BIBLIOGRAPHY

TELIAO, GREGSON S. APRIL 2011. Growth and Yield of Five Corn Entries Intercropped with Bush Bean under Organic Production in La Trinidad, Benguet. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

This study was conducted to identify the highest yielding and most resistant entry/ies of corn intercropped with bush bean; compare the two cropping system used in terms of growth and yield of corn; determine the interaction between corn entries and bush beans; and to determine the economic benefit of intercropping corn varieties with bush beans.

Based on the results, the highest yielder and with highest return on cash expense (ROCE) among the five entries evaluated was KY Bright Jean. All entries were resistant to corn borer. There was no difference between the corn as monocrop and corn intercropped with bush beans. Also, no significant interaction between cropping system and corn entries was observed. The treatments had positive ROCE thus, could also be profitably grown in La Trinidad, Benguet.

TABLE OF CONTENTS

INTRODUCTION

Corn is considered as one of the major crops in the Philippines. It is mainly used for human consumption, feed for animals, and seeds in the industry. As a staple food, about 20% of the population consumes corn (PCCARD, 1997). Corn also constitutes the main ingredient of the animal feed industry as a byproduct of the dry milling process (PCCARD, 1981).

According to the Department of Agriculture (2010), the total corn production for calendar year 2010 is forecast at 6.35 million MT, 9.7% lower than the 2009 output of 7.03 million MT. This is due to the adverse effects of El Nino phenomenon that resulted in contraction of harvest area by 6.7%, 2.68 million hectares in 2009 to 2.50 million in 2010. Yield per hectare declined by 3.5%.

Since cultivated areas limit corn yield, then most of the increase in food production must come from intensive use of cultivated land. The practices used for improving cropping intensities are intercropping, sequential cropping and the like (Ballesil, 1990).

Therefore, to increase corn production in order to meet demand, intercropping may be considered. Intercropping has been regarded as one of the necessary means by which crop production per unit area time can be generally increased and cushion the effect of unfavorable conditions (e.g El Niño) among other things (Ballesil, 1990).

Furthermore, of mixing crops together can reduce the risk of failure. Its main reason is that if several crops are grown at the same time, at least one will survive to harvest. Food crops are usually mixed with cash crops to help ensure both sustenance and disposable income. Cereals and legumes are often mixed due nitrogen-fixing powers of legumes (ICRISAT, 1981).

At the moment, there is no study on the growth and yield of corn intercropped with bush bean. It is likely that further study on this topic may bring about successful results especially under La Trinidad, Benguet condition.

The objectives of the study are to:

1. identify the highest yielding and most resistant entry/ies of corn intercropped with bush beans under organic production;

2. compare the two cropping systems used in terms of growth and yield;

3. determine the interaction between corn entries and bush beans under organic production; and

4. determine the economic benefit of intercropping corn varieties with bush beans under organic production.

The study was conducted at BSU experimental farm in Balili, La Trinidad, Benguet from November 2010 to March 2011.

REVIEW OF LITERATURE

The Plant

In the Philippines, more than eight million people or 20% of the country's population consume 79% of the corn produced. As a cereal grain, corn is second to rice as a source of carbohydrates in the Filipino diet. It is largely consumed in the form of corn grits' and grain corn. Corns produced for food are processed into corn flakes, popcorn, crackers, cakes and bread. From 1970 to 1973, rice and rice products accounted for an average of 104 kilos per capita per year, while corn and corn products accounted to an average of 21 kilos or 14.3 % of the total cereal production (Collado, 1981).

Climatic Requirement

Corn requires an abundance of readily available plant nutrients and a soil reaction between pH 5.5 and 8.0 for the best production (Baluyot, 1984).

The corn plant thrives on a wide variety of upland soils that are well-drained. It can be planted on lowland fields following the rice crop provided that the field moisture is kept below saturation and that the water table is sufficiently below soil surface (DA, 1999).

The daily water consumption of corn is approximately equal to field evaporation (4 to 5 mm/days). However, during the silking and soft dough stages, water use can be as high as 6 to 8 mm/days. If water supply becomes critically inadequate during this period, the potential yield may reduced by 20 to 50% (PCARRD, 1981).

Daily temperature 21- 30°C is the required for adequate growth and development.

Corn requires at least 8 hours of direct sunlight daily in order to grow its best (Pan Germany, 2006).

Intercropping System

Intercropping is an age-old practice of the traditional system of Agriculture in the underdeveloped parts of the world. Proper management of the intercropping systems could play a determinant role in making access of these systems (Rajat and Singh, 1981).

Lantican (2001) stated that intercropping is the growing of two to three crop species in mixed cultures on the same piece of land by putting the crops in alternative strip of row. Normally a short or tall growing crop or quickly and maturing are used as intercrops. To measure the yield advantage, yield of the crop in mixed cultures is compared with that grown in pure stand. Intercropping is used to utilize vacant or unseen spaces between rows of certain crops during the course of their growth.

Intercropping is a system that aims to utilize all the environmental resources. In the intercropping of two or more crops, the following can be expected: better interception of the sunlight energy, risk reduction; and higher exploration of the growing factors related to the environment (Mafra *et al.,* 1981).

Intercropping gives farmer a compromise crop in case the other crop fails to grow or if the market price is below the economic threshold level. Legumes on the other hand, is usually intercropped with other crops due to the legumes ability of harboring nitrogen fixing bacteria (when the specific bacteria are present in the soil and/or the seeds are inoculated) and thereby partly replenishing the lost nitrogen in the soil which the succeeding crop/s could avail of, and both crops could be of market demand at profitable levels (Geren *et a*l., 2008).

