INCREASING WATER PRODUCTIVITY IN WATER-SCARCE AREAS

Water scarcity is perhaps the biggest problem for farmers across northern Africa and the Arabian Peninsula. Rainfall is erratic in the region with annual totals generally below 250 mm, and sometimes as little as 50 mm. Meanwhile, temperatures can rise as high as 50°C. An ongoing research focus at ICARDA has been producing more with less in various production systems in our target regions – greenhouses, fields and rangelands. In 2013, a number of technology packages were optimized and validated, ready for scaling out.

Soilless innovations result in higher yields of cash crops with less water on the Arabian Peninsula

A partnership of scientists, extension workers and pilot farmers across seven countries in the Arabian Peninsula has delivered scalable technology packages for soilless (hydroponic) systems, enabling smallholder farmers in water scarce regions to reap high-yield, high-quality cash crops even under harsh growing conditions. The initiative tested and improved on various innovations in greenhouse design; integrated pest management practices; and soilless production systems to optimize a system that uses less water and provides higher yields.

The soilless culture was optimized for greenhouses, with scientists demonstrating a 40% higher yield for cucumbers grown in greenhouses compared to those in open fields in Oman. An automated water and nutrient management system was found to further increase the production by 50% compared to manual control. In the United Arab Emirates, farmers enjoyed a seven-fold increase in water productivity growing tomatoes in a soilless culture rather than in conventional soil farming.

A cost-benefit analysis computed an average 200% increase in annual profit per m² per year from soilless production in greenhouses. Additional benefits came from measures to control pests, such as soil solarization, which effectively controlled weeds and nematode infestations in tomato plants, increasing yields by 260% for farmers in Kuwait.

Encouraged by the income increases from the soilless farming technologies, a hydroponics demonstration and research site has been built in Yemen in 2013, while Oman, Emirates, Qatar and Bahrain have implemented a catalytic incentive policy to encourage farmers to convert to soilless farming and adopt the integrated technologies.

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**Raisedbed planting machines revolutionize water productivity for Egypt’s smallholders**

Raisedbed planting, where crops are grown in the elevated area between deep furrows, is a traditional practice in Egypt and has many conservation benefits – it reduces the amount of water applied to the land and water loss from percolation, and also ensures good aeration of the roots, efficient use of fertilizer and easier weed control. However, small-scale farmers have poor access to the technology as existing machinery is expensive and not suited to small fragmented lands.

An innovative adaptation of seed drills to formulate the beds and sow seeds also ensures good aeration of the roots, reduces the cost and time required to identify contours for the plow to follow, and has tripled the system’s capacity (up to 30 ha per day), improved efficiency and precision, and substantially reduced the cost of creating microcatchments.

The technique is creating wide areas of water harvesting enabling large-scale planting, which is substantially improving water productivity, yields and incomes for farmers. Benefited farmers are enjoying more than double the yield for barley and 1.6 times for rangeland shrubs compared to those grown without water harvesting. Water harvesting has also been rehabilitating poor quality land by providing improved vegetation cover, thus mitigating degradation and erosion.

The enhanced Vallerani technology has been implemented on over 1,800 ha of rangeland so far, with adoption rates tripling since the start of the project in 2004. The technology is now being promoted in Jordan and Syria to scale out the benefits.

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