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Present Scenario of Global Salt Affected Soils, its Management and Importance of Salinity Research

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ABSTRACT

Salt-affected soils have gained global concern. The world population is increasing rapidly, while the cultivable land is decreasing gradually 1-2% per year. As a result it is threatening the sustained productivity from the limited land resources to meet food and nutritional demands. Soil degradation due to salinization is considered a major constraint for agricultural productivity. Currently approximately 1125 million hectares of lands are salt-affected, of which approximately 76 million hectares are affected by human-induced salinization and sodification. Therefore, tackling salinity problem is very crucial to achieve food security. Two strategies- fighting salinity and living with salinity are suggested by International Center for Agricultural Research in the Dry Areas (ICARDA) to overcome salinity problems. Conducting researches to find high salt tolerant plant species and remove salts from the affected lands applying bio-techniques are also very important. Minimizing the exposure of cultivable land to salinity and recovering or utilizing salt-affected land for agriculture is crucial to attain future food security.

Key words: Abiotic stress, salinity management, salinity stress, salt-affected soils, food security

INTRODUCTION

Salt-affected soils have gained a major global-regional-national-ecosystem-farm level concern. The world's irrigated land is decreasing by 1-2% every year[1]. However, world population is increasing rapidly and will reach 9.6 billion by 2050[2]. Hence, global food productions will need to be increased 38 and 57% by 2025 and 2050, respectively to maintain current level of food supply[3]. Salinity stress is the major abiotic stress that drastically affects plant growth and crop productivity. Soil salinization has been identified as a major cause of land degradation that making the lands unsuitable for cultivation of crops.

DISTRIBUTION OF SALT-AFFECTED SOILS

The extent and distribution of salt-affected soils yet has not been studied in details worldwide. Current data has shown that world's salinity affected area of land is about 1125 million hectares, of which approximately 76 million hectares are affected by human-induced salinization and sodification[4]. Currently, one-fifth of irrigated lands are

