Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

COUNTRY IMPACTS
I R A Q

Sustainable agriculture of salt-affected soils in the lower Mesopotamian Plain of Iraq

THE CHALLENGE

About 4 million hectares of land (over 70%) in the lower Mesopotamian Plain, north of Baghdad to Basra, has been salinized with soil salinity levels above 80 dS/m[1] (Fig. 1). This area was once fertile but abandoned by farmers after it became salinized. Flood irrigation practices and the absence of drainage systems resulting in a high saline water table were the main causes of soil salinization. The challenge for the government and farmers is to reduce the rate of soil salinization and restore the land for agricultural production and rehabilitate the migrated farmers. There are great opportunities to increase crop and livestock production if water and salinity management are improved.

THE PROJECT

Through an IAEA Technical Cooperation project[2] and the technical support from the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, the Iraqi Atomic Energy Agency (currently the Ministry of Science and Technology) developed and applied appropriate soil and water management practices to rehabilitate salt-affected soils. The project started with ten hectares of abandoned wasteland. Two wells of 30 m depth were drilled in the area to obtain available groundwater. An integrated approach was adopted that involved introducing a surface drainage system to flush and leach water and soluble salts out of the crop root zone with 400 mm of saline ground water (4.0 to 5.8 dS/m) after it had been ploughed and leveled; growing of salt tolerant legumes (crops and shrubs) and chemical amendments that includes the application of sulfur, mineral acid and gypsum helping to reduce soil salinity, improve soil quality and fertility and agricultural production (Fig. 2).

Fig.1.
Salt affected soils in lower Mesopotamian Plain

The integrated practice reduced soil salinity from 80 to 40 dS/m. The planting of salt-tolerant sugar beet and barley was repeated for 5 years, increased yield at an estimated rate of 139 and 81 kg/year of sugar beet and barley, respectively, due to the major improvement in soil conditions and success of this package of technology for rehabilitating salt-affected wasteland[3].

THE TECHNOLOGY

The radioactive isotope ^{22}Na was used to evaluate salt removal and redistribution along the soil profile. This can be carried out using soil columns collected from the field. The isotopic data was used to estimate the amount of water and salt moving beyond the crop rooting zone. Columns were installed under a rain simulator system to provide the amount of water required at different application intervals. Radioactive sodium along the soil profile in the column was measured using an automated gamma scanner consisting of NaI^{Th} (Sodium Iodide Thallium activated detector) connected to multi-channel analyzer.

THE IMPACT

The project was successfully extended to the farmers along the lower Mesopotamian Plain of Iraq. About 100 farmers with a total area of 5,000 ha of land have adopted this integrated technology for the sustainable use of salt-affected soils and saline water[4]. The farmers adopted the technology as well as the drilling of wells before financial support from the government was granted.

The Government of Iraq is applying this technology to all salt-affected soils in the Mesopotamian Plain of Iraq. The Ministry of Agriculture and Ministry of Water Resources is collaborating with the Ministry of Science and Technology for the dissemination of this technology. The first step is drilling the wells, which has to be authorized and conducted by government officials before financial support can be provided to farmers. However, due to security issues, this component is delayed in its implementation.

Figure 2. Improvement of soil conditions

In term of socio-economic impact, the technology helped to create jobs, and as a result farmers are expected to return to their land. Financially, net income per hectare from selling of different crops and the rental of land for animal grazing will generate returns of about USD 1,200 per year starting from the second year of implementation of this technology[5], compared to no income previously. Net income per unit area is also expected to increase with land improvement.

[1] The Iraq salinity assessment - Report 1: Situation analysis; 2012
[2] INT5144 on Saline Groundwater and Wastelands for Plant Production conducted between 1997 and 2007
[3] Based on internal data.
[4] Razaq I. B. 2008. Sustainable agriculture of salt affected soil of Lower Mesopotamian Plain of Iraq using saline ground water. Annual report, Arab Atomic Energy Commission, Damascus, Syria, 26-27 Oct. 2008.
[5] Based on internal data.

For further information, please visit:

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