The Increasing of Sweetpotato Production through Application of Organic Fertilizer

By Eko Martanto

WORD COUNT 6375
TIME SUBMITTED 29-APR-2020 09:56AM
PAPER ID 58081834

International Journal of Applied Agricultural Research
ISSN 0973-2683 Volume 11, Number 2 (2016) pp. 143-157

http://www.ripublication.com

The Increasing of Sweetpotato Production through Application of Organic Fertilizer

Eko Agus Martanto*, Adelin Tanati*,
Samen Baan and Irnanda AF Djuuna****

** Laboratory of Plant Disease, Faculty of Agriculture Unipa*
*** Soil Laboratory, Faculty of Agriculture Unipa.*
E-mail : e_a_martanto@yahoo.com

Department of pest and Disease, Faculty of Agriculture UNIPA Manokwari,
Jalan Gunung Salju, Amban , Manokwari 98314
E-mail: e_a_martanto@yahoo.com

Abstract

The objective of this study was to determine the best doses of organic fertilizers for sweet potato yield increase. Specific targets to be achieved is to improve the productivity of sweet potato in West Papua over 20 tonnes/ha compared to the current productivity of 10.13 tonnes/ha. The study was conducted over eight months starting in January 2015.

The experiment was set up as a randomized block design factorial, consisted of 2 treatment with three replications. The first treatment consists of seven formulations of organic fertilizer, namely: husk ash (F1), compost (F2), manure (F3), compost+husk ash (F4), manure+husk ash (F5), compost+manure (F6), and husk ash+compost+manure (F7). While the second treatment in the form of organic fertilizer dose optimization consists of four dose levels, namely: 0 kg per hectare (D0), 2000 kg per hectare (D1), 4000 kg per hectare (D2), and 6000 kg per hectare (D3).

The experiments were performed in the field with experimental unit in the form of plot with a size of 2 x 3 meters. In one plot made two mounds. The parameters observed was scab disease intensity, a long tendril, number of branches, number of tubers and tuber weight . Some soil chemical characteristics were also analyzed before and after planting.

The data analysis was performed using varian analysis and continued with Duncan Multiple Test at the level of 95%.

The result showed th formulations and doses of fertilizers applied cause different responses in long tendrils parameters and the number of branches of sweet potato cultivars. Long tendrils and the number of branches increased to a third observation , then on the fourth observation there is decreased and there were increases. The best formulation of fertilizer to do a production is husk ash with the production of 9.8 kg/plot (equivalent to 16.33 tonnes/ ha). The best dose of fertilizer for generating dose of fertilizer production is 6 tonnes/ha with a production of 9.71 kg/plot (equivalent to 16.18 tonnes/ha). The best combination treatment of fertilizer to do a production is husk ash by dose of 4 tons/ha and husk ash + compost at a dose of 6 tonnes/ha production of 11.0 kg/plot (equivalent to 18.33 tonnes/ha).

Keyword: Sweet potato, scab disease, production, organic fertilizers

INTRODUCTION

Papua is one of the sweet potato production centers in addition to West Java, Central Java, East Java and North Sumatra (Sibuea, 2013). Papua has the potential of local food supply is very large, especially potatoes as a staple food. Approximately 60% of the population plant sweet potatoes and use as a staple food, especially those living in the Highlands Arfak in Manokwari, as well as around the lake Wisel in Paniai and Baliem in Jayawijaya (Samori *et al*., 1998) as well as in various regions in Papua (Rumawas, 2003 *in* Djufry *et al*., 2011).

Papua's population of approximately 2.2 million with a population growth of 3.14% per year. The population that continues cause the need for food increases. Sweetpotato is expected to be one of the substitution of non-rice food on growth and development of population is increasing (Ayomi and Mampioper, 2008).

Sweet potato as food fourth after rice, maize, and cassava. In every 100 grams of sweet potato contains high enough calories and nutritious and a complete composition such as protein, fat, calcium, carbohydrates, phosphorus, iron, vitamins, and water (Directorate of Nutrition and Health, 2005 *in* Logo, 2011). Sweet potatoes have high calories so it suitable for fodder. Sweet potato is usually used for small, sweet potato that contain lots of fiber and which is not sold in the market (Wargiono, 1980). Sweet potato flour is widely used for industrial purposes, such as the food industry, textile industry, glue, cosmetics and others. In Japan, almost 50% of the total production is used for industrial starch which is further used in various industries (Soenarjo, 1984 *in* Widodo,1989)

Productivity sweet potato planted by farmers in West Papua is still very low, is 10.30 tons/ha, while national productivity potential can reach 20-40 tons/ha (BPS, 2014). Low productivity is caused by the application of minimal cultivation techniques and soil fertility is low.

