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Assessment of site specific nutrient management in hybrid maize (Kanchan)

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Abstract
An experiment was conducted on farmer's field in Amanari village of Sadar block: and Bend village of Katakamdag block under OFT for assessment of site specific nutrient management in hybrid maize (Kanchan) during kharif season of 2014 and 2015 in sandy loam soil of pH (5.88), low organic carbon, available nitrogen (166.25kg), available phosphorous (26.23kg/ha) and available potash (175.5kg/ha).There were three treatment including farmers practice (75kg Nitrogen, 43kg P2O5/ha.) as control, Recommended dose of fertilizers 80:60:40 (T2) and site specific nutrients management (Nutrients Expert dose 120:24:51) (T3). Among these treatments (T3) is found most suitable nutrient management technique for obtaining higher grain yield (43.60q/ha.), maximum net return (□ 33891.0) and B:C ratio (2.49:1) in 2014. Similar result was also obtained in 2015 i.e., maximum grain yield (40.36q/ha.), higher Net Return (□35399.0) and B:C ratio (2.68:1) in T3.

Keywords: Site Specific, Nutrient Management, Hybrid, Maize.

Introduction
Maize has been considered as unique plant since the time peoples have developed it to be their staple food. It is important food and feed crop of the world and often referred to as "Queen of cereals, miracle crop and king of grain crops". Maize a crop of worldwide economic importance, together with rice and wheat, provides approximately 40 % food calories to more than 45 billion people in 94 developing countries and the demand for maize in these countries is expected to double by 2050. In India, maize is consider as third most important food crop among the cereals and contributes to nearly 9% of the national food basket (Dass *et al*., 2012). It is grown in 8.78 million hectares with production of 21.76 million tones and productivity of 2.47 tons per hectare during 2011-12 (upkaronline.org). Jharkhand, it occupies 0.16 million hectares of area with 0.19 million tons of production (Director of Economics& statistics, 2009-10).

The goal of Indian agriculture has to be increase in the food grain production with the minimum and efficient use of chemical fertilizers. This calls for a sincere effort on the part of nutrients is a key aspect in increasing maize productivity and production but those nutrients should be balanced based on the plant requirement which need the focus on knowledge intensive technologies and adaptation of the same on individual form or fields. In this content Site specific nutrients management approach is on such option which focuses on balance and crop need based nutrients application (Johnston *et al.* 2009). It provides an opportunity for the time of application fertilizers at optimal rates to fill the deficit between the nutrients needs of high yielding crop and nutrients supply from naturally occurring indigenous sources, including soil crop residue, manure and irrigation water. Site specific nutrient management ensures for balance precision nutrients application of nitrogen, phosphorous and potash along with secondary and micro-nutrients based on the nutrients supply capacity of the soil and nutrients requirement of a particulars crops to produce a unite quantity of yield or set targeted yield. The general principle underlying site specific nutrients management is transferable from place to place but the fine tuning of production system it's necessarily region specific because soil, climate and economic conditions vary.

The Nutrients expert for hybrid maize was developed by IPNI (International Plant Nutrient Institute), Penangmalesia. It is new computer based decision support tool that enable researcher, extension expert and industries agronomist to quickly develop field specific fertilizers recommendation for hybrid maize (Witt *et al.*, 2010) [5, 8].

Methodology
An experiment was conducted at farmer's field (village - amanari, block - sadar and village - bendi, block - katakamdag) under OFT for assessment of site specific nutrient management

(SSNM) in hybrid maize (Kanchan) during *kharif* season of 2014 & 2015 in sandy loam soil of pH (5.88), low organic carbon, available nitrogen (166.25kg), available phosphorous (26.23kg/ha) and available potash (175.5kg/ha). There was three treatments including farmers practice (75kg Nitrogen,43kg P2O5/ha.) as control, Recommended dose of fertilizers 80:60:40 (T2) and site specific nutrients management (Nutrients Expert dose 120:24:51) (T3).

Fertilizer dose was applied as per treatment basal dose of full P_2O_5 in the farm of DAP (Diammonium Phosphate), K_2O through Muriate of potash (MOP) and ½ dose of nitrogen through urea was applied as basal application. The remaining ½ dose of nitrogen was top dressed in two equal splits, first at 25 days after sowing and second at tasseling stage. The SSNM dose was through nutrient expert on software developed my IPNI and CIMMYT for targeted yield of 45 q/ha.

Grain yield was calculated by harvested comb per 5 m^2 from each plot separately. After cleaning and drying grain yield was recorded in q/ha by multiplying with conversion factor. The Stover yield was obtained by weighing the stalk harvested from the 5 m^2 from each plot. The yield was converted in q/ha by multiplying it with conversion factor. The harvest index was calculated by using the formula suggested by Singh and Stoskopt (1972) and shelling percentage was calculated by using the formula. The Net return and B:C was also calculated by using formula.

