The Effect of Double Rows Cropping Pattern with Corn on the Quantitative Characters of Some Varieties of Soybean in the Dry Land, Central Lombok, Indonesia

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Abstract. A field experiment was conducted in May-August 2021 on land in Central Lombok Regency for research purposes. The study's objectives are 1) to increase the Cropping Index from 2 to 3; 2) to know that soybean and corn varieties are in the tip and suitable for superimposing on dry land; 3) to improve the efficiency of dry land use so that it can be used as a reference for farming technology in Central Lombok Regency.

The results of the research showed that: 1) factors of a combination of planting distances in the double planting pattern with the interaction of various soybean varieties superimposed with corn are not significantly different; 2) fundamental differences in the various varieties with the most production yields of Kemuning varieties 1; 3) in the planting distance pattern of 50×20×15 cm with a soybean plant population of 266,608 trees, the production yield is 1.2 tons per hectare, and the corn plant population is 98,224 trees produced 7.3 tons per hectare.

Keywords: planting pattern; dry land; intercropping; quantitative character; corn; soybeans.

INTRODUCTION

Culturing several types of food crops, both in the form of rotation, intercropping, inserts and sequentially, will ensure the success of the farming business [1]. However, soybean plants with shorter plant architectures often experience shading stress, which is indicated by lower growth and yield [6].

Soybeans contain isoflavones which are antioxidants. This makes soybeans a priority food commodity programmed by the Ministry of Agriculture to meet the food needs of the Indonesian people [7]. This effort to meet soybean needs faces obstacles in the form of narrower fertile land. Therefore fulfilment can be carried out with a decertification attempt. Diversification can be done by planting soybeans with a double crop pattern superimposed with corn after planting other food crops such as rice planting rice fields and dry rain in the central Lombok district. West Nusa Tenggara (NTB) is one of Indonesia's provinces producing soybeans and corn. In 2016 and 2017, it was ranked third after East Java and Central Java. The biophysical characteristics of the land in NTB are suitable for the growth of soybean and corn crops due to water availability [4, 6]. Drought-tolerant soybean varieties can produce optimally according to their genetic potential when optimally applied to cultivation technology. The double crop pattern of soybeans superimposed with corn is one of the alternatives to increase the productivity of dry land in the Central Lombok district.

METHODS

This study used Split Plot Design (divided plots) to determine the quantitative characteristics of several varieties of soybeans with double crop patterns superimposed with corn. The main field with double row crops of several soybean varieties consists of 4 levels, namely:

B1 – Single Row with soybean row spacing of 40×15 cm;

B2 – Double Row with a row spacing of 70×20×15 cm;

B3 – Double Row with planting distance 60×20×15 cm;

B4 – Double Row with row spacing 50×20×15 cm.

The main field consists of several soybeans varieties: V1 – Kemuning 1; V2 – Pearl 2; V3 – Pearl 3; V4 – Sugentan 2; V5 – Gamasugen 2 with three replays each.

The linear model of the design used is:

$$Y_{vbk}=\mu+\alpha(v)+\beta(v)+\alpha\beta(vb)+þk+\varepsilon(vb)k, \quad (1)$$

where *Yvbk* – observation value of varieties to *b* planting pattern too *b* on the *k* block; μ – general average value; *α(v)* – influence of *v-to-v* varieties; *β(v)* – the impact of the *b* variety; *αβ(vb)* – the impact of the interaction between *v* and *b* double-row varieties; þk – the impact of the *k* block; *ε(vb)k* – effect of error from double-line *j* and *k* block.

The data were analyzed with the F-test. If there is a real influence, it is continued to be analised with the Duncan'S Multiple Range Test (DMRT). DMRT test to see the differences at the level of α 0.05. The regression test was carried out using Statistical Analysis System.

RESULTS AND DISCUSSION

Effect of Combination of Double Planting Patterns on Parameters of various soybean varieties overridden with corn is presented in Table 1.

