The Fallacy of Irrigation Modernization

Reference: Theib Oweis. 2012. The fallacy of irrigation modernization. REVOLVE, special issue "water around the Mediterranean" the World Water Forum 6, Marseilles, France. Pages 42-43.

The introduction of modern irrigation systems may reduce water use, but it does not necessarily lead to higher agricultural productivity.

Writer: Theib Oweis

Many countries are keen to move away from traditional surface irrigation systems to more modern and efficient systems such as drip and sprinkler irrigation. Surface irrigation systems are less efficient in terms of water application because more water is lost through runoff and deep percolation. However, the losses at field level can be partially or fully recovered at the scheme or basin levels by reusing drainage and runoff or extracting water that has percolated into groundwater aquifers.

The introduction of modern irrigation systems saves water at the field and farm levels, but this saved water does not necessarily become available for use elsewhere – allowing for the expansion of irrigated area or for use by other farmers or sectors – because it is already allocated within the scheme or the system. In Egypt, for instance, water lost during irrigation is recuperated and reused several times through the drainage system before becoming too saline for agricultural use.

Modern irrigation systems can only be efficient if managed properly. In many areas, poor management means that modern systems have the same low efficiency as surface systems. Depending on the physical and socioeconomic conditions, surface systems may be more suitable, especially as farmers are familiar with them.

Modern systems increase productivity not because they reduce water loss, but rather because they allow for better control, higher irrigation uniformity and frequency, and better fertilization among others. The benefits, however, come at a cost: capital, energy and maintenance. Successful conversion requires developed industry, skilled engineers, technicians and farmers, and effective maintenance. Modern systems are most successful in areas where water is scarce and expensive, so that farmers can recover the system costs by reducing irrigation losses and increasing productivity.

When water is abundant and cheap, farmers have little incentive to convert to modern systems. In fact, improving surface irrigation systems through land leveling and better control may be more appropriate for most farmers in developing countries. Globally, surface irrigation systems are by far the most common method of irrigation. Assuming that this will change in the near future is unrealistic. A wise strategy is to invest more in improving surface irrigation and to encourage modern systems only when conditions are favorable.

No more business as usual

Many countries are investing considerably in converting to modern irrigation systems. But the increased efficiency obtained reflects the performance of the system, not the performance of the water: high irrigation efficiency does not rule out low agricultural productivity. Investment should therefore focus on increasing water productivity as well, particularly in water-scarce regions where the amount of water available for agriculture is declining.

Farmer in Raqqa, Syria. Source: Adel Samara.

Water productivity (WP) is the return or the benefits derived from each cubic meter of water consumed. This return may be biophysical (in the form of foodstuffs), socio-economic (through the employment and income it generates), environmental (by providing environmental benefits such as carbon sequestration and ecosystem services) or nutritional (through the protein and calories it provides). Most agricultural water is consumed by evapotranspiration and is therefore "unrecoverable". However, recycled water is not considered to be consumed, depleted or lost by joining salt sinks such as sea, salt lakes or saline aquifers.

Drivers to improve WP vary with scale. At the field scale, one must aim to maximize the biophysical WP of a specific crop or product. At the farm level, the goal is to maximize the economic return of all the crops and products that are generated. At the country level, the drivers for improved WP are food security and exports. At the basin level, competition between sectors, equity issues and conflicts may drive WP issues. Overall, the WP concept offers a standardized way of comparing crops and

production areas, and of determining what to grow and where to grow it. Cropping patterns should be determined by taking into account the different drivers, scales and types of WP that are relevant to the population.

Research has shown that in the developing countries of the Eastern and Southern Mediterranean, agricultural WP can be at least doubled, which is equivalent to doubling the water availability. This can be achieved among others through the introduction of modern technologies, the adoption of more efficient water management practices such as supplemental irrigation and water harvesting, and the improvement of cropping patterns and agribusiness practices. All such measures should, however, be supported by sound socioeconomic policies. Rain-fed agriculture, which still has very low yields due to the historical prioritization of irrigated agriculture, has the highest potential for increased WP and food production. Investment in this field may therefore be the most viable.

'Business as usual' is no longer an option for agricultural water management in water-scarce areas. Unless strategic changes are made, the Mediterranean region, especially the south, will face increasing water and food insecurity. New thinking on agricultural water management and cropping patterns should drive new strategies and approaches.

Theib Oweis is the director of the Integrated Water & Land Management Program at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, Syria.