Organic fertilizer is fertilizer with basic ingredients taken from nature with the amount and type of nutrients that occurs naturally (Musnamar, 2003). The role of organic fertilizer according to Lingga and Marsono (2007) was improve soil structure, increase soil absorption of water, improve the living conditions in the soil and as a source of nutrients for plants. Which included organic fertilizers was manure, compost, green manure, ash agricultural waste, industrial waste and other (Marsono and Sigit, 2002). Most common characteristics of organic fertilizer is a low nutrient content and highly variable, the supply of nutrients occurs slowly, and providing nutrients in a limited number (Sutanto, 2002). Sosrosoedirjo and Rifai (1974) suggested that distinguishes the type of organic fertilizer to one another is in the ratio of C/N. Comparison of C/N indicates the lower organic fertilizer, the better because it has undergone decomposition.

Development of sweet potato become one of the important commodity that needs attention to strengthen national food security. Therefore, the development of sweet potato crop is directed to the expansion of planting area, and improved cultivation techniques such as the use of organic fertilizers available in the area.

This study was aims to increase the production of sweet potato in West Papua through the use of organic fertilizers. The specific objective of this research is to improve the way the cultivation of local farmers to use organic fertilizers such as agricultural waste ash, compost and manure, and get the best formula of organic fertilizers for sweet potato yield improvement.

The results of this study are expected to be applied to overcome the low productivity of sweet potato in West Papua and improve soil fertility. The successful development of sweetpotato in West Papua can strengthen the achievement of non-rice food diversification nationally, which in turn can increase the income of farmers in this area .

MATERIAL AND METHODS

This research was done at the experiment field of Faculty of Agriculture Unipa and Resettlement Unit (SP) II Prafi Manokwari District, which was conducted from January -August, 2015.

a. Soil analysis

Soil sample was collected compositely from all plots of the experiment site. After air-drying and sieving to remove coarse orgaanic matter, the soil sample were mixed thoroughly prior to analysis. All soil sample were analyzed before planting and at one week prior to harvest of sweet potato for some chemical properties (i.e. total nitrogen, phosphorus-available, potassium-available, carbon organic and C/N ratio).

b. Propagation sweet potato cuttings

Propagation sweet potato cuttings carried out in two different places, one place at experiment garden Faculty of Agriculture Unipa and SP II Prafi. Abomourow sweet potato cultivars planted on land plots measuring 4 x 4 m^2, each plot planted 40 shoot cuttings. Cultivars of sweet potato cuttings obtained from the first garden. Planting cuttings is done at the beginning of January 2015. This multiplication takes 3 months, is expected the 1400 shoot cuttings obtained for the purpose of planting in the field.

c. Preparation of fertilizer and organic fertilizer treatment

Husk ash, compost and manure prepared, put in plastic and weighed according to treatment per mounds. Fertilizer prepared then sown with bolt system. The way these applications can suppress the loss of fertilizer as evapotranspiration or erosion.

d. Sweet potato planting

Sweet potato planting was done 3 days after fertilization. Each plot there are two mounds and every mounds planted 8 sweet potato shoot cuttings. Sweet potato shoot cuttings with about 25 cm long are planted at a depth of about 10 cm at an angle, so many books sweet potato stems are buried in the soil where the discharge of roots and tubers.

e. Yield trials Abomourow sweet potato cultivars and fertilizer application

The experiment was conducted using a randomized block design factorial with three replications. The first factor in the form of seven formulations of organic fertilizer made up namely husk ash (F1), compost (F2), manure (F3), compost + husk ash (F4), manure+husk ash (F5), compost+manure (F6), and husk ash+compost+manure (F7). While the second factor in the form of dose optimization organic fertilizers consists of four dose levels, namely : 0 kg per hectare (D0) , 2000 kg per hectare (D1), 4000 kg per hectare (D2), and 6000 kg per hectare (D3), so 28 combined treatment obtained .

Experiments conducted during 8 months, and each experimental unit in the form of plot with a size of 2 x 3 meters. The parameters observed was scab disease intensity, a long tendril, number of branches, number of tubers and tuber weight.

The amount of information infection, obtained by calculating the intensity of the disease. Observations carried disease intensity after 4 weeks, repeated 4 times at intervals of 4 weeks of observation. Disease intensity was calculated with the following equation :

$$IP = \frac{\sum_{i=0}^{n} (n \times v)}{V \times N} \times 100\%$$

IP = Intensity Disease, ni = number of tubers of each category infection, vi = value scale of each category infection, N = Number of tubers was observed, and V = Value of the highest scale .

Category attack that is used by Zuraida *et al*., (1992) as follows :

Category 0 = healthy tendrils, no infections
1 = spots on leaves, leaf stems and tendrils > 0-20%
2 = spots on leaves, leaf stems and tendrils > 20-40%
3 = spots on leaves, leaf stems and tendrils > 40-60%
4 = Spots on leaves, leaf stems and tendrils > 60-80%
5 = spots on leaves, leaf stems and tendrils > 80%

DATA ANALYSIS

The data were analyzed using Analysis of Variance, when the real effect of treatment then continued with DMRT (Duncan Multiple Range Test) on the level of 95%.

