniques (semi-circle, V shaped and Nigari) using an equal area of catchment: to cultivated area ratio of 8:1 for all treatments which was calculated using the following equation:

$$\frac{C}{CA} = \frac{(WR - DR)}{DR \times RC \times Eff}$$

Where;

C: cultivated area (m^2)

CA: catchment (m^2)

WR: crop water requirements (mm)

DR: Design rainfall (mm)

RC: runoff coefficient (0.1 to 0.5)

Eff: water harvesting efficiency factor (0.5 - 0.75)

A split plot design is being used with three replicates of each treatment. This study, which aims to compare the performance of different native species under 3 different water harvesting techniques, is continued. The output will be used for selecting the best grass species and water harvesting techniques for rangeland rehabilitation in similar condition.

Figure 22 - Water harvesting techniques after the first precipitation event at the experiment site.

3.5 Monitoring and assessment of rangeland condition in a selected site using new technology

In **Kuwait**, monitoring-assessing the dynamics of plant cover attributes in a rehabilitated degraded rangeland site at Al-Warf was developed in close collaboration between ICARDA and Public Authority for Agricultural Affair and Fish Resources (PAAAFR) and aims at monitoring the changes in the vegetation cover during several seasons through testing different techniques. Different techniques such as transects, quadrats and plots were established for measuring plant cover, species composition and species density and frequency. The preliminary results showed that total cover was typical of desert areas, with values ranging from 4.1–4.9%. The bulk of this cover is mainly composed of perennial grasses such as *Centropodia forskalii*, Cyperus *conglomeratus* and *Stipagrostis plumosa*. Exclusively dependent on the rainfall occurrence, a total of 12 annual species were recorded in the whole site, although half of them were considered rare. *Brassica tournefortii* and *Schismus barbatus* were the most dominant annual species.

3.6 Enhance water use efficiency through further development of soilless production systems

In **Oman**, cooled greenhouse (270 m^2) and shade net house (270 m^2) were used to evaluate the performance of cucumber production using soilless growing techniques (closed system) for two planting seasons (November-February) and (March-May). Four varieties of cucumber were used, namely Alexandra F1, Dipo F1, Reema F1 and Kirto F1. In the first planting season (November-February) no significant differences were observed in cooled greenhouse and shade net house in number of fruits per m^2, average fruit weight and yield kg/m^2 in all varieties in both cooled greenhouse

and shade net house. With regard to second planting (March-May) significant differences ($p<0.05$) were recorded between cooled greenhouse and shade net house in number of fruits/m^2, average fruit weight (gm) and yield kg/m^2. Fruit number/m^2 varied from 89 to 101 and cooled greenhouse gave more fruit number /m^2 (101). However, heaviest fruit weight (gm) was produced by shade net house (109.3gm). The highest yield was achieved with the cooled greenhouse (10.74 kg/m^2) whereas shade net house produced 9.62 kg/m^2.

In **Qatar**, studies on different high value vegetable production under soilless production systems are continuing. In the first growing season tomato, cucumber, pepper and strawberries placed in different growing system. In this respect cucumber and strawberries were planted in perlite while tomato and pepper in gravel. The productivity in gravel was lower than the previous records of production in perlite. For example tomato production in perlite has a record of 19 kg/m^2 in Qatar, while in gravel the productivity declined to 12 kg/m^2. In the second season all media was changed to perlite. The second season production have not yet completed. However, the yield and production for first season are presented below.

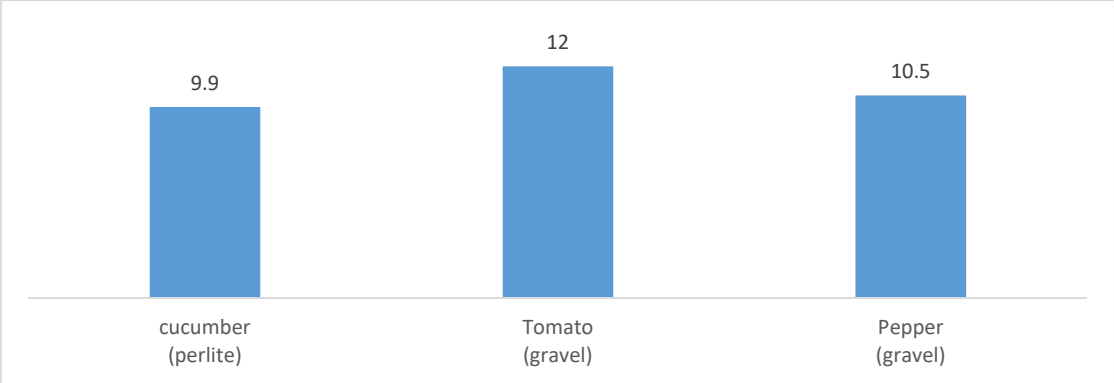


Figure 23 - Cucumber, Tomato and Pepper yield (kg/m^2)

Figure 24 - Pepper production in soilless system in Qatar

In **Saudi Arabia**, the water productivity of green beans under protected agriculture was undertaken. The plants were transferred to a poly carbonate cooled green house (9x40 m) on 30th November 2014 and study was continued in 2015. The yield and water productivity reached to 4 kg/m^2 and 13 kg/m^3, respectively. There are no records for green beans yield in Saudi Arabia. However, ICARDA previous studies show that the average yield and water productivity of green beans in the region is about 5kg/m2 and 11kg/m3 respectively.

4 Capacity Building and Institutional Strengthening

ICARDA-APRP organized a number of field days, workshops and seminars during the visits of ICARDA scientists to the different AP countries (Table 4). During these events ICARDA-APRP scientists provide technical back stopping and hands on training to more than 100 Researchers, Extension Agents and growers from the region. Furthermore, ICARDA-APRP organized two regional training workshops on integrated crop-livestock rangeland system and on soilless and greenhouse management. ICARDA management visited Qatar to strengthen the institutional ties between the center and the countries and to discuss the Global Drylands Alliance.

Table 4 - ICARDA visits to APRP participating country

	Scientists	Period	Country
1	Dr. Ahmed Moustafa	30-31 Jan 2015	Kuwait
2	Dr. Azaiez Ouled Belgacem	17-19 Feb 2015	Kuwait
3	Dr. Ahmed Moustafa	17 - 19 Feb 2015	Bahrain
4	Dr. Ahmed Moustafa	23 Feb - 12 Mar 2015	UAE, Oman, Qatar
5	Dr. Azaiez Ouled Belgacem	24-26 Feb 2015	Bahrain
6	Dr. Arash Nejatian	24 Feb - 02 Mar 2015	Bahrain
7	Dr. Ahmed Moustafa	23 - 27 Mar 2015	Kuwait
8	Dr. Ahmed Moustafa	27- 30 Mar 2015	Dubai -UAE
9	Dr. Azaiez Ouled Belgacem	30Mar - 01 Apr 2015	Muscat - Oman
10	Dr. Naem Mazahrih	29-31 March 2015	Bahrain
11	Dr. Ahmed Moustafa	23 May - 02 June 15	UAE & Saudi Arabia
12	Dr. Azaiez Ouled Belgacem	22 - 26 May 2015	Saudi Arabia
13	Dr. Azaiez Ouled Belgacem, Dr Morad Rekik and Dr Ahmed Amri	9-11 May	Qatar
14	Dr. Ahmed Moustafa	15 - 16 June 2015	Muscat - Oman
15	Dr. Ahmed Moustafa	17 - 19 June 2015	Dubai - UAE
16	Dr. Naem Mazahrih	14-16 September 2015	Saudi Arabia
17	Dr. Azaiez Ouled Belgacem Dr. Naem Mazahrih Dr. Arash Nejatian	Many field visits	UAE

4.1 Training course on integrated crop-livestock rangeland system, Oman, October 2015

ICARDA-APRP, in collaboration with the Ministry of Agriculture and Fisheries in Oman (MAF), organized a training workshop on “Integrated Crop-Rangelands- Livestock Production Systems” in Oman from 5-7 October 2015 where 15 participants from AP countries participated. Please see the training program and list of participant as Annex 2.

