ADAPTATION TESTING OF MAIZE (*Zea mays* L.) AND PEANUT (*Arachys hypogaea* L.) IN INTERCROPPING SYSTEM TREATED BY BIOTECHNOLOGY BOKASHI PLUS FERTILIZER IN MARGINAL SOIL OF KABAWO DISTRICT, MUNA REGENCY, INDONESIA

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ABSTRACT

The main objective of this research was to analyze the adaptation field test of maize and peanut in intercropping system through the use of vaious doses of biotechnology bokashi plus fertilizer in marginal soil of Kabawo district, Muna regency. This research was conducted in three farmer's land with similar slopes of Lamaeo, Kontumere and Kasaka villages, Kabawo district and Laboratory work was carried out in Department of Agrotechnology, Faculty of Agriculture, University of Halu Oleo, held from December 2018 to April 2019. This research was conducted using factorial design in randomized block design (RBD) consisting of two factors: The first factor was the doses bokashi plus fertilizer (B) and the second factor was peanut ecotype (V). The first factor was the dose of bokashi plus fertilizer consisting of four levels: 0 t.ha-1 (B0), 6 t.ha-1 (B1), 12 t.ha-1 (B2) and 18 t.ha-1 (B3). The second factor consisted of three local peanut ecotypes namely Lamaeo (V1), Bende (V2) and.Kontumere (V3), From two factors, there were 12 combinations and every combination was repeated three times, so there were 36 experimental units in all. The variables observed in maize crop were plant height, stem diameter, leaf number, leaf area index, cob weight with cornhusk, cob weight without cornhusk, cob length, diameter, number of row, 100 dry seed weight and yield per ha. The variables observed in peanut crop were plant height, number of leaves, number of branches, total pod number, total pod content, weight of 100 seeds, number of nodules, number of seeds per plant, total dry weight of plant and yield per ha. All variables were analyzed using analyses of variances (ANOVA), if significant different, followed by Duncan's Multiple Range Test (DMRT) with 95 percent confidence level. The results showed that the interaction of bokashi plus fertilizer application and peanut ecotype had no significant effect on the growth and yield of intercropping of maize and peanut in marginal soils. Provision of bokashi plus fertilizer had very significant effect on the growth and yield of corn crops except the components of peanut ($p<0.05$). The highest peanut ecotype yield was obtained at the dose of 18 t ha-1 of bokashi plus fertilizer for Kontumere ecotype (V3) with the best average number of leaves (172,46 strands), number of branches (8,68 stalks), dry weight 100 seeds (36,47 g), seed number (64,52 seeds), total dry weight of plant (26,46 g), number of nodules (46,54 g) and peanut yield (2,73 t ha-1). The highest yield of maize was obtained at the dose of 18 t.ha-1 (B3) with the best average yield of plant height (168,46 cm), stem diameter (3,24 cm), leaf number (15,62 pieces), wide index leaf (846,85 cm), length of cob (18.56 cm), diameter of cob (4.2 cm), number of lines (12.74 lines) and LER 1.36. It was recommended that the application of 18 t ha-1 of bokashi plus fertilizer might increase the adaptation of intercropped maize and three peanut ecotypes growth and yield in marginal soils.

Keywords: adaptation test, bokashi plus fertilizer, intercropping, maize, peanut

I. INTRODUCTION

Muna regency is one of the seventeen regencies in Southeast Sulawesi province, situated in the eastern part of Indonesia covering the total area of 38.140 km^2 with various soil types found. Marginal soil is the dominant soil type (about 60.3 percent) of the region that plays an important role for the smallholding farmers to grow various crops eventhough the yields of agricultural crops planted are relatively low (Karimuna, 2003). This is caused by such limiting factors as low soil fertility, low soil organic matter and low cationic exchange capacity as identified by Karimuna, et al, 2001, shallow top soil and high acidity as reported by Pasolon (1998) and Karimuna (2000). In order to improve agricultural production in the fullfilment of population demand, inovation technology on the use of biomass derived from local natural resources as a source of organic fertilizer in the form of bokashi plus fertilizr is necessary to increase soil fertility of marginal soils. The application of bokashi plus fertilizer derived from local natural resources dominated by *Chromolaena odorata* L. may contribute to improve nutrient content of the soil (Karimuna, 2000) and proved to increase the growth and yields of agricultural crops production in agroforestry landscape (Karimuna, *et al*., 2018).

Based on the recent data in 2017, the total population of Southeast Sulawesi province was 2.653.654 people and about 80 percent of population in the study region are being engaged in agriculture sector as farmer (BPS, 2018), where Muna regency

was the sixth population density in SE Sulawesi province with total population of 221.343 people. Eventhough the soil characeristics of Muna was recognized as a suboptimal or marginal soil, most of such agricultural products as maize, peanut and tomatoes traded in Kendari and Buton markets were produced and transported from Muna farmer's. Muna regency is the main regency that produce maize and peanut in Southeast Sulawesi province for maize total areas of 27.133 ha with 0.25 per ha and total yields of 67.578 ton and for peanut total areas of 24.022 ha and total yields of 60.600 ton and in 2014, total areas of peanut 6.058 ha with total yields of 4.652 ton (Statistical Bureau of Muna Regency, 2016). The total production for those crops was not sufficient due to the declining soil productivity that has to be solved. Several strategies like intensification, extensification and diversification have been implemented by the government to improve agriculture production, but maximum yield of crops has not been achieved. On the other hand, sufficient yield of staple crops for human consumption has to be encouraged. Maize plays as the main staple food after rice not only for human being but also for liverstock feed industry. Then, peanut is as nutricious food needed for human, and all other part of plants can be used to improve soil fertility as organic fertilizer. Maize and peanut are the two crops that can be either planted monocropping or intercropping in order to obtain beneficial for increasing production. The actual productivity of maize and peanut at the farmer level was 0.85 t ha^{-1} and 0.4 t ha^{-1}, respectivelly that is much lower compared to potensial yield for both maize 7-8 t ha^{-1} and peanut 1.2 – 1.9 t ha^{-1} (Department of Agriculture, 2005).

In order to overcome of such significant problems as fast declining soil fertility and the potential use of local crops variety, less optimal soil drainage and poor soil structure, less optimal crop maintenance, pest and disease attacks, and poor seed quality as reported by Suprapto (2003), many research findings had been reported through the use of organic fertilizer that might alleviate the shortages of marginal soil through the improvement of soil physical, chemical and biological behaviours (Poerwidodo, 1992; Hardjowigeno, 2003; Karimuna, 2007). Having assumed that biotechnology application could be one the appropriate alternatives to improve soil fertility using organic fertilizer after decomposed by effective microorganism four (EM4) and the application of mulch derived from secondary vegetation dominated by *Chromolaena odorata* L. (Karimuna, 2000), which has been recognized as a plant associated with mycorrhiza (Halim, 2008). Studies on the efforts organic fertilizer bokashi plus using EM4 on the intercropping maize and peanut (Karimuna *et al*., 2014). Similar study conducted by Haverkort *et al*. (1992) suggested that bokashi fertilizer functions as a nutrient storage which would slowly be released into the soil solution and could be utilized by plants, organic materials in or above the soil surface would also protect and help regulate the temperature and soil moisture. At experimental station, the growth and yield of maize, peanut and other crops using various organic fertilizers as explained above showed a promising result, but adaptation of maize intercropped with peanut applied by various doses of bokashi plus fertilizer in marginal soils was unknown and therefore a research on the adaptation of maize and peanut in intercropping under the collaboration with local government of Muna regency was needed to be tested at the farmer's land.

