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Nitrogen Use Efficiency and Performance of Rice to the Application of Slow-Release Nitrogen Fertilizer Under Waterlogged Conditions in North Western Ethiopia

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Abstract

Highly soluble N fertilizers like urea may be lost from the soil plant system through leaching, ammonia (NH3)

xation by clay minerals. On the other hand, in low moisture area, its low solubility and toxic e ect burns the root so as to reduce its growth and the performance of the crops grown under this condition also

net plot areas following their respective standard measuring methods and procedures. e rice grain yield and thousand seeds weight were adjusted at 14% standard moisture content [10].

Data analysis

All collected data were subjected to analysis of variance (ANOVA) using SAS so ware version 9.0 (SAS-Institute, 2003). Mean separation was done by using Least signi cance di erence (LSD) method at probability levels of P≤ 0.01 and P≤ 0.05 depending on the ANOVA results. Statistical analysis of the grain yield and NUE data were also accomplished by standard analysis of variance (ANOVA) [11].

Partial budget analysis

A method of organizing experimental data and information about the costs and bene ts of various alternative treatments. A partial budget analysis methodology is a way of computing the total costs that vary and the net bene ts of each treatment in an on-farm experiment. Includes the average yields for each treatment, adjusted yields and gross bene t (based on the eld price of the crop). It also incorporates all the costs that vary for each treatment (CIMYYT (1988) [12-15].

e N use e ciency of mineral N fertilization was calculated by equation:

Agronomic N use e ciency (NUE) $= \frac{(\text{Grain Yield F} - \text{Grain yield C})}{\text{Fertilizer N applied kg per kg N}}$

Where F and C represent Fertilized and Control plots respectively. NUE can be calculated as the ratio between the amount of fertilizer N removed with the crop and the amount of fertilizer N applied. It can be expressed in %.

Results and Discussion

e Analysis of variance indicated that plant height was signi cantly (P<0.05) a ected by UREA^{Stabil} and Conventional urea. e highest plant height (83.6cm) was recorded from the split application of 136.5kg N ha^{-1} from UREA^{Stabil} splited at planting (45.5 kg N ha^{-1}) and tillering stage (91 kg N ha^{-1}) while the lowest plant height (70.7cm) was recorded from the control without the application of nitrogen fertilizer **(Table 1).** However, from the conventional urea fertilizer the plant height was recorded 80.8cm from the application of 136.5 kg N ha^{-1} and splited at planting (45.5 kg N ha^{-1}) and 91kg N ha^{-1} tillering stage [16-19].

Panicle length was not signi cantly a ected by conventional urea and UREA^{Stabil} fertilizer application where as the number of total tillers were highly signi cantly (P<0.01) a ected. e highest number of tiller (260.7per m^2) was found from the application of UREA^{Stabil} (136.5kgha^{-1}) at planting and tillering stage where as the lowest number of tiller (154.7 per m^2) was found from the control without application of nitrogen fertilizer. Similar results reported as rice is a unique crop with an indeterminate tillering potential, and the actual tillering number is easily in uenced by nutrients availability, planting density and variety. Split application of conventional urea fertilizer (136.5 kgha^{-1} at planting (45.5 kgha^{-1} and 91 kgha^{-1} at tillering stage) had resulted 245.7 tiller number per m^2 [20].

e analysis of variance for the number of fertile grains showed that signi cantly (P<0.05) a ected by UREA^{Stabil} and conventional urea fertilizer. e highest number of fertile grains (248.0 per m^2) was found from 136.5 kg N ha^{-1} of UREA^{Stabil} in split application 45.5kgha^{-1} at planting and 91kg N ha^{-1} at tillering stage where as the lowest number of fertile grain (147.3) was attained from the control without the application of nitrogen fertilizer. However, from conventional urea through the application of 136.5 kg N ha^{-1}, 45.5 kg N ha^{-1} planting and 91kg N ha^{-1} at tillering stage 226.0 fertile grains per m^2 were produced. 8yN e disadvantage of urea fertilizer is that considerable amount8 578 (248.0 p

ousand seed weight was not signi cantly ($P<0.05$) a ected by UREAStabil and conventional urea treatments even if the grain yield is signi cantly di erent between treatments [26].

e rice harvest index was highly signi cantly ($P<0.001$) a ected by the UREA^{Stabil}.

and decrease the nal out put yield. From the study split application of 136.5 $kgha^{-1}$ conventional nitrogen (as basal 45.5 $kgha^{-1}$ & 91$kgha^{-1}$ tillering stage) reduce net bene t by increasing the total variable cost.