<u>Organic Farming and Intercropping</u>

Organic farming is a steadily increasing production form in European agriculture. It is environmental friendly, due to low input of nutrients and no use of pesticides, and it contributes to the production of food without pesticides and antibiotic residues. A further expansion of organic farming is needed to meet consumers worldwide having an increasing demand for products, which are healthy, safe, and of high quality and produced with consideration for animal welfare and the environment. European organic farming and research within this area are in the forefront internationally and offers the opportunity of a food production, which could strengthen the competitiveness of EU agriculture. Intercropping is of special relevance and importance in future organic farming systems, because it offers a number of significant enhancements of both the net productivity of organic farming and the ecosystems in farming regions as a result of the increased diversity of the cropping system (Inter Crop, 2009).

Intercropping is a method for simultaneous crop production and soil fertility building and it may also contribute to the prevention of nitrogen leaching risks sometimes observed from sole crops such as grain legumes due to changes in incorporated residue chemical quality involving nutrient turnover. It is also an ecological method to manage pests, diseases and weeds via natural competitive principles that allow for more efficient resource utilization. These same competitive principles also contribute to an improved quality of intercrop products. The inclusion of N_2 fixing crops in an intercrop leads to the utilization of the renewable resource of atmospheric nitrogen which increases the sustainability of the agro ecosystem. Intercropping can also be regarded as a practice to increase the production of less stable crops such as grain legumes and hereby contribute to lowering the protein deficit in EU at lower risk for the farmer (Inter Crop, 2009).

Effects of Intercropping

According to Ballesil (1990), the characters of compatible crops for multiple cropping are any of the crops should not be a host of any pest and diseases that will attack the other crops or succeeding crops, the nutrient preference of the crops to be intercropped or rotated should differ and no voracious nutrient uptake of any kind should occur, one of the crops should not encroach heavily for light of the other crops, the growth of one crop should be fast or early in maturity compared to other crops and the crops should not be allelopathic to each other in terms of root exudates, biochemical residues or otherwise.

According to Reloj (1964) as cited by Ballesil (1990), planting legumes in between corn plants will increase its production, planting corn one meter apart does not allow full utilization of the land. Plant food nutrients are wasted and the soil is more prone to soil erosion. It is therefore advisable to intercrop corn with other crops such as mungo, peanut and other legumes.

Effects of Intercropping Cereals with Legumes

Intercropping cereals with legumes enhances the net protein utilization value of the system for subsistence level farmers of developing countries. Legumes have long been very important component of many intercropping situations and in view of high cost nitrogen fertilizers they are likely to remain.

Tropical legumes are capable of fixing large quantities of nitrogen under improved condition. Calopo, cowpea, and green gram fixed equivalents of 450, 354, and 324 kg/ha respectively when not inoculated and grown in unfertilized soils. Soybean, bush sitao, cowpea and mungbean can fix 18 to 28, 14, 8 and 2 kg N per ha crop respectively according to IIRI (1979) as cited by Ballesil.

Fast growing legumes could supply significant portion of the fertilizer needs of corn. One species, Crotolaria juncea, intercrop with corn and plowed under one month after cowing could supply as much as 25 to 30 percent of the total nitrogen requirement of corn.

Effects of Intercropping on Pests and Diseases

The incidence of pests and diseases was sometimes reduced in mixed cropping according to Beets (1975). In multiple cropping, a great diversity of insect types exists which tends to result in greater biological stability. Some insects serve as predators of other insects and therefore help control other insect pests.

Incidence of powdery mildew on green gram was significantly lower in intercrop system than in monoculture and yield losses due to infection were reduced .One of the effective strategy in tropical management is diversification of monocultural systems with other crops especially he non host plants. Corn and mungbean intercrop suppressed more weeds than in monocropping situation. Ballesil (1990) cited that corn intercropped with either cowpea or soybean did not significantly affect the length of ears and the weight of seeds. Longer ears were observed from corn monoculture. This could have been due to the fact that soil moisture, nutrients and light competition among plants was not a problem as cited by Ballesil.

MATERIALS AND METHODS

Field Lay-out and Treatment

An area of $225m^2$ was thoroughly prepared and divided into three blocks representing three replications. Each block consists of 10 plots measuring 0.75 m x 10 m (Figure 1).

The treatments were laid- out using spit plot design as follows:

Main plot: Cropping System (CS)

CS_1 - corn alone

CS_2 -corn intercropped with bush bean (Bokod variety)

Subplot: Corn Entries (E)

E_1- Bighani

E_2- Kaneco

E_3- Glutinous (native)

E_4- KY Bright Jean

E_5- IPBHy576

Planting Distance and Seedling Rate

Two to three seeds per hill were planted at a distance of 50cm between hills and 70cm between rows. Bush beans seeds were planted between hills of corn at a distance of 50cm as shown in the diagram:

Legend: C- Corn X- Bush beans

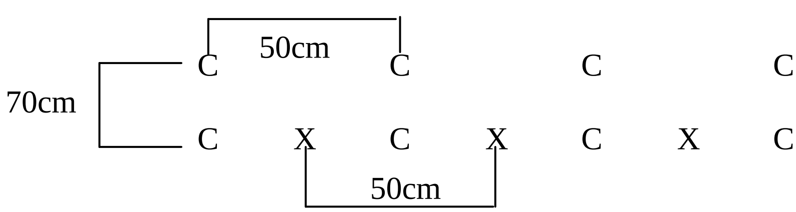


Figure 1. Overview of the experimental area and land preparation

Cultural Management

Fertilizer application, irrigation, cultivation, and weeding were done uniformly and as necessary in all furrows.

The data gathered were:

1. Meteorological data. Daily temperature (ºC), relative humidity (%), rainfall (mm), and sunshine duration (hr, min) were taken at the Philippine Atmospheric Geological Service Administration (PAG-ASA) station based at Benguet State University.

