BIO-FERTILIZERs & FERTIGATION

AN INTERACTIVE APPROACH FOR NUTRIENT MANAGEMENT IN SUGARCANE CROP

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ABSTRACT:

Although per acre yield of sugarcane has increased form 47.78 tons per hectare in year 1998-99 to 56.50 tons per hectare in year 2012-13 but still is far behind the demonstrated yield of 160 tons per hectare in Pakistan. During this 15 years, evolution of new high yielding varieties coupled with ever changing environment has forced the farmer for adopting new package of agronomic practices to achieve desired economic yields and to address the sugar mill's concern of sugar recovery. Among the 11 yield limiting factors for sugarcane, fertilizer's 4R are contributing the maximum loss i.e. 20-30%, followed by abiotic stresses. Bio-fertilizer and fertigation are emerging techniques to address the nutrients management in sugarcane crop.

Major issue earlier with bio-fertilizers was the shelf life, true to type microbes & microbe's population and major issue earlier with fertigation was availability of soluble fertilizers. Now above both the issues are addressed by the marketers. Adoption of bio-fertilizers and fertigation has demonstrated 40-45% yield increase in sugarcane. Now, products for addressing the abiotic stresses, water stresses are also getting space in Pakistan. Need of time is to educate the masses for adoption of bio-fertilizers, fertigation and new agricultural technologies.

INTRIDUCTION:

Population pressure has pushed all the concerned, for vertical farming model due to limitation of land availability. This model is very successful on high value crops like tomato, cucumber, squashes, gourds, berries etc. that took lead in Pakistan's innovative Agriculture. Due to high prices of fertilizers coupled with high nutrient needs of high yielding crops, famers have tried the split application of fertilizers along bio-fertilizers.

Bio-fertilizer in supplement to chemical fertilizers and especially as fertigation has proved to be the one of the best option for farmers that fully suites the needs of famers as well as nutrient requirements of the crops. This successful experience of farmers has resulted in introduction and adoption of water soluble fertilizers and bio-fertilizers in Pakistan.

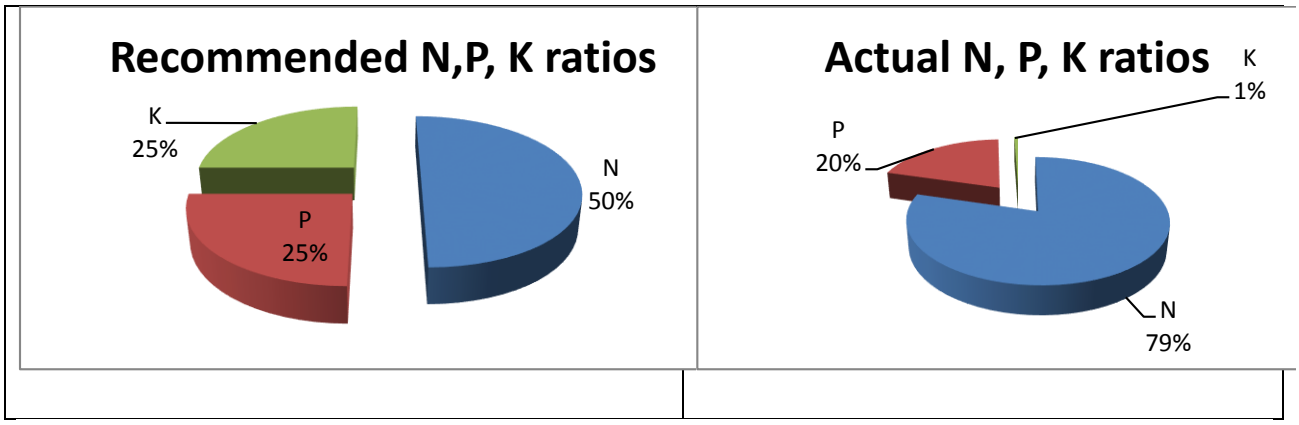
Recently, farmers have enhanced bio-fertilizers use and fertigation on field crops like potato, maize, sugarcane, cotton, wheat and even orchards. Bio-fertilizers and fertigation has helped promoting balanced use of fertilizers including micro nutrients. In addition the farmers, adopting the bio-fertilizers and fertigation technique, are more conscious in water savings than normal, which leads to enhance water use efficiency too. Now farmers are practicing fertigation of bio-fertilizers with classical fertilizers too like, Urea, NP, CAN, TSP and DAP etc. But, there is a gap in fertilizers recommendations and fertilizer use techniques / methods at farmer's level. Progressive farmers are using high doses / adjusted doses of fertilizers/bio-fertilizers, through different application options and at different crop growth stages as suites them in terms of cost, convenience, efficiency and return on investment (ROI). Like Potash, almost same tonnage is used in fertigation as for basal on diffident crops. Likewise, Sugar mills have enough press mud and R&D sections are already working on this aspect. Bio-fertilizers in combination with fertigation will help achieve the demonstrated yield potential of sugarcane in our country and caring of 4R nutrients stewardship will help increase the sugarcane recovery too.