Exploiting the well-integrated crop and livestock systems with close connection to rangeland inputs is one of the powerful entry points to enhance and utilize the capacity of both animal and crop production systems. The integration of crop and livestock production systems increases the diversity, along with environmental sustainability, of both sectors. At the same time, it provides opportunities

for increasing overall production and economics of farming. This would reduce the preference for specialized livestock production systems, in view of their problems with environmental and economic sustainability.

One of the main focuses of ICARDA-APRP in the region is to increase the resilience of production systems and livestock under absolute water scarcity and climate change condition by enhancing the rangelands, forage, crop by-products and livestock integration. This training workshop comprised theoretical and practical sessions on the crop-livestock integration concepts with a focus on ICARDA-APRP targeted technologies including rangelands, indigenous irrigated forages, spineless cactus and feed blocks.

Figure 25 - Integrated crop-livestock rangeland system training course, OCT 2015

4.2 Training course on soilless and greenhouse management, Qatar, November 2015

ICARDA in collaboration with the Ministry of Environment and SAIC, organized a specialized training course on Integrated Management of Protected Agriculture and Soilless Culture in Qatar from 15 to 19 November 2015. A total of 27 participants from seven AP countries participated in this training course.

In Dry areas especially the Arabian Peninsula (AP), agriculture and food production is a challenge, due to harsh climatic conditions, scarcity of water and poor soils. Protected Agriculture (PA) has shown great potential for producing highly nutritious fruit and vegetable crops that are essential for a healthy and balanced diet. Protected agriculture (PA) with its associated modern techniques that include soilless culture could substantially increase water productivity with no or minimal quantities of agro-chemicals. Using such techniques would considerably save water and land.

High quality products require high quality management throughout all production steps. Modern management techniques under PA such as integrated production and pest management (IPPM), and soilless (Hydroponics) production system would significantly improve water and land productivity of high quality crops under PA.

Figure 26 - Training course on soilless and greenhouse management, Qatar, November 2015

4.3 First Regional Technical Cooperation (RTCM) and Steering Committee (RSCM) Meeting, Dubai, 4-7 January 2015.

ICARDA-APRP organized its 1st Regional Technical Coordination Meeting and Regional Steering Committee meeting in Dubai, UAE; during the period between 4 and 7 Jan 2015 where about 40 scientists, researcher and extension agents from 7 Arabian Peninsula countries and ICARDA participated (list of participants and program – annex 4)

Figure 27 -Participants of ICARDA-APRP 1st regional technical coordination meeting

The opening session was inaugurated by H.E. Eng Saif Al Shara, Under Secretary, Ministry of Environment and Water, UAE and Dr Kamil Shideed, ICARDA-ADG IC, attended by number of scientists and researchers from different organization including, FAO, Abu Dhabi Food Control Authority, ICBA, and UAE University.

H.E. Eng Saif Al Shara, on his behalf and on behalf of H.E. Dr Rashid Bin Fahad, the Minister of Environment and Water welcomed all participants and expressed his best wishes for a successful meeting.

HE Eng Saif referred to the challenges facing the development of agricultural sector in the Arabian Peninsula such as water scarcity, and low land fertility in addition to the high rate of population growth. These challenges, said H.E. Saif, reflect the needs of providing more food and the importance of the use of modern technology in agriculture. Introducing modern production techniques,

supporting agricultural development and providing technical backstopping for technology transfers are seen as the main task of scientific and international organizations such as ICARDA, by H.E. Saif.

H.E added that the most promising solution, introduced by ICARDA and applied in Emirates by MEW, for addressing the water scarcity is soilless culture which resulted in a significantly increase of yield at high levels while conserving natural resources, especially water.

With this context, H.E said, MEW cooperates with the International Center for Agricultural Research in the Dry Areas (ICARDA) through implementation of several research activities related to agricultural development under the Arabian Peninsula Regional Program framework. HE Eng Saif pointed out that this meeting aims to develop and improve the packages of appropriate technologies for the AP environment to increase plant and animal production and enhance cooperation with agriculture research institutions in addition to the exchange of experiences in the areas of modern agricultural technology transfer.

H.E Eng Saif ended his opening words by thanking ICARDA's outstanding cooperation with the Ministry of Environment and Water. He also appreciated ICARDA-APRP team efforts for preparing and organizing the meeting. He thanked the participating delegations from different countries and wished them a success meeting and a pleasant stay.

In his opening statement Dr Kamel Shideed acknowledged and appreciated the hospitality of Emirates and the Ministry of Environment and Water specifically H.E. Dr. Fahd Bin Rashid, the Minister, for hosting and supporting ICARDA Office and the meetings. Furthermore, he thanked H.E. Eng Saif Mohamed Al Shara, the Undersecretary for Agricultural and Animal Affairs, for opening the meetings. Dr Shideed welcomed all participants and head of delegations of the seven participating countries. Dr Shideed also thanked the donors of the project, the Arab Fund for Economic and Social Development (AFESD), and the International Fund for Agricultural Development (IFAD) for their continuous support.

The global demand on food will increase by 60% by 2050, said Dr Shideed in his opening statement, due to population growth while the arable land will be increased by 10% only through intensive agriculture and expansion of agricultural land which is very limited. This means that land productivity should increase annually at least by 1.1 to 1.3% to cover the deficit demand for food. This can be achieved by increasing production through widely adopting new production systems and modern techniques especially among small farmers and increasing investments in agricultural applied research and development. Thus, any poverty reduction strategy should focus on agriculture development which is considered as machine key engine for economic growth in many developing countries in the dry areas.

Dr Shideed mentioned that the ICARDA Arabian Peninsula Regional Program (APRP) is an effective and serious contribution to the development of an integrated and sustainable production systems under conditions of the Arabian Peninsula which is characterized by limited natural resources, especially water and agricultural land. He summarized the objectives of the annual meeting as follow:

- Discuss and develop the 2015 work plan for the project "Improving food security and sustainable natural resources management through enhancing integrated agricultural production systems in the Arabian Peninsula";
- Discuss the achievements of the project during 2014;
- Present and discuss the activities, achievements and success stories of ICARDA other projects and works in other dry areas applicable for the Arabian Peninsula.

- Implement the Project Steering Committee meeting to review the achieved results and to approve the work plan and budget for the year 2015.

At the end of his speech, Dr Shideed, thanked again the MEW for hosting the meeting and expressed his gratification for the Abu Dhabi Food Control Authority (ADFCA) become a CGIAR member.

4.4 Second Regional Technical Cooperation (RTCM) and Steering Committee (RSCM) Meeting, Bahrain, 6-9 December 2015.

Figure 28 - Participants at 2nd regional technical coordination meeting

ICARDA-Arabian Peninsula Regional Program (APRP) organized its 2nd Annual Regional Technical Coordination Meeting (RTCM) and Regional Steering Committee Meeting (RSCM) for the project.