The improvement of marginal soils found in the study region is compulsory to be done with the application of organic fertilizer using local organic substances derived from the biomass of secondary vegetation, dominated by *Chromolaena odorata* L integrated with organic waste from chichen dung and micorhyza to form an organic fertilizer which could be applied to increase soil fertility. The main objective of this research was to analyze the adaptation field test of maize and peanut in intercropping system through the use of vaious doses of biotechnology bokashi plus fertilizer and to determine the best response of those treatments on the growth and yield of maize intercropped with peanut in marginal soil of Lamaeo, Kontumere and Kasaka villages, Kabawo district, Muna regency.

II. MATERIALS AND METHODOLOGY

2.1. Place and Time

Adaptation field test of the application of various doses of bokashi plus fertilizer in marginal soils using high adapted crops of local maize and peanut ecotype in intercropping system was carried out in three farmers villages of Kasaka, Lamaeo and Kontumere, Kabawo district, Muna Regency. This research was held from November 2018 to April 2019.

2.2. Materials and Equipment

The materials used in this research were local maize, local peanut (Kasaka, Lamaeo and Bende ecotypes), bokashi plus fertilizer, paper labels, pouches of plastic and newsprint, while equipment used in this activity were soil processing tool, sieve the soil, analytic scales, meter, water pump, watering tools, ropes, poles, plastic pouches, scissors, digital camera, stationery writing, waring net, electric oven, leaf area meter, measurement of moisture content and tools for laboratory analysis of soil and bokashi plus fertilizer.

Materials used in this adaptation field test were local maize seed, peanut local variety, bokashi plus fertilizer, mulch of secondary vegetation, EM4, water, sugar, label, and rope. The instruments used in the field test were hoe, knife, balance, sprayer, oven, camera, measurement, and soil thermometer. In addition, hand tractor was used for land preparation in three farmers areas of Lamaeo, Kontumere and Kasaka villages.

2.3. Methods

This research was conducted using factorial design in randomized block design (RBD) consisting of two factors: The first factor was the doses bokashi plus fertilizer (B) and the second factor was peanut ecotype (E). The first factor was the dose of bokashi plus fertilizer consisting of four levels: 0 t.ha^{-1} (B0), 6 t.ha^{-1} (B1), 12 t.ha^{-1} (B2) and 18 t.ha^{-1} (B3). The second factor consisted of four local peanut ecotypes namely Lamaeo (V1), Bende (V2) and Kontumere (V3), and. From two factors, there were 12 combinations and every combination was repeated three times, so there were 36 experimental units in all, The variables observed in corn plant were plant height, stem diameter, number of leaves, leaf area index, cob weight with cornhusk, cob weight without cornhusk, cob length, diameter, number of row, 100 seed dry weight and yield per ha. The variables observed in peanut plant were plant height, number of leaves, stem diameter, leaf area index, number of branches, total pod number, total pod content, 100 seed dry weight, number of nodules, number of seeds/plant, total dry weight of plant and yield per ha. Five plant samples for maize and peanut were used to record growth and yield data. All data collected of maize and peanut growth and yield variables were analyzed using analyses of variances (ANOVA), if significant different, followed by Duncan's Multiple Range

Test (DMRT) with 95 percent confidence level. All data were tabulated using excell program and were analyzed using descriptive analyses.

2.4. Research Implementation and Data Analyses

Land preparation for adaptation field test of intercropping maize and peanut was carried out using hand tractor. Before ploughing, all vegetation were cleared-cut to avoid machines operation. The provision of bokashi plus fertilizer was made using the combination of komba-komba (*Chromolaena odorata* L.), chichen dung and inoculated with mycorrhiza. Komba-komba is a short of shrub that may reach 5 m tall. Komba-komba was cut into small parts until 5 cm long. Crop space of maize was 120 cm x 40 cm, while peanut was planted between the rows of maize with crop space arrangement 30 cm x 30 cm. The application of bokashi plus fertilizer was done a week before planting with the doses depending on the treatment. Before planted, the seeds were soaked into the water mixed with savin to prevent ant attacks. Planting was done manually by making a small hole with about 2.5 cm depth using wood stick, and each hole planted two seeds. During maintenance of plant growth, weeding was done a week after planting. After two weeks, abnormal plants were cut so that there was only one plant per hole and maintained until harvest. If there was no rain for four days, then watering was applied. To prevent crops from pig attacks, field test were fenced using stone and wood fences.

Maize and peanut growth were recorded for the components of plant height, stem diameter, number of leaves and leaf areas at the age of 2, 4, 6 and 8 weeks after planting (WAP). Component of dry weight biomass observations were carried out for plant sample at the age of harvesting time. Each response variables on the growth and production of intercropping maize and peanut were calculated as a result of the application of bokashi plus on marginal soil. Growth and yield components planted in intercropping systems were recorded using excell program and all data were analyzed using analyses of variances (ANOVA). If significant difference, followed by Honestly Significant Difference (HSD) with 95 confidence level.

III. RESULTS AND DISCUSSION

3.1 Maize

The results of research showed that the higher the doses of bokashi plus fertilizer application the higher the growth and yield of maize planted in intercropping with peanut in marginal soils. The growth dynamic in the combination treatment of maize plant height, stem diameter and leaf area at 2, 4, 6 and 8 WAP applied by bokashi plus fertilizer in Kontumere, Lamaeo and Kasaka villages tested in marginal soils was figured out in Table 1, Table 2 and Table 3. The application testing of bokashi plus fertilizer on the averages of maize yield performances intercropped with local peanut in marginal soils in Kontumere, Lamaeo and Kasaka villages was illustrated in Table 4, Table 5 and Table 6. Table 1, Table 2 and Table 3 showed that in all combination treatment, there was a rapid increase of maize plant height, leaf number, stem diameter and leaf area at 2, 4, 6 and 8 WAP in Kontumere, Lamaeo and Kasaka field tests. In similar trends, it was shown for maize yield components.

Table 1. The application testing of bokashi plus fertilizer on the averages of plant height (cm), leaf number (strands), stem diameter (cm) and leaf area (cm^2) of local maize intercropped with local peanut at 2, 4, 6, and 8 weeks after planting (WAP) in Kontumere village.

