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ABSTRACT

This study was conducted to evaluate the growth and yield performance and economics of intercropping lettuce and green onion.

Results showed that significantly higher marketable yield was obtained when lettuce and green onion were planted alone in two rows per plot or when one row of green onion was intercropped between two rows of lettuce or one row of lettuce was intercropped between two rows of green onion, and with these intercropping schemes, high return on investment of 39.45% and 35.33%, respectively were realized.

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INTRODUCTION

Nature of the Study

One of the major problems of Filipino farmers is the small-size of land holdings that they till. In the province of Benguet, a farmer usually cultivates 250 m^2 and only few farmers own up to one-half hectare. With this land holding, the concern of farmer is how to make the land productive to support the growing households. The land cannot be expanded so crops should be diversified to increase yield per unit area. It is common observation that farmers use green onions as companion crop with most vegetable crops but very few studies were made on documenting the yield performance and profitability of this scheme.

Intercropping is growing more than one crop on the same piece of land at the same time. This practice is one way of maximizing the use of the land and to optimize production. However, crops should be chosen carefully to avoid allelophatic interaction between incompatible crops. When properly done, this practice is very favorable to the soil and to production.

The limited studies on intercropping provide very little information to guide the local farmers of the Cordillera in maximizing the productivity of their small landholdings. Results of this study may provide very specific information on the benefits of intercropping lettuce and green onions to local farmers, agricultural technicians and those who might be writing books on highland vegetable production. The aspects of multiple cropping in the highland has not been fully studied which may be a contributing factor to the monocropping practice of local farmers up to the present. Due to this, the proliferation of pests is still a major problem resulting to claims of farmers losing in their

crop production. Findings in this study will not only benefit the present farmers, but also the following generation, thus it will also contribute to adaptable technologies.

Importance of the Study

Intercropping is a practice usually observed despite the lack of reliable data showing its significance from the stand point of yield and profit. It is a system of vegetable production whereby compatible crops are planted at a time on the same piece of land with the main objective of maximizing the use of land for better productivity. This system, however, can be modified to some extent by the addition of organic and/or inorganic fertilizers.

Furthermore, the growing of more than one crop in the same piece of land at a time can be of great help in increasing production per unit area. It is a practical and effective means of achieving optimum yield from a unit area of land. Increasing vegetable production eventually increases the farmer's income. Hence, the system should be studied intensively and carefully to find out its merits and its limitations with regards to vegetable production under specified location and season (Allan, 1986).

Intercropping as stated by Biglette (1970) is considered as an important source of additional income and source of food. He added that it is advantageous since it increases profit from the cultivated land especially when the area available is limited.

Intercropping of two or more crops does not only increase income but also accounts in reducing or controlling insect pests and diseases in the main crops. Density of the intercropped plant is a very important factor in controlling population of insects. Thus, closer density has greater effects (Floyd, 1935).

Objectives of the Study

The study was conducted to:

1. evaluate the growth and yield of lettuce and green onion intercropped with one another;
2. assess the economics of intercropping lettuce and green onion; and
3. determine the appropriate intercropping scheme for lettuce and green onion.

Time and Place of the Study

The study was conducted at the Horticulture Experimental Area, Benguet State University, La Trinidad, Benguet from November 2008 to January 2009.

REVIEW OF LITERATURE

Intercropping as stated by Biglete (1970) is considered as an important source of additional income and source of food. He added that it is more advantageous since it increase profit from the cultivated especially when the area available is limited.

Various plants for intercropping by market gardeners are nearly all of them small growing and quick maturing one (Thompson and Kelly, 1959). Likewise, Raymond (1971) suggested that intercropping techniques can maximize production per unit area per year. He claimed that intercropping are geared towards attaining the goals of food production and maximizing the benefits of fertilizers used. However, it was found that intercropping sweetpotato with corn had no influence on either maturity of the latter of its marketable and non-marketable green ears and stover (Uichanco, 1959). Victor (1979) also reported that the yield of snap beans is not statistically affected by different cropping systems and crop combinations. He further stated that other crop such as cabbage, tomatoes and onions had no depressing effects on the yield of snap beans.