The meetings were held in Manama, Bahrain where the RTCM was scheduled from 6 to 8 December and the RSCM was convened on 9 December 2015. Meetings was jointly organized by ICARDA-APRP and the Ministry of Municipal Affairs and Urban Planning, Bahrain (list of participants and program – Annex 5).

The meeting opening session attended by 50 participants from different national and international institutes and inaugurated by H.E. Salman Abdul Nabi, under sectary for agricultural affaires, MMAUP opening speech. H.E. Undersecretary welcomed all participants to Bahrain and expressed MMAUP gratitude toward the joint venture with ICARDA. Adoption of soilless production system, said H.E. Abdul Nabi, increased crop production up to five times at pilot sites.

This was followed by Dr. Kamel Shideed, ICARDA-ADG International Cooperation and Communications whose presentation was titled, "Challenges of the 21st Century and Importance of Investment in Agricultural R4D: Implications for AP Region". Dr. Shideed explained ICARDA activities and achievements in close partnership with NARS with focus on AP region to tackle the challenges facing Agricultural R4D. The new Strategy and Result Framework of CGIAR also enlightened by Dr. Shideed as: 1) Reduced poverty; 2) Improved food and nutrition security for health; 3) Improved natural resource systems and ecosystem services.

The meetings were followed by a field visit where participants visited a number of project pilot farms and activities in Bahrain.

Figure 29 – Field day to enhance partnership with Bahrain

H.E. Sheikh Khalifa Bin Isa Al- Khalifa; Undersecretary for Agriculture and Marine Resources, received in a side meeting during the RTCM, Dr Kamel Shideed; ICARDA ADG-IC, accompanied by Dr. Azaiez Belgacem ICARDA-APRP RC and Dr. Mohamed Abdelgadir IFAD representative in presence of Eng. Isam Mustafa Abdul Razaq, Director of plant wealth. During this meeting, the enhancement of collaboration between Bahrain and ICARDA was discussed. The main orientation of the discussions was about the establishment of tissue culture and soil/water analysis Laboratories, as well as a Gene bank in Bahrain and controlling the Red Palm weevil. Human resources development was also discussed during the meeting as mutual interests for expansion of collaboration between two parties.

Figure 30 - H.E. Sheikh Khalifa Bin Isa Al- Khalifa; Undersecretary for Agriculture and Marine Resources, received Dr Kamel Shideed. Dr Azaiez Ouled Belgacem, RC-ICARDA APRP, and Dr. Mohamed Abdelgadir, IFAD representative participated in the meeting.

4.5 Discussion on the Global Dryland Alliance in Doha, May 2015

His Excellency Ambassador Bader Omar Al Dafa, Executive Director of Global Dryland Alliance (GDA) received Dr. Mahmoud Solh, ICARDA Director General at his office in Doha on 19 May 2015. Dr. Solh, in this visit was accompanied by Dr. Kamel Shideed, ICARDA ADG-International Cooperation and Dr. Azaiez Ouled Belgacem, Regional Coordinator, ICARDA-APRP.

Figure 31 - His Excellency Ambassador Bader Omar Al Dafa, Executive Director of Global Dryland Alliance (right) received Dr. Mahmoud Solh, ICARDA Director General (center) and Dr. Kamel Shideed, ICARDA-ADG ICC at his office in Doha, 19 May 2015

H.E. the Ambassador Al Dafa, welcomed Dr. Solh and the ICARDA delegation to Qatar. In return, Dr. Solh expressed his special thanks for arranging this meeting and inviting ICARDA to attend the first ministerial conference of GDA to be held in Marrakech, Morocco on 29-30 May 2015.

Dr. Solh also explained ICARDA's programs with focus on its new decentralization policy and more specifically its platform in Morocco. Dr. Solh also highlighted the recommendations and outputs of his meeting with H.E. the Minister of Environment in Qatar on further joint work on genebanks, livestock, and protected agriculture. In this context, Dr. Shideed presented some documents and publications of ICARDA in terms of increasing food security while sustainably using natural resources in the dry areas. These included the book published jointly by ICARDA and the Qatar National Food Security Program entitled: "The agricultural sector in Qatar: Challenges and Opportunities".

At the end of the meeting, the importance of ICARDA to be more involved in the GDA activities was agreed by both parties, starting from the first Ministerial Conference which will be held in Morocco where ICARDA should provide and follow up technical recommendations based on its research achievements and expertise in the dry areas.

4.6 Strengthening the ties between the Ministry of Environment of Qatar and ICARDA

H.E. Mr. Ahmad Amer Alhemaidi, Qatar Minister of Environment (MoE), received Dr. Mahmoud Solh, ICARDA Director General, at his office in Doha on 18 May 2015. Dr. Solh was accompanied by Dr. Kamel Shideed, ICARDA ADG - International Cooperation and Dr. Azaiez Ouled Belgacem, Regional Coordinator, ICARDA-APRP on this visit. The meeting also was attended by Eng.

Figure 32 - H.E. the Minister of Environment (MoE), Qatar received Dr. Solh ICARDA, DG at his office on 18 May 2015 (Left). The Meeting also was attended by Eng. Masoud J. Al-Marri, Director of Agricultural Department, MoE and Dr. Kamel Shideed, ICARDA-ADG ICC

Masoud J. Al-Marri, Director of Agricultural Department and Mrs. Mona Al Bakri, Director of International Cooperation. Enhancement and further expansion of the joint research for development activities of ICARDA and the Ministry of Environment (MoE) in Qatar was the main focus of the discussions. Dr. Solh started by congratulating the State of Qatar on the success of the Prince initiative in the establishment of Global Dryland Alliance (GDA). Following this, Dr. Solh provided a brief on ICARDA activities in the region with the focus on collaboration with Qatar through two ICARDA programs, namely APRP and Date Palm Project. Dr. Solh also highlighted the importance and the benefits of joining CGIAR for the state of Qatar. In return, H.E. the Minister emphasized on the necessity of taking advantage of the ICARDA experiences for Qatar as well as GDA. His Excellency expressed the priority areas of cooperation between MoE and ICARDA that included: Preservation of genetic resources; Development of livestock and animal feed resources; Soilless production system; and use of treated waste water as well as training farmers and developing their know-how to adopt the new techniques. At the end of the meeting, it was agreed that two ICARDA experts in the field of genebanks and livestock should visit Qatar as soon as possible. In addition, a joint collaborative program to be developed with specific objectives and work plan to cover the MoE priority areas. Furthermore, Qatar will access the benefits of CGIAR membership and the possibility of Qatar to join the CGIAR.

4.7 ICARDA scientists visited Qatar 9-11 June 2015

Following up the recommendations of the meeting between H.E. Mr. Ahmad Amer Alhemaidi, Qatar Minister of Environment (MoE); and Dr. Mahmoud Solh, ICARDA Director General; in 18th May 2015; a delegation from ICARDA traveled to Qatar during the period between 9 and 11 June 2015 to provide advice on the implementation of a genebank and on reproduction and small ruminants flocks mortality and to discuss areas of mutual interests for future collaboration between the Department of Agricultural research and ICARDA and develop a concept note for strengthening research in various dimensions.

Figure 33 - H.E. Sh. Dr. Faleh Bin Naser Al Thani, Undersecretary Assistant for Agriculture Affairs and Fisheries Resources received ICARDA delegation at his office on 11 June 2015

ICARDA's delegation was consisted of Dr Ahmed Amri, Head of Genetic Resources and Deputy Director BIGM program; Dr Mourad Rekik, Livestock Scientist; and Dr Azaiez Ouled Belgacem, Regional Coordinator and Rangeland and Forage Scientist, ICARDA-APRP.