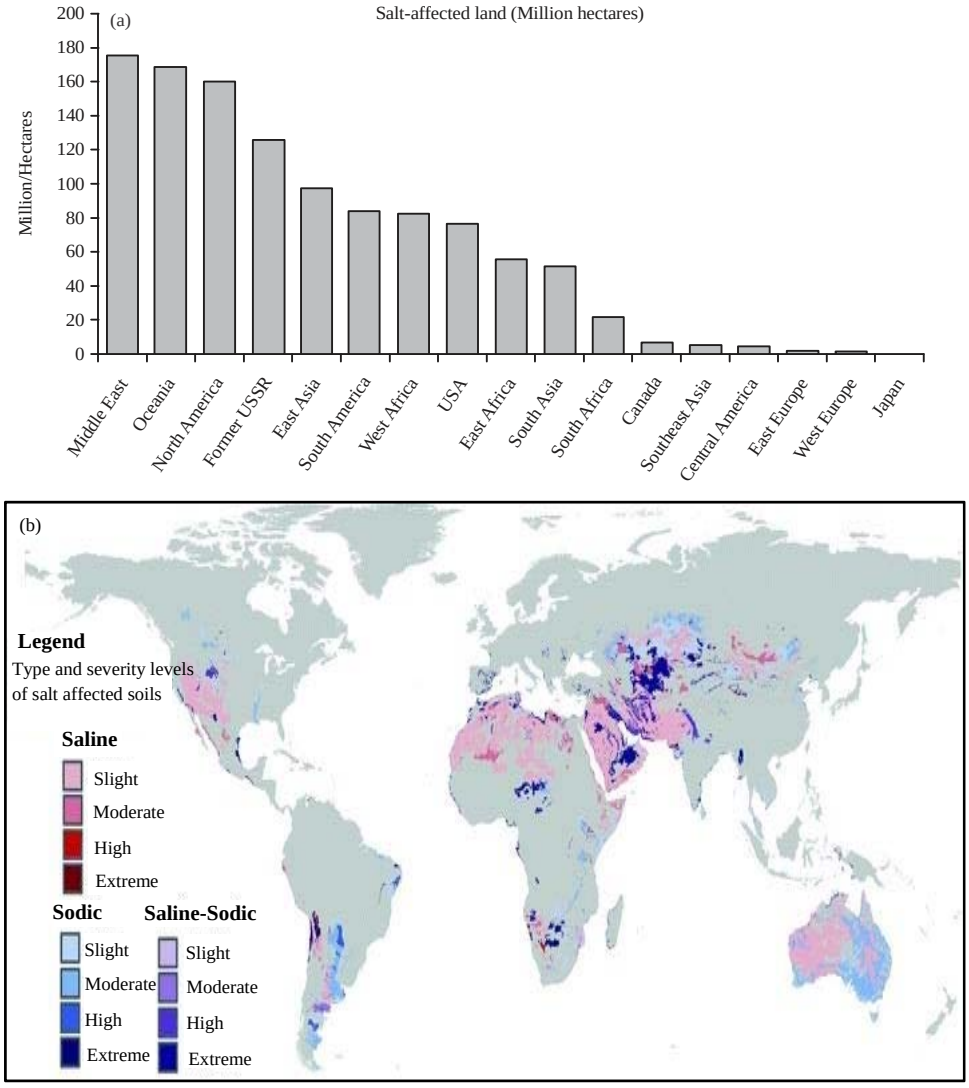

Fig. 1: Global extents and distributions of salt-affected soils, (a): Different countries and continents[4] and (b): Global distribution map[4]

salt-affected and 1.5 million hectares of lands are becoming unsuitable for agricultural production every year because of high salinity levels. If the salinization of soils continues in such way, 50% of cultivable lands will be lost by 2050[5]. The countries where significant salt-affected soils exist include but not limited to Australia, Bangladesh, China, Egypt, India, Iran, Iraq, Mexico, Pakistan, the former USSR, Syria, Turkey and the United States. The world distribution of salinity affected land area is shown in Fig. 1. The major causes of soil salinity are natural, such as weathering of parent material, deposition of sea salt carried in wind and rain and inundation of coastal land by tidal water. Human induced causes of soil salinity includes rise of water table due to excessive irrigation using underground water, irrigation with salt containing water and poor drainage.

MANAGEMENT OF SALT-AFFECTED SOILS

Salinity is a particular problem in irrigated agriculture and tackling of this problem is very crucial for achieving food security. Several control and management strategies such as manage the existing situation, reduce recharge, intercept water in the transmission area, increase water use in the discharge area and strong national policy issues on salinity control and management implementation are essential for tackling salinity problems[6]. Scientists at ICARDA follow two main strategies to control and manage the soil salinization.

These two strategies are (i) fighting salinity and (ii) living with salinity. Fighting salinity refers to reclaim or install drainage systems that allow salts to be washed out of the soil in combination with better irrigation water management, creating salinity levels acceptable to productive crops. Living with salinity is more pragmatic approach which refers to the ways of adapting crops to more saline conditions. For example, cultivation of increased drought and salinity tolerant varieties (i.e., halophytes) and growing deep rooted perennials are alternative ways of management of saline soils[7].

SALINITY RESEARCH

Currently salinity is a severe problem and main threat for food security. Conducting salinity researches to find alternative ways to solve salinity problems are very important to meet current and future food demands. A suitable management practices to control salinity problems must be implemented on irrigated fields, in irrigation projects and for geohydrologic systems[8]. Generally, development of more salt tolerant varieties of crops by either conventional breeding or genetic modifications that use water more efficiently will be more resilient to salinity stress[9].

CONCLUSION

A large area of land is salt-affected in the world which needs to be managed for future food security. A strong networking among researchers, farm advisors and farmers could enhance the management of salinity problems. Finding salt tolerant varieties of crops and uses of salt affected lands for other purposes like biomass production would be effective alternative solutions to combat salinity problems.

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