Combination	Plant height (cm)				Leaf Number (strands)				Stem Diameter (cm)				Leaf Area (cm^2)			
	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP
V1B0	34,80	66,80	154,80	184,70	8,50	10,30	15,30	16,50	0,43	1,32	1,62	2,38	28,50	237,10	556,92	750,42
V1B1	41,50	72,90	169,90	199,60	9,40	11,22	16,40	17,20	0,48	1,34	1,75	2,67	32,80	245,60	596,96	782,26
V1B2	45,80	75,60	174,80	203,50	9,80	11,60	16,50	17,40	0,49	1,36	1,86	2,88	40,30	324,90	600,60	791,35
V1B3	49,50	80,80	189,80	211,60	9,90	12,70	17,50	18,20	0,49	1,48	1,92	2,93	43,40	337,60	637,00	827,74
V2B0	35,20	67,40	158,40	188,40	8,70	10,70	15,50	16,70	0,53	1,38	1,74	2,89	28,50	237,10	564,20	759,52
V2B1	42,40	73,80	172,60	208,30	9,40	11,40	16,60	17,40	0,56	1,44	1,84	2,95	32,80	245,60	604,24	791,35
V2B2	46,70	76,80	177,40	212,60	9,90	12,10	16,70	17,60	0,56	1,68	1,96	3,08	40,30	324,90	607,88	800,45
V2B3	50,10	81,70	182,60	215,70	10,20	13,00	17,60	18,50	0,58	1,79	2,05	3,21	43,40	337,60	640,64	841,38
V3B0	36,40	68,60	157,80	187,40	8,80	11,10	15,80	16,70	0,54	1,75	1,84	2,79	28,50	237,10	575,12	759,52
V3B1	43,80	74,80	175,60	205,80	9,90	12,30	16,70	17,50	0,64	1,78	1,97	2,98	32,80	245,60	607,88	795,90
V3B2	47,90	77,50	179,30	211,60	10,30	13,10	16,80	17,70	0,67	1,84	2,10	3,19	40,30	324,90	611,52	805,00
V3B3	51,50	82,90	185,20	228,50	10,60	13,70	17,80	18,62	0,69	1,93	2,13	3,24	43,40	337,60	647,92	846,85

HSD α=0.05	NS	*	**	**	NS	*	**	**	NS	NS	*	**	*	**	**	**

Notes: WAP = weeks after planting, NS = non significant different, * = sgnificant different,
** = very significant different.

Table 2. The application testing of bokashi plus fertilizer on the averages of plant height (cm), leaf number (strands), stem diameter (cm) and leaf area (cm^2) of local maize intercropped with local peanut at 2, 4, 6, and 8 weeks after planting (WAP) in Lamaeo village.

Combination	Plant height (cm)				Leaf Number (strands)				Stem Diameter (cm)				Leaf Area (cm^2)			
	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP
V1B0	34,80	66,80	154,80	184,70	8,50	10,30	15,30	16,50	0,43	1,32	1,62	2,38	28,50	237,10	556,92	750,42
V1B1	41,50	72,90	169,90	199,60	9,40	11,22	16,40	17,20	0,48	1,34	1,75	2,67	32,80	245,60	596,96	782,26
V1B2	45,80	75,60	174,80	203,50	9,80	11,60	16,50	17,40	0,49	1,36	1,86	2,88	40,30	324,90	600,60	791,35
V1B3	49,50	80,80	189,80	211,60	9,90	12,70	17,50	18,20	0,49	1,48	1,92	2,93	43,40	337,60	637,00	827,74
V2B0	35,20	67,40	158,40	188,40	8,70	10,70	15,50	16,70	0,53	1,38	1,74	2,89	28,50	237,10	564,20	759,52
V2B1	42,40	73,80	172,60	208,30	9,40	11,40	16,60	17,40	0,56	1,44	1,84	2,95	32,80	245,60	604,24	791,35
V2B2	46,70	76,80	177,40	212,60	9,90	12,10	16,70	17,60	0,56	1,68	1,96	3,08	40,30	324,90	607,88	800,45
V2B3	50,10	81,70	182,60	215,70	10,20	13,00	17,60	18,50	0,58	1,79	2,05	3,21	43,40	337,60	640,64	841,38
V3B0	36,40	68,60	157,80	187,40	8,80	11,10	15,80	16,70	0,54	1,75	1,84	2,79	28,50	237,10	575,12	759,52
V3B1	43,80	74,80	175,60	205,80	9,90	12,30	16,70	17,50	0,64	1,78	1,97	2,98	32,80	245,60	607,88	795,90
V3B2	47,90	77,50	179,30	211,60	10,30	13,10	16,80	17,70	0,67	1,84	2,10	3,19	40,30	324,90	611,52	805,00
V3B3	51,50	82,90	185,20	228,50	10,60	13,70	17,80	18,62	0,69	1,93	2,13	3,24	43,40	337,60	647,92	846,85
HSD α=0.05	*	*	**	**	NS	*	**	**	NS	NS	*	**	*	**	**	**

Notes: WAP = weeks after planting, NS = non-significant different, * = sgnificant different,
** = very significant different.

It was found that the highest yield of maize was obtained at the dose of 18 $t.ha^{-1}$ (B3) with the best average yield of plant height (168,46 cm), stem diameter (3,24 cm), leaf number (15,62 pieces), wide index leaf (846,85 cm) as shown in Table 1, while the highest length of cob (18.56 cm), diameter of cob (4.2 cm), number of lines (12.74 lines) and LER 1.36 were shown in Table 4, recorded in Kontumere field test. Variation of growth dynamic and yield components of maize intercropped with peanut was cleared to indicate the high adaptation of local maize to the local condition that could be found out in other two experimental sites.

Table 3. The application testing of bokashi plus fertilizer on the averages of plant height (cm), leaf number (strands), stem diameter (cm) and leaf area (cm^2) of local maize intercropped with local peanut at 2, 4, 6, and 8 weeks after planting (WAP) in Kasaka village.

Combination	Plant height (cm)				Leaf Number (strands)				Stem Diameter (cm)				Leaf Area (cm^2)			
	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP
V1B0	34,80	66,80	154,80	184,70	8,50	10,30	15,30	16,50	0,43	1,32	1,62	2,38	28,50	237,10	556,92	750,42
V1B1	41,50	72,90	169,90	199,60	9,40	11,22	16,40	17,20	0,48	1,34	1,75	2,67	32,80	245,60	596,96	782,26
V1B2	45,80	75,60	174,80	203,50	9,80	11,60	16,50	17,40	0,49	1,36	1,86	2,88	40,30	324,90	600,60	791,35
V1B	49,5	80,8	189,	211,	9,90	12,7	17,5	18,2	0,49	1,48	1,92	2,9	43,4	337,	637,	827,

3	0	0	80	60		0	0	0				3	0	60	00	74
V2B0	35,20	67,40	158,40	188,40	8,70	10,70	15,50	16,70	0,53	1,38	1,74	2,89	28,50	237,10	564,20	759,52
V2B1	42,40	73,80	172,60	208,30	9,40	11,40	16,60	17,40	0,56	1,44	1,84	2,95	32,80	245,60	604,24	791,35
V2B2	46,70	76,80	177,40	212,60	9,90	12,10	16,70	17,60	0,56	1,68	1,96	3,08	40,30	324,90	607,88	800,45
V2B3	50,10	81,70	182,60	215,70	10,20	13,00	17,60	18,50	0,58	1,79	2,05	3,21	43,40	337,60	640,64	841,38
V3B0	36,40	68,60	157,80	187,40	8,80	11,10	15,80	16,70	0,54	1,75	1,84	2,79	28,50	237,10	575,12	759,52
V3B1	43,80	74,80	175,60	205,80	9,90	12,30	16,70	17,50	0,64	1,78	1,97	2,98	32,80	245,60	607,88	795,90
V3B2	47,90	77,50	179,30	211,60	10,30	13,10	16,80	17,70	0,67	1,84	2,10	3,19	40,30	324,90	611,52	805,00
V3B3	51,50	82,90	185,20	228,50	10,60	13,70	17,80	18,62	0,69	1,93	2,13	3,24	43,40	337,60	647,92	846,85
HSD α=0.05	*	*	*	**	NS	*	*	**	NS	NS	*	*	*	**	**	**

Notes: WAP = weeks after planting, NS = non-significant different, * = sgnificant different,
** = very significant different.

