Maize Relay with Legume without Residue Burning Impact on Soil Erosion and N Loss in Northern of Thailand

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Introduction

- Maize production in Thailand has expanded into the highlands.
- Slash and burning residues on land preparation to maize crop
- Effects on soil erosion and soil fertility
- Reduction in maize yield and farmers' income, as well as adding to the haze problem in the lowlands.



Objective

Evaluated soil erosion, nutrient loss and maize grain yield on maize relay cropping with legumes without residue burning.

Material and method

The experiment conducted in season of 2014 and 2015 in a highland field with plot slope 33, 41 and 48 % in replicate 1, 2 and 3 respectively, micro plot in the experiment the size of 40 m^2 at Santisuk district, Nan province in northern Thailand. 3 x 3 RCBD were used in the experiment, the treatment consist of :

1) common farmer's practice of maize with residue burning
2) maize without residue burning
3) maize without residue burning + relay lablab bean

measurement of yield and residue in maize and legume soil erosion and N loss.



Result

Yield and residue

Maize grain yield non-significant difference in first year and in second year, there was a small effect between residue burning and without residue burning and significantly larger effect by the method of without residue burning adding legume. Maize + lablab without burning yielded 22% more maize grain than farmer's practice of residue burning (Table 1).

Crop residue was significant difference among cropping system (Table 2). In season 2014 and 2015, crop residue in maize without residue burning + lablab was increased by 80% and 81% compared to maize residue burning, while crop residue in maize + burning were lost by burning.



Table 1 Maize and lablab grain yield in maize cropping system at Na loa village, Santi Suk district, Nan

Treatment	Maize yield (ton/ha)		Lablab yield (ton/ha)	
	2014	2015	2014	2015
Maize + burning	3.5	3.4 c	0	0
Maize + without burning	3.5	3.9 b	0	0
Maize + without burning + lablab	3.6	4.2 a	0.8 (0.17)*	0.2 (0.03)
mean	3.5	3.8		
F-test	ns	**		
$LSD_{.05}$	-	0.28		

* number in parenthesis are the standard deviation

Table 2 Maize and lablab residue in maize cropping system at Na loa village, Santi Suk district, Nan

Treatment	Maize residue (ton/ha)		Lablab residue (ton/ha)		Total residue (ton/ha)	
	2014	2015	2014	2015	2014	2015
Maize + burning	3.6	3.6	0.0	0.0	3.5 b	3.6 b
Maize + without burning	3.7	4.0	0.0	0.0	3.7 b	4.0 b
Maize + without burning + lablab	3.8	4.0	2.5 (0.20)	2.5 (0.31)	6.3 a	6.5 a
mean	3.7	3.9			4.5	4.7
F-test	ns	ns			*	*
	-	-			1.0	0.8

Soil erosion and N loss

Soil erosion and N loss in the season 2014 and 2015 was significant difference (P<0.01) among cropping system. (Table 3) Soil erosion were reduced in without residue burning and highest reduced in without burning and adding lablab bean.

Maize without residue burning reduced N loss by 67% in season 2014, and 61 – 88 % in 2015 compared to farmer's practice of residue burning.

Table 3 Soil erosion and N loss in maize cropping system at Na loa village, Santi Suk district, Nan

Treatment	Soil erosion (ton/ha)		N loss (ton/ha)	
	2014	2015	2014	2015
Maize + burning	77.5 a	52.5 a	16.9 a	11.3 a
Maize + without burning	33.1 b	20.6 b	5.6 b	4.4 b
Maize + without burning+ lablab	33.8 b	7.5 c	5.6 b	1.3 b
mean	48.1	26.3	9.4	5.6
F-test	**	**	**	**
$LSD_{.05}$	13.2	12.0	5.4	4.2

Conclusion

Growing maize without residue burning practice and relay with legume is promising as a method to reduce soil erosion and nutrients loss, increasing grain yields and farmers income, and lessening the impact on the haze problem. Further studies should explore more legumes for relaying and participatory research to determine the feasibility of how this practice may be adapted to management by highland farmers.

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