The Effect of Inorganic Fertilizer Residue Combined With Chicken Manure on the Yield of Relayed Solanaceous Crops

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Abstract

The study was conducted at the farm of Leonard Q. Rosal, farmer cooperator in Pudoc Centro, San Vicente, Ilocos Sur from January to April 2007. It was aimed to put into practice the concept of relay cropping with the utilization of inorganic fertilizer residue combined with chicken manure and to compare the yield performance of relayed solanaceous crops.

This study made use of the Randomized Block Design (RCBD) with three replications. They were laid out as follows: Treatment 0 – control (not applied with chicken manure, Treatment I- tomato (Lycopersicum esculentum) planted three weeks after sowing and applied twice with chicken manure, Treatment 2- sweet pepper (Capsicum anuum) planted three weeks after sowing applied with chicken manure, and Treatment 3- eggplant (Solanum melongena) planted three weeks after sowing applied with chicken manure.

Results showed that no significant difference on the yield of tomato although applied with chicken manure. This means that the soil nutrients were sufficiently supplied during the vegetative stage of tomato; thus, making the crop grew almost uniformly and develoedp fully. This was attributed to greater number and bigger fruits with a total of 419.5 kg of tomato produced.

The yield of sweet pepper and eggplant gave significant differences. They were affected by the soil nutrient residues combined with chicken manure as a complete fertilizer which is essential for the growth and development. The varieties used, "aruy-uy sweet pepper" and "long violet eggplant" were found promising with total yield of 104.5 and 49.75 kg respectively. The plots applied with chicken manure also produced larger fruits and higher net income than Treatment 0 control (not applied with chicken manure.

Introduction

Rationale

The practice of relay cropping has greatly benefited countries like Taiwan and has also tremendous influence on Philippine agriculture, specifically in increasing the production per unit area.

Relay cropping is the planting of another crop while the original crop is still standing. Crops are interplanted or relayed to take full advantage of slow growth phase of the crop and to maximize the utilization of space and light. Incidentally, the practice will also maximize the utilization of space and light. Seasonality of employment is also obviated and more food is produced.

Its use and practice should be looked with concern. Farmers should not fail to see that there is rapid soil deterioration; and unless remedial measures are instituted first, they cannot have a perpetual type of relay cropping system. They should learn to restore the good productive state of the soils which is conducive to a good bio-economic system.

For a successful and continuous relay cropping practice with vegetable crops, there is a need for a sustained application of chicken manure to provide the food supply needs of crops as well as to feed the beneficial flora and fauna especially the microbes that make the tied-up nutrients available and to prepare the good physical conditions necessary for optimal crop yield.

Objectives

1. To put into practice the concept of relay cropping with the utilization of inorganic fertilizer residue combined with chicken manure with its advantages and disadvantages.
2. To compare the yield performance of the solanaceous crops like tomato, sweet pepper and eggplant in practicing relay cropping.
3. To determine the effect of chicken manure applied in the soil in combination with inorganic fertilizer residue on the yield of relayed solanaceous crops.

Review of Related Literature

Vegetable growers in Baguio and Benguet are the popular users of farm manures, particularly chicken manure. They usually apply 20-30 tons of chicken manure per hectare

and at the same time applies 1-2 tons of mixed fertilizers. (Vegetable Production Manual, 1988).

According to Bautista, et.al (1992), the application of chicken manure computed to give 90 kg. N and complete fertilizer (90-60-60 kg.. NPK/ha) increased the yield of vegetables after rice by 150 % and 200% respectively.

Concepcion (1997) reported that Balanced Fertilization is the optimum use of organic and inorganic fertilizers with the proper grades and amounts that supply the correct ratio of plant nutrients and which ensure that soils will sustain crop yields over long cropping season.

Organic fertilizer turns tight and heavy soils loose and friable resulting in better aeration and increase retention capacity, increase biological activity in the soil by rapid decomposition and other soil organism (Soil Fertility Manual, 1982).

According to Philippine Science Encyclopedia Volume VI, Agriculture, 1984 p. 84, the quality and grade of inorganic fertilizers to be nsed depend on the soil type, soil fertility, crop relation, previous cropping practices, and the nutrient availability in fertilizer itself. Information on the pervious land treatments and cropping practices is essential so that consideration may be given to the nutrients contributed from various sources such as manures, cover crops, and crop residues.

Methodology

Time and Place of the Study. The study was conducted at Pudoc Centro, San Vicente, Ilocos Sur owned by Leonard Q. Rosal, the farmer cooperator of the project from January to April 2007.