Similarly, Toledo and Oliveros (1977) observed that intercropping show less yield than monocropping. They reported that this difference was due to the competition between crops. In contrast, Eustaque (1975) claimed that intercropping does not have a negative effect on the growth and yield of crops. He added that intercropping gives beneficial effect on corn like minimizing the evaporation of soil moisture from the soil. The same study shows that intercropping of corn with radish and mongo gave significant increase in yield than the production of corn alone.

There are many combinations for crop which may be used (Knott and Deanon, 1967). These are: tomato, bean, sweetpotato or either vegetables can be growth as

intercrops depending on preferences. They pointed out that some other combinations for intercropping in various countries are leaf mustard or lettuce between beans. Tobia (1980) likewise claimed that intercropping increase the yield of the crops without harmful effect to the snap bean. The results based on the same study are: the secondary crops, namely cabbage, green onions, radish and sweetpepper can be successfully intercropped.

Intercropping two or more crops does not only increase income but also accounts much in reducing or controlling insect pest and diseases in the main crops (Floyd, 1935). He added that density of the intercropped plants is a very important factor in controlling population of insects where density has greater effects. In addition, Mendiola (1958) recommended that intercropping is one way of minimizing the damaged caused by rust on soy bean plantation. Scientists of the University of the Philippines at Los Banos, College of Agriculture discovered that intercropping tomato with cabbage minimized the attack of diamond backmoth on cabbage and intercropping peanut with corn borer infestation (Anon, 1976).

A well-planned croppding system such as intercropping usually result in an increase in yield and greater profit because it increase and improves the productivity of the soil and permits a more economical management of the plant (Benta, 1973). In addition, Malasco (1979), cited the findings of Pablico (1978) that intercropping maximizes land productivity at the same time increase income per unit area, apart from maximizing labor and maintain soil fertility especially when legumes are planted as the main crop.

Intercropping lettuce, green onion with potato has yield and least yield obtained from green onion only (Fernandez and Padua, 1983). They added that the height of

potatoes at maturity was not affected by the different intercrops like celery, lettuce and green onions and carrot due to its larger canopy, longer stem as well as its root system that may limit the light inside the rows and between hills of potato plants.

Other studies indicate varied findings. For example, intercropping garden with snap beans shortened the number of days from planting to flowering, increased the length of matured harvested pod per plot, total weight, number of marketable pods, average weight and number of pods per hill of the garden pea (Dolique, 1982). Borbe (1964) also reported that pole sitao intercropped with Hawaiian Sweet and Laguna Glutinous corn decreased the yield by 24:14 pods per plot and 13:33 per plot, respectively. He mentioned further that intercropping corn affected the number of days to flowering, the weight as well as the average length of pods. But the same study indicated that pole sitao and corn are not compatible as intercrops.

Bawang and Victor (1983) found that suitable succession crop after white potato, edible podded pea and cabbage is edible podded pea, while after potato and green onion is potato and radish maybe followed after cabbage, cauliflower, white potato and green onion. Green onion is compatible for planting after radish and white potato, cabbage may be appropriate to succession after pole and edible podded pea, and pole bean may be compatible for planting after edible podded pea, white potato and cauliflower.

MATERIALS AND METHOD

Materials

The materials needed in the study were seeds of lettuce 'Tyrol', green onion 'Dulce' leeks, digging tools, watering cans, identifying tags, weighing scale, etc.

Methods

Experimental design and treatments. The experiment was laid out in a randomized complete block design (RCBD) with four replications. The treatments were as follows:

Code	Description
I_1	Two rows lettuce
I_2	Two rows green onion
I_3	Two rows lettuce and one row green onion at the center of the rows
I_4	Two rows green onion and one row lettuce at the center of the rows
I_5	One row lettuce and one row green onion

Growing seedlings. Seeds of lettuce were sown thinly by hand broadcasting in a well prepared seedbed followed by covering with thin layer of soil and immediately supplied with water. Watering was done every two days. The seedlings were sprayed as needed to control insects and diseases.

Land preparation. An area of 100 m^2 was prepared. This area was divided into four blocks to represent the replications and each block was subdivided into five plots measuring 1 m x 5 m to represent the treatments.