2. Plant Vigor. This was taken by visual rating at 30 days after planting (DAT) using the following scale:

Rating Scale	Description	Remarks
1	Plants are weak with few stems	Very poor growth
2	Plants are weak with few less stems (semicolon) pale	Poor growth
3	Better than poor vigor	Moderately vigorous
4	Plants are moderately strong with robust stems and leaves that are light green in color	Vigorous growth
5	Strong with robust stems and leaves, leaves are light to dark green in color	Highly vigorous

3. Days from sowing to emergence. The number of days from planting to emergence was recorded when 80 % of the seeds planted per plot emerged.

4. Days to maturity. This was taken by counting the number of days from sowing up to harvesting when 80 % of the husk turned yellow.

5. Plant height at maturity. This was taken by measuring the height of ten sample plants two weeks before harvesting from the ground level to the tassel tip using meter stick.

6. Days from sowing to silking and tasselling. This was taken by counting the number of days from sowing to silking and tasselling when at least 50% of the plant in a plot starts to show their silk and tassel.

7. Total weight of marketable ears per plot. This was taken by weighing the corn ears with fully developed kernels that are free from any damage or disease during the time of harvest.

8. Total weight of non-marketable ears per plot. This was the total weight of corn ears that were damaged and malformed per plot.

9. Total weight of corn ears harvested per plot. This was taken by weighing all the ears harvested per plot.

10. Length of corn ear (cm). This was done by measuring ten (10) corn ear samples per plot selected at random and measured from the base to the tip using foot rule.

11. Ear diameter (cm). The ear diameter was taken from the widest part of the ten (10) sample ears per plot selected at random using vernier caliper.

12. Reaction to corn ear borer. The damage of corn borer was observed during harvest using the following rating scale:

Rating Scale	Description	Remarks
1	Less than 1% damage	Highly resistant
2	1-5% damage	Moderate resistant
3	6-10% damage	Resistant

4	11-20% damage	Susceptible
5	21-30%damage	Very susceptible

13. Weight of 1000 kernels. This was done by weighing 1000 kernels per treatment after harvesting.

15. Yield per hectare (t/h). This was obtained based using the following formula:

Yield/(t/ha) = Yield/plot x 2

Where 2 is a factor to be used to convert yield/plot in $kg/5m^2$ to yield/ha in t/ha.

14. Return on cash expense (ROCE). This was computed using the formula:

$$ROCE = \frac{\text{Net Profit}}{\text{Total Cost of Production}} \times 100$$

Beans

1. Total weight of marketable green pods (kg). The marketable green pods were weighed right after harvest. Pods were considered marketable if they were straight, tender, and free from any insect damage and diseases.

2. Total weight of non-marketable pods (kg). Includes those that were abnormal in shape, over matured and affected by pests and diseases.

Data Analysis

All quantitative data were analyzed using the analysis of variance (ANOVA) for Split-plot design with four replications. The significance of difference among the treatment means were tested using the Duncan's Multiple Range Test (DMRT) at 5% level of significance.

RESULTS AND DISCUSSION

Meteorological Data

Shown in Table 1 is the meteorological data which include the temperature, relative humidity, rainfall and sunshine duration during the conduct of the study. It was observed that the temperature was high during the month of November and low during the month of December. Relative humidity was high during the month of December and low during the month of January. Rainfall was high during the month of November and low during the month of January while sunshine duration was high during the month of January and low during the month of November.

According to PAN Germany (2006), daily temperature of 21- 30°C is required for adequate growth and development of corn. Corn also requires at least 8 hours of direct sunlight daily in order to grow its best while its daily water consumption is approximately equal to field evaporation (4 to 5 mm/days). However, during the silking and soft dough stages, water use can be as high as 6 to 8 mm/day.

Table 1. Temperature, relative humidity, rainfall, and sunshine duration during the conduct of the study

MONTH	TEMPERATURE (^{O}C) MIN.	MAX.	RELATIVE HUMIDITY (%)	RAINFALL (mm)	SUNSHINE DURATION (min)
NOVEMBER	15.15	23.83	84.50	7.34	262.40
DECEMBER	14.10	24.78	86.75	2.76	303
JANUARY	18.23	24.28	77.50	1.64	318.94

Source: PAGASA office, BSU, La Trinidad, Benguet.

If water supply becomes critically inadequate during this period, the potential yield may be reduced by 20 to 50% (PCARRD, 1981).

Plant Vigor

No significant differences were observed among the cropping systems, corn entries and interaction effect of the different corn entries intercropped with bush bean on plant vigor (Figure 2). All the corn entries either monocropped or intercropped were rated vigorous at 30 days after planting (DAP).

Figure 2. Overview of the plants at 30 DAP

Number of Days from Sowing to Emergence

No significant differences were observed on the number of days from sowing to emergence on cropping system, corn entries and interaction effect of the different entries of corn intercropped with bush bean. All the entries of monocropped and intercropped corn emerged at nine days after planting.

Number of Days from Sowing to Tasselling

Cropping system. No significant differences were observed on the days from sowing to tasselling of monocropped and intercropped corn but monocropped corn tasseled a day later than corn intercropped with bush bean.

Corn entry. Highly significant differences were observed on the number of days from sowing to tasselling of the different corn entries (Table 2). Glutinous was the earliest to produce tassel which indicates its possible earlier maturity.

Interaction effect. No significant interaction between cropping system and corn entries was observed on the number of days from sowing to tasselling.

Number of Days from Sowing to Silking

Cropping system. No significant differences were observed on the days from sowing to tasselling of monocropped and intercropped corn.

Corn entries. Highly significant differences were observed among the entries from sowing to silking (Table 2). Entry Glutinous produced silk two days after tasselling while all the other entries produced silk 6-10 days after tasselling.

Interaction effect. No significant differences between cropping system and corn entries were noted.

Number of Days from Sowing to Maturity

Cropping system. No significant differences were observed on the days from sowing to maturity of monocropped and intercropped corn.

