ABSTRACT

Knowledge of water and Nitrogen (N) balances as well as of their time variations during the crop growing season is essential for estimating their recovery and losses as well as in deciding efficient method and schedule of fertilizer N for crops. Since a little is known about the losses and recovery of applied fertilizer N under rice based cropping system in pluvial lands a controlled field investigation was conducted on a lateritic sandy loam soil during 1985-86 and 1986-87 to assess the seasonal and phasic changes of the distribution of water and N under both rainfed rice and irrigated wheat. The phasic variation of water and N balance components were also evaluated under different methods and schedules of fertilizer N to quantify the use of water and N as well as to estimate use efficiency of water and fertilizer N for rice-wheat sequence.

Rice (MW-10) and wheat (Sonalika HD 104) crops were grown during monsoon and non-monsoon winter seasons respectively. The precipitation during rice and wheat growing seasons ranged respectively from 840 to 890 mm and 21.5 to 24.5 mm. Wheat was irrigated with 6 cm of water timed at 1.0 ratio of irrigation water to cumulative pan evaporation. Fertilizer N was applied by bandplacement (M_1) to a depth of 5 cm and broadcasting (M_2) in two (S_2) and four (S_4) equal splits. In case of rice 120 kg N/ha was applied in the form of ammonium sulphate in two splits of 60 kg N/ha each at early active tillering and booting stage and four splits of 30 kg N/ha each at early

active tillering, maximum tillering, booting and flowering stages, With wheat crop 100 kg N/ha was applied as calcium ammonium nitrate in two splits of 50 kg N/ha each at CRI and booting stage and in four splits of 25 kg N/ha each at CRI, tillering, booting and milk stages.

The results of the investigation indicated that in coarse textured low retentive permeable soil the use efficiency of water and N for rainfed rice - irrigated wheat sequence was maximum when fertilizer N was bandplaced in four equal splits (M_1S_4). M_1S_4 also induced increase in N use efficiency (NUE) of both rice and wheat respectively by 17 and 12 per cent over that under conventional broadcasted application in two splits (M_2S_2). Higher water use efficiency (WUE) and NUE under M_1S_4 resulted from higher grain yield as well as greater water and N uses by crops under this schedule compared to M_2S_2. Grain yield of rice and wheat under M_1S_4 was enhanced respectively by 26 and 24 per cent over that under M_2S_2. The recovery of fertilizer N by rainfed rice and irrigated wheat was respectively 12 and 6 per cent higher under M_1S_4 than M_2S_2 . With rainfed rice high recovery of N under M_1S_4 is attributable to low volatilization and leaching losses which were only 33 and 26 per cent of respective losses under M_2S_2 . Relatively high volatilization loss under M_2S_2 also contributed to low recovery of N by irrigated wheat under this schedule compared to M_1S_4 . Higher recovery of N under four splits application resulted from greater N use during maximum tillering to harvest stage by rice and during tillering to harvest stage by wheat. The rate of N use had higher response to frequency than method of fertilizer N application.