

National Workshop on Agricultural use of Gypsum in Pakistan: Background and Recommendations

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BACKGROUND

In Pakistan, more than six million hectares have been deteriorated completely or partially by salinity and sodicity. Soil sodicity often follows soil salinity, which is quite well known in the country. About 56% of these salt-affected soils are saline-sodic or sodic and are not easily reclaimable. These soils suffer from poor water infiltration, surface crusting, erosion and water logging. So far, soil sodicity is not taken as a serious problem but in terms of area and impact, it is a very severe land degradation problem in Pakistan.

Sodium is a predominant ion in sodic soils, which occupies the exchange complex of the soil. As a result, the soil particles are unable to flocculate together as aggregates and hence the soil becomes unstable and impermeable to air, water and to plant roots. Sodic soils are comparatively more vulnerable to water logging, erosion and nutrient imbalances caused by their high pH. The adverse effects of sodicity are not so evident in the presence of salinity but once the high concentration of salts is removed by leaching below a certain concentration, the adverse symptoms of sodicity will start appearing. At advanced stages of sodicity, pH may increase to more than 10 and the soil becomes barren hence unable to support plants. Therefore, sodicity can rightly be considered as a significant environmental problem.

Sodic soils can be reclaimed effectively by providing a soluble source of calcium e.g. gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), or some acids or acid formers, which can solubilize the native CaCO_3 of the soil. Some of the other materials, which have proved effective, include the direct application of sulfur, aluminium and iron sulfates or iron pyrite, all of which eventually form gypsum in calcareous soils. Even green manuring and Farm Yard Manure have been used successfully but gypsum is the cheapest and most effective amendment readily available in the country for reclaiming large areas affected by sodicity. Gypsum is also very helpful for sustainable use of low quality brackish irrigation waters for crop production. Gypsum also acts as a source of plant nutrients i.e. Calcium and sulphur to the plants. It has 17% sulfate which is the most absorbable form of sulfur for plants. Calcium, which is supplied in gypsum, is essential for the biochemical mechanisms by which most plant nutrients are absorbed by roots. Without adequate calcium, uptake mechanisms would not function properly. Calcium also acts as a regulator of the balance of plant nutrients particularly the micro-nutrients such as Iron, Zinc, Manganese and Copper in plants. It regulates the uptake of non-essential trace elements. Calcium prevents excess uptake of many of them; and once they are in the plant, calcium keeps

them from having adverse effects when their levels get high. Calcium in liberal quantities helps to maintain a healthy balance of nutrients and non-nutrients within plants.

Beneficial effects of gypsum for the reclamation of sodic soils, crop yields and for amelioration of brackish waters have been demonstrated extensively to the farmers by different federal and provincial research and extension departments. Due to these efforts, farmers are now aware of the usefulness of gypsum for soil and crop improvement. In spite of importance of gypsum as an effective soil amendment that is being recommended for soil and brackish water amelioration in Pakistan, use of gypsum has not increased at farm level especially with the small farmers. Present usage is not commensurate with the gravity of the problem.

Keeping in view the above mentioned scenario, Pakistan Agricultural Research Council, Islamabad arranged a "National Workshop on the Agricultural Use of Gypsum in Pakistan" to discuss different research and policy issues regarding gypsum use. The two-day workshop was organized at National Agricultural Research Centre, Islamabad on April 9-10, 2001. Papers on the agricultural use of gypsum e.g. reclamation of sodic soil, amendment of brackish waters, the use of gypsum as a fertilizer, its processing, marketing, development etc. were presented in the workshop. Research organizations, progressive farmers, representatives of different gypsum crushing companies, farmers and NGOs, gypsum processing and marketing agencies, policy makers and agricultural extension agencies participated. At the end of the workshop, a recommendation committee comprising of eminent scientists of the country was formed to formulate recommendations for regulating different aspects of agricultural use of gypsum in Pakistan. The committee consisted of the following.

1. Dr. Sardar Riaz Ahmad, Retired Director General, AZRI, Quetta
2. Dr. Muhammad Aslam, Principal Agricultural College, D.G. Khan
3. Dr. Nazir Hussain, Agricultural Chemist, SSRI, Pindi Bhattian
4. Dr. Muhammad Ramzan Chaudhry, Director, IWASRI, Lahore
5. Dr. Izhar-ul-Haq, Agricultural Chemist, ARI, Tamab, Peshawar
6. Ch. Talib Ali, Director, Pakistan Council of Research in Water Resources, Lahore
7. Mr. Nazir Ahmad Jatial, Agricultural Chemist, RRI, Dokri, Sindh

Recommendations

1. Use of gypsum for saline-sodic/sodic soils and waters should be given due attention and be made popular through media (scientific, public and electronic etc.).
2. Use of gypsum may be encouraged along with FYM/green manures to sustain the irrigated agriculture.
3. Research on gypsum should be continued to arrive at concrete conclusions, specifically its application at a rate less than gypsum requirement (100% GR) as well as through splitting with special relevance to soil type and fineness of gypsum (mesh size).
4. Quality and purity (not less than 70%) of gypsum should be ensured by incorporation in Fertilizer Control Ordinance FCO 1973 (amended 1999) and should be effectively monitored. In the absence of its inclusion in FCO 1973 (amended 1999), it must be got instituted through an executive ordinance.
5. Ground water quality maps be developed on districts basis through special projects.
6. Since subsidy on gypsum has been withdrawn, credit facilities in kind, as in case of other agricultural inputs, should be given and its recovery be made in easy installments when the land becomes productive.
7. Land revenue may be exempted from the lands under reclamation/rehabilitation (with or without gypsum or with plantation), till they become productive to their full potential.
8. A Body/Board be constituted under the supervision of Agricultural Department to monitor and ensure the supply, quality and fineness of gypsum in time and space as is being practiced for NPK fertilized. The Board should include the representatives of the Farmers, Suppliers and Scientists.

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IMPORTANT NEWS

It is heartening to report that consequent upon these recommendations submitted, Government of Pakistan has already implemented the most important recommendation pertaining to quality control of gypsum (Serial No. 4) vide letter no. F. 4-27-98-Fert. Government of Pakistan, Ministry of Food, Agriculture and Livestock dated 23/05/2001, instructing Agriculture Departments of all the four provinces for strict compliance.