Table 2. Number of days from sowing to tasselling, silking and maturity of different corn entries intercropped with bush bean

TREATMENT	DAYS FROM SOWING TO TASSELLING	SILKING	MATURITY
Cropping System (CS)			
Corn only	77	83	112
Corn + bush bean	76	82	112
Corn Entries (E)			
Bighani	78[b]	86[b]	115
Kaneco	84[a]	91[a]	118
Glutinous	66[d]	68[d]	92
KY Bright Jean	76[c]	85[c]	115
IPBHy576	79[b]	86[b]	120
CS x E	ns	ns	ns
CV (%)	5.57	2.01	0.00
CV (%)	4.10	2.66	0.00

Means of different letter are significantly different from each other using 5% level of significance by DMRT

Corn entry. The number of days from sowing to maturity ranged from 92-120 days (Table 2) with Glutinous maturing at least 23 days earlier than the rest. This should make Glutinous highly considered in a crop rotation system.

Interaction effect. No significant interaction between cropping system and corn entries was observed on the number of days from sowing to maturity.

Plant Height at Maturity

Cropping system. It was noted that there were no significant differences on the height of monocropped and intercropped corn at maturity.

Corn entry. Highly significant differences were noted on the height of the different corn entries (Table 3). IPBHy576 was the tallest entry which may signify higher number of ears per plant while Glutinous and Bighani were the shortest (Figure 3).

Interaction effect. It was revealed that there was no significant interaction between cropping system and corn entries on the height of plant at maturity.

Figure 3. Plants at two weeks before harvesting

Table 3. Plant height at maturity of different corn entries intercropped with bush bean

TREATMENT	PLANT HEIGHT (cm)
Cropping System (CS)	
Corn only	153.67
Corn + bush bean	161.03
Corn Entries (E)	
Bighani	144.25^{d}
Kaneco	157.90^{c}
Glutinous	140.92^{d}
KY Bright Jean	162.52^{b}
IPBHy576	181.17^{a}
CS x E	ns
CV (%)	3.71
CV (%)	7.69

Means of different letter are significantly different from each other using 5% level of significance by DMRT

Length of Corn Ear

Cropping system. No significant differences on the length of corn ear of monocropped and corn intercropped with bush bean were noted.

Corn entry. Highly significant differences were observed on the length of corn ears of the different entries of corn (Table 4). Longest ears were observed on entry IPBHy576 while entry Glutinous had the shortest. Although having the shortest ears measured, Glutinous had the heaviest weight of 1000 kernels.

Table 4. Length of corn ear and ear diameter of different corn entries intercropped with bush bean

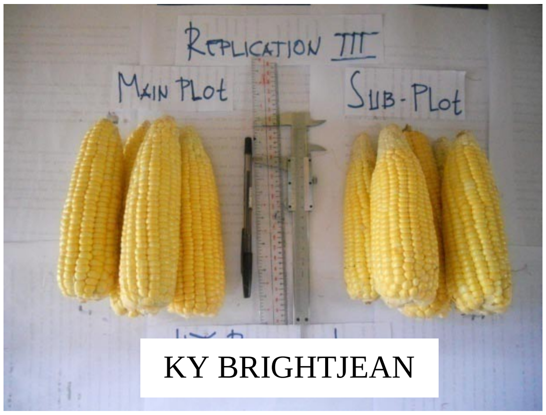
TREATMENT	LENGTH OF CORN EAR (cm)	EAR DIAMETER (cm)
Cropping System (CS)		
Corn only	15.59	4.36
Corn + bush bean	15.15	4.38
Corn Entries (E)		
Bighani	16.58[b]	4.52[a]
Kaneco	14.31[c]	4.43[b]
Glutinous	12.04[d]	4.51[a]
KY Bright Jean	16.67[b]	4.27[c]
IPBHy576	17.01[a]	4.14[d]
CS x E	ns	ns
CV (%)	3.24	3.47
CV (%)	5.25	3.71

Means of different letter are significantly different from each other using 5% level of significance by DMRT

Interaction effect. There was no significant interaction between cropping system and corn entries on the length of corn ears.

Ear Diameter

Cropping system. No significant differences on the ear diameter of monocropped and corn intercropped with bush bean were observed. Figure 4 shows the harvested corn ears under monocropped and intercropped systems.



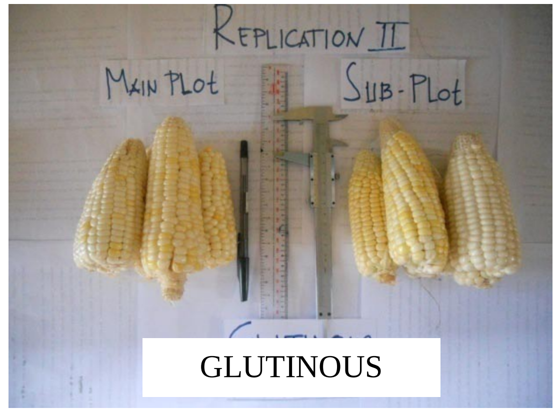


Figure 4. Length of corn ear and ear diameter

Corn entry. Highly significant differences were observed on the diameter of corn ear of the different corn entries (Table 4). Entries Bighani and Glutinous have the widest ears whereas, entry IPBHy576 had the narrowest ear (4.52 cm, 4.41 cm and 4.14 cm, respectively).

Interaction effect. No significant interaction between cropping system and corn entries on the diameter of ear was observed.

Total Weight of Ears Harvested per Plot

Cropping system. No significant differences on the weight of ears harvested per plot of monocropped and corn intercropped with bush bean were observed.

Corn entry. Highly significant differences were noted on the total weight of ears harvested plot of the different corn entries. Entry KY Bright Jean had the heaviest weight of ears harvested per plot (3.60 kg) which denotes higher yield potential while entry Kaneco only had 2.21 kg (Table 5).