During this visit, ICARDA delegation had a number of meetings with high official from Ministry of Environment including H.E. Sh. Dr. Faleh Bin Naser Al Thani, Undersecretary Assistant for Agriculture Affairs and Fisheries Resources, and Eng. Masoud Al Merry, the Director of Agricultural Research. In addition to a number of private farms, ICARDA scientist visited several research facilities in Qatar including: Biotechnology research center and laboratories; Al-Ottoria research station and Al-Khriba station. Base on the observations a number of recommendations were provided and follow up activities discussed.

4.8 Knowledge sharing in regional meetings and publications

4.8.1 Presentations at regional meetings

- Dr. Azaiez Ouled Belgacem represented ICARDA at the World Food Security Summit in Dubai on 9 February where he participated in a panel discussion under the title Improving Domestic Food Production While Preserving Water.
- Global Forum for Innovation in Agriculture: the event was held in Abu Dhabi, March 9-10, 2015. ICARCA presented its research for development activities and organized two round tables on the use of treated waste water and desalinated irrigation water in agriculture. In addition to ICARDA DG and ADG-ICC, five ICARDA scientists participated in different activities at this event. The CGIAR also participated in this event.
- The Third International Conference on Water, Energy and Environment (ICWEE), American University of Sharjah, UAE, March, 24-26, 2015. Dr. Naem Mazahrih represented ICARDA in this event and presented a paper entitled “Growing less Water Consuming Forage in the Arabian Peninsula“.
- Bahrain Garden Show: this event was organized by the Bahrain National Initiative for Agricultural Development under the patronage of His Majesty King Hamad Bin Isa Al Khalifa, King of Bahrain and the support of Her Royal Highness Princess Sabeeka Bint Ibrahim Al Khalifa, Wife of the King of Bahrain, from February 25- March 01, 2015. ICARDA presented its research for development activities and two seminars on APRP achievements as well as date palm management.
- The 3rd International Conference on Global Warming was held in Ras Al Khaimeh, 5-7 May 2015. Food Security was the main topic of the conference. ICARDA-APRP presented a seminar under the title: “Food security enhancement and sustainable use of natural resources in the Arabian Peninsula”.

4.8.2 Publications

- ICARDA-APRP 2015; Improving food security and sustainable natural resources management through enhancing integrated agricultural production systems in the Arabian Peninsula. ICARDA-APRP annual report 2014, Dubai, UAE, 20+IV (including CD for country reports);
- Naem Mazahreh, Arash Nejatian and Mohamed Mousa, 2015. Effect of different growing Medias on Cucumber Production and Water Productivity in Soilless Culture under UAE Conditions. Merit Research Journal of Agricultural Science and Soil Sciences (ISSN: 2350-2274) Vol. 3(9) pp. 131-138. Available online

http://meritresearchjournals.org/asss/index.htm

- Mazahrih N., Al-Wahaibi H., Al-Farsi S., Ouled Belgacem A. Yield and water productivity of Buffel and Rhodes grasses under different irrigation water regimes using the sprinkler line-source system. Grassland Science. *In press*.
- ICARDA 2015. Enhance Rural Livelihoods and Efficient Use of Scarce Water Resources in the Arabian Peninsula. Beirut, Lebanon.
- ICARDA-APRP 2015. Bahrain and ICARDA, working together for enhancing food security and improve natural resources management while conserving the environment in the Arabian Peninsula. Dubai, UAE.

Annex 1- Survey on Agricultural by products as animal feed

Grower Questioner

Serial Number of Questioner in study

Country	
Area	Farm Number
Farm Owner	Contact number
Contact person in Farm	Contact number
Extension agent/Researcher	Contact number
GH coordinates: Longitude	Latitude

4.9 Date Palm

1.1. **How many Date Palm trees do you have in the farm** ⌊_____⌋ **trees**

1.2. **How many Date Palm verities exist in the farm** ⌊_____⌋ **varieties**

Number of trees, variety, and annual production			
	Variety	Number tree	Annual production (kg/tree)
1			
2			
3			
4			

Date Palm by-product for each variety			
Cull Dates [1] (kg/tree/year)	leaves (kg/tree/year)	Panicles/ stem	Seeds

4.10 Greenhouse vegetable waste

1.3. **Vegetable waste after harvesting the main crop (during 2013-2014)**

	Vegetable crop	Greenhouse size (m^2)	Number of crop per year	Total Yield (kg/year)	Total waste [2] (kg/year)
1	Tomato				
2	Chari Tomato				
3	Cucumber				
4	Eggplant				
5	Zucchini				
6	Lettuce				
7	Strawberries				
8	Melon				
9					
10					

4.11 Open Field by-product

[1] Cull dates are those which are too hard, too small, blemished, poor appearance or infested and not good for human consumption.
[2] Wastes are the remaining crops, steam and leaves after harvesting inside the greenhouse.

1.4. **What is the main open field crop? (Exclude fodder crops)**

	Crop	Area (m^2)	Number of crop per year	Total Yield (kg/year)	Total by product [3] (kg/year)
1					
2					
3					
4					
5					
6					

1.5. **How you remove the remaining crop after the hare**

☐ manually remove and burned/throw out
☐ manually remove and feed the animal
☐ Direct grazing by animal
☐ Mixed by soil to enhance the soil fertility
☐ others: ……

4.12 Olive, Citrus and other Fruit Tree

1.6. **Number of trees and annual production**

	Tree	Number tree	Annual production (kg/tree)
1	Olive		
2	Citrus		
3	Mango		
4	other		

1.7. **By-product**

Cull fruits [4] (kg/tree/year)	Leaves (kg/tree/year)	Twigs (kg/tree/year)

4.13 Consumption of FARM by-products as animal feed

1.8. **Do you use farm by-product to feed your livestock?** ☐Yeas ☐No

(If yes please answer 5.2. to E.4. if no goes to 5.5.)

	1.9. Farm By-products			1.10. Source (%)		1.11. How do you feed your livestock			
	By-product	Yes	No	Own farm	buy	Fresh	Dry	Silage	Mix[5]
1	Cull dates	☐	☐			☐	☐	☐	☐
2	Date palm lives	☐	☐			☐	☐	☐	☐
3	Date palm **Panicles/stem**	☐	☐			☐	☐	☐	☐
4	Date Palm Seeds	☐	☐			☐	☐	☐	☐
5	Green house vegetable waste (Tomato)	☐	☐			☐	☐	☐	☐
6	Green house vegetable waste (Cucumber)	☐	☐			☐	☐	☐	☐
7	Green house vegetable waste –others:	☐	☐			☐	☐	☐	☐
8	Open field crop (tomato)	☐	☐			☐	☐	☐	☐
9	Open field crop (cucumber)	☐	☐			☐	☐	☐	☐
10	Open field – Hay	☐	☐			☐	☐	☐	☐
	Open field – other:	☐	☐			☐	☐	☐	☐
11	Olive fruits	☐	☐			☐	☐	☐	☐
12	Olives Leaves	☐	☐			☐	☐	☐	☐

[3] Include remaining crop, steam and leaves after harvesting main crop.
[4] Cull fruits: too hard, too small, blemished, poor appearance or infested and not good for human consumption.
[5] Mix with other feed resources.

