Planting System and Mulch Related to Growth and Results Corn in the of Land Slope of Riau Province

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ABSTRACT. Riau Province has about 49% of dry land, which has a large partly undulating topography, for it to overcome the low yield of corn in this area conducted assessment cropping systems and mulching on maize cultivation. The purpose of this study is to find ways of planting and mulching the right dose in the cultivation of maize on sloping land in Riau Province that carried out in Kepenuhan, Rokan Hulu, on MT 2011. Regional studies have Ultisol soils with agro climatic zones B1. The study was arranged in a randomized block design with two factor. Factor I is cropping systems consisting of: (1) parallel to the slope cropping system, with distances in rows 20 cm, one plant per hill and the distance between rows of 75 cm, (2) planting system parallel to the slope, with distance role in rows 40 cm, two plant per hill and row spacing of 75 cm, (3) System tiles, 20 cm x 75 cm, one plant/hole and (4) Spacing 40 cm x 75 cm, two plants/hill. Factor II is a dosage of rice straw mulch, which consists of (a) 2 t/ha, (b) 4 t/ha ,and (c) 6 t/ha. The result showed the system of planting 1 (parallel to slope planting system, with the distance in rows 20 cm, one plant per hill and the distance between rows 75 cm) with rice straw mulching as much as 6 t/ha, giving the best growth and yield compared to other treatments.

Introduction

Productivity of maize in Indonesia is still low, reached 3.47 t/ha in 2006, but it tends to increase at a rate of 3.38% per year. Nevertheless, national maize production has not been able to keep pace with demand driven partly by the development of the feed and food industries. Because it had to do with import considerable the starting from 1994 and 1995 that reached an average of more than 1 million ton. Low productivity illustrates that the adoption of maize production technologies is still not optimal. Increased corn production in Indonesia is more determined by the productivity improvement of the increase in harvested area (BPS and the Directorate General of Food Crops 2006). While Riau productivity touched 2-3 t/ha.

Increased need for corn in Riau province is closely related to the rapid development of the food and feed industry. Today, about 50% of animal feed use of corn as a feedstock. Riau province with 47% of its area was dry land and partly large.

Increased corn production in the country continue to do them through technological improvements, such as (1) an increase in soil fertility by providing ameliorant and (2) weed control. Mulch as organic material/ameliorant after decomposed important role in improvement of soil physical and chemical properties and can also be a provider of nutrients (Hardjowigeno 1987). Improved soil fertility positive effect on the growth and yield, but also spur the growth of weeds (Sutoto *et al.* 2005). On the cultivation of food crops, weeds adversely affect the growth and yield of soybean (Guntoro *et al.* 2003), due to competition in the absorption of water, nutrients, light and other growing medium (Suroto 2001). One way to reduce growth of weeds in cropping corn is by mulching. Weed control is an attempt to suppress the growth of weeds to not cause disruption to the plant (Sutoto *et al.* 2001).

There is a close relationship between the amount of organic material to the soil processing quality. Intensive tillage on soil containing low organic material will result in damage to the soil structure (soil structure deteoration). Straw incorporation may reduce the density of the soil (bulk density), increasing total porosity and water holding capacity (De Datta and Hunsdal 1984; Lala 1985).

The purpose of this study is to find ways of planting and mulching the right dose in the cultivation of maize on sloping land in Riau Province.

Methodology

The research was conducted on farmers' fields in Rokan Hulu, Riau on rainy season 2011. Regional studies

have Ultisol soils. In climatological locations including climate type B1, of which 9 months in a row is a wet month (rainfall > 200 mm) and 3 months of dry (rainfall < 100 mm). The study was arranged in a randomized block design with two factor. Factor was cropping systems consisting of: (1) parallel to the slope cropping system, with distances in rows 20 cm, one plant/hole and the distance between rows of 75 cm, (2) planting system parallel to the slope, with distance role in rows 40 cm, two plant/hole and row spacing of 75 cm, (3) system tiles, 20 cm x 75 cm, one plant/hole and (4) spacing 40 cm x 75 cm, two plants/pit. Factor II is a measure of rice straw mulch, which consists of (a) 2 t/ha, (b) 4 t/ha ,and (c) 6 t/ha. Maize variety planted Sukmaraga with 300 kg urea/ha, 100 kg SP-36/ha, and 100 kg KCl/ha. Observations included plant height, ear height, ear length, number of rows per ear, ear circle, weight of 100 seeds, and results.