RESULTS AND DISCUSSION

Results

1. Soil Charecteristics

Table 1 shows the soil characteristic both before and after fertilizers treatment.

Table 1. The results of the soil analysis before fertilization treatment

No	Code	C-Organic (%)		N-Total (ppm)		P-available (ppm)		K- available (me/100 g)		C/N	
		BT	AT	BT	AT	BT	AT	BT	AT	BT	AT
1	F1D0	1.99	1.59	133.77	174.29	6.69	34.75	0.48	0.58	148.76	91.23
2	F1D1	1.83	1.82	134.70	188.45	57.,87	36.17	0.40	0.45	135.86	96.58
3	F1D3	1.75	1.59	200,48	211.75	64.27	28.53	0.48	0.68	87.29	75.09
4	F1D3	1.75	1.74	170.29	193.59	55.98	44.48	0.40	0.47	102.77	89.88
5	F2D0	1.83	1.58	130.06	223.05	57.74	46.66	0.39	0.42	140.70	70.83
6	F2D1	1.82	1.66	128.00	234.49	61.13	45.58	0.45	0.91	142.19	70.79
7	F2D2	1.82	1.83	184.79	205.70	64.43	49.05	0.47	0.58	98.49	88.96
8	F2D3	1.99	1.82	156.89	187.39	54.50	62.42	0.42	0.65	126.84	97.12
9	F3D0	1.66	1.50	234.19	281.54	57.22	35.55	0.57	0.55	70.88	53.28
10	F3D1	1.50	1.51	194.82	169.68	50.14	40.96	0.43	0.63	76.99	88.99
11	F3D2	1.74	1.50	164.12	214.08	54.95	38.83	0.50	0.73	106.02	70.07
12	F3D3	1.58	1.50	142.26	189.38	32.46	47.74	0.43	0.47	111.06	79.20
13	F4D0	1.58	1.59	184.67	153.60	60.96	50.65	0.47	0.55	85.56	103.52
14	F4D1	1.50	1.58	115.48	241.21	50.67	59.56	0.44	0.68	129.89	65.50

15	F4D2	1.90	1.59	190.44	223.76	60.38	5742	0.38	1.04	99.77	71.06
16	F4D3	1.66	1.50	103.55	176.80	60.29	55.79	0.60	0.65	160.31	84.84
17	F5D0	1.83	183	156.72	258.29	57.38	42.12	0.42	0.52	116.77	70.85
18	F5D1	1.66	1.74	220.23	221.81	50.78	70.53	0.46	0.73	75.38	78.44
19	F5D2	1.66	1.83	160.11	208.94	61.80	43.31	0.45	0.63	103.68	87.58
20	F5D3	1.58	1.67	113.41	176.83	56.11	52.76	0.45	0.65	139.32	94.44
21	F6D0	1.59	1.74	167.20	157.28	49.51	55.13	0.45	0.45	95.10	110.63
22	F6D1	1.43	1.58	155.44	176.49	66.60	45.01	0.46	0.55	92.00	89.53
23	F6D2	1.82	1.74	174.63	204.15	53.54	62.66	0.57	0.60	104.22	85.23
24	F6D3	1.66	1.50	109.12	172.50	61.95	57.97	0.46	0.73	152.13	86.96
25	F7D0	1.50	1.75	213.43	217.50	52.14	58.97	0.44	0.71	70.28	80.46
26	F7D1	1.58	1.66	164.21	256.29	58.36	38.31	0.46	0.73	96.22	64.77
27	F7D2	1.59	1.83	138.25	267.55	38.05	52.99	0.46	0.65	115.01	68.39
28	F7D3	1.74	1.83	194.06	274.59	43.35	63.34	0.45	0.58	89.66	66.64

Note :

F1 = husk ash, F2 = compost, F3 = manure, F4 = compost+husk ash,
F5 = manure+husk ash, F6 = compost+manure, dan
F7 = husk ash+compost+manure.
D0 = 0 kg per hectare, D1 = 2000 kg per hectare,
D2 = 4000 kg per hectare, dan D3 = 6000 kg per hectare
BT = Before treatment,
AT = After treatment

Based on the soil analysis data on Table 1, it can explained that the soil C-organic value range from 1.43 to 1.99% (before treatment) and 1.50 to 1.83% (after treatment). These indicated that soil C-organic in all plots were considered low and some of the plots the C-organic were decreased. These might be caused by the different type and doses of organic fertilizer application. In contrast, the value of N-total (>1%) and C/N ratio (>25) were very high for all treatment plots. In addition, the value of P-available and K-available were also high for almost all the plots at before and after fertilizer treatments.

