Management of phosphorus in the low-input agricultural systems of the West Asia and North Africa region

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The Mediterranean region, where settled agriculture began, and where cereals and pulses evolved, is invariably constrained by drought. The climate is typically Mediterranean, with a relatively wet season (fall-winter)) where rainfed cropping is practiced (rainfall range of 200 to 600 mm rainfall) and a dry summer period where cropping is possible only with irrigation. Historically, irrigation was possible where surface water sources (rivers) were available, but irrigation has increased in formerly rainfed areas, with the proliferation of deep wells to tap groundwater. With declining groundwater levels, management of dryland/rainfed agriculture is all the more important. The Mediterranean climate of the North Africa-West Asia region is modified by landmass features, especially elevation. Areas inland tend towards a continental climate. The dominant cropping system is based on cereals, barley in drier area and wheat in more favorable areas, and food and forage legumes, as well as a range of other crops. Livestock, mainly sheep and goats, are integrated with cereal production. Though the cropping system was traditional and unchanged for centuries, and was characterized by low yields, much has changed in recent decades, especially with mechanization, new varieties, and chemical inputs, especially fertilizers. Land use pressure has caused a reduction of fallow, which was practiced as a hedge against drought. Increasingly, monoculture is practiced, with inevitable concerns about bits sustainability. Since the 1970s, most countries of the region have experienced a 10-20 fold increase in nitrogen use, with somewhat lower amounts of phosphorus (P). By comparison, the amounts of potassium used are low due to the inherent richness of the region's soils in that element. The awareness of micronutrients in the region's agriculture is recent, and the practice of micronutrient fertilization is rare, except in Turkey. Much research attention has focused on P, not only for its direct impact on crop growth, but also its indirect effects in relation to adaptation to drought as well as its complex chemical reactions in soils. The work conducted by the International Center for Agricultural Research in the Dry Areas (ICARDA) in northern Syria, in conjunction with the national programs in the region, provide a broad insight into the course of P research in the past 3 decades. The work on P response of various crops in the range of rainfall zones in Syria mirrored similar collaborative work elsewhere, especially in Pakistan, Turkey, and Morocco. Much has been accomplished at the applied level to assess crop responses and application methods, and at the basic level to understand the fundamental reactions that underpin P behavior in Mediterranean soils. Despite perceptions of irreversible reactions of P fertilizer in calcareous soils, a significant change has been the gradual build-up in available P, and thus the need for less P on an annual basis. Despite the accumulated knowledge on all aspects of P use in the region's dryland cropping, the major obstacles to effective transfer of this knowledge to farmers are the general absence of soil testing services upon which to base rational fertilizer use, and the weak extension-technology transfer systems. This presentation gives a snapshot of soil and fertilizer P research in the West Asia-North Africa region through the context of an international research center dedicated to the agricultural development of the region.