Result and discussion

Effect of Site specific Nutrients Management on yield and yield attributes.

The data pertaining to grain yield, comb yield and Stover yield (q/ha.), harvest index and shelling percentage influence by nutrients management practices.

Grain yield: The data (table no.1) that grain yield of maize differed significantly due to the nutrients management practices SSNM produce significantly higher grain yield (43.6, 40.36) than farmers practices (31.0, 28.0) similarly, application of RDF also brought significant improvement in yield (41.0, 38.53) over farmers practices. In other worlds SSNM and RDF brought about 40.6, 44.0 and 32.2, 36.9 percent higher grain yield compare to farmers practice.

Cob yield: The data (table no.1) SSNM and RDF produce significant higher cob yield than farmers practice. In other word SSNM&RDF produce 4.35, 4.05 and 28.7, 33.1 percent higher cob yield than Farmers practice, respectively.

Stover Yield: Analysis of data (Table no.1) reveled than nutrients management practices caused significant effect of stover yield of maize the maximum stover yield was associated with SSNM which was significant higher than farmers practice. Similarly, RDF also improves significantly superior over farmer's practices in this respect. In other world, SSNM and RDF produce 9.48, 25.69 and 9.44, 20.7 percentage higher yield than farmers practice.

Shelling percentage: Data on shelling percentage (table no.1) revealed significant effect of nutrients management practices on shelling percentage. Among the nutrients management practices, SSNM recorded significantly higher shelling percentage (7.13, 6.50) as compared to farmers practice but failed to cause significant variation with RDF. Similarly RDF brought significantly improvement in shelling percentage over farmers practice. In other word SSNM and RDF enhance shelling percentage by 7.13, 6.50 and 6.03, 5.95 percentages higher than farmers practice.

$$\text{Shelling percentage} = \frac{\text{Grain yield}}{\text{Weight of Cob}} x\ 100$$

Harvest index: Data on harvest index (Table no.1) revealed significant effect of nutrients management practices, SSNM and RDF recorded significantly higher harvest index than farmers practice. In other word SSNM and RDF enhance harvest index percentage by 5.43, 3.19 and 4.35, 3.04 percentages higher than farmers practice.

$$\text{Harvest Index} = \frac{Economic\ Yield}{Grain\ yield} x\ 100$$

Effect of site specific nutrients management on plant population and height.

Plant population: The data present in table No.2 reveled that nutrient management practices failed to cause significant variation plant population.

Plant height: The data table no.2 present the SSNM significant taller farmers practice but failed to cause significant difference with RDF. Similarly, RDF recorded significantly taller plant height than farmers practice.

Economics

Net Return: It is apparent from the in table no.2 that SSNM gave higher net return (□ 33891.00 & □ 35399.00) than farmers practice (□ 17885 & □ 17878). The RDF (□ 29827.00 & □ 9809.00) also gave higher net return than farmers practice.

Net Return= Gross return- Cost of Cultivation

Table 1: Effect of Site specific Nutrients Management on yield and yield attributes.

Treatment	Grain yield q/ha.		Cob yield q/ha.		Stover yield q/ha.		Shelling %		Harvest index %	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
PF	31	28	39.99	35.63	76.11	52.36	77.56	78.59	28.67	34.86
RDF	41.2	38.53	49.24	45.58	83.3	63.21	83.59	84.54	33.02	37.9
SSNM	43.6	40.36	51.48	47.43	83.33	65.79	84.69	85.09	34.1	38.05
CD(P=0.05)	2.92	2.14	3.63	2.67	6.13	3.44	1.63	1.19	1.2	1.26

Table 2: Effect of Site Specific Nutrients Management on Plant population, growth and economics.

Treatment	Plant population /m2			Plant height (CM)		Net return Rs.		B:C ratio
	2014	2015	2014	2015	2014	2015	2014	2015
PF	7.3	7.67	219	118	17885	17878	1.8	1.83
RDF	8.3	8	226	125	29827	29809	2.26	2.27
SSNM	8.3	8	230.63	128	33891	35399	2.49	2.68
CD(P=0.05)	NS	NS	6.19	6.12				

B: C Ratio: The maximum benefit cost ratio was observed with SSNM (2.49:1 & 2.68:1). It is greater than RDF (2.26:1& 2.27:1) and farmers practice (1.8:1&1.33:1). In other world SSNM is increase 38.33, 46.45 percentage B:C ratio than farmers practice. The RDF also increases 25.56, 24.04 percent than farmers practice.

$$\text{B:C Ratio} = \frac{\text{Gross return}}{\text{Cost of Cultivation}} x\ 100$$

Conclusion

Site specific nutrients management (130:24:51kg/ha) is found to be the most suitable nutrient management techniques for obtaining higher grain and straw yield with higher net return, B:C ratio of maize at farmers field of Hazaribag, Jharkhand.

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