sugarcane productivity and reduce the cost of cane production on account of fertilizers.

Table 1.1 Chemical Fertilizers

INM	Recommended N; 100% P_2O_5 + 100 % K_2O through Chem Fertilizer (112.50N:85P_2O_5: 60K_2O/ha) + along with micronutr Zinc (+ 25% N through Organic source along with Biofertilize		
CP 1.	Chemical Fertilizer	Quantity of Fertilizer (Kg)	Total Cost (Rs)
1	Urea	172	9441.00
2	Diammonium Phosphate	185	
3	Muriate of Potash	100	
	*Zinc sulphate	25	
CP2.	Organic Fertilizer		
		Quantity of Fertilizer (Kg)	Total Cost (Rs)
1	Option 1 FYM	20 t/ha	30000
2	Option 2 Vermicompost	5 t/ha	30000
CP 3.	Biofertilizer		
1	*Azotobacter*	4 kg/ha	800.00
2	PSB	4 kg/ha	
INM cost/ha for sugarcane (Rs)			40,241

Organic fertilizer

Application of FYM/Vermicompost after preparation of land and furrow opening. The recommended dose of FYM/vermicompost should be applied in furrow. The biofertilizer should be mixed properly with 200 kg compost and uniformly applied in furrow.

Chemical fertilizer

Application of N, P and K through urea, diammonium phosphate (DAP) and muriate of potash (MOP), respectively and Zinc sulphate in furrow before planting of sugarcane. Half of the N and the entire P and K were applied as basal doses as per treatment at the time of sowing, with the remaining N top-dressed in two equal portions 1 st irrigation and at Earthing up stage of crop growth. All these fertilizers should be properly mixed in soil before planting to avoid direct contact of sugarcane setts with chemical fertilizer.

Outcome

INM reduce the amount of chemical fertilizer. The application of organic will improve the soil quality in terms of improvement in physical, chemical and biological properties of soil. Organic manures improves the quality of juice and jaggery due to balanced supply of all essential nutrients in right proportion and slow release throughout the cropping season. It increases the nutrient use efficiency and supplement micronutrient in soil. INM improve the yield of sugarcane by 15-20% and juice quality. The application of organic fertilizer in combination of chemical fertilizers will not only helps sugarcane growing better, but also will reduce the cost of cultivation, dependency on the chemical fertilizers, environmental pollution and soil health deterioration.

For more details please contact to:

Authors

C. K. JHA, Assistant Professor
AJEET KUMAR, Assistant Professor
SUNITA KUMARI MEENA, Assistant Professor
S.K SINHA, Assistant Professor
S.K. THAKUR, Professor & Head

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INTEGRATED NUTRIENT MANAGEMENT MODEL: SUGARCANE

C. K. JHA, AJEET KUMAR, SUNITA KUMARI MEENA, S.K SINHA and S.K. THAKUR

Department of Soil Science
Sugarcane Research Institute
Dr. Rajendra Prasad Central Agricultural University
Pusa, Samastipur

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Sugarcane being a heavy feeder and long duration crop suffers from persistent nutrient unbalance due to gap between nutrient removal and application. The crop is long duration and nutrient exhaustive. The depleting soil health and crop productivity in the sugarcane cultivating area of sub-tropical states namely Uttar Pradesh. Punjab, Haryana, Uttarakhand and Bihar are a major concern. The frequent and excessive use of chemical fertilizers has created various problems like widespread deficiency of secondary and micronutrients, decline in crop productivity and increasing environmental pollution.

Soil Health status

The deterioration in soil health and ecology has been reported in recent years mainly due to erratic and imbalance use of chemical fertilizer. The loss in organic matter is the root cause for decline in factor productivity. Restoration of soil organic matter is thus, needed for improving productivity through correction of essential macro and micronutrients deficiencies and improvement in soil health. Continuous use of heavy doses of fertilizers and plant protection chemicals potentially impaired the soil microbial activity, leading to poor soil health. The alluvial sandy loam soils of Bihar are deficient in micronutrients and low in organic matter. A great part of applied Zn remains in soil as unutilized by the crop to which they are applied. Therefore, it would be desirable to optimize the nutrient-use efficiency and curtail the cost of fertilizer for making the system more remunerative.

Need of INM:

The long term experiment on sugarcane clearly indicated that neither the chemical fertilizer alone nor the organic sources exclusively can achieve production sustainability of soil and crop. It is imperative to substitute a part of N fertilizer by locally available organic sources of nutrients viz., manure, crop residue, bio-fertilizers in a synergistic manner. Several elite varieties of sugarcane has been developed from Sugarcane Research Institute, Pusa with a potential of producing cane yield of about 90-100 t ha-1. The poor yield of sugarcane in Bihar is mainly due to lack of application of organic nutrient sources and erratic and unbalanced use of chemical fertilizer. The decline in organic matter and available nutrient especially N is root cause of low productivity. Secondly, soils of sugarcane growing areas are rich in free $CaCO_3$ resulting in low availability of available P and micronutrient especially Zn. Currently deficiency of B has been reported from many parts of India which underline the need of B fertilization.

- High nutrient turn over in soil-plant system coupled with low and imbalance fertilizers use
- Emerging deficiencies of micro and secondary nutrients (S, Zn, B and Fe)
- Soil degradation due to acidification, aluminium toxicity, soil salinization, alkalinization and soil erosion
- Wide nutrient gap between nutrient demand and supply
- Deterioration in soil physical, biological and chemical quality,Low fertilizer use efficiency

INTEGRATED NUTRIENT MANAGEMENT

Integrated nutrient management (INM) is maintenance of soil fertility and nutrient supply to an optimum level for sustaining desired productivity through optimization of all possible sources of plant nutrients in an integrated manner. The main objective of integrated nutrient management is to improve and sustain soil fertility for providing a sound basis for crop production systems and to meet changing needs. The basic principle of INM is the maintenance of soil fertility, sustain agricultural productivity and improve farmers' profitability through judicious and efficient use of chemical fertilizers, organic matter, green manures and biofertilizer. In sugarcane growing areas, there is an ample scope for recycling back of some organic wastes (viz. press mud, sugarcane trash, bio compost, etc.) in soil and integrated application of sugarcane waste may reduce the use of chemical fertilizers and improve sugar productivity.

Basic objective of INM

To reduce the inorganic fertilizer requirements /restore organic matters in soils. To enhance nutrient use efficiency and maintain soil productivity through balanced use of mineral fertilizers combined with organic and biological sources of plant nutrients. To utilize the potential benefits of green manure, leguminous crops, crop residues and biofertilizers.

Components of INM:

The relative contribution of each component to INM for a forming system depends mainly on their local availability and socio-economic factors. The major components of INM are fertilizer, organic manures, and biofertilizer. Recycling of sugar industry wastes can be gain fully utilized to enhance