The treatment plots were dug at least 30 cm deep, leveled then applied with compost and mixed thoroughly with the soil. The rate of compost application was one-half can (eight liters) per plot.

Transplanting, care and management. Seedlings were transplanted at four weeks old. Seedlings were carefully uprooted and transplanted on the prepared 1 m x 5 m plots at a distance of 25 x 25 cm between hills and rows. Transplanting was done late in the afternoon to avoid transplantation shock and scorching of seedlings. Immediately after transplanting, the seedlings were watered to prevent wilting and to enhance recovery. Watering was continued every other day for one week afterwhich the plants were watered every week until the plants were harvested. Spraying was done when there were signs of attack of insect pests and diseases. Likewise, weeding and cultivation was done to ensure good growth of the plants.

Data Gathered

The data gathered and subjected to variance analysis and mean separation test by Duncan's Multiple Range Test (DMRT) were the following:

1. Plant height at harvest (cm). Ten selected plants at random were measured during harvest from the base to the tip of the longest leaf. There were separate measurements for lettuce and green onions.

2. Average plant weight of lettuce and green onion (kg). This was taken by using the formula:

$$\text{Average Plant Weight} = \frac{\text{Total Plant Weight per Plot}}{\text{Number of Plants per Plot}}$$

3. Marketable yield (kg/plot). This was the weight of lettuce and green onion without defects which can be sold in the market.

4. Non-marketable yield (kg/plot). This was the weight of lettuce and green onion that were stunted or with deformities, excessively small, and rotten that cannot be sold in the market.

5. Total yield per plot (kg/plot). This was the weight of all lettuce and green onions that was harvested.

6. Computed yield per hectare (ton). The yield per plot was converted to tons/hectare using the following formula:

$$\text{Yield (t/ha)} = \text{Yield (kg/5 m}^2\text{)} \times 2000$$

Where: 2000 is the number of 5 m^2 plots/ha

7. Other observations. The following data was taken:

a) Incidence of insect pests and diseases. Observations were made on the presence of insect pests and diseases.

b) Allelophaty. Undesirable growth due to allelophaty was also observed.

8. Economic analysis. All expenses incurred in the study were recorded such as labor, seeds, fungicides, insecticides, fertilizers, etc. These were subtracted from the sales per plot to get the net profit on loss per treatment plot.

$$\text{ROI} = \frac{\text{Net Profit}}{\text{Expenses}} \times 100$$

9. Documentation of study. This was taken in pictures.

RESULTS AND DISCUSSION

Final Height at Harvest

Final height of lettuce and green onion was not significantly affected by the intercropping schemes evaluated (Table 1).

Average Plant Weight

Table 2 shows that the average plant weight of lettuce and green onion was not significantly affected by the intercropping schemes evaluated.

Table 1. Plant height at harvest

TREATMENT	MEAN (cm)	
	Lettuce	Green Onion
Two rows lettuce	22.00[a]	
Two rows green onion		60.80[a]
Two rows lettuce + one row green onion	22.42[a]	57.18[a]
Two rows green onion+ one row lettuce	22.17[a]	59.09[a]
One row lettuce + one row green onion	21.38[a]	57.08[a]

In a column, means with a common letter are not significantly different at 5% level by DMRT

Table 2. Average plant weight

TREATMENT	MEAN (kg/ 5 m^2 plot)	
	Lettuce	Green Onion
Two rows lettuce	0.19[a]	
Two rows green onion		0.14[a]
Two rows lettuce + one row green onion	0.18[a]	0.09[a]
Two rows green onion+ one row lettuce	0.17[a]	0.13[a]
One row lettuce + one row green onion	0.19[a]	0.13[b]

In a column, means with a common letter are not significantly different at 5% level by DMRT

Marketable Yield

Table 3 shows that lettuce planted in two rows and planting two rows of lettuce + one row green onion significantly had higher marketable yield of 6.36 and 5.83, respectively, while the lowest marketable yield of 2.84 was obtained from one row lettuce + one row green onion. In onion, planting two rows green onion alone and planting two rows green onion + one row lettuce significantly had higher marketable yield of 5.33 and 5.13, respectively, while the lowest marketable yield of 1.88 was obtained from one row green onion + two rows lettuce.