Interaction Effect. There were no significant interaction between cropping system and the different entries on the total weight of ears harvested per plot.

Table 5. Weight of marketable ears/plot, non- marketable ears/plot and weight of ears harvested/plot of different corn entries intercropped with bush bean

TREATMENT	WEIGHT		
	MARKETABLE EARS ($kg/7m^2$)	NON-MARKETABLE EARS ($kg/7m^2$)	TOTAL ($kg/7m^2$)
Cropping System (CS)			
Corn only	2.43	0.52	2.97
Corn + bush bean	2.28	0.52	2.97
Corn Entries (E)			
Bighani	2.28[b]	0.37	2.65[c]
Kaneco	1.51[d]	0.70	2.21[d]
Glutinous	1.97[c]	0.96	2.93[b]
KY Bright Jean	3.47[a]	0.10	3.60[a]
IPBHy576	2.55[b]	0.62	3.17[b]
CS x E	ns	ns	ns
CV (%)	29.84	109.54	19.51
CV (%)	23.91	88.54	13.94

Means of different letter are significantly different from each other using 5% level of significance by DMRT

Total Weight of Marketable ears
Harvested per Plot

Cropping system. No significant differences on the total weight of marketable ears per plot of monocropped and corn intercropped with bush beans were noted.

Corn entry. Highly significant differences were noted on the total weight of marketable ears per plot. Entry KY Bright Jean had the heaviest marketable ear harvested per plot of 3.47kg while entry Kaneco had a weight of only 1.51kg (Table 5). This result further affirms the high yield potential of the former. Figure 5 shows marketable and non marketable corn ears harvested.

Interaction effect. There was no significant interaction between cropping system and corn entries on the total weight of marketable ears per plot.

Total Weight of Non- Marketable ears
Harvested per Plot

Cropping system. No significant differences were observed on the weight of non-marketable ears/plot of monocropped and corn intercropped with bush beans.

Corn entry. The different corn entries did not significantly vary on the total weight of non- marketable ears/plot (Table 5) although Glutinous (Native) seem to have the highest weight of non- marketable ears/plot and KY Bright Jean, the least weight of non- marketable ears/plot.

Interaction effect. There was no significant interaction between cropping system and corn entries on the total yield of non- marketable ears/plot.

Figure 5. Marketable and non- marketable corn ears

Weight of 1000 Kernels

Cropping system. Table 6 shows that the weight of 1000 kernels for monocropped and intercropped corn did not vary from each other.

Corn entries. Highly significant differences were distinguished on the weight of 1000 kernels of the different entries (Table 6 and Figure 6). Entry Glutinous produced the significantly highest weight of 1000 kernels (301.83 g) followed by Kaneco (265.50 g). The lightest kernels were registered by KY Bright Jean. The heavy kernels of Glutinous compensates for its shorter ear length.

Interaction effect. No significant differences were observed between cropping system and the different entries on the weight of 1000 kernels.

Yield per hectare

Cropping system. It was shown in Table 6 that there were no significant differences on the weight of ears harvested per hectare of monocropped and intercropped.

Corn entries. Highly significant differences were found on the total weight of ears harvested per hectare of the different entries. Entry KY Bright Jean had heaviest ears harvested per hectare of 3.60 tons followed by IPBHy576, Glutinous, and Bighani (3.17 tons, 2.92 tons, and 2.65 tons, respectively). The high yield of entry KY Bright Jean may be attributed to its high plant vigor, weight of marketable ears per plot and resistance to corn borer.

Interaction Effect. There were no significant interaction between cropping system and the different entries on the total weight of ears harvested per hectare.

Table 6. Weight of 1000 kernels and yield/hectare of different corn entries intercropped with bush bean

TREATMENT	WEIGHT OF 1000 KERNELS (g)	COMPUTED YIELD (t/ha)
Cropping System (CS)		
Corn only	263.20	3.00
Corn + bush bean	256.47	2.85
Corn Entries (E)		
Bighani	247.00[c]	2.65[c]
Kaneco	265.50[b]	2.21[d]
Glutinous	301.83[a]	2.92[c]
KY Bright Jean	239.00[d]	3.60[a]
IPBHy576	245.83[c]	3.17[b]
CS x E	ns	ns
CV (%)	7.00	19.51
CV (%)	4.68	13.94

Means of different letter are significantly different from each other using 5% level of significance by DMRT

Reaction to Corn Borer

All the different corn entries were highly resistant to corn borer.