Maize yield performances intercropped with peanut applied by bokashi plus fertilizer in marginal soils was further calculated using Honestly Significant Difference (HSD) at 95 percent confidence level shown in Table 4, Table 5 and Table 6.

Table 4. The application testing of bokashi plus fertilizer on the averages of maize yield performances intercropped with local peanut in marginal soils in Kontumere village.

Combi-nation	Corn with husk (g)	Corn weight without husk (g)	Cob length (cm)	cob diameter (cm)	number of row (lines)	100 dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})	Land Equivalent Ratio (LER)
V1B0	230,51	218,92b	15,73c	3,76b	10,50	22,80b	5,21b	5,62b	1,20c
V1B1	230,83	219,83b	15,86c	3,90ab	10,60	24,72ab	5,31ab	5,76b	1,23c
V1B2	231,28	220,60ab	16,34bc	4,07ab	11,50	25,56ab	5,45ab	6,80ab	1,26bc
V1B3	231,59	221,95ab	18,24a	4,13ab	12,00	26,91ab	5,58ab	7,12ab	1,32ab
V2B0	231,61	219,76b	15,76c	3,77b	10,80	23,73b	5,25b	5,84b	1,22c
V2B1	232,11	220,51ab	15,98c	3,87ab	11,40	24,61ab	5,37ab	6,42ab	1,26bc
V2B2	233,64	221,46ab	17,94ab	3,95ab	12,50	25,82ab	5,46ab	6,83ab	1,28abc
V2B3	233,89	222,07ab	18,38a	4,13ab	12,70	27,20a	5,61ab	7,48ab	1,33a
V3B0	232,52	220,27ab	16,49abc	3,91ab	11,40	24,26ab	5,42ab	6,14ab	1,24bc
V3B1	234,57	221,27ab	17,96ab	3,97ab	12,50	25,46ab	5,49ab	7,25ab	1,28abc
V3B2	236,12	223,06a	18,54a	4,19a	12,68	27,38a	5,67a	7,94a	1,32ab
V3B3	237,94	223,43a	18,56a	4,20a	12,74	28,24a	5,73b	8,14a	1,36a
HSD α=0.05	NS	3,28	2,16	0,37	NS	4,18	0,46	2,25	0,09

Notes: 1. NS = non-significant different,
2. The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level

Table 5. The application testing of bokashi plus fertilizer on the averages of maize yield performances intercropped with local peanut in marginal soils in Lamaeo village.

Combi-nation	Corn with husk (g)	Corn weight without husk (g)	Cob length (cm)	cob diameter (cm)	number of row (lines)	100 dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})	Land Equivalent Ratio (LER)
V1B0	231,55	215,37b	14,84b	3,70b	10,43	21,82b	5,05c	5,31b	1,22c
V1B1	231,86	217,82ab	15,39b	3,91ab	10,54	23,71ab	5,26abc	5,42b	1,24bc
V1B2	232,28	219,65ab	16,24ab	4,01ab	11,38	24,48ab	5,46abc	6,37ab	1,27abc
V1B3	232,55	220,93ab	17,20ab	4,12a	11,98	25,86ab	5,72a	6,96ab	1,31ab
V2B0	232,62	216,76b	14,95b	3,78b	10,60	22,74b	5,15c	5,65b	1,24bc
V2B1	233,13	219,48ab	15,48b	3,84ab	11,32	23,61ab	5,22bc	6,23ab	1,25bc
V2B2	234,65	220,81ab	17,28ab	3,93ab	12,48	24,32ab	5,45abc	6,44ab	1,29abc
V2B3	234,89	221,41a	17,34ab	4,11a	12,56	26,22ab	5,72a	7,25ab	1,34a
V3B0	232,58	220,20ab	15,45b	3,93ab	11,32	23,84ab	5,25abc	6,08ab	1,25bc
V3B1	233,97	221,08ab	16,88ab	3,96ab	12,43	24,46ab	5,36abc	7,16ab	1,27abc
V3B2	235,94	222,15a	17,04ab	4,10a	12,63	26,35ab	5,58ab	7,75a	1.31ab

V3B3	236,02	223,02a	18,35a	4,14a	12,71	27,93a	5,71ab	7,94a	1,35a
HSD α=0.05	NS	5,94	2,87	0,34	NS	5,02	0,49	2,17	0,08

Notes: 1. NS = non-significant different,
2. The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level

Table 6. The application testing of bokashi plus fertilizer on the averages of maize yield performances intercropped with local peanut in marginal soils in Kasaka village.

Combi-nation	Corn with husk (g)	Corn weight without husk (g)	Cob length (cm)	cob diameter (cm)	number of row (lines)	100 dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})	Land Equivalent Ratio (LER)
V1B0	228,52	214,00b	14,57c	3,71b	11,51	22,90b	5,07b	5,32b	1,22c
V1B1	230,11	216,88ab	15,64bc	3,93ab	11,62	24,79ab	5,28ab	5,44b	1,25abc
V1B2	231,92	217,43ab	16,86ab	4,03ab	12,46	25,56ab	5,48ab	6,39ab	1,26abc
V1B3	232,04	218,96ab	17,14ab	4,15a	13,06	26,94ab	5,74a	6,99ab	1,32ab
V2B0	230,61	215,74b	14,76c	3,79b	11,68	23,82ab	5,17ab	5,66ab	1,24bc
V2B1	231,10	217,32ab	15,26bc	3,86ab	12,40	24,69ab	5,24ab	6,25ab	1,26abc
V2B2	233,88	219,12ab	17,17a	3,95ab	13,56	25,40ab	5,47ab	6,46ab	1,28abc
V2B3	234,55	220,08ab	17,29a	4,14a	13,64	27,30ab	5,74a	7,28ab	1,33ab
V3B0	231,22	219,23ab	15,34bc	3,94ab	12,40	24,92ab	5,27ab	6,09ab	1,24bc
V3B1	232,18	220,54a	16,65bc	3,98ab	13,51	25,54ab	5,38ab	7,18ab	1,28abc
V3B2	234,97	221,44a	16,96ab	4,12a	13,71	27,43ab	5,60a	7,77ab	1.32ab
V3B3	235,85	222,64a	17,84a	4,17a	13,79	29,01a	5,73a	7,97a	1,35a
HSD α=0.05	NS	6,43	2,15	0,32	NS	5,83	0,51	2,46	0.09

Notes: 1. NS = non-significant different,
2. The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level

Table 7. The application testing of various doses bokashi plus fertilizer on the averages of maize yield performances intercropped with local peanut in marginal soils in Kontumere, Lamaeo and Kasaka villages.