	1.9. Farm By-products			1.10. Source (%)		1.11. How do you feed your livestock			
	By-product	Yes	No	Own farm	buy	Fresh	Dry	Silage	Mix[5]
13	Olives twigs	☐	☐			☐	☐	☐	☐
14	Citrus fruits	☐	☐			☐	☐	☐	☐
15	Citrus Leaves	☐	☐			☐	☐	☐	☐
16	citrus twigs	☐	☐			☐	☐	☐	☐
17	Mango fruits	☐	☐			☐	☐	☐	☐
18	Mango Leaves	☐	☐			☐	☐	☐	☐
19	Mango twigs	☐	☐			☐	☐	☐	☐
20	Other tree	☐	☐			☐	☐	☐	☐

1.12. **What is the reason you do not feed your livestock with farm by-product *(if answer to E.1. was No):***

☐ Not produce enough at my farm;
☐ Not Available in the Market;
☐ Animal don't like it;
☐ Other reasons *(please explain).*
☐ Reduce animal production;
☐ Because of agro-chemical used during the production, not good for animal health;

4.14 Consumption of Agro-Industry by-products as animal feed

1.13. **Do you use Agro-Industry by-product to feed your livestock?** ☐Yeas ☐No

(If yes please answer 6.2.and 6.3. if no goes to 6.4.)

	1.14. By-products	Yes	No	1.15. Annual consumption (Kg)
Tomato	Pomace[6]	☐	☐	
	Skin[7]	☐	☐	
	Seed[8]	☐	☐	
	Seed cake[9]	☐	☐	
Date Palm	Date pits[10]	☐	☐	
	Press cake[11]	☐	☐	
Olive	Crude olive cake[12]	☐	☐	
	Exhausted olive cake[13]	☐	☐	
	Partly destoned cake[14]	☐	☐	
	Vegetation water[15]	☐	☐	
Other				

1.16. **What is the reason you do not feed your livestock with Agro industry by-product *(if answer to E.1. was No):***

☐ Not Available in the Market;
☐ Animal don't like them;
☐ Reduce animal production;
☐ Because of agro-chemical used during the process, not good for animal health;
☐ Other reasons *(please explain).*

[6] Pomace is the mixture of tomato peels, crushed seeds and small amounts of pulp that remains after the processing of tomato for juice, paste and ketchup
[7] Skins (peels) are a by-product of the peeling of tomatoes used for canning.
[8] Tomato seeds are a by-product of tomato cannery, notably from the production of de-seeded canned tomatoes
[9] Seed cake by product of tomato seed oil extraction
[10] Also called pips, stones, kernels, or seeds produced in packing plants or in industrial date processing plants based on juice extraction
[11] Press cakes are the result of processes where dates are extracted such as for syrup and alcohol
[12] The residue of the first extraction of oil from whole olive by pressure
[13] The residue obtained after extraction of oil from crude olive cake by a solvent.
[14] The result of partly separating the stone from the pulp by screening or ventilation
[15] The liquid obtained during oil manufacturing and separated by centrifugation or sedimentation after pressing

4.15 Fodder crops

1.17. **Do you grow fodder crop at the farm** ☐**Yeas** ☐**No If no please only answer 7.3.**

	1.18. Fodder crops production				1.19. Total consumption in the farm (kg/year)
	Crop	Area (Ha)	Number of cut /year	Total Yield (kg/year)	
1	Alfalfa				
2	Clover				
3	Rhodes grass				
4	Buffel grass				
5	Corn/maize				
6					

4.16 Animal Diet

1.20. **What is the animal production and their feed combination (%) in the farm?**

	Animal in Farm			Fodder crop (%)	Concentrate (%)	Farm by product (%)	Industrial by product (%)
	Number	Milk production (litter/day/head)	Meat production (kg/year/head)				
Sheep and Goats							
Cows (Diaries)							
Cows (Meet)							
Camels							
Chicken							

1.21. **When (period) do you use by-products to feed your animals?**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Farm by-Product												
Date palm by product												
Greenhouse vegetable waste												
Open field vegetables waste												
Other open field waste and Hay												
Olive tree by products												
Citrus by products												
Other tress by product												
Industrial By-product												
Date palm by products												
Olive by products												
Tomato by products												

4.17 Growers' perception

1.22. **Do you have access to enough fodder crop (Buffel grass, Rhodes Grass, Alfalfa, …) for your farm animal**

☐**Yes , from my farm** ☐**Yes from Market** ☐ **No**

If no please indicate shortage in different months in percentage

fodder crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Do you have access to enough concentrate animal feed for your farm animal ☐Yes ☐ No

If no please indicate shortage in different months in percentage

concentrate	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

1.23. **In your opinion, agricultural by products:**

☐ Very good for animal production
☐ Not good for animal and reduce the production
☐ Not enough alone need to be mixed by other fodder crops
☐ If mixed with other animal feed resources such as concentrate will be very good
☐ Makes no difference in production

Do you think agricultural by-product (farm and plants remains) are safe to be used as animal feed ☐Yes ☐ No

Please explain

1.24. **Do you think agro-industry by-product (dates, olive cakes, …) are safe to be used as animal feed**

☐Yes ☐ No

Please explain

1.25. **Do you think packing and selling agricultural by product will increase your farm income?**

☐Yes ☐ No

Please explain

1.26. **What techniques you are using to increase by-product palatability for animal feed (you can select more than one)?**

☐ Hey ammunition; ☐ Fermentation; ☐ Silage; ☐ Using feed block technology, ☐ Mix with other feed crop, ☐ Mix with other crop and concentrates

1.27. **In your opinion please rank these techniques based on their effectiveness on improving by-product palatability**

⌊—⌋Hey ammunition;⌊—⌋ Fermentation;⌊—⌋ Silage;⌊—⌋ Using feed block technology⌊—⌋ Mix with other feed crop,⌊—⌋ Mix with other crop and concentrates

Annex 2- Training course on integrated crop-livestock rangeland system, Oman, October 2015

Program

Time	Activities	Presented by
Day One – Monday 5 October 2015		
08:00-08:45	Opening statements • *Dr Hamoud Al Hasni*, Director General, Agriculture & Livestock Research, Ministry of Agriculture & Fisheries, Oman • *Dr Azaiez Belgacem*, Regional Coordinator, ICARDA-APRP	
08:45-09:15	Coffee break and group pictures	
09:15-10:45	Integrated Crop-Rangeland-Livestock Production Systems for sustainable agriculture the Arabian Peninsula: Introductory talk	Dr Azaiez Belgacem
10:45-12:00	Rangeland management and productivity improvement	Dr Azaiez Belgacem
12:00 -12:30	Coffee break	
12:30-14:30	Technologies for better use of agro-industrial by-products in livestock feeding	Alaa Al-Hamdani
14:30-15:30	Irrigated indigenous forages with high water use efficiency: the case of Buffel grass (Libid)	Dr Azaiez Belgacem
Day Two – Tuesday 6 October 2015		
8:00-10:00	Eco-physiological characteristics, agricultural practices and integration of Spineless Cactus in livestock feeding	Dr Azaiez Belgacem
10:00-10:15	Coffee break	
10:15-12:00	Integration of Date palm and olive trees by-products in livestock feeding	Alaa Al-Hamdani
12:00-12:30	Coffee break	
12:30 -14:30	Developing animal feed calendar using indigenous forage species, spineless cactus, and alternative feed sources under Arabian Peninsula conditions	All participants
14:30-15:00	General discussion	All participants
Day Three – Wednesday 7 October 2015		
08:00-08:30	**Travel from Hotel to Livestock Research Center, Al Rumais**	
08:30-10:30	**Practical and field works:** Cactus and buffel grass propagation and management and animal feeding	All participants
10:30-11:00	Coffee break	
11:00-13:00	**Practical and field works:** Feed blocks making-Ingredient mixing, pressing and drying	All participants
13:00-13:30	**Travel back to Hotel**	
13:30 -14:30	General discussion and closing	All participants