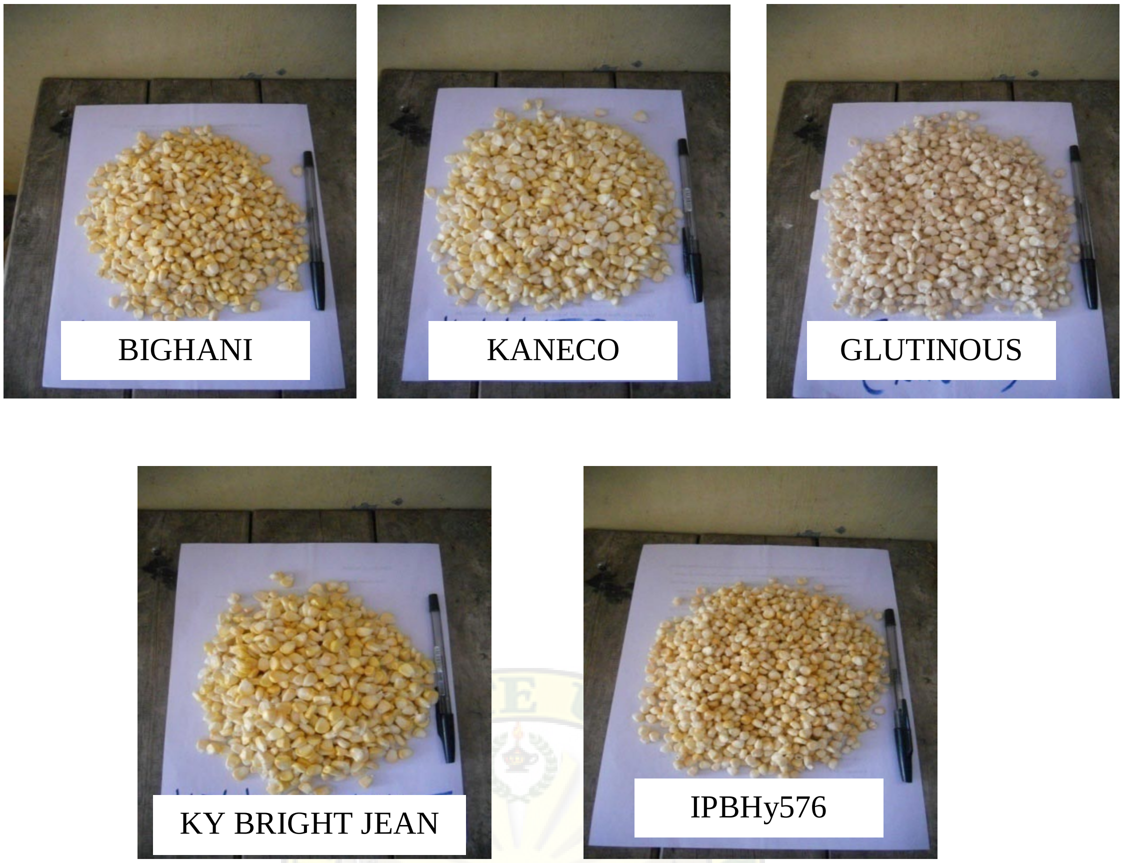


Figure 6. Kernels of the different corn entries

Return on Cash Expense (ROCE)

Table 7 shows the return on cash expense (ROCE) of the different corn entries intercropped with bush bean. KY Bright Jean had the highest ROCE as compared with the other entries although they appear to be all profitable. This result shows that all the entries can be produced in La Trinidad, Benguet. The best variety to be intercropped with beans is KY Bright Jean which resulted to higher profit.

Table 7. Return on cash expense of the different corn entries intercropped with bush bean

TREATMENT	YIELD (kg/ 7.5m^2)	COST OF PRODUCTION (PhP)	GROSS INCOME (PhP)	NET PROFIT (PhP)	ROCE (%)
Monocrop					
Bighani	7.55	61	226.50	165.50	271.31
Kaneco	4.05	61	121.50	60.50	99.18
Glutinous	6.20	61	186.00	125.00	204.92
KY Bright Jean	10.05	61	301.50	240.50	394.26
Ipbhy576	10.10	61	303.00	242.00	396.72
Intercrop					
Bighani	6.15	75	242.25	167.25	223.00
Kaneco	5.00	75	182.25	107.25	143.00
Glutinous	5.60	75	222.00	147.00	196.00
Ky Bright Jean	10.50	75	396.00	321.00	428.00
Ipbhy576	6.95	75	272.25	197.25	263.00

Note: Selling price of corn ears was based on PhP 30/kg (organic corn)
Beans were sold at PhP 15/kg

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The study was conducted to identify the highest yielding and most resistant entry/ies of corn intercropped with bush beans under organic production; compare the two cropping systems used in terms of growth, yield and ROCE of corn; determine the interaction between corn entries and bush beans under organic production; and determine the economic benefit of intercropping corn varieties with bush beans under organic production.

Results show that cropping system did not influence the growth and yield of corn.

On the corn entries, highly significant differences were observed on the number of days from sowing to tasselling and silking, total weight of ears harvested per plot and marketable ears per plot, plant height at maturity, length of corn ear and ear diameter, weight of 1000 kernels and yield per hectare.

In terms of growth, entry Glutinous was the earliest to mature which is desirable in a crop rotation system, entry IPBHy576 was the tallest at maturity, had the longest ear but had the lowest weight of 1000 kernel. KY Bright Jean was the top performing entry because it had the highest yield per plot, marketable ears and had the highest ROCE.

No significant interaction effect between corn entries and cropping system observed on all parameters.

Conclusions

Based on the results, the highest yielder and with the highest ROCE among the five entries evaluated was KY Bright Jean. All entries were resistant to corn borer. There was no difference between the corn monocrop and corn intercropped with bush beans.

Also, no significant interaction between cropping system and corn entries was observed. The other entries had positive ROCE thus; they could also be profitably grown in La Trinidad, Benguet.

Recommendations

Based on the findings, KY Bright Jean is recommended for corn growers of La Trinidad. However, further study with the use of other corn entries is recommended.

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APPENDICES

Appendix Table 1. Number of days from sowing to maturity

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	115	115	115	345	115
Kaneco	118	118	118	354	118
Glutinous	92	92	92	376	92
KY Bright Jean	115	115	115	345	115
Ipbhy576	115	115	115	345	115
Sub Total	555	555	555	1665	555
Intercrop					
Bighani	115	115	115	345	115
Kaneco	118	118	118	354	118
Glutinous	92	92	92	376	92
KY Bright Jean	115	115	115	345	115
IPBHy576	115	115	115	345	115
Sub Total	555	555	555	1665	555
TOTAL	1110	1110	1110	3330	1110

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	115	115	230	115
Kaneco	118	118	236	118
Glutinous	92	92	184	92
KY Bright Jean	115	115	230	115
IPBHy576	115	115	230	115
TOTAL	555	555	1110	
MEAN	185	185		185

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.00	0.00	0.00^{ns}	19.99	99.00
Main plot (A)	1	0.00	0.00	0.00^{ns}	18.51	98.44
Error (a)	2	0.00	0.00			
Sub-plot (B)	4	3108	777	0.00^{ns}	3.01	4.77
AxB	4	0.00	0.00	0.00^{ns}	3.01	4.77
Error (b)	16	0.00	0.00			
TOTAL	29	0.00				

