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EVALUATION OF IMPROVED NUTRIENT MANAGEMENT PRACTICE IN YIELD OF RICE IN JHAPA DISTRICT

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ABSTRACT

Rice is one of the most important cereal crops in Nepal. As per the preliminary estimate of f.y.2014/15, the rice crop was grown in 1,425,346 ha and producing 4,788,612 mt and its productivity is 3.171 t/ha. It contributes nearly 20% to Agricultural Gross Domestic Product and provides more than 50% of the total calories required to the Nepalese people. But the productivity of Nepal is very less compared to other developed country. The main cause is the less use of fertilizer and lack of site nutrient management technology. So A field experiment was conducted on farmer's field at two sites of Jhapa district viz. Dhukurpani(Damak)and Gauradha using Nutrient Expert® Rice model from 3rd week of July to 2nd week of october. The research design was Randomized Completely Block Design with 3 treatments and 13 replication. Three treatments were NE (Nutrient Expert recommendation), GR (Government recommendation), and FP (Farmer practices). The result revealed significant difference in terms of no. of effective tiller/ m2, plant height, yield at 15.5% moisture and straw weight. The highest yield (5 ton ha-1) was obtained from NE field which was followed by GR (4.08 ton ha-1) and FP (3.8 ton ha-1). NE based practices produced (1.2 ton) higher yield and in comparison with GR it produced (0.7 ton ha-1) higher yield .Comparison of Nutrient Expert® (NE) estimated attainable Rice yield provided by the software with actual Rice yield from the farmer field trial; NE-based fertilizer recommendations proved to be successful in reaching the yield targets estimated by the software. The actual Rice yields recorded in farmer fields were similar than the NE estimated attainable yields, so NE recommendation was found better over GR and FP

KEYWORDS: Nutrient Expert, Government Recommendation, Farmers Practice

INTRODUCTION

Nepal is the agro-based country in where around 60% of her total gross product (GDP) comes from agriculture(wikipedia). Agriculture in Nepal is characterized by intensive crop production, mainly rice. The area and production of paddy at 1,425,346 ha and 4,788,612 mt respectively with an average yield 3.171 t/ha.(MOAD 2014/15 and Rice wikipedia). Never the less, the yield of Rice is low in Nepal compare to other country like china produce 6.59 tonnes per hectare and other developed countries (Wikipedia). There are many factor behind it ,of them, depletion of organic matter, imbalance use of fertilizer, intensive cropping without inclusion of legumes crops in rotation, use of modern varieties, nutrient leaching with monsoon rain, lack of knowledge of new inputs and techniques etc. fertilizer is the major limiting factor for the yield reduction. The imbalance used of fertilizers contribute loss of yield. Thus , one of the way to increase the production is judicious application of fertilizers and using of appropriate variety are very important. Fertilizer being the most crucial input for increasing crop production in the shortest possible time plays a vital role to mitigate the food demand of the country. In Nepal, fertilizer utilization is still below the optimum level to achieve the potential yield for

satisfying the countries food requirement.(indexmundi 2012). Similarly farmer are not able to apply the balanced amount of the fertilizer or uses blanket amount of fertilizer without knowing the necessity of the crops which helps in reduction of the productivity of rice. Unbalanced applications, on the other hand, with an oversupply or deficit of some nutrient elements, can have a detrimental effect on crop performance and yield. Similarly, goverrnment of Nepal provide the regional based fertilizer recommendation which address the average fertility status of the soil of very region. So, recommendation of the fertilizer doesn't addressed the soil of farmers field and it s seems impractical to use due to insufficient dissemination of the developed approach. Thus there is the requirement of the site specific nutrient management technique.(SSNM). SSNM is an approach for "feeding" crops with nutrients as and when needs and thus can improve NUE, crop yield and farmers' income (Dobermann *et al.*, 1996).. It advocates the optimal use of existing indigenous nutrient sources and timely applicaton of fertilizers at optimal rates. Based on SSNM principles, Nutrient Expert – Rice was developed. it helps to enable the Rice growing farmer to implement SSNM for their individual which utilizes the information given by local expert to suggest meaningful yield for that location and formulate a fertilizer management strategy .(satyanaryan *et al.*, 2014)

In Nepal, limited research has been concerning about site specific nutrient management in yield, productivity and profitability. Therefore the present study was undertaken to evaluate the improved nutrient management practice in Rice in Jhapa district.

