



CUSTOMIZED FERTILIZERS: KEY FOR HIGHER CROP PRODUCTIVITY

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Chemical fertilizer is one of the key inputs that help in sustaining the production and productivity of crops. Since there is no scope for extending the cultivable area in many countries, the only option to improve agriculture production to meet the requirements of growing population is increase productivity to the maximum possible level per unit area using fertilizers. In countries like India where imbalanced use of chemical fertilizers already created multi-nutrient deficiencies there is an urgent need to motivate farmers to adopt balanced fertilizer use. Though there are blanket fertilizer recommendations for crops for different regions and countries research conducted by Dobermann and Cassman (2002) identified limitations in blanket fertilizer recommendations widely practiced across Asian countries. In fact, existence of large field variability in nutrient supply capacity of soils, nutrient use efficiency, and crop response to available nutrients affect the effectiveness of blanket fertilizer recommendations in producing a good crop yield. Knowledge-intensive soil and crop management technologies are required to manage these constraints and ensure increased crop productivity on a sustainable basis.

WHAT ARE CUSTOMISED FERTILIZERS?

Fertilizer (Control) Order 1985 defined customized fertilizers as “multi nutrient carrier designed to contain macro and /or micro nutrient forms., both from inorganic and/or organic sources, manufactured through a systematic process of granulation, satisfying the crop’s nutritional needs, specific to its site, soil and stage, validated by a scientific crop model capability developed by an accredited fertilizer manufacturing/ marketing company”. These forms of fertilizers are considered as the best available option to correct site specific multi-nutrient deficiencies of soils so as to attain then maximum crop production through improved nutrient use efficiency.

MANUFACTURING METHODOLOGIES

Chemical granulation: It is also called ‘slurry granulation’ or ‘complex granulation. Here, fertilizer production start with the basic raw materials like rock phosphate, acids and ammonia rather than their salts like diammonium phosphate and urea. A large capacity manufacturing plants are needed to carry out chemical reactions. Infrastructure cost of handling and storage of acids and ammonia are huge due to difficulty in undertaking chemical reactions. It is less flexible to produce variety of grades.

Bulk blending: It is the simplest and cheapest option available for the production of customized fertilizers, which involves pure mixing of solid fertilizers in a ratio required to get the desired nutrient ratio. It only requires warehouse, weighing and mixing equipment. It has the advantage of smaller capacities of decentralized production uniquely suited to give the customer exactly the NPK ratio he requires. The physical standard should be such that the shape and size of



all fertilizers, raw materials are similar and also high quality granular fertilizer material is needed, which are to be used in bulk blends. In Indian context, importing of the raw materials is needed because of these stringent specifications of raw materials, and for large scale production it is not suitable. However for the experimental purposes this is the most suitable method (FAI, 2011).

Compaction: Compaction is also called as 'dry granulation' process as not using any liquid binders for making it as granule. Fertilizer material should be powdered and apply high pressure on this powdered materials to squeeze them together which results in large dust generation and the final products in the form of briquettes or flakes.

Fluid method: Most suited method in the intensive farming system to obtain a higher yield. Two types of liquid formulations are there; clear liquids and suspension liquids. If it is suspension liquids, it needs constant agitation. It provides a dust free application method. A mixture of ammonia, phosphoric acid and micronutrients gives a good homogenous liquid fertilizer.

Compound/Steam granulation: Raw materials are in solid form and uniform size reduction of this fertilizer material is the key to granulation. Agglomeration of granules can be attained by use of hot water or low pressure steam. Then the granulated materials should be dried and cooled by dehumidified air. Hygroscopic products like urea containing grades need dehumidified bagging plant also otherwise caking of the products will occur. This is the most suited method for the large scale production of customized fertilizers in India.