List of Participants

	Name	Country
1	Ebrahim Mohamed Abdel Wahab	Bahrain
2	Yousef Mekkei	Bahrain
3	Athari Almuatwa	Kuwait
4	Al Walid Al Hanaie	Oman
5	Hamad Al Mushefri	Oman
6	Aida Al Maqbalia	Oman
7	Nadia Al Jaberia	Oman
8	Aliaa Al Hanaee	Oman
9	Abdulla Al Waelai	Oman
10	Khalfan Al Sharji	Oman
11	Talal Al Sedari	Oman
12	Gumhooria Alkhader Ahmed	Yemen
13	Eqbal Mohammad Salem Gehlan	Yemen
14	Sena Mahfoud Ali Ahmed	Yemen
15	Suaad Ali Mohammed Nasser	Yemen

Annex 3 - Training course on soilless and greenhouse management, Qatar, November 2015;

Program

<table>
<tr><td>Saturday</td><td>Sunday</td><td>Monday</td><td>Tuesday</td><td>Wednesday</td><td>Thursday</td><td rowspan="2">Time</td><td>Friday</td></tr>
<tr><td>14-Nov-15</td><td>15-Nov-15</td><td>16-Nov-15</td><td>17-Nov-15</td><td>18-Nov-15</td><td>19-Nov-15</td><td>20-Nov-15</td></tr>
<tr><td rowspan="15">Arrive to Doha</td><td>Leave to MoE</td><td>Leave to SAIC</td><td>Leave to SAIC</td><td>Leave to SAIC</td><td>Leave to SAIC</td><td>7:30</td><td rowspan="15">Depart Doha</td></tr>
<tr><td>Opening</td><td rowspan="3">Practicum: Planting Horizontal Hydroponics system</td><td rowspan="3">Practicum: Strawberry planting in Vertical System</td><td rowspan="7">Field trip to modern farm</td><td rowspan="3">Fertilizers injection and maintenance</td><td>8:30</td></tr>
<tr><td>Break</td><td>9:00</td></tr>
<tr><td rowspan="2">Leave to SAIC</td><td>9:30</td></tr>
<tr><td>Break</td><td>Break</td><td>Break</td><td>10:00</td></tr>
<tr><td rowspan="2">Farm tour and harvest</td><td rowspan="2">Hydroponics Techniques</td><td rowspan="2">Irrigation and Fertigation of GH Crops</td><td rowspan="2">Economics of production Dr Simeon Kaitibie</td><td>10:30</td></tr>
<tr><td>11:00</td></tr>
<tr><td>Break</td><td>Break</td><td>Break</td><td>Break</td><td>Break</td><td>11:30</td></tr>
<tr><td rowspan="4">Protected agriculture & production techniques</td><td rowspan="4">Practicum: Stock solution preparation</td><td rowspan="4">Nutrients requirements for Veg crops</td><td rowspan="4">Soft Wear for Irrigation and Fertigation of GH Crops</td><td rowspan="2">Open discussion</td><td>12:00</td></tr>
<tr><td>12:30</td></tr>
<tr><td rowspan="2">Closing and certificates</td><td>1:00</td></tr>
<tr><td>1:30</td></tr>
<tr><td>Lunch</td><td>Lunch</td><td>Lunch</td><td>Lunch</td><td>Lunch</td><td>2:30</td></tr>
<tr><td>Leave to Hotel</td><td>Leave to Hotel</td><td>Leave to Hotel</td><td>Leave to Hotel</td><td>Leave to Hotel</td><td>3:00</td></tr>
</table>

List of Participants

	Names	Country
1	Khalifa Ibrahim Elamin Elhaj	Bahrain
2	Hasan Ali Ahmed Ali	Bahrain
3	Jamal Mahmoud Hassan Mahmoud Al Naqbi	UAE /MOEW
4	Halima Yousif Hassan Ibrahim Alblooshi	UAE /MOEW
5	Moahmed Ahmed Hamdan Alghasyah Aldhanhani	UAE / ADFCA
6	Ahmed Salem Moahmed Suhail AlKaabi	AUE /ADFCA
7	Abrar A M GH A Dehrab	Kuwait
8	Shaikha N Z M L Dhaifallah	Kuwait
9	Ibrahim Aisa Al Hadad	Qatar
10	Mohamed Qaad Nagi Saed	Qatar
11	Awad Abudo AL Sadi	Qatar
12	Naif Said Al Mari	Qatar
13	Nasser Safi Al Mansori	Qatar
14	Hayel Mohamed Al Wawi	Qatar
15	Mohamed Yahiya Al Masri	Qatar
16	Khiro Frhan Al Zoniqa	Qatar
17	Khalid Mohamed Amer	Qatar
18	Amel Ali M. Al Mahoud	Qatar
19	Muna Abdulla Hassan	Qatar
20	Ali Khalaf Al-Shaikh	Qatar
21	Akram Mohammed Al-Munazel	Qatar
22	Abdulmoahsen Ibrahim A Bin Suliman	Saudi Arabia
23	Sanad Munif Sand AlQahtani	Saudi Arabia
24	Mohammed Ayed Abdullah Amran	Yemen
25	Ali Abdulkarem Ahmed Al-Gendari	Yemen
26	Hazem Hezam Ahmed Al-Ashwal	Yemen
27	Saleh Ali Thabit Al-Mwald	Yemen

Annex 4 -First Regional Technical Coordination (TCM) and Steering Committee Meetings (SCM)

List of Participants

Eng Esam Abdul Razag
Manger, Farm Operation & Maintenance Department
Ministry of Municipalities Affairs and Urban Planning (MMAUP) ,Bahrain

Eng Khalifa Elhaj
Agricultural extension specialist
(MMAUP), Bahrain

Eng Ahmed El Safi
Soilless specialist
(MMAUP), Bahrain

Eng Jasim Ejwaid
Agricultural extension specialist
(MMAUP), Bahrain

Eng Mohammed Mousa Abdullah Al Alameeri
Director of Agricultural Research Ministry of Environment & Water
Ministry of Environment and Water, Emirates

Eng Mohammad Jamal
Director of Plant Research & Nurseries Department Public Authority for Agricultural Affairs and Fish Resources (PAAFR), Kuwait

Eng Jalal Al-Tahow
G.S. Development Center of Native Plants, Directorate of Agricultural Research & Nurseries
PAAFR, Kuwait

Eng Faryal Ayal Alenzi
Biological researcher
PAAFR, Kuwait

Eng Athari Almutawa
Agricultural plant researcher developer
PAAFR, Kuwait

Dr Hamood Al-Hasani
DG of Agricultural and Livestock Research
Ministry of Agriculture and Fisheries (MAF), Oman

Dr Hamdan Al-Wahaibi
Director of Soil and Water Research Center, Directorate General of Agricultural and Livestock Research
MAF, Oman

Eng Muthir Al-Rawahi
Head of Vegetable research laboratory, Directorate General of Agricultural and Livestock Research
MAF, Oman

Eng Safaa Al Farsi
Head of Seed and Genetic Resources Laboratory, Directorate General of Agricultural and Livestock Research
MAF, Oman

Eng Masoud Almarri
Director, Agricultural Research Department
Ministry of Environment (MOE), Qatar

Eng Mohammed Salem Al-Yafei
Head of Agricultural Research and Extension Division, Agricultural Affairs Department
MOE, Qatar

Dr Hail Al Wawai
Agricultural expert, Agricultural research and extension
MOE, Qatar