MATERIALS AND METHOD

This study was conducted in Eastern Nepal in Jhapa district in an amalgamation with FORWARD(Nepal) , NRNA-NCC(Australia) and IPNI(Delhi) project "Transfer, Evaluation and Dissemination of an Improved Nutrient Management Tool (Nutrient Expert®) for Increasing Crop Yields and Farmers' Income in Eastern Nepal". Two site of Jhapa namely Dhukurpani and Gauradha Municipality was selected since it was a major summer rice growing area. Preliminary survey was done in these sites with the Nutrient Expert Rice questionnaire. The information was collected from the farmers and simulated attainable yield for each farmer field was obtained by using the Nutrient Expert® Rice model software.

Randomized Complete Block Design with 3 treatment and 13 replication was set up. Three treatments were NE (Nutrient Expert recommendation), GR (Government recommendation), and FP (Farmer practices). Gross plot size of 100 m2 for each treatment and net plot size of 1m2 (from where all yield attributing data was taken) was maintained. Similarly the actual yield was taken from 10 m2.

Sambha Mansuli sub 1 rice variety was sown from 2nd week of july in farmer field according to the treatment set-up. Harvesting was done from last week of October. Observation of plant height, tiller per m2 ,panicle length was taken at harvesting time. Similarly, spike length, filled grain number, unfilled grain number, panicle weight and test weight were taken at 4 days sun dried.

Data entry and analysis was done using: Microsoft word for data processing, MS excel for data input, table, charts, graphs & simple statistical analysis, IBM SPSS Statistics 21, Gens Stat 2008 for statistical analysis. ANOVA was done at 0.05% level of significance.

RESULTS AD DISCUSSIONS

Table 1: Effect of Improved Nutrient Management on Plant Height and Effective Tiller in Sambha Mansuli Sub -1

Treatment	Plant Height	Effective Tiller
NE	108a	421a
GR	105b	354b
FR	101.62c	350b
Significant	**	*
CV	3	10.3
LSD	1.76	50.55
** means Highly significant,	*means significant	

Table 2: Effect of Improved Nutrient Management on Panicle Length, Panicle Weight Filled Grain, Test Wt, and Sterility of Sambha Mansuli Sub 1 Rice

Treatment	Panicle Length	Panicle Wt.	Filled Grain	Test Wt.	Sterility
NE	22.27	2.223	133.14	14.94	13.83
GR	22.2	2.161	128.81	14.51	16.79
FR	22.02	2.224	129.66	15.30	14.63
Significant	NS	NS	NS	NS	NS
CV	3.9	13.4	5.4	3.9	25.6
LSD	0.72	0.19	13.45	0.68	4.80
NS Means	Non Significant				

Table 3: Effect of Improved Nutrient Management on Yield, Straw Wt. and Harvest Index of Sambha Mansuli Sub-1 Rice

Treatment	Yield (T/Ha)	Yield Difference Over FPP(T/Ha)	Increased % in Yield Over FFP	Straw Wt.(T/Ha)	Straw Wt, Difference Over FPP	HI (%)
NE	5.0a	+1.2	+37.2%	8.17	1.46	37.62
GR	4.3b	+0.5	+16.2%	7.3	0.59	36.36
FR	3.8b	0		6.71	0	36.16
Significant	**			**		NS
CV	13.4			8		4.8
LSD	0.48			0.83		2.7
**Means Highly Significant, NS= Non Significant						