Results and Discussion

The Nature of the Soil

The acidity of the soil used in this activity rather sour (pH 4.7), has a clay texture, low organic C (1.84%), C/N ratio is low (10), so the organic material is cooked, it looks too levels N is very low (0.18%). Potential phosphorus levels are also low (22%), and K2O levels are also very low potential to basanya also very low base, with base saturation (KB) 17% and low CEC 18.20 cmol (+)/kg. Aluminium can be exchanged is high at 3.78 cmol (+)/kg, and micro elements Fe, Mn, Cu and Zn are very low (Table 1). Land like this is very necessary improvement by reducing soil acidity or decrease the saturation of al to do with the calcification. Lime dose given depends on the type of plant. For rice, soybean, mungbean, lime is needed more than the remedy of corn.

System of planting did not significantly affect plant height and ear height (Table 2). However, treatment of 1 (slope parallel cropping system, with distances in rows 20 cm, one plant/hole and the distance between rows 75 cm) plant height and ear height gives the best (174.7 cm and 83.2 cm).

Giving rice straw compost has not significantly affect plant height and ear height. This means that the provision of rice straw compost to 6 t/ha not affect plant height and ear height. However, the trend seen the addition of rice straw compost given providing plant height and ear height better (Table 3). Giving rice straw compost more, is likely to affect the growth of plant height and ear height. Provision of 6 t of rice straw compost gave the highest of plant height and ear height highest at 192.2 cm and 86.1 cm, whereas no provision giving the rice straw compost gave the lowest of plant height and ear height (182.0 cm and 77.7 cm) (Table 3).

Cropping systems has not affected the number of rows per ear, ear diameter and a weight of 100 seeds (Table 4). But the visible tendency, treatment of 1 gives the best results. For treatment of 4 gives the lowest results, both

Table 1. The results of soil analysis in Rokan Hulu, Riau.

The results of analysis types	Analysis results
pH: H_2O	4,7
KCl	3,8
Tekstur (%)	
Sand	10
Dust	33
Clay	57
C organk (%)	1,84
C/N	10
N(%)	0,18
HCl 25% mg/100 g soil	
P_2O_5	22
K_2O	8
Ca	2,23
Mg	0,67
K	0,18
Na	0,07
Total	3,16
KTK	18,20
KB (%)	17
Al dd	3,81
H+	0,59
Micro elements (ppm)	
Fe	14,4
Mn	22,0
Cu	0,6
Zn	1,5

Table 2. Effect of cropping systems on plant height and high corn ears in Rokan Hulu, Riau.

Cropping system	Plant height (cm)	Ear height (cm)
1	174,7 a	83,2 a
2	171,7 a	82,1 a
3	169.9 a	81,4 a
4	167,8 a	80,1 a

Remark : (1) parallel to the slope cropping system, with distances in rows 20 cm, one plant/hole and the distance between rows of 75 cm
(2) parallel to the slope, with a role in row spacing of 40 cm, two plants/hole and the distance between rows of 75 cm
(3) System tiles, 20 cm x 75 cm, one plant/hole
(4) System tiles 40 cm x 75 cm, two plants/hole
The numbers in the column followed by same letter are not significantly different at 5% level test DNMRT

for the number of rows per ear, and ear diameter and weighing 100 seeds.

Dose rice straw compost effects on the number of rows per ear, ear diameter and weighing 100 seeds of corn in Kepenuhan, Riau, presented in Table 5. It appears that the provision of rice straw compost to 6 t/ha not affect the growth of the number of rows per ear, ear diameter and weight of 100 seeds. The pattern of growth in the number of rows per ear, ear diameter and weighing 100 seeds seems directly proportional to the provision of rice straw compost, the higher the amount given rice straw compost the better growth of the number of rows per ear, ear diameter and weight of 100 seeds.

Cropping systems and the provision of rice straw compost and provide a real influence on the growth of long-ear of corn in the Kepenuhan of Riau (Table 6). Highest ear length obtained in the combination treatment 1 by treatment with c (16.7 cm). The shortest length of ear acquired in the combination treatment between treatment 4 with a (14.1 cm). This is caused by the influence of both compost and rice straw. The advantage of parallel contour cropping systems and the provision of rice straw compost was reduced soil erosion, increased water-holding capacity of the soil, reduce evaporation, increase soil organic matter, reduce weeds that will reduce needed of labour. The parallel contour cropping system will constructing diminishing erosion, soil around the roots will be loose so that root growth will be better which will ultimately lead to nutrient uptake by plants will increase.

The results of corn yieldis influenced significantly by the cropping system and rice straw and compost delivery (Table 7). The highest corn yield obtained from combination treatment 1 with c is 6 t/ha. While the lowest results obtained from the treatment of 4 with a of 4.5 t/ha.

In stabilizing the soil aggregate organic compounds play a pivotal role in addition to other materials such as

Table 3. Effect of rice straw mulch to measure plant height and high corn ears in Rokan Hulu, Riau.