Eng Hassen Al Asmakh
MOE, Qatar
Dr Bander Mohammed Al Odiani
Director General, National Agricultural Animal Resource Center in Riyadh,
Ministry of Agriculture (MOA), Saudi Arabia

Eng Saud A. Al-eyyed
Assistant Director General, National Agricultural Animal Resource Center in Riyadh
MOA, Saudi Arabia

Eng Melahi Awad Al Shrarei
Agricultural specialist, Forage department
MOA, Saudi Arabia

Eng Sanad Al Qahtani
Head of Agronomy , fooder & Wild plants section
MOA, Saudi Arabia

Dr Mansour Mohamed Al-Aqil
Chairman of Agricultural Research & Extension Authority (AREA)
AREA, Yemen

Dr Khader Balem Atroosh
Senior Researcher . DG of National Livestock Resources Research Center, National Livestock resources Research Center,
AREA, Yemen

Eng Jumhoryah Mesari
Assistant Researcher, Range and Forages
AREA, Yemen

Eng Wajih Al-Mutawakel
Assistant Researcher, Protected Agriculture
AREA, Yemen

Dr Salwa Al Orifan
Consultant, Kuwait

Dr Abdul Wahid Mukred Al-Aghbari
Consultant, Yemen

Dr Faisal Awawdeh
Consultant, Jourdan

Dr Mohamed Abdelgadir Adam
Country Program Manager, Near East, North Africa and Eroupe Devision, Program Management Department, IFAD

Dr Kamel Shideed
Assistant Director General - International Cooperation
ICARDA

Dr Hichem Ben Salem
Director, Diversification and Sustainable Intensification of Production Systems Program
ICARDA

Dr Theib Oweis
Director, Integrated Water and Land Management Program
ICARDA

Dr Azaiez Ouled Belgacem
Regional Coordinator and Rangeland scientist, Arabian Peninsula Regional Program
ICARDA

Dr Naem Mazaherih
Irrigation and Water Management Specialist, APRP
ICARDA

Dr Mohamed Ben Saleh
Date palm specialist, APRP
ICARDA

Dr Ahmed T. Moustafa
Protected Agriculture specialist, APRP
ICARDA

Dr Mounir Louhaichi
Range Ecology and Management Research Scientist
ICARDA

Dr Arash Nejatian
Activities coordinator officer, APRP
ICARDA

Program

Day 1 (4th January 2015)

08:30	09:00	Opening statements: 1- H.E. Eng. Saif Mohamed Al Shara, Assistant Undersecretary for Agriculture and Animal Affairs Sector, Ministry of Environment and Water 2- Dr Kamel Shideed, Assistant Director General, International Cooperation, ICARDA
09:00	09:30	The status of ICARDA program for the Arabian Peninsula; *Dr Azaiez Ouled Belgacem, Regional Coordinator, ICARDA-APRP*
09:30	10:00	coffee break
Session 1: ICARDA-APRP Achievements, Challenges and Priorities for future Research 4 development activities		
Chairperson: Dr. Bander Mohammed Al Odiani		
10:00	10:30	Emirates Presentation; *National/Technical Coordinator*
10:30	11:00	Bahrain Presentation; *National/Technical Coordinator*
11:00	11:15	Discussions
Session 1 Cont. : ICARDA-APRP Achievements, Challenges and Priorities for future Research 4 development		
Chairperson: Eng. Issam Abdul Razaq		
11:15	11:45	Kuwait Presentation; *National/Technical Coordinator*
11:45	12:15	Oman Presentation; *National/Technical Coordinator*
12:15	12:30	Discussions
12:30	12:45	coffee break
Session 1 Cont. : ICARDA-APRP Achievements, Challenges and Priorities for future Research 4 development		
Chairperson: Eng. Hamood Al-Hasani		
12:45	13:15	Qatar Presentation; *National/Technical Coordinator*
13:15	13:45	Saudi Arabia Presentation; *National/Technical Coordinator*
13:45	14:15	Yemen Presentation; *National/Technical Coordinator*
14:15	14:45	Discussions
15:00		Lunch

Day 2 (5th January 2015)

Session 2: Success stories from other programs applicable in the Arabian Peninsula		
Chairperson: Dr. Masoud Almarri		
08:30	08:45	Integrated Water and Land Management (IWLM) program: Success stories and lessons learned *Dr Theib Oweis, Director, IWLM Program,: ICARDA*
08:45	09:00	Diversification and Sustainable Intensification of Production Systems Program (DSIPS): Success stories and lessons learned; *Dr. Hichem Ben Salem, Director DSIPS, ICARDA*
09:00	09:15	Production techniques for high value crops to enhance food security in the Arabian Peninsula

		Dr Ahmed Moustafa, Protected Agriculture Specialist, ICARDA-APRP
09:15	10:00	General discussions
10:00	10:15	Coffee break
Session 3: General Workplan for the new ICARDA-APRP project		
10:15	10:45	ICARDA presentation on the general workplan for the new project *Dr Azaiez Ouled Belgacem, Regional Coordinator, ICARDA-APRP*
10:45	11:15	Discussions
Session 4: Advisory panel comments and recommendations		
Chairperson: Dr. Mansour Al Aqil		
11:15	12:30	Presentation and general discussions *Ms. Salwa Al Oeaifan, Dr Abdul Wahed Mukred*
12:30	12:45	Coffee break
Session 5: APRP Annual Workplan for 2014-2015		
Chairperson: Eng. Mohammad Jamal		
12:45	13:45	Group I: Protected Agriculture/Water Group II: Irrigated forage and Rangeland Rehabilitation/Water
13:45	14:00	Workplan presentation - Protected Agriculture and Water
14:00	14:15	Workplan presentation - Irrigated forage and Rangeland Rehabilitation
14:15	14:30	Closing remarks of the 1st RTCM
15:00		Lunch

Day 3 (6th January 2015)

Session 6: Field visit to growers and experimental station		
Field Trip chairman/coordinator: Eng. Mohamed Mousa Al Alameeri		
08:00	09:00	Leave hotel – travel to Protected Agriculture farm
09:00	10:30	Visit Mr. Naeemi Farm (Protected Agriculture)
10:30	11:00	Coffee break
11:00	11:45	Travel to Irrigated forage farm
11:45	12:15	Visit Mr. Mahamed Al Mansori Farm (Irrigated forages)
12:15	12:45	Travel to Agricultural Innovation Center, MEW, Al Dhaid
12:45	13:45	Visit the Agricultural Innovation center, MEW
13:45	14:30	Travel to Hotel and lunch

Annex 5 - Second Regional Technical Coordination (TCM) and Steering Committee Meetings (SCM)

List of Participants

Esam Mustafa Abdul Razag
Acting Director of Plant Wealth Directorate
Plant Wealth Directorate
Ministry of Municipalities Affairs and Urban Planning,
Bahrain

Khalifa Ibrahim AL El Amin El Haj
Horticulture Specialist
Plant Wealth Directorate
Ministry of Municipalities Affairs and Urban Planning,
Bahrain

Ahmed El Safi
Agriculture Engineer
Soil and Fertilizers Department
Ministry of Municipalities Affairs and Urban Planning, Bahrain

Hasan Ali Ahmed Ali
Agricultural technician
Plant Wealth Directorate
Ministry of Municipalities Affairs and Urban Planning, Bahrain

Mohamed Mousa Abdullah Al Alameeri
Director of Agricultural Research Directorate
Agricultural Research Directorate
Ministry of Environment & Water
UAE