Experimental Design and Treatments. The relayed solanaceous crops were laid out in Randomized Complete Block Design (RCBD) with three replications. This experimental design was intended for plants that are produced in an open area and there no such control to any adverse condition affecting the growth and yield of solanaceous crops. The treatments that were used as relayed crops were: T_1 – control (no application of chicken manure); T_2 – tomato planted three weeks after sowing applied twice with chicken manure; T_3 - sweet pepper planted three weeks after sowing and applied twice with chicken manure; and T_4 – eggplant planted three weeks after sowing and applied twice with chicken manure. Each treatment occupied 2.5m x 3m plot at .5 m apart.

The approved cultural practices involved in raising the solanaceous relayed crops were the following:

Sowing the seeds. Tomato, sweet pepper and eggplant seeds were sown thinly and evenly at the prepared seedbed for three weeks at different intervals.

Land Preparation. Tractor was used for the first plowing and harrowing then followed again after one week.

Application of chicken manure. Split application of chicken manure was done a day before the transplanting the seedlings and the second application was made through furrow method one month after transplanting.

Planting **of seedlings**. Tomato seedlings were transplanted three weeks after sowing. Sweet pepper five weeks after sowing and eggplant seven weeks after sowing.

Irrigation. The same irrigation frequency was done in all the treatments. Two irrigations at a three day interval were followed at 14 days after transplanting and one irrigation at seven days interval until 90 days after transplanting.

Weeding. Weeding was done in the experimental set up to prevent competition for nutrients, water and sunlight.

Harvesting of crops. Tomato was harvested 65 days after transplanting while sweet pepper and eggplant were harvested at 60 and 70 days after transplanting, respectively.

Data Gathered. All the produced crops were weighed in kilograms per treatment.

Results and Discussion

The result of this experimental study is shown in the following tables:

Table 1. Total weight of tomato fruits of the four treatments in kilograms.

Treatments	Total Weight of Tomato Fruits k	Mean Weight (kg.)
1	58.75	19.58
T_1	137	45.67
T_2	108.75	36.25
T_3	115	38.33

The total weight of tomato fruits in different treatments generated different plant responses in terms of yield.

Table 1 showed that Treatment I yielded the highest with 45.67 kg followed by Treatment 3 and Treatment 2 respectively. Treatment 0, as expected, gave the least yield with 19.58 kg.

Table 2. ANOVA table on the total weight of tomato fruits of the four treatments.

SV	Df	SS	MS	F ratio	Critical Value
Block	2	2444.41	1222.21		.05
Treatments	3	109.37	364.12	3.37	4.76
Error	6	648.09	108.02		
TOTAL	11	4184.87			

Table 2 presents the ANOVA among the treatments which indicates that there were no significant differences among the treatments.

Table 3. Total weight of sweet pepper fruits of the four treatments in kilograms.

Treatments	Total Weight of Sweet Pepper Fruits (kg)	Mean weight (kg)
1	13	4.33
T_1	39	13
T_2	17.75	5.92
T_3	34.75	11.58

Treatment 1 produced the highest yield of 13 kg followed by Treatment 3 with 11.58 kg. Treatment 2 had 5.92kg and Treatment 0 (control)– 4.33 kg. Despite of the split application of chicken manure to the plants, Treatment 2 did not respond well due to the inadequacy of water absorbed by the plant roots. The crops at the nearest distance from the source of water absorbed more and yielded more.

It was also observed that the sweet pepper planted on the third application had the best growth performance as compared to the rest of the other crops. This is due to the moisture which retained longer in the last application.

Table 3a. ANOVA table on the total weight of sweet pepper fruits of the four treatments

SV	df	SS	MS	F ratio	CV
Block	2	56.18	28.09		
Treatment	3	160.85	53.62	97.49	4.76
Error	6	3.31	0.55		
Total	11				

Significant at 0.05 level

When the difference in the total weight of sweet pepper fruits was considered, it was found out that there was significant difference. This means that the yield performance of sweet pepper fruits was adversely affected by the soil nutrient residues combined with chicken manure as fertilizer.

Table 3b. Treatments with significant **difference**

Treatments	Value of t
T_0 vs T_1	8.67
T_0 vs T_3	7.25°
T_1 vs T_2	7.08°
T_2 vs T_3	5.66

Significant at 0.05 level

Table 3b shows the treatments with a significant difference T versus T, has a value of 8.67 with a significant difference. T versus T attained a value of 7.25 while T, versus T has a value of 7.08 and T versus T got a value of 5.66. These imply that the yield performance of sweet pepper fruits has something to do with the nature of the soil due to nutrient residues, the split application of chicken manure, and the volwne of water received by the sweet pepper during its early stage of growth as well as its full development.

