THE CHALLENGES OF AGRICULTURE IN THE INTERNATIONAL YEAR OF WATER COOPERATION

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In December 2010, the United Nations General Assembly declared 2013 as the United Nations International Year of Water Cooperation. The objective of this International Year is to raise awareness, both on the potential for increased cooperation, and on the challenges facing water management in light of the increase in demand for water access, allocation and services. The Year will highlight the history of successful water cooperation initiatives, as well as identify burning issues on water education, water diplomacy, trans boundary water management, financing cooperation, national / international legal frameworks, and the linkages with the Millennium Development Goals. It also will provide an opportunity to capitalize on the momentum created at the United Nations Conference on Sustainable Development, and to support the formulation of new objectives that will contribute towards developing water resources that are truly sustainable.

Water is, indeed, an aspect of great relevance for agriculture. Plant sciences are more than ever at the centre of major challenges to global societies. Scarcity of resources is becoming increasingly evident in the last years. Water availability is already a major limitation on agricultural production in some regions of the world and it is expected to become even more severe with the increase in intensified agriculture, together with developing issues of water quality, and as a result of modified rainfall patterns due to the climate change.

Factors affecting yield reliability of agricultural crops vary across agrosystems, but water availability is among the most common factors, since many commercial crop varieties are particularly sensitive to low or fluctuating water availability. Reduced tillage is known to increase soil water retention (particularly early in season); in addition, through conservation of soil organic matter, reduced tillage can indirectly increase soil water content and buffer against fluctuations. A relevant goal of agricultural practices is the optimization of the use of water resources, aiming to reduce energy inputs to agrosystems looking for their sustainability.

Sustainability will imply there is a need for reducing the costs for farmers. One the one hand is the problem of the wide use of N-fertilizers which increase the cost of production and affect the environment due to the emission of greenhouse gas (NxO). By the other hand the agricultural production should be based in small-medium farms with low inputs and environmentally friendly (together with large-scale farms) with an efficient use of local adapted plant genetic resources, that will request less water intake. There is a need for a wide
use of the local germplasm in small-medium scale. This adapted germplasm is well adapted to its agro-ecological conditions and will need reduced inputs and the use of local resources will reduce transport costs and pollution.

There is a need to empower the rural areas that could be achieved by the enhancement of small-medium farms that will shape an added value network of food supply based on sustainable agrosystems. This means also to develop opportunities for the rural communities by strengthening the capacity of small-medium farms for primary production and delivery of eco-systems services, and opening avenues for the production of new and diversified and safe high quality food products, including those requested by processors and the restaurant industry.

As far as crop production is concerned, water is very likely the most limiting factor. We should not forget that photosynthesis is the process used by autotroph organisms like plants to utilize light (a kind of energy) to form carbohydrates (a chemical energy), which are synthesized from carbon dioxide and water. So, without water there are no plants and without plants there is no animal life.

In the particular case of our country and from the standpoint of natural water availability, Spain is usually divided into two great regions: Humid Spain and Dry Spain. The first region comprises the North and Northwest of the country, i.e. Galicia and the Cantabric communities (Asturias, Cantabria and the Basque Country), while the second is formed by the rest of peninsular Spain as well as the Balearic and Canary Islands.

From what has been said above it seems at first sight that agriculture needs irrigation in Dry Spain to be successful, while that is not the case in Humid Spain. This is not completely true because of the irregular distribution of rainfall in the latter. In general, most rainfall in Humid Spain falls from autumn to spring, with a minimum in summer, precisely the season when crops needs most water. This problem is especially serious in the South of Galicia. Data from the Misión Biológica de Galicia (Sánchez, 1986) show that the average rainfall in Pontevedra (average from 35 years) is 1,657 mm, with a great variation from a minimum of 961 mm up to a maximum of 2,596 mm. But the averages for July and August are only 26 and 48 mm, respectively, with years in which it does not rain absolutely nothing in June or July or practically nothing in August.

What can be done to overcome that problem? Two measures are possible. First, a rational net of cisterns and/or dams to store water during the winter months. Second, to establish programs of plant breeding to obtain varieties more tolerant to drought. Or, in other words, to obtain plants that use water more efficiently.

Genetics has revolutionize agriculture in many areas of the world developing plants better adapted to short supplies of water and nutrients. Plant breeders have two basic approaches for breeding for drought resistance: indirect breeding and direct breeding. Under indirect breeding, breeders expose genotypes to an environmental stress, even though they are not being directly evaluated for environmental stress. For direct selection for drought there are several methods that can be used: field selection, selection under managed stress environments, selection based on yield per se, selection based on development traits… (Acquaah, 2007). A common strategy is to breed for earlier genotypes hoping that flowering will occur before drought stress.
In conclusion, the challenges of agriculture in the international year of water cooperation involve the rational use of water resources, including in areas considered as wetlands, as those mentioned in Spain, and especially in arid areas with subsistence farming.

References