Shamma Al Shamsi
Agricultural Research Engineer
Agricultural Research Directorate
Ministry of Environment & Water
UAE

Mohammad A. Jamal
Director of Plant Research
Plant Research & Nurseries Directorate
Public Authority for Agricultural Affairs and Fish Resources
Kuwait

Amal Abdulkareem Abdullah
Head of Plant Protection Research
Plant Research & Nurseries Directorate
Public Authority for Agricultural Affairs and Fish Resources, Kuwait

Zainab Haji Al-Jazzaf
Biological Researcher
Plant Research & Nurseries Directorate
Public Authority for Agricultural Affairs and Fish Resources, Kuwait

Sarah Salah Alateeqi
Biological Researcher
Plant Research & Nurseries Directorate
Public Authority for Agricultural Affairs and Fish Resources, Kuwait

Saud Bin Saif Bin Ali Al Habsi
Director of Agricultural Research Directorate
Directorate of Agricultural Research in South Batnaa Governorate
Ministry of Agriculture & Fisheries, Oman

Mohammed salm albakre Al-yafei
Chief of Agricultural research and Extension
Department of Agricultural Affairs
Ministry of Environment, Qatar

Hayel Mohamed Al Wawi
Agricultural Specialist
Department of Agricultural Affairs
Ministry of Environment
Qatar

Hassan Al Asmakh
Head of Unit and feed crops and wild plants
Department of Agricultural Affairs
Ministry of Environment
Qatar

Bander Bin Mohamed Al Odiani
General Director
National Agricultural and Animal Resources Research Center
Ministry of Agriculture
Saudi Arabia

Abdulmoahsen Ibrahim A Bin Suliman
Vice Director General and Assistant for Technical Affairs
National Agricultural and Animal Resources Research Center
Ministry of Agriculture, Saudi Arabia

Saud A. Al-eyyed
Consultant
National Agricultural and Animal Resources Research Center
Ministry of Agriculture
Saudi

Melhi O.S. Al Sharary
General Director
Camel & Range Research Center
Ministry of Agriculture
Saudi

Sanad Munif Sand AlQahtani
Laboratory Technician
National Agricultural and Animal Resources Research Center
Ministry of Agriculture
Saudi

Mansour Mohamed Al-Aqil
Chairman of AREA
Agricultural Research and Extension Authority (AREA), Yemen

Khader Balem Atroosh
Director General of National Center for Livestock Research
National Center for Livestock Research
Agricultural Research and Extension Authority (AREA), Yemen

Jumhoryah Al-Khader Ahmed Mesari
Rangeland and Forage Researcher
National Center for Livestock Research
Agricultural Research and Extension Authority (AREA), Yemen

Wajih Abdullah Ahmed Al-Mutawakel
Agricultural Researcher
Research Station, Northern Highlands in Sanaa – AREA, Yemen

Mohamed Abdel Gadir Adam Ahmed
Country Programme Manager
Programme Management Department
IFAD

Kamil Haif Shideed
Asst. DG for International Cooperation
ICARDA,

Azaiez Ouled Belgacem
Regional Coordinator, Arabian Peninsula Regional Program, ICARDA

Mounir Louhaichi
Range Ecology & Management Research Scientist, ICARDA

Boubaker Dhehibi
Agricultural Resource Economist
ICARDA

Biju George
Irrigation & Water Management Specialist
ICARDA

Mohamed Ben Salah
Date Palm Regional Project Coordinator in GCC Countries
Date Palm Project
ICARDA

Naem Mazahrih
Irrigation and Water Management Specialist
Arabian Peninsula Regional Program
ICARDA

Arash Nejatian
Activities Coordinator Officer
Arabian Peninsula Regional Program
ICARDA

Program

Day One 6 Dec 2015

8:00	8:30	**Registration**
8:30	9:00	**Opening statements** **1) H.E Eng. Esam Bin Abdullah Khalaf, Minister Of Municipalities Affairs And Urban Planning Bahrain** **2) Dr Kamel Shideed, Assistant Director General, International Cooperation and Communication, ICARDA**
9:00	9:30	group pictures and coffee break
9:30	10:00	**ICARDA-APRP achievement and progress in the AP with focus on Bahrain** *Dr Azaiez Ouled Belgacem, Regional Coordinator, ICARDA Arabian Peninsula Regional Program*
Session 1- Protected Agriculture & Water **Chairperson: Dr. Bander Bin Mohamed Al Odiani** **Rapporteur: Dr Khader Balem Atroosh**		
10:00	10:20	Bahrain progress report
10:20	10:30	Discussions
10:30	10:50	Emirates progress Report
10:50	11:00	Discussions
11:00	11:20	Kuwait progress report
11:20	11:30	Discussions
Session 2- Protected Agriculture & Water **Chairperson: Eng. Essam Mustafa Abdul Razaq** **Rapporteur: Eng. Amal Abdul Kareem**		
11:30	11:50	Oman progress report
11:50	12:00	Discussions
12:00	12:20	Qatar progress report
12:20	12:30	Discussions
12:30	12:50	Saudi Arabia progress Report
12:50	13:00	Discussions
13:00	14:00	Lunch
Session 3- Protected Agriculture & Water (continue) **Chairperson: Eng. Mohammad A. Jamal** **Rapporteur: Eng. Saud Bin Saif Bin Ali Al Habsi**		
14:00	14:20	Yemen progress reports
14:20	14:30	Discussions
14:30	15:00	Experience of growers with Protected Agriculture and soilless in AP
15:00	15:15	General Discussion
15:15	15:30	Coffee Break
Session 4- Irrigated Forages and Rangeland Rehabilitation **Chairperson: Eng. Mohammed salm albakre Al-yafei** **Rapporteur: Eng. Khalifa Ibrahim AL El Amin El Haj**		
15:30	15:50	Emirates Progress report
15:50	16:00	Discussions
16:00	16:20	Kuwait Progress report
16:20	16:30	Discussions

Day Two 7 Dec 2015

Session 5- Irrigated Forages and Rangeland Rehabilitation **Chairperson: Dr. Khader Balem Atroosh** **Rapporteur: Dr Naem Mazahrih**		
8:30	8:50	Oman Progress report
8:50	9:00	Discussions
9:00	9:20	Qatar Progress report
9:20	9:30	Discussions
9:30	9:50	Saudi Arabia Progress report
9:50	10:00	Discussions
10:00	**10:15**	**Coffee Break**
Session 6 Irrigated Forages and Rangeland Rehabilitation **Chairperson: Eng. Mohamed Mousa Abdullah Al Alameeri** **Rapporteur: Dr Mohamed Bin Saleh**		
10:15	10:35	Yemen progress report
10:35	10:45	Discussions
10:45	11:15	Experience of growers with Buffel grass and spineless cactus in the Arabian Peninsula
11:15	11:30	General discussion
Session 7- Work plan		
12:15	13:00	Group work: 1- Rangeland Rehabilitation and irrigated forages; Moderator: Dr. Mounir Louhaichi 2- Protected Agriculture and Water; Moderators: Dr. Naem Mazahrih
13:00	**14:00**	**Lunch**
Session 7- Work plan (continue) **Chairperson: Eng. Saud A. Al-eyyed**		
14:00	14:30	Group presentations on work plan 2016 and recommendations to RSCM
Session 8- Closing		
14:30	15:00	General Discussion
15:00	16:45	closing remarks

20:00	**Dinner Invitation by Ministry Of Municipalities Affairs And Urban Planning Bahrain or ICARDA**

Day Three 8 Dec 2015

Field visit