Doses of bokashi plus	Corn with husk (g)	Corn weight without husk (g)	Cob length (cm)	cob diameter (cm)	number of row (lines)	100 dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})	Land Equivalent Ratio (LER)
	Kontumere								
0 t ha^{-1}	231,55	219,65a	15,99a	3,81a	10,90	23,60a	5,29	5,87a	1,23
6 t ha^{-1}	232,50	220,54a	16,60a	3,91ab	11,50	24,93a	5,39	6,48a	1,24
12 t ha^{-1}	233,68	221,71ab	17,61ab	4,07b	12,23	26,25ab	5,53	7,19ab	1,27
18 t ha^{-1}	234,47	222,48b	18,39b	4,15b	12,48	27,45b	5,64	7,58b	1,33
HSD 0,05	NS	2,51	2,04	0,21	NS	3,62	NS	1,43	NS
	Lamaeo								
0 t ha^{-1}	232,25	217,44a	15,08a	3,80	10,78a	22,80a	5,15a	5,68a	1,25a
6 t ha^{-1}	232,99	219,46ab	15,92ab	3,90	11,43ab	23,93ab	5,28ab	6,27ab	1,29ab
12 t ha^{-1}	234,29	220,87ab	16,85ab	4,01	12,16ab	25,05bc	5,50ab	6,85bc	1,34b
18 t ha^{-1}	234,49	221,79b	17,63b	4,12	12,42b	26,67c	5,72b	7,38c	1,35b
HSD 0,05	NS	3,54	2,40	NS	1,61	2,61	0,52	1,43	0,05
	Kasaka								
0 t ha^{-1}	230,12	216,32a	14,89a	3,81a	11,86	23,88a	5,17a	5,69a	1,24a
6 t ha^{-1}	231,13	218,25ab	15,85ab	3,92ab	12,51	25,01ab	5,30a	6,29a	1,28ab
12 t ha^{-1}	233,59	219,33b	17,00bc	4,03ab	13,24	26,13ab	5,52ab	6,87a	1.32bc
18 t ha^{-1}	234,15	220,56b	17,42c	4,15b	13,50	27,75b	5,74b	7,41b	1,35c
HSD 0,05	NS	2,44	2,15	0,23	NS	3,26	0,43	1,21	0,06

Notes: 1. NS = non-significant different,
2. The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level.

Table 7 revealed that the higher, the level of bokashi plus fertilizer applied, the more the yields components of maize produced for corn with cornhusk, corn weight without cornhusk, cob length, cob diameter, number of row, 100 dry weight, total dry weight, yield of corn and land equivalent ratio. Table 7 also showed that the treatment of bokash plus fertiliser amounted to 18 t ha^{-1} had the highest yileds components of maize produced significantly different compared to others in Kontumere, Lamaeo

and Kasaka field test. Effects of various doses of bokashi plus fertilizer derived from secondary vegetation on the different variables of growth and yield of maize at the intercropped with peanut varied as shown in Table 7.

3.2. Peanut

Similar results for peanut growth and yield performances, it showed that the higher the doses of bokashi plus fertilizer application the higher the growth and yield of local peanut planted in intercropping with maize in marginal soils. The adaptation feld test of three ecotypes of peanut, the growth dynamic of peanut plant height, stem diameter and leaf area at 2, 4, 6 and 8 WAP applied by bokashi plus fertilizer in Kontumere, Lamaeo and Kasaka villages tested in marginal soils was figured out in Table 8, Table 9 and Table 10. Table 8, Table 9 and Table 10 showed that in all combination treatments, there was a consistent rapid increase of peanut plant height, leaf number, stem diameter and leaf area at 2, 4 and 6 WAP, and reached a maximum growth of vegetative components at 8 WAP in Kontumere, Lamaeo and Kasaka villages. In similar trends, it was shown for peanut yield components.

Table 8. The application testing of bokashi plus fertilizer on the averages of plant height (cm), leaf number (strands), stem diameter (cm) and leaf area (cm^2) of local peanut intercropped with local maize at 2, 4, 6, and 8 weeks after planting (WAP) in Kontumere village.

Combination	Plant height (cm)				Leaf Number (strands)				Stem Diameter (cm)				Leaf Area (cm^2)			
	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP
V1B0	7,51	13,79	25,73	34,76	7,74	37,75	98,89	150,76	0,22	0,23	0,32	0,38	20,18	113,42	286,78	437,20
V1B1	8,03	13,83	25,86	35,90	8,88	38,86	103,70	158,97	0,24	0,33	0,45	0,47	24,70	126,17	300,73	461,01
V1B2	8,28	14,60	26,34	37,47	9,40	39,07	115,57	160,09	0,25	0,34	0,46	0,48	27,54	136,31	335,15	464,26
V1B3	9,59	15,98	28,64	38,69	9,59	41,62	126,91	169,68	0,26	0,37	0,52	0,53	29,88	138,00	368,04	492,07
V2B0	7,61	13,76	25,76	36,77	7,75	37,72	102,75	152,74	0,19	0,24	0,34	0,39	21,42	116,70	297,98	442,95
V2B1	8,11	14,51	25,98	36,00	8,96	38,02	113,38	157,97	0,23	0,34	0,44	0,45	26,44	118,72	328,80	458,11
V2B2	8,64	15,47	27,94	36,95	9,95	38,95	121,88	162,34	0,24	0,34	0,46	0,48	29,73	123,56	353,45	470,79
V2B3	9,89	17,07	28,70	39,73	8,67	38,72	125,22	170,89	0,26	0,37	0,50	0,51	31,22	128,90	363,14	495,58
V3B0	7,52	13,81	26,49	37,61	8,49	37,55	113,29	157,61	0,22	0,25	0,34	0,39	22,86	121,34	328,54	457,07
V3B1	8,57	14,27	27,96	39,00	9,31	39,01	120,48	160,25	0,24	0,34	0,47	0,48	26,53	123,69	349,39	464,73
V3B2	9,12	15,02	28,59	39,71	8,58	39,57	124,38	169,68	0,25	0,36	0,47	0,49	32,16	130,48	360,70	492,07
V3B3	9,88	16,10	28,69	38,80	9,70	40,66	128,21	172,46	0,27	0,39	0,49	0,50	34,36	136,38	371,81	500,13
HSD α=0.05	*	*	**	**	NS	*	**	**	NS	*	*	**	*	**	**	**

Notes: WAP = weeks after planting, NS = non-significant different, * = sgnificant different,
** = very significant different.

Table 9. The application testing of bokashi plus fertilizer on the averages of plant height (cm), leaf number (strands), stem diameter (cm) and leaf area (cm^2) of local peanut intercropped with local maize at 2, 4, 6, and 8 weeks after planting (WAP) in Lamaeo village.

Combination	Plant height (cm)				Leaf Number (strands)				Stem Diameter (cm)				Leaf Area (cm^2)			
	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP
V1B0	8,24	15,85	28,77	40,38	11,70	47,11	90,16	134,10	0,22	0,23	0,32	0,38	24,24	129,55	252,45	388,89
V1B1	8,76	15,89	28,90	41,52	12,84	48,22	95,97	135,31	0,24	0,31	0,45	0,47	28,76	132,61	268,72	392,40
V1B2	9,01	16,66	29,38	43,09	13,36	48,43	102,84	140,43	0,25	0,33	0,46	0,48	31,60	133,18	287,95	407,25
V1B3	10,32	18,04	31,68	44,31	13,55	50,98	114,18	152,02	0,26	0,37	0,52	0,52	33,94	140,20	319,70	440,86

V2B0	8,34	15,82	28,80	42,39	11,71	47,08	93,02	135,09	0,20	0,24	0,34	0,39	25,48	129,47	260,46	391,76
V2B1	8,84	16,57	29,02	41,62	12,92	47,38	96,67	137,31	0,23	0,34	0,44	0,45	30,50	130,30	270,68	398,20
V2B2	9,37	17,53	30,98	42,57	13,91	48,31	105,15	147,34	0,24	0,34	0,47	0,47	33,79	132,85	294,42	427,29
V2B3	10,62	19,13	31,74	45,35	12,63	48,08	120,49	162,23	0,26	0,37	0,50	0,51	35,28	132,22	337,37	470,47
V3B0	9,45	17,17	31,65	44,16	13,25	49,11	102,19	144,92	0,25	0,34	0,44	0,47	36,95	135,05	286,13	420,27
V3B1	10,74	17,43	33,03	45,60	13,78	49,39	110,05	156,46	0,28	0,39	0,46	0,50	40,66	135,82	308,14	453,73
V3B2	10,87	18,42	33,24	46,23	14,09	49,77	115,84	161,73	0,29	0,40	0,49	0,51	42,79	136,87	324,35	469,02
V3B3	10,91	20,11	34,05	46,42	13,98	51,03	121,66	165,12	0,31	0,41	0,52	0,54	48,47	140,33	340,65	478,85
HSD α=0.05	*	*	**	**	NS	*	**	**	NS	*	*	**	*	**	**	**

Notes: WAP = weeks after planting, NS = non-significant different, * = sgnificant different,
** = very significant different.

