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Marginal-quality Water: A Solution to Fresh Water Scarcity

ALEPPO, SYRIA and JOHANNESBURG, SOUTH AFRICA. 26 August 2002 — Water may be a life-giving restorative for plants and humans alike, but dealing with it once it has been used either in agriculture or in cities is often nearly as big a problem as acquiring it in the first place. But marginal quality water could provide a solution to meet the scarcity of fresh water.

It is no mean task for farmers in the dry areas who are pleased to apply any irrigation water at all. If the salinity of irrigation water is 500 mg/liter TDS (total dissolved solids), every 10,000 cubic meter of water contains 5,000 kg of salts. But that's not all. Additional salt comes from naturally-occurring salt in the soil structure, and from consumptive use of capillary ground water.

In an experiment in Syria conducted by the International Center for Agricultural Research in the Dry Areas (ICARDA), a Future Harvest Center of the CGIAR, in collaboration with Aleppo University and with financial support from the Canadian International Development Research Centre (IDRC), preliminary results show that bread wheat irrigated with saline groundwater of about 5 dS/m (1dS/m = 650 mg/l or 650 parts per million total dissolved solids) produced 1 kg of grain per cubic meter of water. The same crop irrigated with water of double the salinity produced just 0.3 kg grain per cubic meter of water.

In Egypt, where about a third of the 2.7 million hectares irrigated land in the early 1970s was salt-affected, results show salinity reducing yields from conventional agriculture by 30%. An intensive program has been started to improve sub-surface drainage on at least two million hectares.

More than half of the 2.32 million hectares of irrigated land in Uzbekistan is salt-affected, and the build-up of salinity is seriously threatening productivity. ICARDA, with national scientists, has established a research site near the Arys-Turkestan Canal in Kazakstan.

The research there aims to improve irrigation efficiency with attention to leaching; to improving drainage in order to reduce soil salinity; to irrigation regime; to crop rotation, and other experimental treatments. An important component of the project is building awareness among farmers of the importance of drainage and that better management can lead to higher yield with less water used and better soil quality. Early results look very promising, having produced significantly more cotton yield with about 40% less applied irrigation water.

Adequate drainage is an important agricultural practice, particularly in arid and semi-arid regions to prevent soil salinization and waterlogging-related problems. Traditionally, collected drainage water is disposed of to sea, in a river, lake, or drainage reservoir. When drainage water contains naturally-occurring and potentially toxic trace elements such as selenium and boron, or pesticide residues which impact negatively on the environment at high concentrations, new drainage disposal strategies have to be developed.

Yields of up to double the usual forage output have been obtained in ICARDA's Central Asia Soil and Water Project, using treated wastewater. In the Sorbulak area, north of Almaty, Kazakstan, the project is developing a sustainable agronomic system which safely utilizes treated wastewater to produce various forage and industrial crops. At least 40,000,000 cubic meter of treated wastewater from the Almaty area is potentially available each year for agricultural use, enough for 10,000 hectares of land designated to produce forage crops under irrigation.

Egypt is also trying to benefit from drainage to improve not only the quality of its natural resource and its sustainability but to expand agriculture production horizontally, based partly on drainage water as a source for irrigation. The officially-reused drainage water increased from 2.6 billion cubic meters per year in the 1980s to about 4.2 billion cubic meters per year in the early 1990s. Two projects, the El Ummum drain and the Salam Canal, coming on stream will bring the total reused drainage water in the Nile Delta to about 7.2 billion cubic meters per year.

Irrigation water guidelines indicate that waters of salinity below 0.7 dS/m can be used for agriculture without restriction. If salinity is between 0.7 and 3.0 dS/m, slight restriction on use is warranted, and if the salinity of waters is greater than 3 dS/m then some salinity problems and perhaps a reduction in crop yield should be expected.

By treating the drainage as a 'resource' rather than as a waste, it is possible to help the growers, as well as to contribute to the sustainability of agricultural systems.

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).