2. The Effect of fertilizer formulations

a. The long tendril

The analysis shows that the length of the tendril cultivars Abomourow significantly different at the first to the last observation (4th). At first observation, the longest tendrils encountered in formulation F7 (husk ash +manure+compost) 36.56 cm, while tendrils of the shortest on the formulation F6 (compost and manure) 29.01 cm. In the second and third observation of the addition and reduction in long tendrils on cultivar attempted. In last observation (4th), the longest tendrils on the formulation F7 (husk ash+compost+manure) 168.42 cm no different to formulations F6 (compost+manure) 157.34 cm and F4 (husk ash+compost) 156.5 cm, was long tendrils of the shortest on the formula F3 (manure) 143.45 cm (Table 2).

Table 2. The Effect of fertilizer formulations to long tendril

Treatment	Long tendrils of observation to .... (cm)			
	I	**II**	**III**	**IV**
F1 (husk ash)	33.65 abc	98.35 ab	157.46 ab	149.49 b
F2 compost)	37.26 a	98.96 ab	136.93 c	149.29 b
F3 (manure)	31.69 bc	105.90 a	140.71 bc	143.45 b
F4 (husk ash + compost)	38.79 a	99.63 ab	170.48 a	156.5 ab
F5 (husk ash + manure)	33.97 abc	95.56 ab	161.82 a	150.71 b
F6 (compost + manure)	29.01 c	91.73 b	153.76 abc	157.34 ab
F7 (husk ash + compost + manure)	36.5 6 ab	89.35 b	154.13 abc	168.42 a

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

b. Number of branches

The analysis shows that the number of branches Abomourow cultivars significantly different at the first to the last observation (4th). At first observation, the number of branches the most encountered in formulation F1 (husk ash) of 1.78, while the least number of branches in the formulation F6 (compost + manure) 0.68 . In the second and third observation of the addition and reduction in the number of branches on the tested cultivars. In the last observation (4th), the largest number of branches in the formulation F7 (husk ash+compost+manure) of 6.71 which is not different to the formulations F6 (compost+manure) amounted to 6.69, while the number of branches at least at F4 formula (husk ash+compost) of 4.91 (Table 3) .

Table 3. The Effect of fertilizer formulations to Number of branches

Treatment	Number of branches on observation to .... **ke ....**			
	I	**II**	**III**	**IV**
F1 (husk ash)	1.78 a	4.61 ab	5.79 b	5.59 bc
F2 compost)	1.48 ab	4.95 a	4.68 c	5.32 bc
F3 (manure)	1.17 bc	4.93 a	4.83 c	5.86 b
F4 (husk ash + compost)	1.,26 b	4.08 bc	6.60 a	4.91 c
F5 (husk ash + manure)	1.21 b	3.69 c	5.86 b	5.68 b
F6 (compost + manure)	0.68 c	3.59 c	5.03 c	6.69 a
F7 (husk ash + compost + manure)	1.05 bc	3.65 c	4.61 c	6.71 a

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

c. Scab disease intensity

Based on the formulation of fertilizer applied, the symptoms of scab on cultivar Abomourow not found on the first observation until the last observation.

d. The number of tubers per plant, tuber weight per plant and weight of tuber per plot

The analysis shows that there are significant differences in the number of tubers per plant, tuber weight per plant and weight of tuber per plot of cultivars were tested. The number of tubers per plant that is most found in the formulation F7 (husk ash+compost+Manure) (1.59) and that produce tubers at least in the formulation F6 (compost+manure) (1.1). Based on the weight of tuber per plant, the weight of the heaviest tubers in the formulation F1 (husk ash) (612.48 g/plant), and the lowest in the formulation F6 (compost+ manure) (431.25 g/plant). Weight of tuber per plot greatest in the formulation F1 (husk ash) (9.8 kg/plot), and lowest in the formulation F6 (6.95 kg/plot) (Table 4).

Table 4. The Effect of fertilizer formulations to the number of tubers per plant, tuber weight per plant and weight of tuber per plot

Treatment	Number of tubers per plant	Tuber weight per plant (g)	Weight of tuber per plot (kg)
F1 (husk ash)	1.57 a	612.48 a	9.8 a
F2 compost)	1.46 a	547.39 ab	8.76 ab
F3 (manure)	1.37 ab	513.54 ab	8.18 ab
F4 (husk ash + compost)	1.47 a	502.60 ab	8.00 ab
F5 (husk ash + manure)	1.36 ab	560.42 ab	8.86 ab
F6 (compost + manure)	1.11 b	431.25 b	6.95 b
F7 (husk ash + compost + manure)	1.59 a	530.21 ab	8.66 ab

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

3. The Effect of Dose of fertilizer to the observed variables

a. The long tendril

The analysis shows that there is no real difference in the long tendrils of fertilizers is attempted on the first observation to observation fourth . In the last observations seem that long tendrils D3 (152 cm) shorter than the D0 (152.80 cm), D1 (154.64cm) and D2 (154.97 cm) (Table 5).