Table 1 – Results of the analysis of the diversity of parameters of observation of vegetative and generative development of soybeans in Double Crops that are superimposed with Corn Crops

Factor	Diversity Observations Vegetative Parameters												Diversity Observations Genetative Parameters						
	Tall Plant (hst)			Sum Leaf (hst)		Sum Book (hst)			Sum Branch (hst)			Broad Leaf	Flower Age (hst)		Number of Stuffed Pods	Number of Hollow Pods	Number of seeds	Plot Weight	Weight of 100 seeds
	30	60	P	30	60	30	60	P	30	60	P	60	30	60	Harvest (P)				
b×o	NS	NS	S	S	NS	NS	S	S	NS	S	S	S	NS	NS	NS	S	NS	S	NS
v×o	S	S	S	S	S	NS	S	S	S	S	S	S	S	NS	S	S	S	S	S

Notes: b×o – combination of Double Planting Pattern Planting Distance; v×o – Interaction of Various varieties of soybeans; S – Real Difference; NS – No Real Difference.

Table 1 is a summary result:

1. The effect of a single interaction on various varieties (v×o) on the pattern of double plants superimposed with corn showed no real difference (NS) in the number of books at 30 HST. The flowering period of 60 HST is when the plant is already 100 %.

2. From the explanation of points 1 and 2, the interaction of various soybean varieties on different double planting patterns superimposed with corn has a real difference effect on the quantitative characteristics of soybeans, both vegetative and generative growth. The influence of double planting patterns (b×o) on various soybeans varieties of soybeans can be seen in Figure 1.

Effect of Combination of Double Planting Patterns (b×o) on corn parameters on interaction with various soybean varieties (v×o) is presented in Table 2.

Table 2 is a summary result:

1. Interaction factor combination double planting pattern against each developmental parameter of the Real Different (S) at plant height (30 hst), while in other parameters. There is no real difference such as cob length, cob diameter, the number of seeds per cob, the weight of the seeds per cob, per plot seed weight and weight of 100 grains.

2) Interaction factors of various soybean varieties against single-anglers of corn crop parameters Differed Markedly (S) on plant height age (30 HST) and No Real Difference (NS) on other parameters. More details can be seen in Figure 2.

By sharing the single parameter, the effect of the combination of double planting patterns on various varieties of soybeans superimposed with corn can be analyzed on potential production yields, especially on the parameters of yield weight per treatment plot. It can be seen in Table 3.

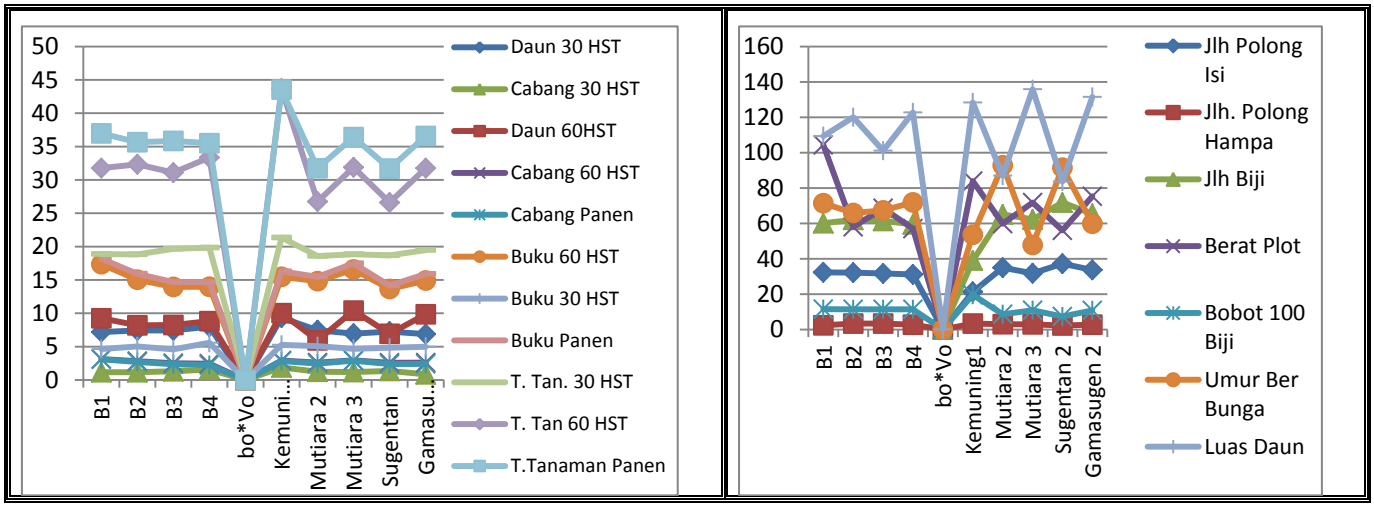

Figure 1 – ANOVA, Recapitulation of the Results of Observations of the Single Influence of Various Parameters of Soybean Plants Superimposed with Corn at the Age of 30 HST and 60 HST