Table 4. Total weight of **eggplant fruits of the four treatments in kilograms.**

Treatments	Total Weight of Eggplant Fruits (kg.)	Mean Weight (kg)
T	8.75	2.92
T_1	14.5	4.83
T_2	12.75	4.25
T_3	13.75	4.58

Treatments I, 2 and 3 were closely related with each other as far as mean treatments are concerned. This simply means plots applied with chicken manure produced larger eggplant fruits than the control.

Table 4a. ANOVA table on the total weight of eggplant of the four treatments

SV	df	SS	MS	F ratio	CV
Block	2	10.25	5.15		
Treatments	3	6.45	2.1S	15.81	4.76°
Error	6	2.05	0.34		
Total	11				

Significant at 0.05 level

Table 4a presents the ANOVA result with significant difference. Although at the early stage of development few fruits were harvested but with the second application of chicken manure, the eggplant responded well by growing robustly and producing more fruits. This kind of crop also loves enough moisture that's why during its vegetative growth sufficient irrigation was provided to the eggplant for proper nourishment.

Table 4b. Treatments with significant difference

Treatments	Value oft
T_1 vs T_0	1.91%

Significant at 0.05 level

Table 4b shows the treatments with the significant difference. T, versus T are significantly different from each other while the yield for each treatment did not differ significantly. This implies that chicken manure is a complete nutrient for the growth and development of the eggplant although the same frequency of irrigation was provided to all plants.

Results showed that the highest was that of the tomato fruits having 419.5 kg. with a gross sales of ₱ 4,195.00 and comparable with the yield obtained from sweet pepper fruits which was 104.5 kg and eggplant fruits was 49.75 kg the gross sales of sweet pepper fruits was P 1567.50 and eggplant fruits was P 497.50 respectively. Application of chicken manure increased the yield over the yield from the control.

Table 5. Yield performance of relayed solanaceous crops as affected by the inorganic fertilizer residues in combination with chicken manure

TREATMENTS	TOTAL YIELD PERFORMANCE			GROSS SALES (Php)			TOTAL GROSS SALES
	Tomato	Sweet Pepper	Eggplant	Tomato	Sweet Pepper	Eggplant	
1	58.75	13	8.75	587.50	195	87.50	870
r	137	39	14.5	1370	585	145	2100
1,	108.75	17.75	12.75	1087.5	266.25	127.50	1481.25
1,	115	34.75	13.75	1150	521.25	137.50	1808.75
Total	**419.5**	**104.5**	**49.75**	**4195**	**1567.50**	**497.50**	**6260**

Tomato fruits were sold at P10/kg.
Sweet Pepper Fruits were sold at P15/kg.
Eggplant Fruits were sold at P10/kg.

Table 6. Cost benefit analysis of relayed solanaceous crops as affected by inorganic fertilizer residues in combination with chicken manure

Treatments	Cost of Production In Pesos				Total Cost of Production In Pesos	Total Gross Sales In Pesos	Net Income In Pesos	Return of Investment (%)
	Seeds	labor	Chicken Manure	Gasoline &Oil				
TO	107.50	200		626.33	933.88	870	-63.88	-7
T	105.50	200	333.33	626.38	1267.21	2100	832.79	66
T2	107.50	200	333.33	626.38	1267.21	1481.25	214.04	17
T3	107.50	200	333.33	626.38	1267.21	1808.75	541.54	**43**
Total	**430**	**800**	**999.99**	**2505.52**	**4735.51**	**6260**	**1524.49**	**32**

Higher net income was obtained from those plots applied with chicken manure. Although higher production cost was incurred in plots applied with chicken manure and other expenses, the net income was still higher because of higher yields.

T, - tomato fruits gave the highest yield having a net income of **P** 832.79 and the return of investment was 66%

There was a recorded yield derived from the control plots but due to the expenses incurred in the treatments, there was no net income and there was a deficit of P 63.88 and the return of investment was -7%.

Conclusion

I. The crops planted on the first replicate had the best growth. On the other hand, the leaves of the crops planted at the last replicate are greener and broader. One factor that greatly affected the growth and development of relayed solanaceous crops was due to longer moisture retention.

2. Results showed that split application of chicken manure significantly affected the agronomic parameters and yield of relayed solanaceous crops.

3. The income derived from applying chicken manure as a mixture of residual inorganic fertilizer is far greater than the income derived from the crops without chicken manure.

4. The use of chicken manure for tomato production is optimum for increased yield and soil productivity.

Recommendations

I. Sufficient moisture should be provided to the relayed solanaceous crops during their early stage of growth for better development.

2. Split application of chicken manure as an additional nutrient to the inorganic fertilizer residue is applicable to relayed solanaceous crops.

3. Since the highest yield performance are the crops applied with chicken manure as combination of inorganic fertilizer residue, it is recommended that farmers should adapt this technology for greater crop production.

4. Chicken manure is most profitable to use in tomato growing for better yield.

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