FERTILIZER USE STATUS IN PAKISTAN:

As appended below (courtesy National Fertilizer Development Centre-NFDC, Islamabad, Annual Report 2013-14) review of last 5 year fertilizers use statistics of Pakistan has revealed that as against the standard general recommendation of N, P and K in ratio of **2:1:1** for general crops, but on ground reality is **2: 0.5:0.014**. In case of sugarcane, farmers are more inclined towards nitrogen but P and K are underutilized.

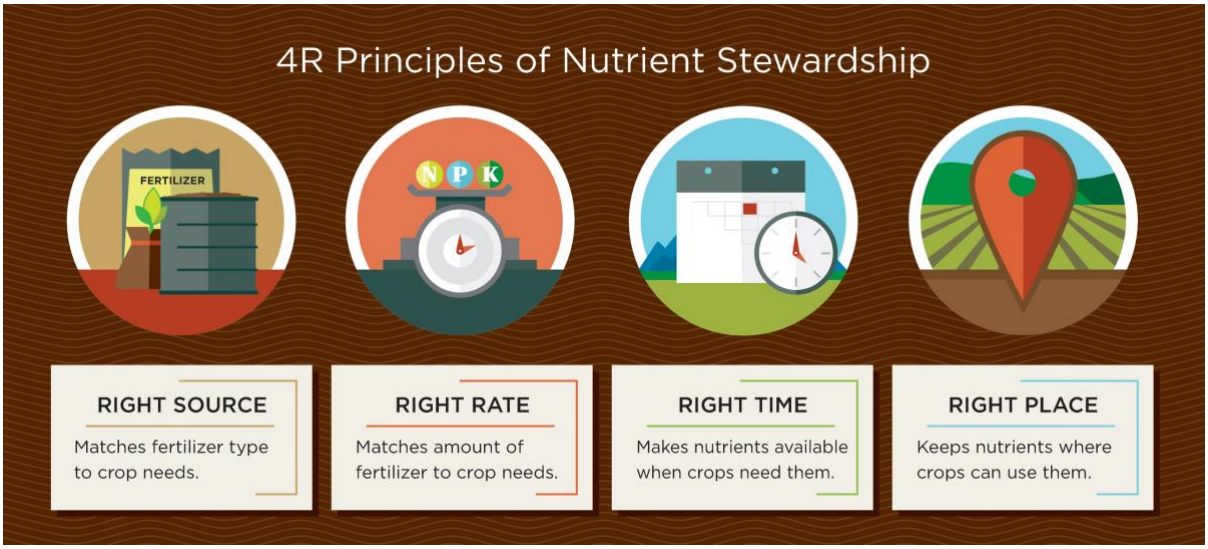
Pakistan Crop Nutrients Use (Tons)					
	2009-10	2010-11	2011-12	2012-13	2013-14
Nitrogen	3,476,000	3,134,000	3,206,000	2,853,000	3,182,000
Phosphate	860,000	767,000	633,000	747,000	875,000
Potash	24,000	32,000	21,000	20,000	24,000
Pakistan Crop Nutrients Use Ratio					
	2009-10	2010-11	2011-12	2012-13	2013-14
Nitrogen	2	2	2	2	2
Phosphate	0.5	0.5	0.4	0.5	0.5
Potash	0.014	0.021	0.013	0.013	0.014

N, P, K use ratios (More elaborated)



4R Nutrient Stewardship for Sugarcane:

Right time and right place are more critical for sugarcane as it is the yearlong crop. So, for nitrogen, farmers are caring it through split application but for P and K there needs a great focus to split the application so makes nutrient available when crop needs them. Here the combination of basal N, P and K and fertigation of N, P and K will serve the purpose.