Table 3. Marketable yield

TREATMENT	MEAN (kg/5 m^2 plot)	
	Lettuce	Green Onion
Two rows lettuce	6.36[a]	
Two rows green onion		5.33[a]
Two rows lettuce + one row green onion	5.83[a]	1.88[b]
Two rows green onion+ one row lettuce	3.13[b]	5.13[a]
One row lettuce + one row green onion	2.84[b]	2.63[b]

In a column, means with a common letter are not significantly different at 5% level by DMRT

Non-Marketable Yield

The non-marketable yield of lettuce and green onion was not significantly affected by the intercropping schemes evaluated (Table 4).

Table 4. Non-marketable yield

TREATMENT	MEAN (kg/5 m^2 plot)	
	Lettuce	Green Onion
Two rows lettuce	0.90[a]	
Two rows green onion		0
Two rows lettuce + one row green onion	1.24[a]	0
Two rows green onion+ one row lettuce	0.60[a]	0
One row lettuce + one row green onion	0.73[a]	0

In a column, means with a common letter are not significantly different at 5% level by DMRT

Total Yield

Presented in Table 5 is the yield per plot as affected by the different intercropping schemes evaluated. Result showed that two rows lettuce and two rows lettuce + one row green onion significantly had the highest total yield of lettuce of 7.26 and 7.07, respectively. In green onion, planting two rows green onion alone and planting two rows green onion + one row lettuce had higher total yield of 5.33 and 5.13, respectively.

Computed Yield

Presented in Table 6 is the computed yield of lettuce and green onion. Result shows that lettuce planted in two rows and planting two rows of lettuce + one row green onion significantly had higher computed total yield of 14.53 and 14.13 t/ha, respectively. Two rows green onion and two rows green onion + one row lettuce significantly had higher computed total yield of green onion of 10.65 and 10.25 t/ha, respectively.

Table 5. Total yield

TREATMENT	MEAN (kg/ 5 m^2 plot)	
	Lettuce	Green Onion
Two rows lettuce	7.26[a]	
Two rows green onion		5.33[a]
Two rows lettuce + one row green onion	7.07[a]	1.88[b]
Two rows green onion+ one row lettuce	3.44[b]	5.13[a]
One row lettuce + one row green onion	3.85[b]	2.63[b]

In a column, means with a common letter are not significantly different at 5% level by DMRT

Table 6. Computed yield

TREATMENT	MEAN (t/ha)	
	Lettuce	Green Onion
Two rows lettuce	14.53[a]	
Two rows green onion		10.65[a]
Two rows lettuce + one row green onion	14.13[a]	3.75[b]
Two rows green onion+ one row lettuce	6.88[b]	10.25[a]
One row lettuce + one row green onion	7.70[b]	5.25[b]

In a column, means with a common letter are not significantly different at 5% level by DMRT

Other Observations

Incidence of insect pests and diseases. There were occurrence of insects such as mole crickets, leaf miner, aphids, and cutworms. However, through the application of insecticides, these were minimized.

The presence of leaf blight and head rot were observed on lettuce especially in two rows of lettuce + one row green onion, probably due to dense population. In green onion, leaf blight was noticed.

Incidence of allelopathy. The growth and yield of lettuce and green onion was not affected by possible allelopathy effects of the intercrops.

Economic Analysis

Table 7 shows the cost and return analysis of lettuce and green onion production as affected by different intercropping schemes evaluated. Planting two rows of green onion + one row lettuce and two rows lettuce + one row green onion were more profitable at 39.45% and 35.33% ROI, respectively, while the lowest ROI of 9.77% was realized from planting two rows of green onion.