^{ns}= Not significant

CV (a) = 0.00

CV (b) = 0.00

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Appendix Table 2. Number of days from sowing to tasselling

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	78	78	78	234	78
Kaneco	89	90	81	260	86.67
Glutinous	66	66	66	198	66
KY Bright Jean	78	78	78	234	78
Ipbhy576	80	80	70	230	76.67
Sub Total	391	392	373	1156	386.34
Intercrop					
Bighani	82	80	74	236	78.67
Kaneco	82	78	81	241	80.33
Glutinous	66	66	66	198	66
KY Bright Jean	74	74	74	222	74
IPBHy576	83	76	87	246	82
Sub Total	387	374	382	1143	381
TOTAL	778	766	755	2299	766.34

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	78	78.67	156.67	78
Kaneco	86.67	80.33	167	84
Glutinous	66	66	132	66
KY Bright Jean	78	74	152	76
IPBHy576	76.67	82	158.67	79
TOTAL	385.34	381	766.34	
MEAN	77	76		77

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	26.467	13.233	0.73[ns]	19.99	99.00
Main plot (A)	1	5.633	5.633	0.31[ns]	18.51	98.44
Error (a)	2	36.467	18.233			
Sub-plot (B)	4	1024.800	256.200	25.99**	3.01	4.77
AxB	4	121.867	30.467	3.09*	3.01	4.77
Error (b)	16	157.733	9.858			
TOTAL	29	1372.967				

[ns]= Not significant
*= Significant
**= Highly significant

CV (a) = 5.57
CV (b) = 4.10

Appendix Table 3. Number of days from sowing to silking

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	86	95	86	257	85.67
Kaneco	95	95	89	285	95
Glutinous	68	68	68	204	68
KY Bright Jean	86	85	86	257	85.67
Ipbhy576	89	85	78	252	84
Sub Total	424	418	407	1249	416.33
Intercrop					
Bighani	87	89	82	258	86
Kaneco	89	89	89	267	89
Glutinous	68	68	68	204	68
KY Bright Jean	85	85	81	251	83.67
IPBHy576	89	89	87	265	88.33
Sub Total	418	420	407	1245	415
TOTAL	842	838	814	2494	831.33

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	85.67	86	171.67	86
Kaneco	95	89	184	92
Glutinous	68	68	136	68
KY Bright Jean	85.67	83.67	169.34	85
IPBHy576	84	88.33	172.33	86
TOTAL	416.33	431.33	847.66	
MEAN	83	86		83

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	41.867	20.933	7.48^{ns}	19.99	99.00
Main plot (A)	1	1.200	1.200	0.43^{ns}	18.51	98.44
Error (a)	2	5.600	2.800			
Sub-plot (B)	4	1848.200	462.050	94.94^{**}	3.01	4.77
AxB	4	57.133	14.283	2.93^{ns}	3.01	4.77
Error (b)	16	77.867	4.867			
TOTAL	29	2031.867				

^{ns}= Not significant　　CV (a) = 2.01

**= Highly significant　　CV (b) = 2.66

Appendix Table 4. Plant height at maturity

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	147.7	140.7	138.9	425.3	141.77
Kaneco	141.20	146.6	168.6	456.4	152.13
Glutinous	125.6	142	133.5	401.1	133.7
KY Bright Jean	154.5	151	195.2	500.7	166.9
Ipbhy576	180.6	186.9	154	521.5	173.83
Sub Total	747.6	757.2	790.2	2295	765
Intercrop					
Bighani	141.8	146.2	152.2	440.2	146.73
Kaneco	163.3	160	167.7	491	163.67
Glutinous	147.3	147.8	149.3	441.1	148.03
KY Bright Jean	157.6	156.1	160.7	474.4	158.13
IPBHy576	195.6	181	188.9	565.5	188.5
Sub Total	805.6	791.1	818.8	2415.5	805.17
TOTAL	1553.2	1548.3	1609	4720.5	1570.17

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	141.77	146.73	305.5	153
Kaneco	152.13	163.67	315.8	158
Glutinous	133.7	148.03	281.73	141
KY Bright Jean	166.9	158.13	325.03	163
IPBHy576	173.83	188.5	362.33	181
TOTAL	765	805.17	1570.17	
MEAN	153	161		159

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	190.338	95.169	2.79^{ns}	19.99	99.00
Main plot (A)	1	407.008	407.008	11.92^{ns}	18.51	98.44
Error (a)	2	68.309	34.154			
Sub-plot (B)	4	6215.370	1553.842	10.61^{**}	3.01	4.77
AxB	4	579.950	144.988	0.99^{ns}	3.01	4.77
Error (b)	16	2343.720	146.482			
TOTAL	29	9804.695				

^{ns}= Not significant　　CV (a) = 3.71

**= Highly significant　　CV (b) = 7.69

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Appendix Table 5. Length of corn ear

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	17.29	17.88	15.55	50.72	16.91
Kaneco	15.23	14.84	14.97	45.05	15.01
Glutinous	11.50	11.77	12.00	35.27	11.76
KY Bright Jean	17.20	15.24	16.80	49.24	16.41
Ipbhy576	16.95	17.01	18.12	52.08	17.36
Sub Total	78.17	76.74	77.44	232.36	77.45
Intercrop					
Bighani	17.07	15.36	16.32	48.75	16.25
Kaneco	12.48	13.86	14.48	40.82	13.61
Glutinous	11.8	12.58	12.57	39.95	12.32
KY Bright Jean	16.64	17.41	16.7	50.75	16.92
IPBHy576	16.83	15.98	17.15	49.96	16.65
Sub Total	74.82	75.19	78.22	228.23	76.08
TOTAL	152.99	151.93	156.66	460.58	153.53