Table 10. The application testing of bokashi plus fertilizer on the averages of plant height (cm), leaf number (strands), stem diameter (cm) and leaf area (cm^2) of local peanut intercropped with local maize at 2, 4, 6, and 8 weeks after planting (WAP) in Kasaka village.

Combination	Plant height (cm)				Leaf Number (strands)				Stem Diameter (cm)				Leaf Area (cm^2)			
	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP	2 WAP	4 WAP	6 WAP	8 WAP
V1B0	8,52	16,82	30,68	43,73	12,26	45,59	89,52	128,71	0,23	0,27	0,37	0,39	35,69	147,02	250,66	373,26
V1B1	8,60	17,11	31,85	45,94	12,80	46,73	96,73	136,78	0,26	0,37	0,47	0,49	42,01	149,81	270,84	396,66
V1B2	9,58	17,84	32,93	48,16	12,94	47,85	99,85	140,89	0,27	0,37	0,49	0,50	46,52	155,49	279,58	408,58
V1B3	10,68	19,74	34,22	49,27	14,21	50,16	104,16	152,21	0,30	0,39	0,54	0,54	48,59	160,94	291,65	441,41
V2B0	8,93	16,25	31,56	45,69	12,58	48,51	98,51	138,60	0,24	0,27	0,36	0,42	38,09	152,00	275,83	401,94
V2B1	10,09	16,81	31,84	46,98	12,85	48,73	104,73	141,84	0,27	0,35	0,47	0,48	42,04	156,82	293,24	411,34
V2B2	10,78	17,88	32,89	47,98	13,94	49,85	109,85	159,88	0,28	0,38	0,48	0,50	48,59	160,12	307,58	463,65
V2B3	10,93	19,92	33,14	49,21	14,13	51,02	114,02	164,06	0,29	0,42	0,52	0,54	50,76	169,37	319,26	475,77
V3B0	9,52	15,95	31,72	46,88	12,73	48,70	101,70	152,78	0,25	0,27	0,36	0,42	39,01	155,58	284,76	443,06
V3B1	9,57	16,41	33,19	48,27	13,55	50,16	106,16	160,17	0,27	0,36	0,49	0,50	42,68	157,93	297,25	464,49
V3B2	10,13	17,16	33,82	48,98	12,82	50,72	112,72	163,93	0,28	0,38	0,49	0,51	48,31	164,72	315,62	475,40
V3B3	10,89	18,24	33,92	48,07	13,94	51,81	115,56	168,36	0,30	0,41	0,51	0,52	50,51	170,62	323,57	488,24
HSD α=0.05	*	*	*	**	NS	*	*	**	NS	*	*	*	*	**	**	**

Notes: WAP = weeks after planting, NS = non-significant different, * = sgnificant different,
** = very significant different.

The application of bokashi plus fertilizer on the averages of peanut yield performances intercropped with maize in marginal soils in Kontumere, Lamaeo and Kasaka villages was illustrated and further calculated using Honestly Significant Difference (HSD) at 95 percent confidence level in Table 11, Table 12, Table 13 and Table 14.

Table 11. The application testing of bokashi plus fertilizer on the averages of peanut yield performances intercropped with local maize in marginal soils in Kontumere village.

Combi-nation	branch number (pieces)	total pod number (pieces)	total pod filled (pieces)	100 dry weight (g)	nodule number (pieces)	seed number /plant (pieces)	total dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})
V1B0	6,22c	60,45b	51,32b	30,30c	31,18b	90,64c	29,42c	3,96b	2,14b
V1B1	6,74bc	62,76ab	52,45b	30,67bc	37,70ab	110,40abc	30,17bc	4,10ab	2,37b
V1B2	7,25abc	64,34ab	54,46ab	31,98abc	37,54ab	112,75ab	33,31abc	4,11ab	2,54ab
V1B3	7,48abc	65,37ab	55,52ab	32,53abc	40,42ab	120,32a	35,04a	4,23a	2,65ab
V2B0	6,29c	61,24b	52,34b	30,39c	39,88ab	107,13bc	31,70abc	3,96b	2,31b
V2B1	6,83abc	64,39ab	54,44ab	31,45abc	41,42ab	112,98ab	32,72abc	3,98b	2,46ab
V2B2	7,24abc	67,34ab	56,46ab	33,48abc	43,44a	121,10a	33,56abc	4,08ab	2,65ab
V2B3	8,26a	69,37a	58,50ab	35,51ab	46,43a	125,10a	35,90a	4,14ab	2,84a
V3B0	7,22abc	63,25ab	53,34b	32,40abc	40,47ab	113,18ab	33,34abc	3,95b	2,48ab
V3B1	7,74abc	66,34ab	56,47ab	34,78abc	43,53a	124,29a	34,69ab	3,97b	2,59ab
V3B2	8,25ab	68,36a	59,47ab	35,59ab	45,16a	126,54a	36,40a	4,00ab	2,87a
V3B3	8,68a	70,24a	64,52a	36,47a	46,54a	129,12a	36,47a	4,08ab	2,96a
HSD α=0.05	1,86	7,75	10,08	5,14	9,78	20,43	5,22	0,24	0,53

Notes: The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level.

Table 12. The application testing of bokashi plus fertilizer on the averages of peanut yield performances intercropped with local maize in marginal soils in Lamaeo village.

Combi-nation	branch number (pieces)	total pod number (pieces)	total pod filled (pieces)	100 dry weight (g)	nodule number (pieces)	seed number /plant (pieces)	total dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})
V1B0	6,18bc	58,42c	49,21b	29,12b	31,18b	89,05c	28,36c	3,43c	2,11c
V1B1	6,52bc	61,76bc	51,45b	30,62bc	37,70ab	97,46bc	29,42bc	4,01ab	2,25c
V1B2	7,14abc	62,32abc	53,42ab	31,90abc	37,54ab	106,75abc	31,37abc	4,06ab	2,43abc
V1B3	7,25abc	64,34abc	55,07ab	32,46abc	40,42ab	111,36abc	34,57a	4,19a	2,54abc
V2B0	6,14c	60,13c	51,54b	30,16bc	39,88ab	97,35bc	30,72abc	3,75bc	2,28bc
V2B1	6,66abc	62,83abc	53,02ab	31,41abc	41,42a	101,94abc	31,65abc	3,82abc	2,35abc
V2B2	7,18abc	65,22abc	55,66ab	33,04abc	43,44a	112,15abc	32,50abc	4,02ab	2,58abc
V2B3	8,13a	67,63ab	57,52ab	35,25a	46,43a	117,14ab	34,92a	4,07ab	2,77ab
V3B0	7,16abc	61,50bc	52,45ab	31,43abc	40,47ab	103,21abc	32,31abc	3,87ab	2,46abc
V3B1	7,54abc	65,43abc	55,75ab	34,33ab	43,53a	113,00abc	33,64ab	3,98ab	2,53abc
V3B2	7,94abc	66,65ab	58,43ab	35,26a	45,16a	124,02a	35,44a	4,03ab	2,79ab
V3B3	8,26a	69,42a	62,47a	36,21a	46,54a	125,83a	35,42a	4,06ab	2,86a
HSD α=0.05	1,65	7,27	10,46	4,93	9,74	24,58	4,85	0,42	0,51

Notes: The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level.