Table 2 – Summary of the analysis of the diversity of observation parameters of vegetative and generative development of corn in Double Crops that are superimposed with soybean varieties

Observation of Age Gap of 30 HST, 60 HST, and Corn Crop Harvest										
Factor	Vegetative				Generative					
	Planting Height		Number of Leaves		Cob Length	Cob Diameter	Number of Cob Seeds	Cob Seed Weight	Heavy Seed Plot	Weight 100 Seeds
	30 HST	60 HST	30 HST	60 HST						
b×o	S	NS	NS	NS	NS	NS	NS	NS	NS	NS
v×o	S	NS	NS	NS	NS	NS	NS	NS	NS	NS

Notes: b×o – Combination of Double Planting Pattern Planting Distance; v×o – Interaction of Various varieties of soybeans; S – Real Difference; NS – No Real Difference.

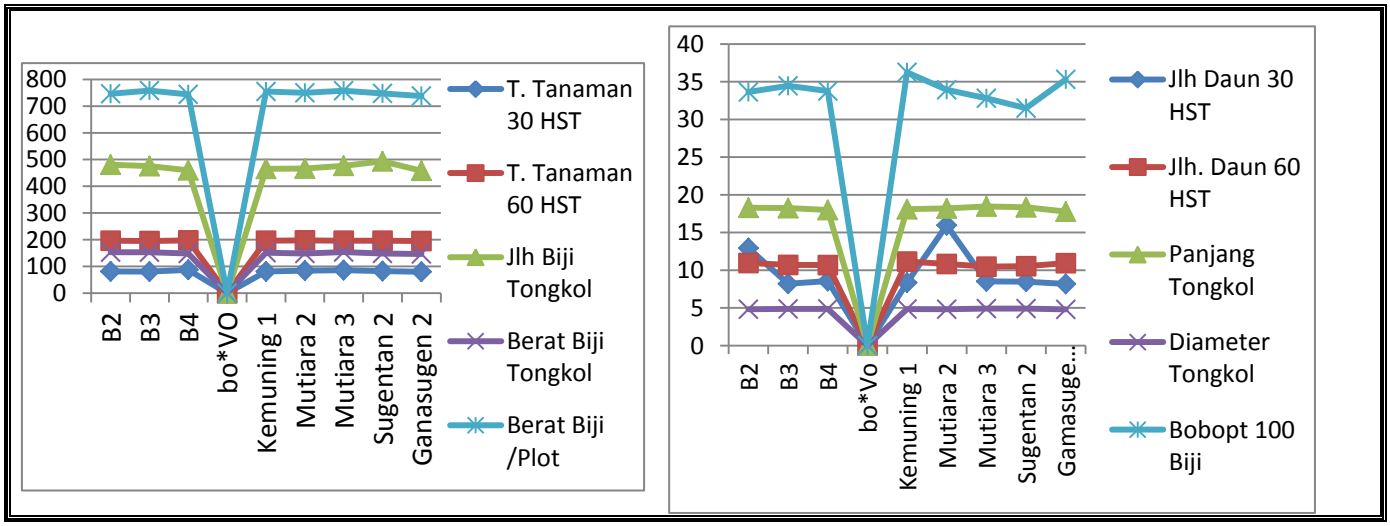

Figure 2 – ANOVA Results of Interaction Observations of Double Crop Patterns Superimposed with Corn on the Effect of Single Parameters on Corn Crops

Table 3 – Potential production yields combining double planting patterns (b×o) soybeans and interaction blended soybean varieties (v×o) stacked with corn

Factor	Data recapitulation of the results of Duncan's Multiple Test Sass 9.1 Advanced Test on Perplot Seed Weight						
	Seed Weight/ Plot				Production Potential (Ha)		
	M	N	R	D	Mp	Mph	Production (kg)
b×o	104.4	A	B1	S	280	245.560	1.281,82
	58.5	B	B3	S	304	266.608	779,83
	57.7	C	B2	S	304	266.608	769,16
	57.0	D	B4	S	304	266.608	759,83
v×o	83.91	A	V1	S	298	261.346	1.106,42
	75.28	B	V5	S	298	261.346	1.003,51
	71.83	C	V3	S	298	261.346	957,52
	59.88	D	V2	S	298	261.346	798,22
	56.02	E	V4	S	298	261.346	746,77

Notes: M – Mean (average); N – Notation; R – Rengking; D – DMRT; Mp – average population perpetak/plot; Mph – average population/acre.