Table 5. Effect of fertilizers on the long tendrils

Treatment	Long tendril of observation to .... (cm)			
	I	II	III	IV
D0 (control)	34.58	94.96 b	157.53	152.80
D1 (2000 kg/ha)	32.86	94.86 b	150.01	154.64
D2 (4000 kg/ha)	35.97	105.34 a	159.72	154.97
D3 (6000 kg/ha)	34.26	93.12 b	147.18	152.00

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

b. Number of branches

The analysis shows that the number of branches significantly different cultivars observed in the first and third observation, while the second and fourth observation is no different. In the last observasion seen that the number of branches cultivars tested range of 5.65 - 5.88 (Table 6).

Tabel 6. Influence of fertilizers on the number of branches

Treatment	Number of branches of observation to			
	I	II	III	IV
D0 (kontrol)	0.76 b	4.16	5.62 a	5.85
D1 (2000 kg/ha)	0.93 b	4.24	5.34 ab	5.65
D2 (4000 kg/ha)	1.70 a	4.34	5.41 ab	5.88
D3 (6000 kg/ha)	1.54 a	4.13	5.00 b	5.92

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

c. Disease intensity

Based on the dose of fertilizer applied, the symptoms of scab on cultivar Abomourow was not found on the first observation until the last observation.

d. The number of tubers per plant, tuber weight per plant and weight of tuber per plot

The analysis shows that there are significant differences in weight and tubers per plant and tuber weight per plot, but did not differ in the number of tubers per plant cultivars tested. The number of tubers per plant at D0 dose was lower (1.29) than D1 (1.41), D2 (1.47) and D3 (1,49). This phenomenon is similar to the parameter weight of tuber per plant and weight of tuber per plot where D0 is smaller than D1, D2, and D3 (Table 7).

Table 7. The Effect of dose fertilizer to the number of tubers per plant, tuber weight per plant and weight of tuber per plot

Treatment	Number of tubers per plant	Tuber weight per plant (g)	Weight of tuber per plot (kg)
D0 (kontrol)	1.29	447.92 c	735 b
D1 (2000 kg/ha)	1.41	506.85 bc	8.12 b
D2 (4000 kg/ha)	1.47	545.83 ab	8.64 ab
D3 (6000 kg/ha)	1.49	612.5 a	9.71 a

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

4. Effect of combination formulations and dose fertilizer to the observed variables

a. The number of tubers per plant, tuber weight per plant and weight of tuber per plot

Based on the results of the analysis show that there are different combinations of formulations and dose fertilizer of the number of tubers per plant, tuber weight per plant and weight of tuber per plot. The number of tubers per plant that is most often found in combination F1D2 and F7D2 (1.81) and the least combination F6D1 (0.79). Weight of tubers per plant were most common in the combination F1D2 (687.41 grams) and fewest combination F3D0 (320.83 g). Broadly speaking F1D2 combination has a large tuber weight, so the weight of tuber per plot on a combination of these treatments are also large (Table 8).

Tabel 8. Effect of combination formulations and dose fertilizer to the number of tubers per plant, tuber weight per plant and weight of tuber per plot

Treatment	Number of tubers per plant	Tuber weight per plant (gr)	Weight of tuber per plot (kg)
F1D0	1.21 abcd	491.67 abc	7.87 abc
F1D1	1.77 ab	618.77 abc	9.9 abc
F1D2	1.81 a	687.41 a	11 a
F1D3	1.48 abc	652.08 ab	10.43 ab
F2D0	1.31 abcd	531.25 abc	8.5 abc
F2D1	1.34 abcd	497.92 abc	7.97 abc
F2D2	1.49 abc	566.67 abc	9.07 abc

F2D3	1.69 abc	593.75 abc	9.5 abc
F3D0	1.11 bcd	320.83 c	5.13 c
F3D1	1.5 abc	610.42 abc	9.77 abc
F3D2	1.52 abc	600 abc	9.45 abc
F3D3	1.33 abcd	522.92 abc	8.37 abc
F4D0	1.44 abcd	458.33 abc	7.33 abc
F4D1	1.73 abc	422.92 abc	6.77 abc
F4D2	1.27 abcd	477.08 abc	7.63 abc
F4D3	1.43 abcd	652.08 ab	10.27 abc
F5D0	1.35 abcd	472.92 abc	7.57 abc
F5D1	1.25 abc	527.08 abc	8.43 abc
F5D2	1.34 abcd	560.42 abc	8.43 abc
F5D3	1.54 abc	681.25 a	11 a
F6D0	1.34 abcd	410.42 abc	7.3 abc
F6D1	0.79 d	339.58 bc	5.43 bc
F6D2	1.06 cd	431.25 abc	6.9 abc
F6D3	1.23 abcd	543.75 abc	8.12 abc
F7D0	1.4 abcd	450 abc	7.73 abc
F7D1	1.42 abcd	531.25 abc	8.63 abc
F7D2	1.81 a	497.92 abc	7.97 abc
F7D3	1.71 abc	641.67 ab	10.3 ab

Numbers followed by the same letter in the same column are not significantly different by Duncan's Multiple Range Test at the level of 5%

