**Nutrient Balance of Rainfed Highland Rice - Legume**

**Crop Rotation in Northern of Thailand**

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**Abstract**

Highland farmer of Thailand's had growing rice as a main crop and rice areas cultivation is dominated by rainfall. The farmers grow rice once time a year and they leave the area until next season. They had been lacked the maintenance of soil and growing crop rotation. Therefore, crop rotation rice-legume base should be the way to improve land uses on highland. The objective is to increase productivity and additional income for farmers in the highland area. The study conducted in the farmer fields at Mae Wak village, Mae Chaem distict, Chiang Mai province and altitude 670 MSL. Over the period April 2016 to March 2017. RCBD designed in the experiment 5 treatments and 3 replicates, the treatments were conducted as follow: (1) rice (*Oryze sativa*) monoculture, (2) rice - navy bean *(Phaseolus vulgalis)*, (3) rice – kidney bean *(Phaseolus vulgalis)*, (4) lablab (*Lablab purpureus*) – rice - navy bean and (5) lablab – rice - kidney bean. The experiment shows that rice grain yield was non-significant difference between treatments by 5.5 – 5.7 t/ha. Legume grain yield was 1.5 – 1.6 t/ha in navy bean and 1.0 – 1.3 t/ha in kidney bean. Total crop residue and nitrogen retaining in the soil was significant difference between treatments, total crop residue in rice –legume crop rotation base increased by 1.4 - 1.6 times compared to rice monoculture. Nitrogen were retained in the soil increased by 2.0 – 2.2 times in rice-legume (2,3) and 2.6 – 2.7 times in lablab-rice-legume (4,5) when compared to rice monoculture. Nitrogen balance in the experiment was negative N balance by 4.6 – 51.8 kg N/ha, while rice monoculture with highest N budget was removed out of the plot. Therefore, rice - legume system base reduced the nutrient removal from the rice field in the highland. Furthermore, the future works will be evaluated the adoption in farmers and explored the knowledge to them for the sustainable agriculture on the highland.

**Key word:** rice, legume, nutrient balance