SAG: An expensive deviation

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M. AZHAR JAVAID criticises the use of sulphurous acid generators in soil and brackish water amelioration, and says that it is an expensive system of little use to the country

Some foreign agencies in collaboration with our experts are working for the development of sulphurous acid generators (SAG). A sulphurous acid generator was also installed under the supervision of Agricultural University, Faisalabad. The preliminary results of the SAG are not so encouraging compared to the conventional approach to sulfuric acid application through fertigation. Excluding the operational and maintenance expenditures, a sulphurous acid generator costs more than about Rs 2.5 lakh per piece. The purpose intended to achieve with SAG can be simply attained with any non-fragile container/applicator of worth Rs 1000-2000 only. Only acid applicators need to be designed.

The sulphurous acid generator is a machine in which sulphur is burnt to sulphur dioxide and ultimately with water mixing the sulphurous acid is produced. The average sulphurous acid consumption estimates 1.5 kg/hour and discharge of the generator is reported to be 3.3-3.5 liters/second. Theoretically the chemical reactions taking place in SAG can be distorted or modified to serve the purpose intended. Extolling the merits of the technology without identifying its gaps and weaknesses is the secret of a profitable business.

The objections are: a) Does the fixed volume of sulphurous acid coming out of the SAG stand sufficient to any degree of water quality deterioration? Is the recent try to control sulphur-burn really successful by fuel adjustment? (b) Should not the fixed quantity of sulphurous acid produced by the SAG differ with the discharge of the tube wells? (c) Can the sulphur burnt in the SAG as raw material not be used directly for application to soil on water requirement basis? Is sulphur not already in use? Is this trend not in conformity with the replacement of hydroelectric power projects with thermal electricity projects for which nation is now suffering and paying for. (d) Has the sulfurous/sulphuric acid produced by the SAG not been earlier recommended to manage soil and water problems? (e) Is the ready made sulphuric acid not available in the markets? (f) Is SAG in the reach of poor farmers having a peter engine but land holding unit less than 12 acres? (g) Can we not apply sulphuric acid with non-fragile acid applicators to make it within reach of the farmers? (h) Can we manufacture SAG locally to reduce cost? (I) Is the import of SAG really in the interest of nation? (j) Has the cheaper and conventional methods of sulphuric acid application to soil failed?

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The ground realities are that Sulphurous acid generator produces sulphurous acid, which is claimed to amend all types of brackish waters. It does not correct completely a saline sodic brackish water and also not amicable to all types of sodic waters. This is clarified here that sodicity of brackish water is mainly due to high sodium adsorption ratio (SAR) and that of high residual sodium carbonate (RSC). The acid can neutralise only high RSC sodic water into CO_2 and H_2O. It cannot correct sodic water where sodicity prevails due to high SAR.

The following simple classification of brackish water may help judge the limitation of the SAG to amend water. The SAG cannot correct a water having brackishness due to (i) high EC, (ii) high SAR, (iii) high EC – SAR. (b) The SAG can partially amend (i) EC-RSC water (ii) SAR-RSC water (iii) EC-SAR-RSC water (c) The SAG can correct only (i) RSC water.

It reflects limitation of SAG technology in amending the brackish water. The data often quoted to support SAG import is a cumulative figure, which is mis-leading to the people and the policy makers. It is moral responsibility of our technical quarters to apprise Government of the factual position.

(2) The sulphuric acid like gypsum, on reacting with sodium contents of water produces sodium sulphate. Sodium sulphate builds up salinity and subsequently sodicity front in the soils with impeded drainage. So it is not fit for all type of soils and waters.

(3) Use of acids results in dissolution of insoluble calcium carbonate in soil. The cation exchange capacity of our soils is low (8 – 12 cmol (+) 1kg) due to dominating Illite type clay minerals. At this low CEC the optimum concentration of calcium in soil solution for Na-Ca exchange is 6-10 me/L. The excess quantity of Ca released may subject to leaching and fix phosphorous into insoluble calcium phosphate, hence making it less available to plants. Gypsum besides its low solubility furnishes adequate amount of calcium i.e compatible with our low CEC soils and Na – Ca exchange rate. So acid is not only recommended for calcareous soil. Its application is effective in high CEC soils.

(4) Use of acids converts Smectite and Illite into Vermiculite by protonation process, which is a greater fixer of potassium, hence also decreasing the availability of potassic fertilisers to the plants.

Alternate strategy: Gypsum in the country estimate to 5540 metres metric tonnes. The gypsum deposits of Sindh and Balochistan are still unexploited. They should use gypsum that costs about Rs. 800/- per tonnes against sulphuric acid costing about Rs. 6000 per tonnes. Gypsum in contrast to sulphurous acid is also fit for brackish water having sodicity due to high SAR value. It holds equally good for high RSC water and SAR-RSC brackish water combination. Similarly sulphur used as raw material in SAG can be directly applied to soil on water requirement basis. One month earlier sulphur application to cropping may facilitate biological oxidation of sulphur to achieve the purpose.

The government should constitute a technical committee comprising of soil scientists and economists for performance evaluation of the S.Acid Generators. The SAG should be locally manufactured to reduce its cost so as to make SAG within the reach of the poor farmers of this country. Preparation of one or two locally manufactured SAGs should not be displayed as models to the policy makers or just to cover objections. These should be sincerely manufactured on commercial lines with the intention to discourage its import at the cost of loan to this country. The SAG under testing should reflect the comparison of conventional approach to acid use on exact calculation basis under a wide range of soil and hydraulic characteristics. It should not remain limited to SAG and non-SAG treated practice. Loss to soil microflora and fauna in response to acid-use should also be monitored.

The country is already overburdened with heavy loans. A loan of $ 3.5 billion has already been taken for the completion of the SCARP during 1960 and 2000. The government has again borrowed $ 785 million from the World Bank for the National Drainage Programme. Before thinking of the import of SAG to Pakistan and asking the Government to subsidise, we must think in term of finance. If heavy finance is involved, then it is better to organise sulphuric acid application through conventional methods by manufacturing locally the sulphuric acid applicators. Sulphur use as raw material in SAG has always been recommended for direct application to soil on crop water requirement basis. It does not involve costly machine like imported SAG for application and also needs no fuel. However, to facilitate bio-chemical oxidation of sulphur, timely application under moist field condition is must. It requires a little but wise management to alleviate the hazardous effect of brackish water on soils. There is no need to import and involve costly SAG machinery and fuel for burning sulphur. ■