Note :

F1 = husk ash, F2 = compost, F3 = manure, F4 = compost + husk ash,
F5 = manure + husk ash, F6 = compost + manure, dan
F7 = husk ash + compost + manure.
D0 = 0 kg per hectare, D1 = 2000 kg per hectare,
D2 = 4000 kg per hectare, dan D3 = 6000 kg per hectare

DISCUSSION

Based on the map RePPProT 1986 in Manokwari Prafi region, there are three major groups (Great Group) land that is tropofluven, distropept and tropopsamment. Location of the study including the Great Group Tropofluvent. The soil type is usually derived from the parent material deposition. Sandy loam soil texture, deep solum and flat topography, it can be said almost no permanent limiting factor. The only limiting factor is the dynamic nature of soil fertility.

The results of the soil analysis of 28 experimental plots before treatment showed that almost all of the nutrient content in the soil is relatively uniform, relatively low organic C between 1.43 - 1.99%, N-provided low of 103.55 - 234.19 ppm, P-provided moderate to high between 32.46 - 66.60 ppm and K-available medium to high between 0.38 to 0.60 me/100 g, while the C/N is very high. From the results of this analysis can be concluded that soil fertility is low and research sites still require additional nutrients, especially of macro nutrients C, N and K. Because usefull land intensively, then it appears that the residue remaining P nutrients in the soil, considering that the nutrients in the soil P less mobile so that the residue P is still lagging behind in the soil as a result of fertilization. The results of the soil analysis a week before harvest showed the same status as before the treatment occurs. This is because the applied fertilizer used by plants for growth and sweet potato tuber formation. In general the application of organic fertilizer will increase some of the soil chemical properties content and will also effect possitively to the physical properties of soil. Moreover, most of organic fertilizer residue are still remain in the soil longer than anorganic fertilizers, this can be useful for next growing season of the other plants.

Sweet potato studied planted in loose soil and created ridges as well as using shoot cuttings so that the vegetative growth and tuber formation maximum. Hendroatmojo (1990) states that the use of shoot cuttings between the 25-30 cm will accelerate the development of cutting the tubers rather than the middle or base. Wargiono (1990) states that the sweet potato is not planted on ridges cause the tuber yield little because the stems spread in every direction and every root on books related to soil forming small tubers .

Long tendrils and the number of branches is an important variable in observing plant growth as it relates to the number of leaves formed . The results of this trial showed a trend long tendrils and the number of branches increased to a third observation, then on the fourth observation decreased. This is in according with the opinion of Edmond and Ammerman (1971 *in* Legiawati, 1995) which states that in first phase plant sweet potato growing canopy and trunk fast, the next phase of vegetative accompanied tuber formation in second phase, and third phase is the development phase tubers. In the phase of enlargement of the tubers, stem and leaf growth is reduced as well as the plant's leaves begin to turn yellow and fall off (Sarwono, 2005). It is further the opinion Hanh and Hozyo (1996) which says that there is an inverse relationship between the growth of leaves and tubers. The larger the bulb, the production of branches and leaves gradually decreased and stopped.

Based on the long tendrils parameters and the number of branches, the formulations of rice husk ash +compost+Manure provides the greatest impact, but fro the production parameters so award husk ash provides the greatest impact either on the number of tubers per plant, tuber weight per plant and weight of tuber per plot. Organic fertilizer into the soil can improve the physical, chemical and biological soil (Adiningsih, 1996). Manure is very useful as a "soil condisioner" with high organic

matter content, due to the nature of the equilibrium, the organic matter in manure will be degraded slowly and retained effectively for a longer time than the organic material that has not been composted (Suharno, 2014).

According Supriyanto (2001 *in* Suharno *et al*., 2010) can compost for land reclamation due to the use of inorganic fertilizers as it will increase the population of soil microorganisms serve to provide the nutrients that is readily absorbed by the roots. But husk ash excess is a high potassium content. According to Gardner *et al*. (1991 *in* Irianto, 2009) that the plants enough potassium little loss of water, because potassium can increase the osmotic potential and have a positive effect on the opening and closing of stomata. In photosynthesis potassium directly improve growth and leaf area index thus increasing CO2 assimilation and increase the translocation of photosynthesis into the phloem.

D3 doses of fertilizers (6 tonnes/ha) gives the most influence on all the parameters of observation, both long tendrils, number of branches, the number of tubers per plant, tuber weight per plant and tuber weight per plot, compared to the other dose of fertilizer (D0-D2). The higher the dose of fertilizing more availability of nutrients that are used for plant growth.

Weight of tubers per plant represents the weight of tuber per plot. Tuber weight Abomourow cultivars with fertilizer formulations husk ash 9.8 kg/plot (equivalent to 16.33 tonnes/ha) was higher than compost fertilizer formulations of 8.76 kg/plot (equivalent to 14.6 tonnes/ha), formulation fertilizing manure 8.18 kg/plot (equivalent to 13.63 tonnes/ha), even formulation fertilizing husk ash+manure+compost 8.66 kg/plot (equivalent to 14.43 tonnes/ha).