FERTILIZER APPLICATION TIMING RECOMMENDATIONS FOR SUGARCANE

4R for Sugarcane	Basal Application	Fertigation
Right Source	Compost+ Classic Fertilizers + Bio-fertilizers	WS *fertilizers + Bio-fertilizers
Right Rate	Compost+ Classic Fertilizers + Bio-fertilizers	Partial N,P & K + Bio-fertilizers^
Right Time	Compost+ Classic Fertilizers + Bio-fertilizers	Partial N,P & K + Bio-fertilizers
Right Place	Compost+ Classic Fertilizers + Bio-fertilizers	Partial N,P & K + Bio-fertilizers

*WS = Water Soluble

^= Internationally Bio-fertilizers are used to:

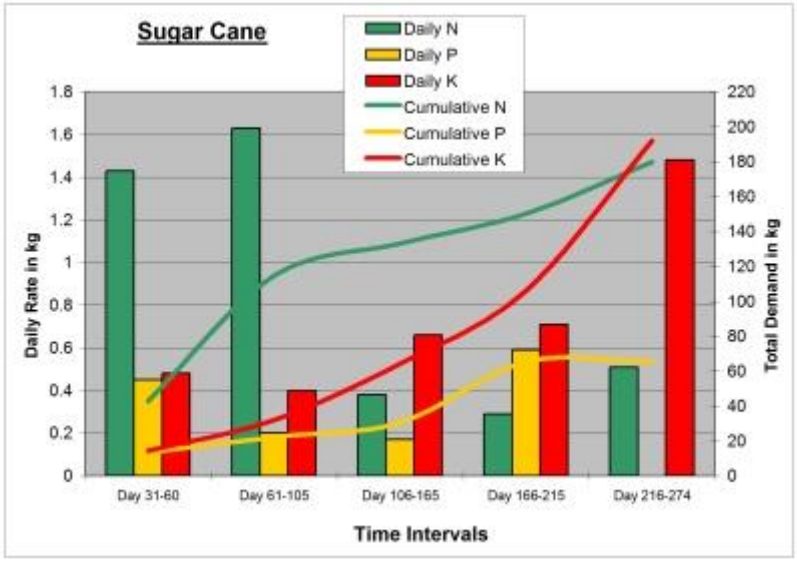
1) Increase fertilizer use efficiency through solubilization.

2) Antagonistic towards many plant pathogens

3) Induce plant stress resistance 4)Promote root growth 5)Improve soil condition

NUTRIENTS UPTAKE PATTERN to age FOR SUGARCANE:

Appended below graph (Courtesy Haifa) suggest to revisit our fertilizer recommendations as per the nutrients uptake pattern of N, P and K.



