Water and soil salinity has rendered 30% of arable land in western Algeria unsuitable for crop growth.

The Challenge

Algerian agriculture, which accounts for about 8% of gross domestic product and employs 14% of the workforce, is unable to meet food demands. As a result, some 45% of food is imported, the primary import crops being wheat, barley and potatoes. Furthermore, water and soil salinity are increasingly becoming a hindrance to Algerian agriculture, resulting in declining farming outputs and a deterioration in farmer livelihoods that often lead to the abandonment of previously fertile lands and consequently to desertification. This has led to a dramatic reduction in the acreage of productive agricultural lands, particularly in the western part of the country where 30% of the total arable area of 140,000 hectares are now considered unsuitable for crop production due to high soil salinity level (5 g of salt per kg soil) for crop growth.

The situation is further exacerbated by the acute shortage of fresh water with low salinity (less than 1.3 g of salt per litre of water), which accounts for only 10% of the available water and is being used primarily as drinking water.

To alleviate this situation there is an urgent need to develop agricultural practices that allow crops to grow effectively on these arid and saline lands using the available saline irrigation water in a manner that effectively alleviates the current salinity problems and consequent land degradation.

The Project

Through an IAEA technical cooperation project, the Institut National des Sols, de l’Irrigation et du Drainage (INSID) set out to develop appropriate farming practices capable of reducing salinity-induced land degradation. The study concentrated on irrigation scheduling, soil fertility improvement and the introduction of salt-tolerant crops such as oats, barley and olive that can grow on the large areas of barren lands in this part of Algeria. In the project, the soil moisture neutron probe was used to quantify the optimal amount of soil water available for crop growth.

The project was carried out in the north-western province of Relizane, one of the five main irrigated areas in western Algeria. With scheduling of irrigation water (containing 3.3 g salt per litre of water) to meet crop demand, determined through the use of the soil moisture neutron probe (see next section), three moderately salinity tolerant varieties of barley and oat were grown and provided grain yields of up to 2.5 t/ha. Also salt-tolerant olive trees thrived under these farming practices, especially when the fertility of the soil was improved with organic manure.

The newly developed agricultural practices were successfully disseminated through farmers’ field days, organized 2-3 times during each cropping season to create awareness of the possibility to grow salt tolerant crops so that abandoned land can be utilized to feed livestock and generate extra income.
The Technology

The soil moisture neutron probe (SMNP) measures soil water content for crop production. During the measuring process, the probe emits neutrons that collide with hydrogen atoms in soil water. This collision slows down the speed of the neutrons. The change in the speed of the neutrons is detected by the probe and provides a reading that corresponds to the soil water content. The SMNP is currently the most suitable instrument to accurately measure soil moisture under saline conditions. It is also widely used to calibrate other moisture sensors for direct use in farmers’ fields.

The Impact

Considering the magnitude and implications of water and soil salinity on agricultural production in Algeria, as well as the role of salinity in advancing the desertification of previously fertile lands, the development of agricultural practices that facilitate effective farming on these barren lands is a major accomplishment. Through the effective management of available water by accurately determining the time and amount of water applied through irrigation scheduling and the introduction of salt-tolerant crops, yields of up to 2.5 t/ha of e.g. barley and oat could be harvested. Within a year of project completion 15 households had reclaimed 17 ha of the abandoned farmland. Extrapolated to the 42,000 ha of the above abandoned land, this would generate a total yield production of 105,000 tonnes of barley and oats. At the current price on the Algerian market of US $250/t (June 2011), this would be equivalent to US $26.3 million in additional earnings to small scale farmers and would save the national economy a corresponding figure in foreign exchange imports of food products. Furthermore, it would generate additional biomass useful as livestock fodder and wood fuel.

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