In Table 3, it is explained that:

1) In the combination of double planting patterns planting pattern B1 (Single Row Planting) M=104.4 with notation (A); average plot population Mp=280 trees, declared Real Difference (S); with other double planting patterns so that the soybean population per hectare Mph=245,560 trees, the potential per hectare production yield = 1,281.82 kg; following the other Pattern;

2) while at the interaction of various soybean varieties, M=83.91 with the notation (A) expressed Real Different (S), where the sum Mp= B1; B2; B3 and B4) divided by 4, = represents the average interaction population of various soybean varieties (Mp) hence the Kemuning variety 1 (V1); Mp=298 trees, Mph=261,348 trees, with a potential production yield of 1,106.47 kg per bushel.

Table 4 – Potential production yields in a combination of double planting patterns (b×o) parameters corn and interaction of corn production yields grown with soybean varieties (v×o)

Factor	Data recapitulation of results of Advanced Test Sass 9.1 Duncan's Multiple Test against Corn per plot seed weight						
	Seed Weight/Plot				Production Potential (hectares)		
	M	D	R	N	Mp	Mph	Production (Ha)
b×o	758.05	A	B3	NS	84	84.192	6.237,41
	746.06	A	B2	NS	96	73.668	5.631,51
	743.71	A	B4	NS	112	98.224	7.260,47
V×o	757.35	A	V3	NS	97	85.069	5.657,33
	754.47	A	V1	NS	97	85.069	5.582,49
	749.70	A	V2	NS	97	85.069	5.471,03
	747.16	A	V4	NS	97	85.069	5.452,39
	737.67	A	V5	NS	97	85.069	5.394,41

Notes: M – Mean (average); N – Notation; R – Rengking; D – DMRT; Mp – average population perpetak/plot; Mph – average population/acre

In Table 4, it is explained that:

1) In the combination of double planting pattern against corn production, the planting pattern B4 (5×20×15 cm), M=758.05, notation (A), is stated not significantly different (NS) from other patterns, where Mp=112 trees, so that Mph=98,224 so that the potential production yield is 7,260.47 kg of dry flat corn harvested per hectare, following another Pola.

2) while interacting with various soybean varieties then, the highest corn production was planted with Pearl varieties 3 (V3), M=757.35, notation (A) was declared Not Significantly Different (NS) from other varieties; Mp=97 trees, Mph=85,069 trees then the potential yield of corn = 5,657.33 kg dry Pipil corn harvested per hectare.

CONCLUSIONS

Based on the results of observations and discussions that have been carried out in this study, it can be concluded as follows:

1. The combination of double planting patterns (planting distance or plant population) can affect the significance of quantitative characteristics of various soybean varieties against vegetative and generative growth.

2. The double planting pattern and soybean varieties superimposed with corn affect the amount of yield as follows: potential soybean yield in single plant pattern B1 (40×20 cm), plant population 245,560 trees/ha, production 1,281.82 kg/ha; while the double planting pattern B3 (60×20×15 cm), production 779,8 kg/ha, B2 (70×20×15 cm), production 769.16 kg/ha, B4 (50×20×15 cm), production 759.83 kg/ha with a population of 266,608 trees/ha of gonad planting soybeans. Medium varieties that are ideal to yield: Kemuning 1 – 1,281.82 kg/ha, Gamasugen 2 – 1,003.51 kg/ha, Pearl 3 - 957.52 kg/ha, Pearl 2 – 798.22 kg/ha and Sugentan 2 – 746.77 kg/ha.

3. In corn yields, the most ideal planting patterns for soybeans are: B4 (50×20×15 cm), maize population 98,224 trees/ha, production 7,260.47 kg/ha; B3 (60×20×15 cm) population 84,192 trees/ha, production 6,237.41 kg/ha and B2 (70×20×15 cm), population 73,668 trees/ha, production 5,631.51 kg/ha.

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