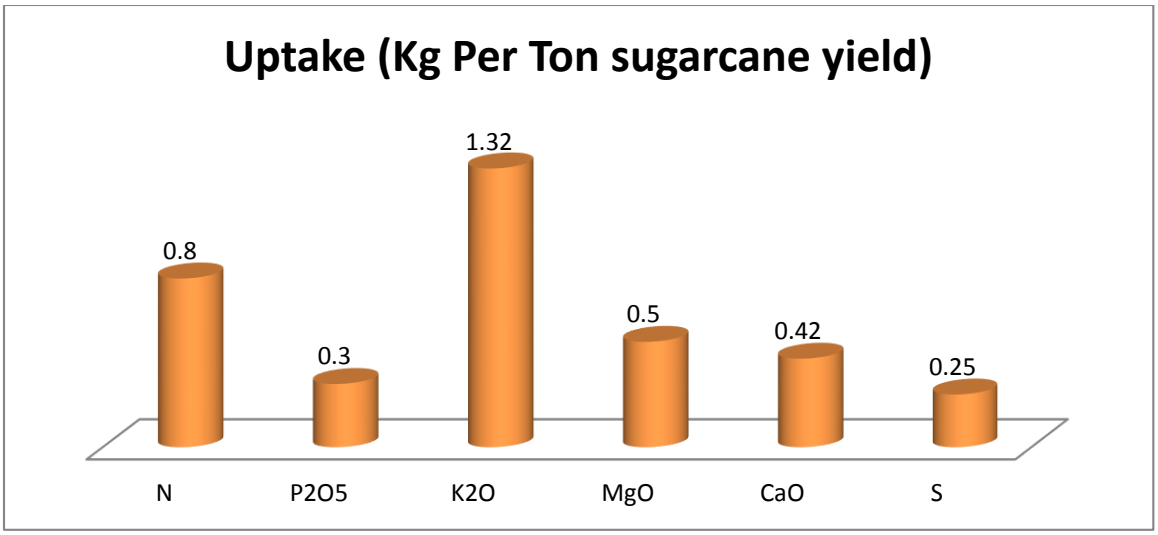
Nitrogen uptake is maximum in earlier growth stages and that can be enriched with the addition of press mud / compost @ 200 -250 kg per acre.

Phosphorus need is spread in earlier to mid growth stage. Basal application of phosphorus is fulfilling the earlier growth stage absorption and severe phosphorus deficiencies are observed (due Ca-sorption of P) in mid growth stage. Mid growth stage needs of Phosphorus can be fulfilled through soluble fertilizers of phosphorus treated with bio-fertilizer.

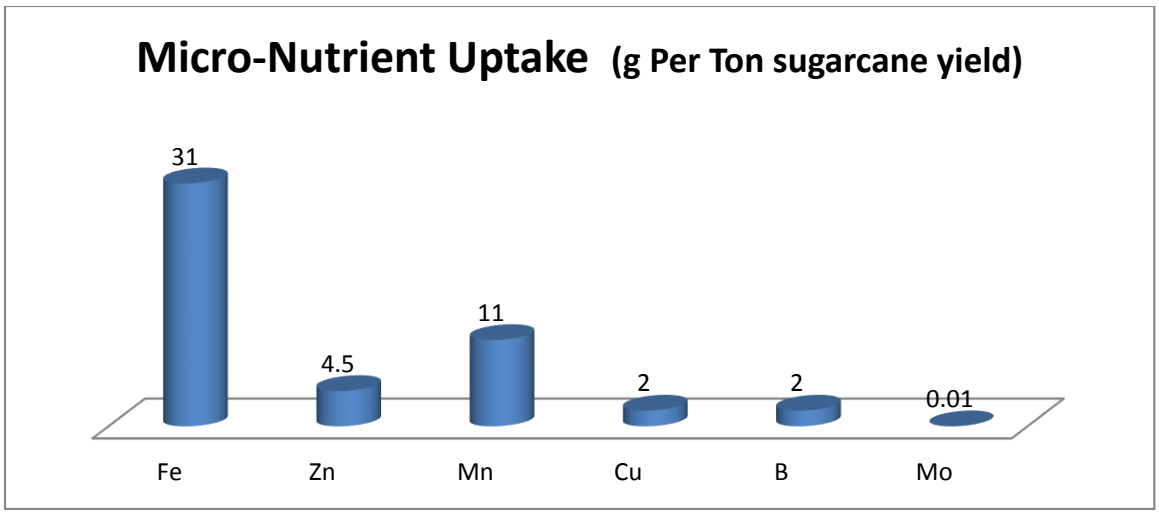
Potash absorption pattern is skewed towards mid growth stage to maturity. So, in addition to basal potash application to sugarcane, there is a dire need to educate the farmers for supplementing the potash during mid-growth stage to maturity.

MACRO & MICRO NUTRIENT'S NEED FOR SUGARCANE: (courtesy FAO report)

Qualitatively, pattern of nutrient uptake is: Potash at top followed by nitrogen, Magnesium, calcium, phosphorus and sulfur.



In micro nutrients, pattern of uptake is like:



Among macro nutrients, there is a dire need to focus on K and P application/availability during growth period of sugarcane and among micro nutrients Iron needs a focus along Manganese and zinc.

Thanks

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