Table 7. Economic analysis (20 m^2 area)

PARTICULAR	TREATMENT				
	T_1	T_2	T_3	T_4	T_5
Marketable Yield (kg)	23.45	21.30	30.80	31.85	23.00
A. Sales (Php)	763.50	852.00	999.00	1160.50	795.00
B. Expenses					
1. Seedlings/Suckers	112.00		112.00	56.00	56.00
a. Lettuce					
b. Green onion		300.00	150.00	300.00	150.00
2. Insecticide					
a. Prodone	23.00	23.00	23.00	23.00	23.00
3. Fertilizers					
a. 14-14-14	30.40	30.40	30.40	30.40	30.40
b 46-0-0	22.80	22.80	22.80	22.80	22.80
4. Gasoline	35.00	35.00	35.00	35.00	35.00
5. Labor	365.00	365.00	365	365.00	365.00
Total Expenses	588.20	776.20	738.20	832.20	682.20
C. Net Profit	175.30	75.80	260.80	328.30	112.80
D. ROI (%)	29.80	9.77	35.33	39.45	16.53
E. Rank	3	5	2	1	4

Note: The selling price of lettuce per kilo during harvest was Php30.00 while green onion was sold at Php40.00/kg.

Legend:

T_1 = Two rows lettuce
T_2 = Two rows green onion
T_3 = Two rows lettuce + one row green onion
T_4 = Two rows green onion + one row lettuce
T_5 = One row lettuce + one row green onion

