GREEN FARMING STRATEGIC VISION : 5

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PROBLEMS AND TECHNOLOGY FOR DESERT SOILS

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Sandy and Calcareous soils are covering wide areas around the world specially in arid and semiarid regions. Egypt occupies a total area of about 100 million hectares, out of this area, is about 3.1 million hectares as cultivated area covering three different production zones : 1. The old irrigated lands with an area of 2.3 millions hectares lying in the Nile Valley and Delta and most is fertile soils. 2. The newly reclaimed lands (0.8 million hectares included sandy and calcareous soils, the soil is poor in organic matter and macro-and micronutrients). 3. The rainfed area is about 0.1 million hectares of sandy soil located in the Northwest Coast and North Sinai.

Sandy soils have two major problems: *i.e.* low fertility and inadequate water retention. Wind erosion, drought and loss of irrigation water and plant nutrients are expected. High CaCO3 content in the soil cause more difficulties. Of these are: surface crusting and cracking, high pH and loss of N fertilizers, low availability of nutrients particularly P and micro-nutrients (Zn, Fe, Mn and Cu) and nutritional imbalance between some elements (K and Mg) and calcium . Under such severe conditions, desired yield levels are difficult to attain. However, they could be as productive as any fertile soil, if the right soil water management practices are followed. Other than adding clays or organic manures and composts to sands, the only obvious way to keep moisture more available in such soils is frequent water application and / or the use of synthesized soil conditioners. Although clays (100 to 150 m3 / acre.) could be mixed with sand to improve its water retentively, such treatment is expensive. It is usually justified only when land is very limited. The application of organic materials to sandy soils (10 to 20 Mg /acre.), has quite a similar effect to that of clay with some exceptions that organic matter is usually decomposed too fast that it is difficult to maintain more than 1 or 2 percent without heavy and seasonal manuring. Frequent irrigation is the usual solution for keeping enough water available in sandy soils. The high porosity of sands will allow excessive losses of water and dissolved fertilizers especially if overland flow methods of watering are used. The use of synthesized conditioners to avail suitable environment for planting sandy and sandy calcareous soils under the severe conditions of our deserts has become an accepted practice. Among these conditioners are super absorbent materials i.e. hydrogels Application rates ranged between 6 and 100 kg/acre. It is expected that applying organic materials mixed with the proper hydrogel to the soil may be more effective and economic than using each of them alone.

Mixing organic matter with hydrogels before incorporating into the sandy calcareous soil gave higher increments in the nutrients uptake by growing plants than those obtained when applying each of them solely. More increase was obtained in the marketable yield due to mixing OM with G before incorporating into the soil. The positive effects that gained on crop production, nutrients uptake and both water and fertilizers use efficiency by the plants. Regarding hydro-physical and mechanical properties of the soil, the effect of both types of soil conditioners (OM or G) include: 1) Promoting good soil structure that protects the soil surface against wind and water erosion through improving soil structurization and increasing the percentages of water stable structural units. 2) Increasing soil water holding capacity and the ability the soil to retain water due to their effect on pores size distribution towards the finer ones *i.e.* water holding pores, from one hand and the swellability of conditioners particularly the hydrogels, on the other hand 3) Improving the dynamic soil water characteristics *i.e.* decreasing downward movement of water through infiltration and the upward movement of it via evaporation and 4) improving the mechanical strength of the soil *i.e.* decreasing both penetration resistance and compressive strength of the soil surface to be suitable for soil management practices, root growth and distribution. Concerning the bio-chemical properties of the soil, the improving effect of applied conditioners includes: 1) lowering soil pH that leads to more solubilization of nutrients and increasing nutrients availability. 2) increasing the low exchange capacity and specific surface area of the soil that raises its nutrients retention abilities and in turn minimizing the loss of such nutrients by leaching or deep percolation and 3) increasing soil microbial biomass and enzymes activity indicating an improvement in the biological fertility of the soil.

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