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Evaluation of Yield and Economic Benefit of On-Farm Maize-Rice Bean Relay Cropping without Residue Burning

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Abstract

Maize production in Thailand has been introduced to the highlands, where residues of crop and weeds are burned to prepare land for the next crop causing air pollution. This study evaluated the yield and economic benefit from maize - legume relay cropping system to reduce burning in the highlands of Pang Dang Nai and Long Khod Royal Project Extension area in Chiangmai province, Thailand. The treatment conducted with no burning of maize-rice bean was compared with burning maize monoculture in 3 farmer fields/locations during the wet season of 2012 to 2014. The grain yield of maize from maize-mono in these two areas of study was 3.3 and 2.4 Mg ha⁻¹ respectively, which were 18 and 33% respectively higher than the maize-rice bean relays. In addition, yield of legume was 1.3 and 1.4 Mg ha⁻¹ in maize-rice bean in Pang Dang Nai and Long Khod respectively. While the residue in maize-mono was lost due to burning, there remained 5.5 Mg ha⁻¹ and 6.4 Mg ha⁻¹ of residue in the maize and legume field from no-burning maize-rice bean. There was a contribution of total N retained on the fields of 79.7 and 91.5 kg ha⁻¹ in Pang Dang Nai and Long Khod, respectively. Moreover, economic benefit analysis found that total cost in maize-mono (farmers' practice) was lower in comparison with maize - rice bean of US\$ 129.2 ha⁻¹ and US\$ 192.8 ha⁻¹, respectively. Total gross margin was highest in maize - rice bean in comparison with maize mono in farmers' practice with US\$ 744.4 ha⁻¹ and US\$ 662.8 ha⁻¹, respectively. In conclusion, the maize-rice bean relay cropping system is promising as a means to reduce burning in the highlands while increasing maize yield and income for farmers. Other benefits which were not taken into account included the reduction of nutrient losses, sedimentation, and air pollution.

Keywords: Burning, maize, relay cropping, residues, rice bean