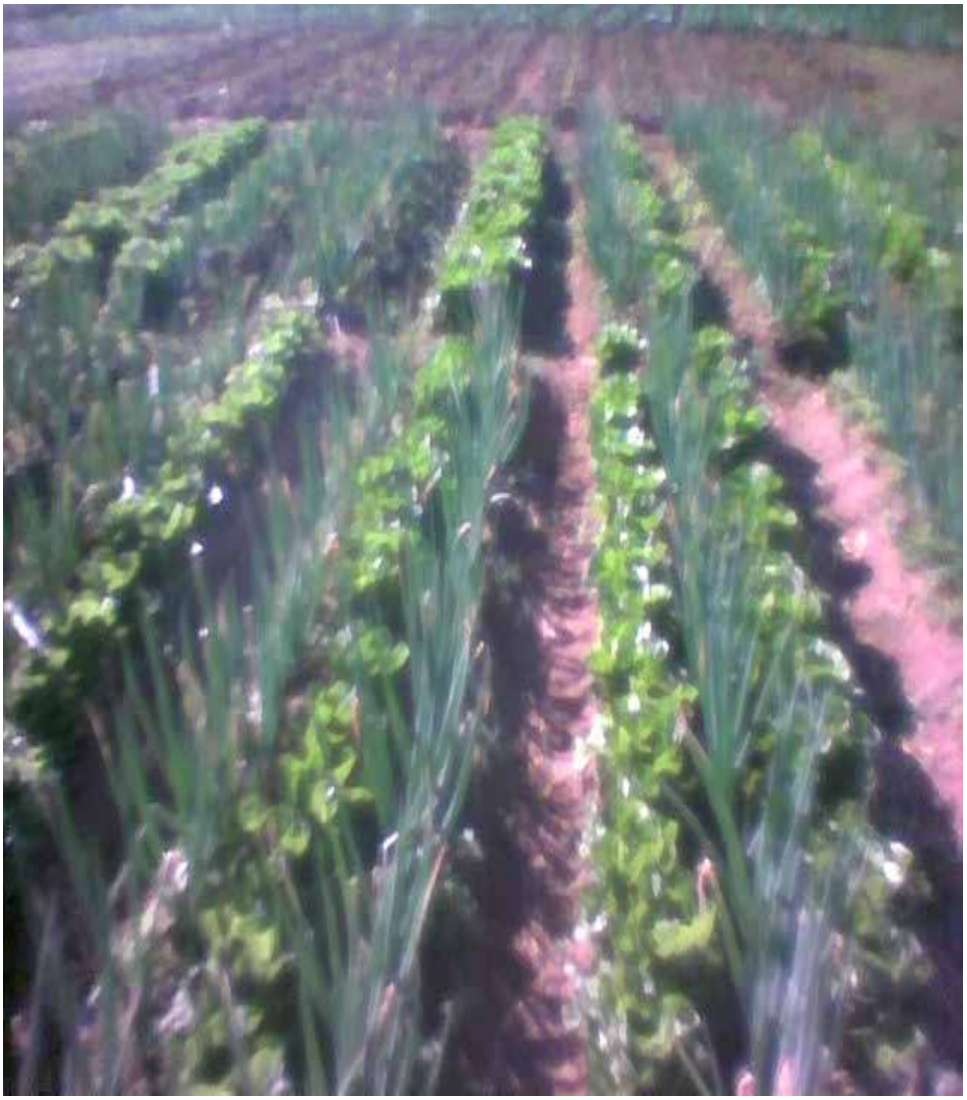

Figure 1. Overview of the experimental field

Figure 2. Overview of the intercropping treatments in replication 1

Figure 3. Overview of the intercropping treatments in replication 2

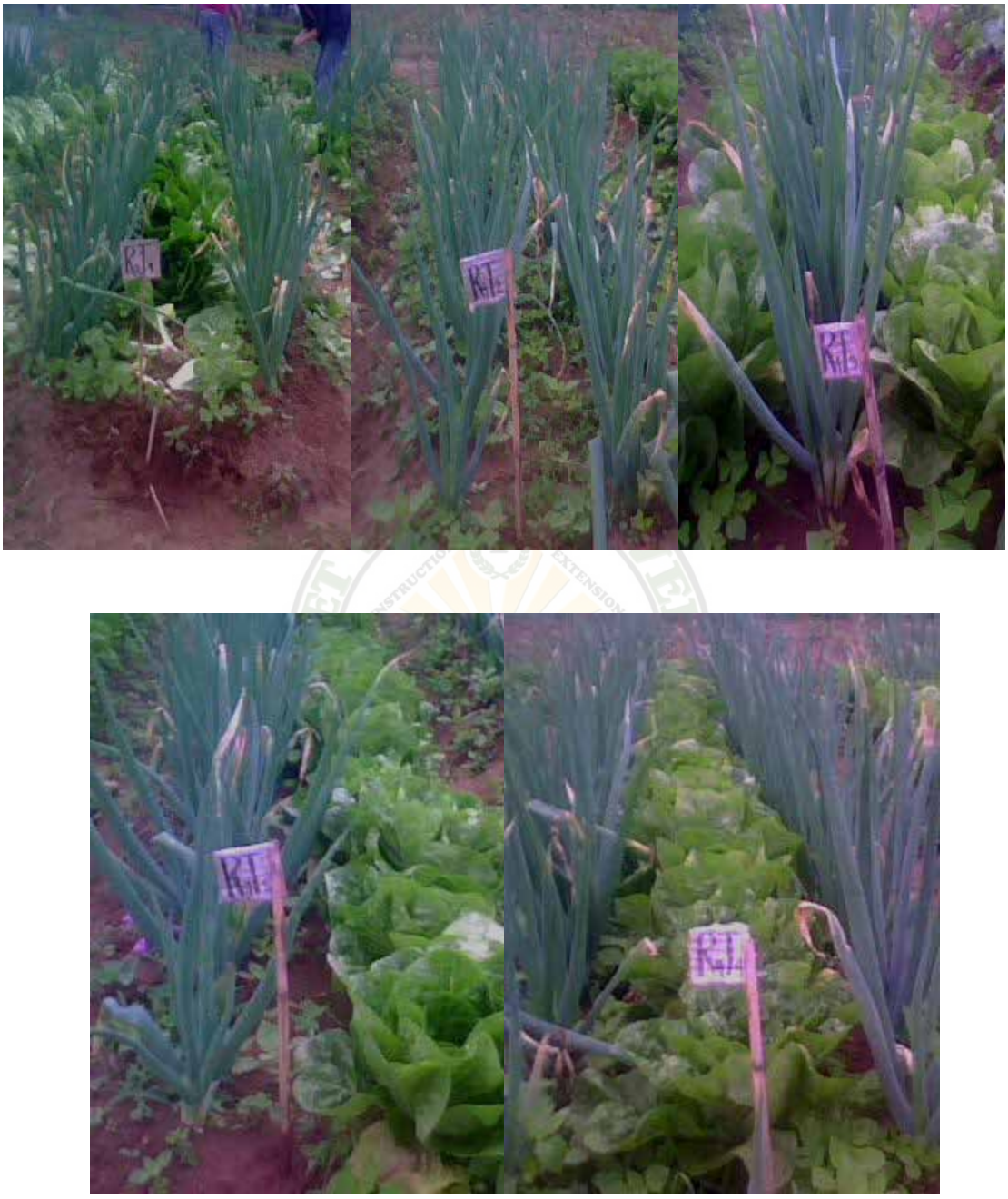

Figure 4. Overview of the intercropping treatments in replication 4

Figure 5. Overview of the intercropping treatments in replication 5

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted at the Benguet State University Horticulture Experimental Area at Balili, La Trinidad, Benguet from November 2008 to January 2009 to evaluate the growth and yield of lettuce and green onion intercropped with one another, assess the economics of intercropping lettuce and green onion, and to determine the appropriate intercropping scheme(s) for lettuce and green onion.

Results of the study showed that significantly higher marketable yield was obtained when lettuce and green onion were planted alone in two rows per plot or when one row of green onion was intercropped at the center of two rows of lettuce or one row of lettuce was intercropped at the center of two rows of green onion and these intercropping schemes effected high return on investment of 39.45% and 35.33%, respectively.

Observations also show that lettuce and onion are compatible intercrops.

Conclusion

Based on the results, it is inferred that planting two rows of green onion plus one row lettuce or two rows of lettuce plus one row green onion per plot have high yield and high return on investment.

Recommendation

It is therefore recommended, that intercropping two rows of lettuce plus one row green onion or two rows of green onion plus one row of lettuce per plot should be done to obtain higher yield of the crops and greater profit pr area.

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APPENDICES

APPENDIX TABLE 1. Plant height of lettuce (cm)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	19.87	20.66	23.95	23.52	88.00	22.00