Dose straw of rice	Plant height (cm)	Ear height (cm)
a	182,0 a	77,7 a
b	188,7 a	80,3 a
c	192,2 a	86,1 a

Remark : a dose of rice straw mulch 2 t/ha
b dose of rice straw mulch 4 t/ha
c dose of rice straw mulch 6 t/ha
The numbers in the column followed by same letter are not significantly different at 5% level test DNMRT

Table 4. Effect of cropping systems on the number of rows per ear, ear diameter and weighing 100 seeds of corn in Rokan Hulu, Riau.

Cropping system	Number of rows per ear	ear diameter (cm)	Weight of100 seeds (g)
1	13.35 a	4.98 a	29.00 a
2	13.00 a	4,65 a	28,60 a
3	13,00 a	4,48 a	28,40 a
4	12,80 a	4,45 a	28,00 a

Remark: (1) parallel to the slope cropping system, with distances in rows 20 cm, one plant/hole and the distance between rows of 75 cm
(2) parallel to the slope, with a role in row spacing of 40 cm, two plants/hole and the distance between rows of 75 cm
(3) System tiles, 20 cm x 75 cm, one plant/hole
(4) System tiles 40 cm x 75 cm, two plants/hole
The numbers in the column followed by same letter are not significantly different at 5% level test DNMRT

Table 5. Effect of rice straw mulch to the number of rows per ear, ear diameter and weighing 100 kernels of corn in Rokan Hulu, Riau.

Dose straw of rice	Number of rows per ear	ear diameter (cm)	Weight of100 seeds (g)
a	12,33 a	4,43 a	28,43 a
b	12,67 a	4,47 a	28,93 a
c	13,00 a	4,50 a	29,63 a

Remark : a dose of rice straw mulch 2 t/ha
b dose of rice straw mulch 4 t/ha
c dose of rice straw mulch 6 t/ha
The numbers in the column followed by same letter are not significantly different at 5% level test DNMRT

Table 6. Effect of interactions between cropping system and rice straw mulch on corn ear length in Rokan Hulu, Riau.

Dose straw of rice	Cropping system			
	1	2	3	4
a	14,4 c	14,3 c	14,2 c	14,1 c
b	15,1 c	15,5 b	16,1 b	15,9 b
c	16,7 a	16,7 a	16,5 ab	16,2 a

Remark: (1) parallel to the slope cropping system, with distances in rows 20 cm, one plant/hole and the distance between rows of 75 cm
(2) parallel to the slope, with a role in row spacing of 40 cm, two plants/hole and the distance between rows of 75 cm
(3) System tiles, 20 cm x 75 cm, one plant/hole
(4) System tiles 40 cm x 75 cm, two plants/hole
a dose of rice straw mulch 2 t/ha
b dose of rice straw mulch 4 t/ha
c dose of rice straw mulch 6 t/ha
The numbers in the column followed by same letter are not significantly different at 5% level test DNMRT

Table 7. Effect of cropping system interactions and dosing rice straw mulch on grain yield in the Kepenuhan of Riau

Dose straw of rice	Cropping system			
	1	2	3	4
a	4,5 b	4,5 b	4,0 bc	3,9 c
b	5,4 a	5,1 a	4,7 b	4,5 b
c	6,0 a	5,4 a	5,0 ab	4,5 b

Remark: (1) parallel to the slope cropping system, with distances in rows 20 cm, one plant/hole and the distance between rows of 75 cm
(2) parallel to the slope, with a role in row spacing of 40 cm, two plants/hole and the distance between rows of 75 cm
(3) System tiles, 20 cm x 75 cm, one plant/hole
(4) System tiles 40 cm x 75 cm, two plants/hole
a dose of rice straw mulch 2 t/ha
b dose of rice straw mulch 4 t/ha
c dose of rice straw mulch 6 t/ha
The numbers in the column followed by same letter are not significantly different at 5% level test DNMRT

iron oxide, aluminum oxide and clay (Lynch *et al.* 1985). Rice straw mulching or other plant materials as a source of soil organic matter will donate organic compounds so as to increase aggregate stability. Organic compounds can stabilize the soil by binding aggregate and primary particle bonding envelops the land or with further binding of aggregate grains grain that has been formed (Tisdall 1994). From the results of research conducted Bistok (1997) showed manure 20 t/ha can increase aggregate stability significantly compared with no manure.

Conclusion

1. Cropping systems and the provision of rice straw compost to 6 t/ha affect plant height growth, high corn ear, number of rows/ear, ear diameter and weighing 100 seeds.
2. The combination system of planting rice straw compost giving a real influence on the ear length and yield. Highest ear length obtained from the slopes of parallel planting cropping system, with distances in rows 20 cm, one plant/hole and row spacing of 75 cm by providing straw compost 6 t/ha with tillage in a row (16.7 cm and 6 t/ha). The length of the ear and the lowest result obtained cropping system tiles 40 cm x 75 cm, two plants/hole without giving organic material (14.4 cm and 3.9 t/ha.

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