

INTRODUCTION

Rice (*Oryza sativa* L.) requires approximately 15-20 kg nitrogen for each ton of grain produced (Watanabe *et al.*, 1981). Increasingly this nitrogen requirement is being supplied in the form of fertilizer, although the actual rate of fertilizer nitrogen applied varies greatly in the different regions of South-east Asia (De Datta, 1986). At the higher rates of fertilizer use, substantial amounts of nitrogen may remain in the soil after the grain is harvested. Data of De Datta (1988) for example indicated that almost equal proportions of the original application of 90 kg N/ha were taken up by the growing crop, lost and remained in the soil.

One of the most common sequences of cropping in Asia is to follow rice with soybeans (*Glycine max* L. Merrill), grown with irrigation in the cool dry season (Shanmugasundaram *et al.*, 1978). In the Chiang Mai Valley it is recommended to apply about 25 kg N/ha to the soybean as a starter fertilizer. This recommendation is based on results over a number of seasons and sites which have consistently shown increases in yields the starter nitrogen, compared with

unfertilized controls (Tieranan, 1980). Soybean is an appealing crop in rice-based cropping systems because it produces well in the dry season and has the capacity to satisfy its own nitrogen requirements via symbiotic nitrogen fixation. Furthermore, it has the potential to contribute surplus nitrogen to the soil pool following seed harvest. However, symbiosis may be inhibited, and the amounts of nitrogen fixed may be substantially reduced by residual fertilizer nitrogen from the previous rice crop and though the use of 'starter' nitrogen on the soybean itself.

It is desirable that nitrogen fixation be as high as possible since the potential contribution of legume nitrogen to the soil may be further threatened by the common practice of removing straw with the harvested seed. This study was initiated to estimate the amount of nitrogen fixed in rice-soybean cropping systems where various rates of fertilizer nitrogen were applied to both rice and soybean crops.