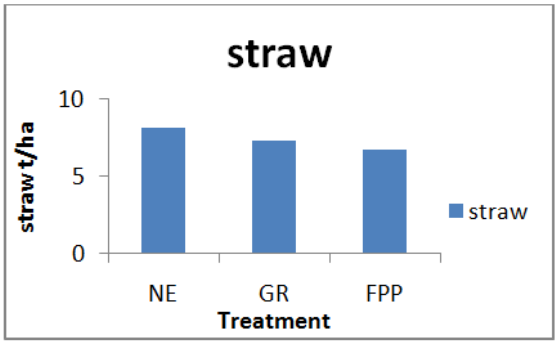


Figure 1: Effect of Improved Nutrient Management in Straw Wt

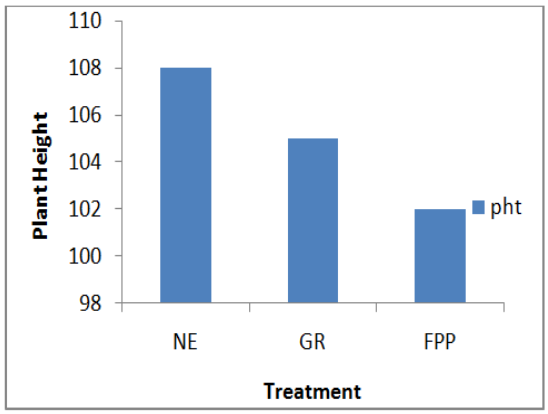


Figure 2: Effect of Improved Nutrient Management in Plant Height

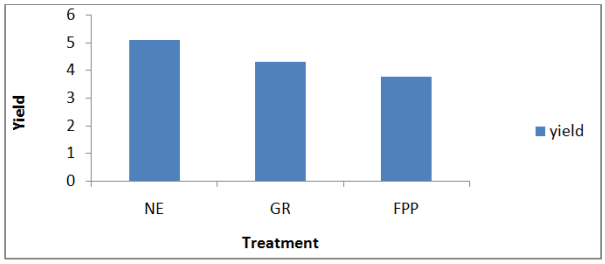


Figure 3: Effect of Improved Nutrient Management in Yield

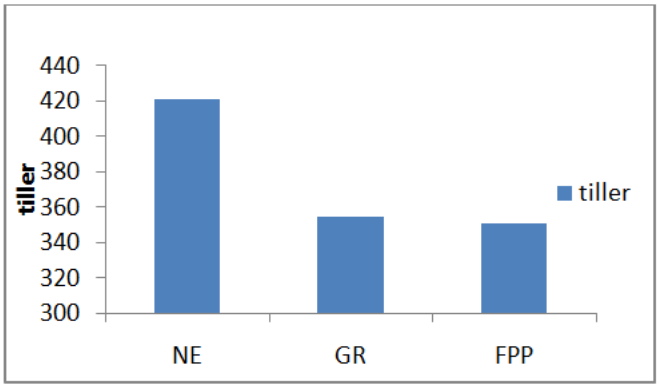


Figure 4: Effect of Improved Nutrient Management in Tillers

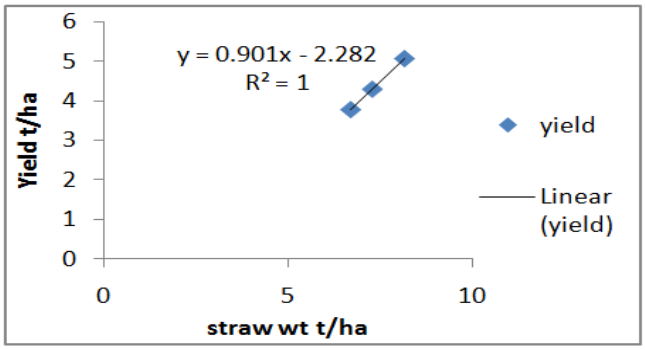
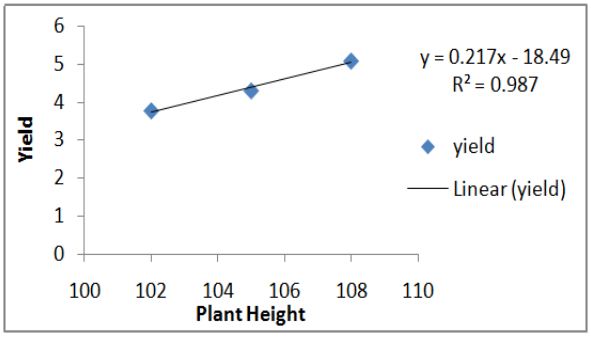