T_2	19.73	20.31	24.51	25.13	89.68	22.42
T_3	20.02	22.57	22.65	23.43	88.67	22.17
T_4	18.21	22.03	20.90	24.38	85.52	21.38

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	49.245	16.415	0.55^{ns}	0.00	0.66
Factor A	3	2.354	0.785			
Error	9	12.903	1.434			
TOTAL	15	64.502				

^{ns} = Not significant CV (%) = 5.44

APPENDIX TABLE 2. Plant height of onion (cm)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	62.72	57.56	63.18	59.72	243.18	60.80
T_2	54.95	57.39	57.82	58.55	228.71	57.18
T_3	56.31	56.10	61.76	62.18	236.35	59.09
T_4	53.04	59.84	52.82	2.60	228.30	57.08

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	35.679	11.893	1.14^{ns}	0.40	0.38
Factor A	3	37.549	12.516			
Error	9	98.541	10.949			
TOTAL	15	171.769				

^{ns} = Not significant CV (%) = 5.65

APPENDIX TABLE 3. Average plant weight of lettuce (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	0.21	0.23	0.19	0.13	0.76	0.19
T_2	0.15	0.18	0.18	0.21	0.72	0.18
T_3	0.14	0.19	0.15	0.21	0.69	0.17
T_4	0.15	0.26	0.14	0.22	0.77	0.19

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	0.007	0.002	0.23^{ns}	0.23	0.87
Factor A	3	0.001	0.000			
Error	9	0.013	0.001			
TOTAL	15	0.021				

^{ns} = Not significant CV (%) = 20.78

APPENDIX TABLE 4. Average plant weight of green onion (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	0.15	0.11	0.16	0.12	0.54	0.14
T_2	0.10	0.06	0.11	0.10	0.37	0.09
T_3	0.09	0.10	0.16	0.16	0.51	0.13
T_4	0.11	0.16	0.11	0.14	0.52	0.13

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	0.002	0.00	1.91^{ns}	0.48	0.19
Factor A	3	0.004	0.00			
Error	9	0.007	0.00			
TOTAL	15	0.013				

^{ns} = Not significant CV (%) = 23.20

APPENDIX TABLE 5. Marketable yield of lettuce (kg/5 m^2 plot)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	7.00	7.75	6.60	4.10	25.45	6.36
T_2	5.65	5.00	5.65	7.00	23.30	5.83
T_3	1.85	3.25	2.50	3.75	11.35	3.13
T_4	1.75	4.90	2.35	3.50	12.50	2.84