Tuber weight Abomourow cultivars with fertilizer dosage of 6 tons/ha 9.71 kg/plot (equivalent to 16.18 tonnes/ ha) was higher than the dose of fertilizer 4 ton/ha 8.64 kg/plot (equivalent to 14.4 tonnes/ha), dose of fertilizer 2 tonnes/ha 8,12 kg/plot (equivalent to 13.53 tonnes/ha), and a control dose of 7.35 kg/plot (equivalent to 12.25 tonnes/ha).

In the combined treatment of weight of tuber per plot were the highest seen in combination F1D2 (husk ash a dose of 4 tons/ ha) and F5D3 (husk ash+compost at a dose of 6 tonnes/ha) with tuber weight of 11.0 kg/plot (equivalent to 18.33 ton/ ha). Based on the results generated tuber production either independently (formulation of 16.33 tonnes/ha and a dose of 16.18 tonnes/ha) and interaction (18.33 tonnes/ha), the tuber production is already approaching the national production standard (20-40 tons/ha).

CONCLUSION

1. Formulation and dosage of fertilizer given cause different responses in long tendrils parameters and the number of branches of sweet potato cultivars studied. Long tendrils and the number of branches increased to third observation, then on the fourth observation there is declining and there were increasing.
2. Formulation of fertilizer is best to do a production is husk ash with the production of 9.8 kg/plot (equivalent to 16.33 tonnes/ha)
3. Dose of fertilizer is best for generating dose of fertilizer production is 6 tonnes/ha with a production of 9.71 kg/plot (equivalent to 16.18 tonnes/ha)
4. Combination treatment best fertilizer for produce production is husk ash by dose of 4 tons/ha and husk ash + compost at a dose of 6 tonnes/ha production of 11.0 kg/plot (equivalent to 18.33 tonnes/ha).

ACKNOWLEDGEMENT

Acknowledgements authors forward to the government through the Directorate General of Higher Education DP2M the funds provided in 2015 through a skim MP3EI.

REFERENCES

[1] Adiningsih , S. 1996. Role of Efficient Use of Fertilizers to Preserve Food Self-Sufficiency. In Proceedings of the National Symposium and Congress VI Peragi, Jakarta.

[2] Ayo and Mampioper. 2008. Consumption-local-food-in-Papua-low.http://ta oidjubi. wordpress.com /2008/04/28

[3] BPS, 2014. Harvest Area, Production and Yield of Potatoes. www.bps.go.

[4] Djufry, F., M.S. Lestari, Arifuddin., and Soplanit . A. 2011. Growth And Production of Sweet potato in the Lowlands In Different Varieties And Source cuttings. Agrivigor Journal 10(3): 228-234, May-August 2011; ISSN 1412-2286. December 22, 2014

[5] Hahn, S.K., and Y. Hozyo, 1996. Sweet Potato. *In* Goldswworthy, P.R. and N.M. Fisher. Cultivation of Tropical Plant Physiology. Gadjah Mada University Press, Yogyakarta.

[6] Hendroatmodjo, K.H. 1990. Distribution of Dry Materials and Results Three Sweet potato Cultivars Derived from Cuttings Different. Research Crops, 5(1): 48-59

[7] Irianto. 2009. Growth and Crop Cucumber On Multiple Type Abu. Agronomy Journal Vo.13 No. 1, January-June, 2009.

[8] Legiawati , R.I. 1995. Plant Growth and Development of Sweet potato For Optimum Harvest Determination criteria. Faculty of Agriculture, IPB, Bogor.

[9] Lingga, P. and Marsono. 2007. Instructions for Use Fertilizer. Penebar Swadaya, Jakarta

[10] Logo, O. 2011. Morphology Description Some Type Sweet potato (*Ipomea batatas* (L.) Lamb. Based on the Pattern of Utilization by Dani In Kurulu District Jayawijaya. Thesis, Fapertek Unipa, Manokwari.
[11] Marsono and P. Sigit. 2002. Fertilizer Association, Type and Application. Penebar Swadaya, Jakarta .
[12] Musnamar, E.F. 2003. Organic Fertilizer: Liquid and Solid, Development, Applications. Penebar Swadaya, Jakarta.
[13] P. Samori , F.A. Paiki and La Musadi. 1998. Study on Disease Scabies *Elsinoe batatas* In Different Cultivars and Sweet potato Cultivation System in Baliem Wamena. Hyphere, Scientific Journal Bulb and Sago, 3(1): 1-7
[14] Sibuea, P. 2013. Community Assistance for Food Diversification Based Business Sweet potato. Bulletin, Vol. 6, No. 2. 2013.
[15] Sosrosoedirjo, S. and B. Rifai. 1974. Fertilizer. PT. Soeroengan, Jakarta.
[16] Suharno. 2014. Effect of Organic Fertilizer to Production of Clon Madu Sweet potato. Journal of Agricultural Sciences, Vol 3 No. 1, July 2007.
[17] Suharno, A. K. Rachman, and S.R. Apsari. 2010. Effect of Organic Fertilizer type on Sweet potato Production. Agriekstensia Vol . 9 No. 2, July 2010.
[18] Sutanto, R. 2002. Organic Farming, Towards Alternative and Sustainable Agriculture. Canisius, Yogyakarta.
[19] Wargiono, J. 1980. How to Grow Sweet potatoes and Cropping. Central Research Institute of Agriculture. Bogor
[20] Widodo , Y. 1989. Prospects and Development Strategy Sweet potato as a Source of Foreign Exchange . Agricultural Development Research Journal.
[21] Zuraida, N., A. Bari., C.A. Wattimenna., M. Amir and R. Soenaryo. 1992. Effects of Mixed Planting Sweet potato Clones of The Disease Scabies and Results. Agricultural Research 12 (3): 119-121