CUSTOMIZED FERTILIZER FORMULATION

Fertilizer Association of India (FAI) is recommending certain specifications of customized fertilizers for a particular grade of formulation. For basal application it should be granular in size with minimum 90 per cent materials remains between 1-4 mm. Indian standard sieve and size less than 1 mm should not exceed 5 per cent and the product should not exceed 1.5 per cent. Foliar application grades should be 100 per cent

water soluble. Minimum nutrient content in the grade should be 30 units of all the nutrients combined.

CUSTOMIZED FERTILIZER GRADES

The grades of customized fertilizer which the manufacturing companies propose to manufacture and sell shall be based on area specific and crop specific soil testing results. The manufacturer may be in association with Agricultural Universities/KVKs concerned, shall also conduct agronomy trials of the proposed grade to establish its nutrient efficiency. The manufacturing companies, preferably in association with concerned agriculture universities/KVKs may continue to conduct agronomy tests of the proposed grades on the farm, for at least one season. The minimum nutrient contents in a specific grade of customized fertilizer, proposed to be manufactured, shall contain not less than 30 units of all nutrients in combined.

APPLICATION OF CUSTOMIZED FERTILIZER

The objective behind the customized fertilizer is to provide site specific nutrient management for achieving maximum fertilizer use efficiency for the applied nutrient in a cost effective manner. Customized fertilizers are combination of micro nutrients like sulphur, zinc, boron added to the key items such as urea and diammonium phosphate (DAP) and potash, in a proportion that suits specific crops and soil patterns. A fertilizer formulated according to specifications that are furnished by/for a consumer prior to mixing, usually based on the results of soil tests.

The efficiency of customized fertilizers depends on soil properties, crop, water and specific nutrients. Customized fertilizers manufacture basically involves mixing and crushing of urea, DAP, MOP, ZnS, bentonite sulphur and boron granules for obtaining the desired proportion of N, P, K, S and micronutrients.

MAJOR CONSTRAINTS TO PROMOTE CUSTOMIZED FERTILIZERS

The available research information sounds well for upward revision of fertilizer recommendations as the existing fertilizer



doses (NPK) are proving to be sub-optimal for maximum economic yield. It is also evident that application of nutrients according to current recommendations is causing nutrient depletion particularly in respect of potassium and micronutrients. The current soil test based recommendations consider only the nutrient deficiency magnitude, not the yield targets. Only one recommendation being currently given without considering the yield target is proving to be sub-optimal for higher yield targets, thus farmers are losing yield, produce quality and profits. The current fertilizer recommendations support only medium yield target provided the supply of nutrients other than NPK is not a limiting factor. In contrast, the deficiency of one or the other secondary and / or micronutrient deficiency is observed in all parts of the country. The most important issues which hinder the marketing of customized fertilizers are:

- High cost of customized fertilizers.
- Necessity of investing heavy capital in state of the art manufacturing facility for customized fertilizer.
- Limited awareness and very low affordability of customized fertilizers among the farmers.
- Uncertainty in response when fertility is restored in the field.

BENEFITS OF CUSTOMIZED FERTILIZERS

- Mostly use in fertilizers best management practices and generally assumed to maximize crop yields while minimizing unwanted impacts on the environment and human health.

- Application of customized fertilizer is compatible with existing farmers system and hence, it will be comfortably accepted by the farmers.
- Production of customized fertilizers will ensure improved 'Fertilizer Use Efficiency' and creating a new "Virtual" source of nutrients – implying from the existing quantity of DAP, MOP, Urea, SSP are consumed in India, the agricultural produce output will increase, simultaneously the distribution and availability of fertilizer will be better. Customized fertilizer satisfies crop's nutritional demand with respect to specific to area, soil, and growth stage of plant.
- As the micronutrients are also added with the granulated NPK fertilizer the plants can absorb the micronutrient along with macronutrient which prevents nutrient deficiency in plant.
- The farmer need not buy micronutrient separately at extra cost, thus reducing the total cost.
- Mixed fertilizers with micronutrients provide recommended micronutrient rates for the agricultural field at the usual fertilizer application.

REFERENCES

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