

## In Arabian Peninsula

### Enhancing livelihoods and food security through sustainable natural resource management

#### BACKGROUND

Smallholder farmers in the Arabian Peninsula region face several constraints, including extreme aridity, limited water resources, erratic rainfall, salinization, and increased desertification due to wind and water erosion. The region's growing population is increasing pressure on underground water supplies and continued dependence on imported food is undermining food security.



A smallholder farmer growing buffel grass for forage. Buffel grass saves an average 52% of irrigation water while providing higher quality fodder

ICARDA's Arabian Peninsula Regional Program enhances livelihoods and strengthens food security. The Program develops, transfers, and scales-out sustainable natural resource management technologies and strengthens human and institutional capacity in Bahrain, UAE, Kuwait, Oman, Qatar, Saudi Arabia and Yemen.

#### The Program

The Arabian Peninsula Regional Program works with national agriculture research and extension systems (NARES) and pilot farmer groups to implement new technologies that deliver:

a) on-farm water efficiency, b) high-value cash crop production, and c) rangeland rehabilitation and forage production. In its 2008-2013 technology transfer phase the Program introduced improved technologies to 80% more farmers than initially targeted.

Soilless production techniques bring increased yields and water productivity for farmers by **50%** (average).

## Innovations at Work

- **Indigenous forage plants** with high water-use efficiency are naturally adapted to the region. Based on collection missions and the screening of hundreds of accessions of native forage plants – a novel undertaking in the Arabian Peninsula – the program identified indigenous Buffel grass for its high water-use efficiency and superior feed quality, and validated technologies for its open field production.
- **Spineless cactus plants** require minimum water and can be combined with on-farm and agro-industry byproducts to obtain quality feed blocks - even under drought conditions. The project introduced new species with 38 accessions from Tunisia and established a mother nursery in Oman.
- **Rehabilitating degraded rangelands** through a combination of natural resource management methods such as water harvesting, reseeding and protection is being implemented at research sites in Yemen, Oman, Saudi Arabia, Kuwait and Qatar. The project screened a number of native forage and pastoral plant varieties and uses GIS to monitor performance.

*Spineless cactus, a desert-friendly plant that makes nutritious feed for livestock, adopted by a pilot grower in Qatar*



- **Protected agriculture** is helping farmers effectively overcome the region's harsh growing conditions. The project developed a range of innovations and adapted and optimized them into an integrated production and protection management (IPPM) system based on soilless culture for cash crop production. The result: improved quality and yields and the reduced application of water, fertilizers and pesticides.
- **Improving date palm production and quality.** The program is enhancing water productivity and reducing water losses through the application of sub-surface irrigation; reducing the costs of labor and other inputs through the application of liquid pollination; improving date quality through post-production drying in polycarbonate chambers; and eradicating the threat of pests using integrated pest management and organic pesticides.

## Project Impacts

Farmers receive technical backstopping from NARES researchers, extension agents and ICARDA scientists, encouraging further innovation to fine-tune and improve technologies. The technologies have brought several benefits:

- **Buffel grass saves water and increases fodder production.** The forage can be harvested 10 times a year and is steadily gaining ground over the popular Rhodes grass. In UAE, 100 pilot farmers have saved roughly 850 m<sup>3</sup> of water for each ton of dry matter produced. Compared to Rhodes grass this translates to an average annual increase of USD 545 per hectare (ha). In Oman, farmers are saving 55% water by adopting Buffel grass.

*“The Arabian Peninsula Program (project) has played a clear role in transferring efficient and applicable technologies to the region. These technologies certainly help resource poor growers to enhance their livelihood.”*

Dr. Mansour M. Al-Aqil,  
Chairman Agricultural  
Research  
& Extension Authority, Yemen,  
December 2013

- **Water saving, reduced use of pesticides and increased yields and income through IPPM techniques.** Validated pest management practices under hydroponics production system were adopted by some 410 pilot farmers by mid-2017 in the seven Arabian Peninsula countries. In UAE, farmers enjoyed a seven-fold increase in water productivity by growing tomatoes in soilless culture. The cost benefit analysis indicated an average 200% increase in annual profit/m<sup>2</sup>/year.

These gains have led to a 2.7-fold increase in the number of greenhouses being used in UAE, while the total number of greenhouses using soilless system reached more than 1100. In Oman, farmers adopting the closed soilless system for growing cucumbers reaped 40% higher yields than those using the soilless open system. The installation of automated water and nutrient management systems increased production by 50% over manual control.