The Increasing of Sweetpotato Production through Application of Organic Fertilizer

ORIGINALITY REPORT

11%

SIMILARITY INDEX

PRIMARY SOURCES

1	ripublication.com Internet	170 words —	3%
2	www.mdpi.com Internet	149 words —	2%
3	Jajang Sauman Hamdani, Anne Nuraini, Syariful Mubarok. "The Use of Paclobutrazol and Shading Net on Growth and Yield of Potato 'Medians' Tuber of G2 in Medium Land of Indonesia", Journal of Agronomy, 2017 Crossref	128 words —	2%
4	media.neliti.com Internet	72 words —	1%
5	R Sulistiani, Rosmayati, L A M Siregar, F Harahap. " Differences in morphology and sugar content of purple sweet potato (L.) with potassium treatment at several altitudes ", IOP Conference Series: Earth and Environmental Science, 2018 Crossref	46 words —	1%
6	Goswami, Subhendu Bikash. "Dynamics of Yield Accumulation of Sweet Potato (Ipomoea batatas (L.) Lam.) as Influenced by Cultivars and Water Management Practices Under Short Day Cool Temperature Condition.", Bidhan Chandra Krishi Viswavidyalaya University (India), 2020 ProQuest	27 words —	< 1%
7	Gaurav Jha, O.P. Choudhary, Rakesh Sharda. "Comparative effects of saline water on yield and quality of potato under drip and furrow irrigation", Cogent Food &	23 words —	< 1%

Agriculture, 2017
Crossref

8	Yuni Sugiarti, Achmad Tjachja N., U. Maman, Fitri Mintarsih, E. Oos M Anwas, Elida Syarifah. "Design and Build Mango E-Commerce Information System", 2019 7th International Conference on Cyber and IT Service Management (CITSM), 2019 Crossref	22 words — < 1%
9	Fantaw Solomon, Ayalew Asrat, Tadesse Daniel, G/Medhin Zenebe, Agegnehu Eshetu. "Evaluation of potato (Solanum tuberosum L.) varieties for yield and yield components", Journal of Horticulture and Forestry, 2019 Crossref	19 words — < 1%
10	ijcrbp.com Internet	11 words — < 1%
11	Tripura, Angkurita. "Evaluation of Potato for Yield and Quality.", Bidhan Chandra Krishi Viswavidyalaya University (India), 2019 ProQuest	11 words — < 1%
12	sjrwmd.com Internet	10 words — < 1%
13	link.springer.com Internet	9 words — < 1%
14	www.thejakartapost.com Internet	9 words — < 1%
15	Marje Särekanno, Jüri Kadaja, Katrin Kotkas, Viive Rosenberg, Virge Vasar, Triin Saue, Viacheslav Eremeev. "Potato seed from meristem plants using EVIKA multiplication methods", Acta Agriculturae Scandinavica, Section B - Plant Soil Science, 2010 Crossref	8 words — < 1%
16	Eko Agus Martanto, Adelin Tanati, Samen Baan. "EVALUASI KETAHANAN TERHADAP PENYAKIT	7 words — < 1%

KUDIS DAN PRODUKSI BEBERAPA KULTIVAR UBIJALAR", JURNAL HAMA DAN PENYAKIT TUMBUHAN TROPIKA, 2016
Crossref

17 "Advances in Integrated Soil Fertility Management in sub-Saharan Africa: Challenges and Opportunities", Springer Science and Business Media LLC, 2007 — 6 words — < 1%
Crossref

18 Madhao, Pradhan Atul. "Selection from Diverse Germplasm of Potato for High Yield, Quality and Storability.", Bidhan Chandra Krishi Viswavidyalaya University (India), 2020 — 6 words — < 1%
ProQuest

EXCLUDE QUOTES	OFF	EXCLUDE MATCHES	OFF
EXCLUDE BIBLIOGRAPHY	OFF		