Table 13. The application testing of bokashi plus fertilizer on the averages of peanut yield performances intercropped with local maize in marginal soils in Kasaka village.

Combi-Nation	branch number (pieces)	total pod number (pieces)	total pod filled (pieces)	100 dry weight (g)	nodule number (pieces)	seed number /plant (pieces)	total dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})
V1B0	6,35bc	59,59c	50,38b	29,20c	32,35b	90,22b	28,44c	3,44c	2,12b
V1B1	6,66bc	62,90abc	52,59b	30,70bc	38,84ab	98,60b	29,50bc	4,03ab	2,27b
V1B2	7,27abc	63,45abc	54,55ab	31,98abc	38,67ab	107,88ab	31,45abc	4,08ab	2,45ab
V1B3	7,40abc	65,49abc	56,22ab	32,54abc	41,57ab	112,51ab	34,65a	4,22a	2,57ab
V2B0	6,32c	61,31bc	52,72b	30,24bc	41,06ab	98,53b	30,80abc	3,76bc	2,29b
V2B1	6,81abc	63,98abc	54,17ab	31,49abc	42,57ab	103,09ab	31,73abc	3,84abc	2,37b
V2B2	7,31abc	66,35abc	56,79ab	33,12abc	44,57ab	113,28ab	32,58abc	4,04ab	2,60ab
V2B3	8,28a	68,78a	58,67ab	35,33a	47,58a	118,29ab	35,00a	4,10ab	2,80a
V3B0	7,32abc	62,66bc	53,61ab	31,51abc	41,63ab	104,37ab	32,39abc	3,88ab	2,47ab
V3B1	7,68ab	66,57abc	56,89ab	34,41ab	44,67ab	114,14ab	33,72ab	4,00ab	2,55ab
V3B2	8,09a	67,80ab	59,58ab	35,34a	46,31a	125,17a	35,52a	4,05ab	2,81a
V3B3	8,39a	70,55a	63,60a	36,29a	47,67a	126,96a	35,50a	4,09ab	2,89a
HSD α=0.05	1,34	7,85	10,29	4,88	12,63	28,16	4,75	0,43	0,49

Notes: The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level.

Table 14. The yields performances of three peanut ecotypes intercropped with local maize applied by bokashi plus fertilizer in marginal soils in Kontumere, Lamaeo and Kasaka villages.

Peanut Ecotype	branch number (pieces)	total pod number (pieces)	total pod filled (pieces)	100 dry weight (g)	nodule number (pieces)	seed number /plant (pieces)	total dry weight (g)	dry biomass (t ha^{-1})	Yield (t ha^{-1})
	Kontumere								
V1	6,77a	61,71a	52,29a	31,03a	36,71a	101,16a	30,93a	3,92	2,33a
V2	7,03ab	63,95ab	54,44b	32,47b	42,79b	107,15b	32,45ab	3,92	2,50ab
V3	7,73b	65,75b	57,28c	34,31c	43,93b	116,52c	34,20b	3,99	2,66b
HSD 0,05	1,32	2,46	2,13	1,20	4,21	5,06	2,42	NS	0,21
	Lamaeo								
V1	6,92a	62,86a	53,44a	31,11	37,86a	102,30a	31,01a	3,94a	2,35a
V2	7,18ab	65,11b	55,59b	32,55	43,95b	108,30b	32,53ab	3,96a	2,52b
V3	7,87b	66,90b	58,42c	34,39	45,07b	117,66c	34,28c	4,01b	2,68b
HSD 0,05	1,24	2,46	2,18	NS	3,47	5,68	1,62	0,04	0,16
	Kasaka								
V1	6,92a	63,23a	53,44a	31,37a	36,71a	108,53a	31,99a	4,10	2,43a
V2	7,16ab	65,59b	55,44ab	32,71a	42,79b	116,58b	33,47a	4,04	2,57ab
V3	7,97b	67,05b	58,45b	34,81b	43,93b	123,28c	35,23b	4,09	2,73b
HSD 0,05	1,36	2,18	2,65	1,39	4,33	7,14	1,58	NS	0,27

Notes: 1. NS= non significant different, V1= Lamaeo ecotype, V2 = Bende ecotype, V3 = Kontumere
2. The figures in column followed by the difference letters were significant difference using Honestly Significant Difference (HSD) at 95 percent confidence level.

Table 14 showed that adaptation test of three peanut ecotypes in Kontumere village was consistent to give a positive effect on yield component. Kontumere ecotype (V3) had the highest branch number, total pod number, total pod filled, 100 dry weight, nodule number, seed number per plant, total dry weight, dry biomass and yield components, followed by Bende ecotype (V2) and Lamaeo ecotype (V1). It was revealed that the provision of bokashi plus fertilizer had very significant effect on the growth and yield of corn crops and the components of peanut ($p<0.05$). The highest peanut ecotype yield was obtained at the dose of 18 t ha^{-1} of bokashi plus fertilizer for Kontumere ecotype (V3) with the best average number of leaves (172,46 strands), number of branches (8,68 stalks), dry weight 100 seeds (36,47 g), seed number (64,52 seeds), total dry weight of plant (26,46 g) and number of nodules (46,54 g).

3.2. Discussion

The application of bokashi plus fertilizer at 6, 12 and 18 t ha-1 might improve the growth and yields of maize intercropping with peanut in marginal soils of Kontumere, Lamaeo and Kasaka field tests. This could be seen in Table 1, Table 2, Table 3, Table 7, Table 8 and table 9 where plant height, stem diameter, number of leaf and leaf area of maize and peanut were all increased of doses bokashi plus fertilizer at 2, 4, 6 and 8 WAP. Compared to the treatment without bokashi plus fertilizer, in all three field tests, the growth and yield of maize intercropped with peanut were lower. Both maize and peanut planted in intercropping system had a positive adaptation response to the local condition that indicated of a better growth dynamic of maize and peanut treated by bokashi plus fertiliser. Table 1, Table 2, Table 3, Table 7, Table 8 and Table 9 also showed a significant effect of bokashi plus fertiliser application on the growth of plant height, leaf number, stem diameter and leaf area of maize and peanut in Kontumere, Lamaeo and Kasaka villages. This was affected by the presence of sufficient nutrient content in the soil so that the plants were able to be absorbed. The application of various doses bokashi plus fertilizer significantly affected to the increase of soil nutrient. The results of research also showed a higher trend of the growth components compared to research finding reported by Karimuna, *et al*., 2018. In addition, yields components for both maize and peanut were higher compared with the previous findings. This was caused by the sufficient space, light, nutrient and water availability as reported by Zakaria (2016). Moreover, research finding also indicated that higher level of bokashi fertilizer provided sufficient nutrients and reached nutrient balance that promotes photosynthesis running in proper way, and sustained the allocation and distribution of nutrient to all parts of maize and peanut tissues. Then, the effects of mulch and bokashi fertilizer on plant growth of maize and peanut, and on yield of maize and peanut varied. This finding was similar to the results reported by Setyamidjaja (1986), Hardjowigeno, 2003; Histiani (2005), Karimuna (2006) and Karimuna, *et al*., (2009). Selection of a crop cultivated in a certain area determines the sustainability of high production either planted monocropping or intercropping. Maize and peanut are two crops of suitable option which can be more advantageous to cultivate in intercropping system, since peanut is a legume crop that may contribute nutrient through Nitrogen fixation to the soil. The arrangement of crop space for maize and peanut properly in intercropping system might increase soil efficiency (Turmudi, 2002).