- **Sustainable date palm production – for higher yields, improved quality, and cost-effectiveness.** Sub-surface irrigation has lowered water losses, reduced the water supply by 30-40%, and prevented the growth of weeds. Liquid pollination has reduced labor needs and the amount of pollen required – reducing overall costs by almost 50%. Post-production drying in polycarbonate chambers has accelerated the drying process and improved date quality – producing cleaner fruits that are free of dust. Integrated pest management and the application of organic pesticides have successfully eradicated the threat of dust palm mites – a significant impact in a region where date palm losses due to pests can be as high as 30-40%.

- **Increased yields and income for farmers, along with water savings and reduced use of pesticides, from Integrated Production and Protection Management (IPPM):** The validated IPPM practices have been adopted by a large number of growers. Most of the greenhouses in the region are using all, or at least some, IPPM techniques such as double doors or insect proof nets to cover greenhouse ventilations. With substantial gains in water productivity from the soilless method, the total number of greenhouses using the soilless system are increasing rapidly. In UAE, farmers enjoyed a seven-fold increase in water productivity growing tomatoes in soilless culture compared to conventional soil culture. In Oman, farmers adopting the closed soilless system to grow cucumbers reaped a 40% higher yield. The installation of an automated water and nutrient management system further increased production by 50% over manual control.

## Seeding a Stronger National Agriculture Sector

ICARDA also prioritizes two fundamental requirements of strong national agricultural sectors – capacity building and resilient seed systems. In recent years the following activities were conducted:

- Between September 2008 and June 2017 some 42 specialized training courses, 15 workshops and 140 field days helped impart skills to over 1500 farmers, extension agents and researchers in the field of rangeland and forages, protected agriculture and date palm.

*“The project is important to the region as growers in Oman have greatly benefited from its technologies, such as those or protected agriculture and the use of water-efficient indigenous forages species.”*

Dr. Ahmed Al Bakri,  
Under Secretary for Agriculture,  
Ministry of Agriculture and Fisheries, Oman  
December 2013

- Seed technology units were established in UAE, Yemen, Saudi Arabia, Qatar and Oman to enhance the availability of seed, and seed health units were added in the latter three.
- Powered and manual feed block units were developed in Oman, Qatar, UAE and Yemen to produce alternative animal feed resources made from farm and agro-industrial waste and by-products.

The initiative is also strategically delivering technology packages suited to the production potential and constraints of the region’s two broad agroecosystems:

- In higher potential areas, sustainable intensification and diversification through protected agriculture technologies for higher and varied sources of incomes.
- In marginal lands, building the resilience of smallholder livelihoods.

Consolidating technology packages along these two pathways will deliver an enhanced and wider range of impacts for both farmers and the environment.

<b>Project Title</b>	Improving food security & sustainable natural resource management through enhanced integrated agricultural production systems in the Arabian Peninsula
<b>Donors</b>	AFESD, IFAD, GCC General Secretariat
<b>Period</b>	2014-2018 (Scaling-up phase) Completed technology transfer (2008-2013)
The Program’s Regional Coordination Unit is hosted in Dubai by the UAE Ministry of Environment and Water	
Development of Sustainable Date Palm Production Systems in the GCC Countries of the Arabian Peninsula	
The project is hosted by Ministry of Agriculture and Fisheries in Oman	

## NATIONWIDE SCALING UP & POLICY IMPACTS

Oman could halve its water consumption in the production of forage if it replaced all its Rhodes grass with water-efficient Buffel grass – saving the country 112 million m<sup>3</sup> annually.

In UAE, the adoption of soilless over soil-based protected culture increased water productivity seven-fold for tomatoes, and about 60-100% for cucumbers. Impacts have encouraged three out of seven countries to incentivize and facilitate the adoption of the technologies.

- In Oman and UAE the government is encouraging growers to replace Rhodes with more sustainable Buffel grass. In Abu Dhabi, all subsidies on Rhodes cultivation have been phased out.
- The governments of Oman, UAE, and Bahrain have instituted incentives such as grants, technical assistance and financial aid to encourage growers to adopt soilless greenhouses.
- Some 38 pilot date palm farmers have adopted liquid pollination, and 71 have adopted polycarbonate chambers for drying dates across all GCC countries.

## LINKING SCIENCE TO DEVELOPMENT PROJECTS

ICARDA’s research adds value to IFAD development projects in Yemen. The project is training IFAD’s development project team in:

- Management of seed health units
- Agricultural extension and technology transfer
- Project proposal development.

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