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	3.078	1.026	8.21**	0.60	0.00
Factor A	3	39.493	13.164			
Error	9	14.425	1.602			
TOTAL	15	56.996				

** = Highly significant CV (%) = 27.90

APPENDIX TABLE 6. Marketable yield of green onion (kg/5 m^2 plot)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	6.00	4.25	6.30	4.75	21.30	5.33
T_2	2.00	1.25	2.25	2.00	7.50	1.88
T_3	3.75	4.00	6.50	6.25	20.50	5.13
T_4	2.25	3.25	2.25	2.75	10.50	2.63

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	2.976	0.992	14.68**	0.36	0.00
Factor A	3	36.608	12.202			
Error	9	7.478	0.830			
TOTAL	15	47.062				

** = Highly significant CV (%) = 24.39

APPENDIX TABLE 7.Non-marketable yield of lettuce (kg/5 m^2 plot)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	1.20	1.25	0.90	0.25	3.60	0.90
T_2	0.50	1.70	1.50	1.25	4.95	1.24
T_3	0.90	0.50	0.50	0.50	2.40	0.60
T_4	1.25	0.25	0.50	0.90	2.90	0.73

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	0.131	0.043	1.36^{ns}	0.89	0.31
Factor A	3	0.919	0.306			
Error	9	2.033	0.225			
TOTAL	15	3.083				

^{ns} = Not significant CV (%) = 54.90

APPENDIX TABLE 8. Non-marketable yield of green onion (kg/5 m^2 plot)

TREATMENT	REPLICATION I	II	III	IV	TOTAL	MEAN
T_1						
T_2						
T_3						
T_4						

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F 0.05	0.01
Replication	3				0.89	0.31
Factor A	3					
Error	9					
TOTAL	15					

^{ns} = Not significant CV (%) = 54.90

APPENDIX TABLE 9. Total yield of lettuce (kg/5 m^2 plot)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	8.20	9.00	7.50	4.35	29.05	7.26
T_2	6.15	6.70	7.15	8.25	28.25	7.07
T_3	2.75	3.75	3.00	4.25	13.75	3.44
T_4	3.00	5.15	2.85	4.40	15.40	3.85

ANALYSIS OF VARIANCE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	3.145	1.048			
Factor A	3	49.946	16.648	8.91**	0.65	0.00
Error	9	16.810	1.867			
TOTAL	15	69.901				

** = Highly significant CV (%) = 25.29

APPENDIX TABLE 10. Total yield of green onion (kg/ 5 m^2 plot)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	6.00	4.25	6.30	4.75	21.30	5.33
T_2	2.00	1.25	2.25	2.00	7.50	1.88
T_3	3.75	4.00	6.50	6.25	20.50	5.13
T_4	2.25	3.25	2.25	2.75	10.50	2.63

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	2.976	0.992	14.68**	0.36	0.00
Factor A	3	36.608	12.202			
Error	9	7.478	0.830			
TOTAL	15	47.062				

** = Highly significant CV (%) = 24.39

APPENDIX TABLE 11. Computed yield of lettuce (t/ha)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	16.40	18.00	15.00	8.70	58.10	14.53
T_2	12.30	13.40	14.30	16.50	56.50	14.13
T_3	5.50	7.50	6.00	8.50	27.50	6.88
T_4	6.00	10.30	5.70	8.80	30.80	7.70

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	14.241	4.747			
Factor A	3	212.166	70.722	8.77**	0.63	0.00
Error	9	72.540	8.060			
TOTAL	15	298.947				

** = Highly significant CV (%) = 26.03

APPENDIX TABLE 12. Computed yield of green onion (t/ha)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T_1	12.00	8.50	12.60	9.50	42.60	10.65
T_2	4.00	2.50	4.50	4.00	15.00	3.75
T_3	7.50	8.00	13.00	2.50	41.00	10.25
T_4	4.50	6.50	4.50	5.50	21.00	5.25

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARE	F VALUE	TABULAR F	
					0.05	0.01
Replication	3	11.905	3.968			
Factor A	3	146.430	48.810	14.68**	0.36	0.00
Error	9	29.915	3.323			
TOTAL	15	188.250				

** = Highly significant CV (%) = 24.39