Bokashi plus fertilizer was derived from the fermentation process of secondary vegetation biomass with the addition of EM4 where microbial decomposers of Lactobacillus, Actinomycetes, fermentation fungy, photosynthetic bacteria, yeast and phosphate solvent bacteria could make nutrients added to the soil more available and easily absorbed by maize and peanut. The present of beneficial microbes in bokashi plus fertilizer might help maize and peanut plants to improve their root growth. Then sufficient root surface area was enable the plants to uptake more nutrients from the soil (Baligar *et al*., 2001). It has been reported

that bokashi plus fertilizer had an important role, which was to make the role of fertilizers more effective, especially fertilizers containing macro nutrients. This was relevant to the finding reported by Jeschke, et al., (2014).

Based on the results of research showed that the higher the dose of bokashi plus fertilizer given, the higher the average plant height, leaf number, stem diameter and leaf areas performances of local maize and local peanut obtained in all cases of data collected during 2, 4, 6 and 8 weeks after planting (WAP). There was no significant different among location, indicating high adaptability of maize intercropping with peanut in marginal soils. Similar trend was shown in Table 4, Table 5, Table 6 and Table 7 that maize had a good potential to be cultivated in intercropping system through the application of bokashi plus fertiliser. It was revealed that the growth and yields of maize crops was sufficient and not influenced by the presence of peanut in its surroundings since the soil media provide enough quantity of nutrient, water and other elements as explained by Karimuna, *et al.*, 2017, and others. This finding was relevant to findings reported by Pasaribu, *et al.*, (2014), Andila, *et al.*, (2016), Rahayu, *et al.*, (2006) and Ekowati and Nasir, 2011). Furthermore, Karimuna, *et al.* (2009) suggested that bokashi fertilizer could improve the physical, chemical and biological properties of the soil, improve yields and maintain the stability of crop production, and was able to produce quality and quantity of agricultural products in a sustainable manner.

It was also revealed that based on Table 8, Tabel 9, Table 10, Table 11, Table 12, Table 13 and table 14 showed a clear trend of high adaptation of three types of local peanut cultivated in three villages through the bokashi plus application of appropriate technology for the sake of increased efficiency and effectiveness of the utilization of marginal lands. There was a rapid increase of vegetative components during the early development growth of local peanut planted in intercropping system. The shortage of nutrient content into the soil could be overcome by the application of bokashi plus fertilizer. Therefore, some local ecotype of peanut had the level of adaptation to local conditions. This was caused by the dry climatic conditions with marginal lands which include a shortage of nutrient elements, sensitive to erosion and very little organic material content (Karimuna *et al.*, 2009; Kasno *et al*., 2006; Nursyamsi, 2004; Karimuna, 2000). However, it was through the management and cultivation of good ways, dry land had the potential of very marginal potential for regional development of peanuts and other crops (Fachruddin, 2000; Sopandie, 2006; Karimuna *et al.*, 2001), where the application of appropriate technology by using bokashi plus might increase the potential of soil fertility on marginal soils. This was suspected because of the introduction of bokashi fertilizer in such doses was able to contribute nutrients that fit the needs of plants, and could create a physical condition and chemical soil that was better for plant growth and yield. Rinsema (1986) and Karimuna (2009) stated that the number of nutrients available to plants was sufficient, the growth and development of plants went well. Physiological activity of the plant would take place well depending on the availability of nutrients in the media and plant tissues, so as to determine the proportion of the distribution of the results of assimilation on the roots organs, stems and leaves (Setyamidjaja, 1986). The existence of bokashi fertilizer derived from secondary vegetation with the help of microorganisms in the soil as a parser of organic matter, able to provide nutrients needed by maize and peanut crops in field test plants. Tejaswarna (1990) stated that to obtain a normal plant and high production was required macro and micro nutrients. The results of the test content bokashi kerinyu showed the high composition of macro (N, P, and K) and sufficient amount of micro nutrients contained in the fertilizer (Karimuna, 2009). It was recomended that the application of 18 t ha^{-1} of bokashi plus fertilizer might increase the adaptation of intercropped maize and three peanut ecotypes growth and yield in marginal soils. It was clearly defined that the participation of local government official from the Food Security Board, Muna Regency was an indication of good interest in the application of organic fertilizer to be used not only the increasing of main staple foods production but also the stability of other crops growth and yield.

Based on the results and discussion above, it could be concluded that the adaptation test of maize intercropping with peanut through the application of bokashi plus fertiliser had a significant different ($p<0,05$) to the stability of maize and peanut growth and yields in marginal soils in the study region. The participation of the farmers on the adaptation field test of three villages strengthened the potential adoption of this system to improve community welfare and to achieve the stability of global environmental fluctuation of Indonesian region. I would like to express my sincere thanks to the Government of Indonesia, via Ministry of Research, Technology and Higher Education for the financial support to carry out this research in 2018 and 2019, I did like to say that this activity was highly benefited to the improvement of community welfare of the study region. One of the main program especially in agriculture sector as stated in the midterm planning of Muna regency 2015-2020 was the development of sustainable agriculture productivity through the use of organic farming. We do appreciate that this activity was supported under mutual collaboration between University of Halu Oleo, Kendari, Higher Education of Wuna Agriculture, Raha and Food Security Board, Muna Regency.

4. CONCLUSION AND RECOMMENDATION

Based on the results and discussion of research, it could be concluded that as follows

1. The higher the level of bokashi plus fertilizer applied, the higher the growth and the yield components of maize intercropping with peanut produced and the interaction between local peanut ecotype and the doses of bokashi plus fertiliser was highly significant.
2. Adaptation testing of intercropping maize and peanut through the application of bokashi plus fertilizer in marginal soils was significant different and better effects on the growth and yields components.
3. The application of bokashi plus fertilizer treatment gave the best response on the growth and yields of intercropping local maize and local peanut planted in marginal soils.
4. The best yields of local maize and local peanut treated by various bokashi plus fertilizer might achieve to 8,93 and 2.96 t ha^{-1}, respectively with the best of bokashi plus fertilizer amounted to 18 t ha^{-1} with the best LER = 1,36.
5. Therefore it was recommended that in order to achieve the best growth and yields components of intercropping maize and peanut in marginal soils, the best treatment doses was 18 t ha^{-1}.

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