Figure 5: Relationship between Straw and Yield



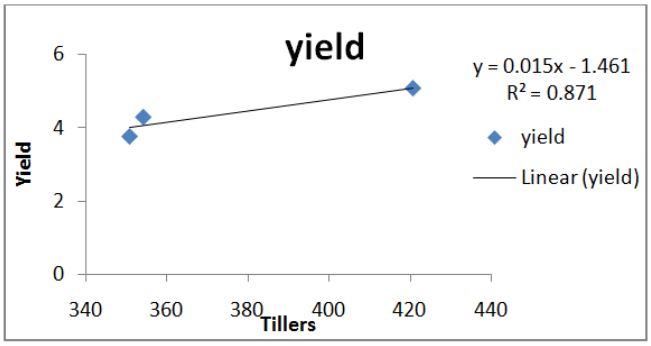


Figure 6: Relationship between Plant Height and Yield **Figure 7: Relationship between Tillers and Yield**

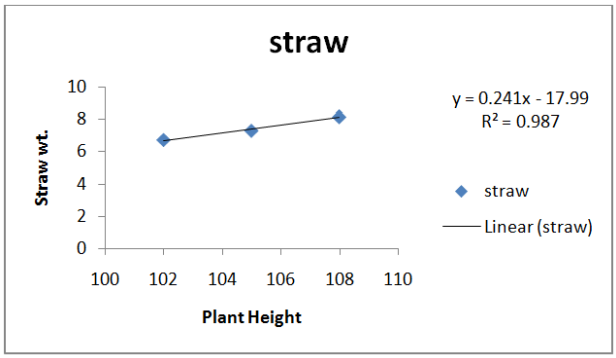


Figure 8: Relationship between Plant Height and Straw Wt

Plant Height

Plant height of sambha mansuli sub 1 rice was significantly affected by selected treatments. The height of plant varied from 101.62 cm in FPP treatment (T3) to 108 cm in NE treatment (T1). The highest plant height was found in NE treatment(108 cm) which was followed by GR treatment(105 cm) and FPP (101.62 cm). table 1 showed that plant height height increased with balanced fertilizer used that required by the site field.

M. A. Salam et al., 2011, Haq et al., 2002 and Awan et al., 1984 reported that highest plant height was found in high and balanced NPK fertilizer.

Effective Tillers

The tiller number was highly significant with all the treatment. The number of effective tillers due to different treatment varied from 351 to 421. The highest tillers number were found in NE treatment (T1) i.e 421 and followed by T2 treatment i.e 354 and T3 treatment i.e 351.

M.T. Haq et al., 2002 and uddin et al., 1998 reported that balanced and optimum use of fertilizer application increased the number of effective tiller. similar result was showed by Mirza et al., 2010

Rice Yield

Result shows that the yield was found significant effect in different nutrient management practices. The yield found to be highest was 5 t/ha in NE nutrient management practice than those of farmer pactices was 4.08 t/ha. The yield in

government practice and farmer practice had similar result. The yield in the Nutrients expert management is nearly 1 t/ha than the farmer practice

The NE-based fertilizer recommendation for rice improved the grain yield as compared to FFP across multiple sites in West Bengal. The highest yields achieved using the NE recommendation and FFP were 7,250 kg/ha and 6,200 kg/ha, respectively. The yield variability across sites was higher in the farmers' practices as compared to the NE treatment due to variable management of farmers. Rice yields were far more stable and varied within a short range as the NE recommendation for each individual farmer was designed to achieve the maximum attainable yield of HYV rice in the kharif season. (M.K. Mandal et al., 2015)

Other studies using NE for maize and wheat also showed significant yield advantage from the tool-based fertilizer recommendation as compared to existing practices (Satyanarayana et al., 2012; Sapkota et al., 2014).Dubermann et al., 2003 also reported the same result that NE or SSNM practice showed the highest yield than the farmer practice.

Straw Wt

All the treatment of nutrient management showed significant result. In the NE recommendation, the straw wt. was found to be highest (8.17 t/ha) and followed by government recommendation(7.3 t/ha) and Farmer practices(6.71 t/ha).

Straw yield is a function of vegetative growth. Balanced and optimum used of fertilizer increased plant higher, green leaves/hill, tillers/hill and dry matter production which finally resulted in higher straw yield. Similar results were reported by Mirza *et al*. (2010).

CONCLUSIONS

From the trail, we got the highest yield in the NE treatment whereas least yield in farmer practice. The highest yield help to increase the income. NE helps in high income and profitability. With use of NE only we can gain the highest attainable yield as shown by the NE software. High increase in production helps to fulfils the increasing demand of the people. NE is the best tools to increase the productivity and profitability of Rice in Nepal as well as in grainary area called Terai region.

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