

Thesis Title    Nitrogen Availability of Fertilizer and Straw in Crop  
Production under Rice Based Cropping Systems.

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M.Sc.             Agriculture (Soil Science)

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### Abstract

A study involving rice-wheat and rice-soybean cropping experiments was conducted concurrently on a San Sai soil series at the Multiple Cropping Center, Faculty of Agriculture, Chiang Mai University during June 1987 - March 1988. Use efficiency and losses of nitrogen through various methods of fertilizer application in paddy rice were evaluated by using  $^{15}\text{N}$  tracer and microplot techniques. Nitrogen fertilizer was applied at a rate of 100 kg N/ha for all the five methods employed in the study. Residual effects of nitrogen fertilizer in the soil and nitrogen availability of rice straw on the succeeding crops were also investigated.

Results indicated that mudball application was the most efficient method increasing the yield up to 17 kg rice/kg N. In this method, the amount of nitrogen loss was the lowest, accounted for about 31.3% which was mainly due to denitrification process. Single application as whole layer or surface incorporation as well as 2 or 3 split-applications induced losses up to 50-57% of applied-N. The major pathway of nitrogen loss was denitrification, ranging from 27-35%.

of the total-N added. In terms of leaching, single incorporation resulted in the higher loss (15-25%) as compared to split-application methods (6-7 %). About 10-19% run-off loss was also observed in the latter methods.

After rice harvesting, some portions of nitrogen were still remained in the soil approximately 9-15% of the added  $^{15}\text{N}$  fertilizer. Only 8-38% of this residual nitrogen was mineralized. Nitrogen utilizations by wheat and soybean were in the range of 3.4-19.0% and 1.2-8.9% of the residual nitrogen, respectively.

Without fertilizer, the straw application prior to planting soybean and wheat resulted in the lowest yield of the succeeding crops. The yield, however, was increased markedly when fertilizer was added together with straw. There were no significant differences in yield among treatments receiving fertilizer or fertilizer plus straw. Nitrogen released from straw was in the range of 17-25%. The incorporation of nitrogen did not stimulate nitrogen mineralization from the straw, but promoted plant uptake of straw nitrogen. When the straw was used solely, wheat and soybean could utilize this nitrogen only 1.5-1.8% of the total nitrogen in straw. The utilization was increased up to 4.5-4.7% if nitrogen fertilizer was also added. There were no significant differences in nitrogen uptake from soil, straw and fertilizer sources for wheat and soybean. However, nitrogen accumulation in soybean was higher than that observed in wheat. This might be due to nitrogen fixation by rhizobium. Results also indicated that nitrogen remained in the soil was higher in rice-soybean as compared to rice-wheat system. The incorporation of fertilizer with the straw resulted in a higher residual effect than the sole application of nitrogen fertilizer.