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Making Every Drop Count

ALEPPO, SYRIA and JOHANNESBURG, SOUTH AFRICA. 26 August 2002 — As if severe drought was not enough, what little water is available for crops in the world's driest areas is being badly managed, turning a serious difficulty into a desperate problem. Many solutions to the challenge of getting more production per unit of water are being explored and found but sharing ideas through collaboration is essential to success in farmers' fields.

For millions of resource-poor dryland farmers in sub-Saharan Africa (SSA) and Central and West Asia and North Africa (CWANA), small total rainfall and its erratic, unreliable distribution constrain the achievement of stable, sustainable production systems which would provide them with satisfactory, low-risk livelihoods. High population growth rates in arid and semi-arid regions increase the demand for food, feed, and other agricultural products.

Effective soil, water, and nutrient management requires actions not only at the farm level, but also at community, national and regional levels. The agricultural priority across all dry-area farming systems in SSA and CWANA is to increase biological and economic yield per unit of water.

OSWU Consortium

One of the CGIAR's activities directed at improving the productivity of water-use in dry areas taps into knowledge and expertise from diverse stakeholders. Two of the Future Harvest Centers—the International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)—and the national research organization of South Africa (ARC-SCW) are co-conveners of the Optimizing Soil Water Use (OSWU) Consortium. This is a constituent of the CGIAR System-wide Soil, Water, and Nutrient Management Program (SWNMP). The overall goal of the consortium is sustainable and profitable agricultural production in dry areas based upon the optimal use of the available water. It brings together 12 national agricultural research and extension systems (NARES) in Burkina Faso, Egypt, Iran, Jordan, Kenya, Mali, Morocco, Niger, South Africa, Syria, Turkey, and Zimbabwe.

However, actual water-use efficiency in current farming systems in the drought-prone countries of CWANA and SSA is often very low, and a surprisingly small proportion of the available water is actually transpired by the crop. The water losses at the field-level include surface runoff, percolation below the rooting zone, evaporation from the soil surface, seepage in deep cracks,

and transpiration by weeds, but vary according to site- and situation-specific conditions and are often not well quantified.

Viable farm-level techniques, such as those developed by ICARDA and ICRISAT for their mandate areas, are applicable in many other dry countries to reduce these losses and to increase the capture and retention of incoming water as well as maximize the proportion of water that is productively transpired by the crop. The development of water-efficient cultivars is one way to achieve this. Such new varieties, which are often developed by national programs from germplasm sourced from Future Harvest Centers, usually require improved soil, crop and cropping system management, which by itself can make a major contribution to improved productivity from scarce and erratic rainfall.

Improving productivity

The main agronomic strategies to intensify crop production systems are *(i)* soil and water management, and *(ii)* cropping system management, with strong emphasis on soil fertility management. The choice of appropriate rotations, intercropping or relay cropping determines to a great extent the productivity of rainfed farming systems.

About 30 million hectares of land is left fallow in CWANA every year. If only 70% of this land could be sown to forage legumes, it would produce enough feed for 80 million sheep. Moreover, there would be an influx of 1.4 million tonnes of nitrogen from symbiotic nitrogen fixation per year.

Use of medic and vetches in the cereal-based rotation over a period of 10 years in ICARDA trials showed a significant increase in total nitrogen and organic matter in the soil, when compared with cereal monocropping or cereal/fallow rotations. These changes improved soil physical properties and fertility, thereby increasing the productivity of cereals following legumes. These rotations also broke the disease and insect pest cycles that had built up in monocropping.

One of ICARDA's recent successes in rain-fed areas has been with 'Arta', an improved barley landrace developed by the Center from germplasm collected in Syria. Compared with most local landraces, 'Arta' averaged on-farm about 70% greater yield. Further drought-tolerant barley and wheat cultivars have been selected and are being tested under stress conditions in a number of CWANA and SSA countries.

When these and other lines emerge as varieties suitable for planting by farmers in combination with the various improved technologies to optimize soil water use, the scope for improving the livelihood of the farmers will be greatly increased.

ICARDA's (www.icarda.org) mission is to improve the welfare of people and alleviate proverty through research and training in dry areas of the developing world by increasing production, productivity, and nutritional quality of food, while preserving and enhancing the natural resource base. ICARDA is a Future Harvest Center.

Future Harvest (www.futureharvest.org) is a global nonprofit organization that builds awareness and support for food and environmental research for a world with less poverty, a healthier human family, well-nourished children, and a better environment. Future Harvest is an initiative of 16 food and environmental research centers that receive funding from the Consultative Group on International Agricultural Research (CGIAR).