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	16.91	16.25	33.16	17
Kaneco	15.01	13.61	28.62	14
Glutinous	11.76	12.32	24.08	12
KY Bright Jean	16.41	16.92	33.33	17
IPBHy576	17.36	16.65	34.01	17
TOTAL	77.45	78.08	153.53	
MEAN	15	16		15

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.379	0.379	0.77^{ns}	19.99	99.00
Main plot (A)	1	0.874	0.847	3.54^{ns}	18.51	98.44
Error (a)	2	0.494	0.247			
Sub-plot (B)	4	108.226	27.056	41.85^{**}	3.01	4.77
AxB	4	4.341	1.085	1.68^{ns}	3.01	4.77
Error (b)	16	10.344	0.647			
TOTAL	29	124.657				

^{ns}= Not significant CV (a) = 3.24

**= Highly significant CV (b) = 5.25

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Appendix Table 6. Ear diameter

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	4.59	4.73	4.48	13.8	4.6
Kaneco	4.45	4.59	4.26	13.3	4.43
Glutinous	4.50	4.46	4.50	13.46	4.49
KY Bright Jean	4.40	3.86	4.38	12.64	4.21
Ipbhy576	4.19	3.94	4.06	12.19	4.06
Sub Total	22.13	21.58	21.68	65.39	21.80
Intercrop					
Bighani	4.46	4.24	4.61	13.31	4.44
Kaneco	4.29	4.44	4.52	13.25	4.42
Glutinous	4.71	4.44	4.43	13.58	4.53
KY Bright Jean	4.29	4.15	4.55	12.99	4.33
IPBHy576	4.20	4.19	4.25	12.64	4.21
Sub Total	21.95	21.46	22.36	65.77	21.92
TOTAL	44.08	43.04	44.04	131.16	43.92

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	4.6	4.44	9.04	5
Kaneco	4.43	4.42	8.58	4
Glutinous	4.49	4.53	9.02	5
KY Bright Jean	4.21	4.33	8.54	4
IPBHy576	4.06	4.21	8.27	4
TOTAL	21.8	21.92	43.72	
MEAN	4	4		4

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.069	0.035	1.51^{ns}	19.99	99.00
Main plot (A)	1	0.005	0.005	0.21^{ns}	18.51	98.44
Error (a)	2	0.046	0.023			
Sub-plot (B)	4	0.642	0.161	6.09**	3.01	4.77
AxB	4	0.092	0.023	0.87^{ns}	3.01	4.77
Error (b)	16	0.422	0.026			
TOTAL	29	1.277				

^{ns}= Not significant CV (a) = 3.47

**= Highly significant CV (b) = 3.71

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Appendix Table 7. Total weight of ears harvested/plot

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	3.65	2.8	2.45	8.9	2.97
Kaneco	2.20	1.75	2.5	6.45	2.15
Glutinous	3.05	2.5	3	8.55	2.85
KY Bright Jean	3.65	3.2	4.05	10.9	3.63
Ipbhy576	2.6	3.6	3.5	9.7	3.23
Sub Total	15.15	13.85	19.5	44.5	14.83
Intercrop					
Bighani	2.5	2.3	2.2	7	2.33
Kaneco	2.5	2.2	2.1	6.8	2.27
Glutinous	3.5	2.5	3	9	3
KY Bright Jean	4	3.5	3.2	10.7	3.56
IPBHy576	3.45	3.45	2.4	9.3	3.1
Sub Total	15.95	13.95	12.9	42.8	14.27
TOTAL	31.1	33.8	32.4	87.3	29.1

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	2.97	2.33	5.53	3
Kaneco	2.15	2.27	4.42	2
Glutinous	2.85	3	5.85	3
KY Bright Jean	3.63	3.56	7.19	4
IPBHy576	3.23	3.1	6.33	3
TOTAL	14.83	14.26	29.1	
MEAN	3	3		3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.618	0.309	0.96^{ns}	19.99	99.00
Main plot (A)	1	0.096	0.096	0.30^{ns}	18.51	98.44
Error (a)	2	0.645	0.322			
Sub-plot (B)	4	6.613	1.653	10.05^{**}	3.01	4.77
AxB	4	0.593	0.148	0.90^{ns}	3.01	4.77
Error (b)	16	2.632	0.165			
TOTAL	29	11.197				

^{ns}= Not significant

**= Highly significant

CV (a) = 19.51

CV (b) = 13.94

Appendix Table 8. Total weight of marketable ears harvested per plot

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	3.20	1.9	2.45	7.55	2.52
Kaneco	1.75	1	1.3	4.05	1.35
Glutinous	2.35	2	1.85	6.2	2.07
KY Bright Jean	3.20	2.8	4.05	10.05	3.35
Ipbhy576	3.65	2.95	3.5	10.1	3.37
Sub Total	14.15	10.65	13.15	37.95	12.65
Intercrop					
Bighani	2.5	2	1.65	6.15	2.05
Kaneco	2	1.3	1.70	5	1.67
Glutinous	1.3	2.2	2.1	5.6	1.87
KY Bright Jean	3.8	3.5	3.2	10.5	3.5
IPBHy576	1.75	3.2	2	6.95	2.32
Sub Total	11.35	12.2	10.65	34.2	11.4
TOTAL	25.5	22.85	23.80	72.45	24.05

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	2.52	2.05	4.57	2
Kaneco	1.35	1.67	3.02	2
Glutinous	2.07	1.87	3.94	2
KY Bright Jean	3.35	3.5	6.85	3
IPBHy576	3.37	2.32	5.69	3
TOTAL	12.65	11.4	24.05	
MEAN	3	2		2

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.129	0.065	0.13[ns]	19.99	99.00
Main plot (A)	1	0.169	0.169	0.34[ns]	18.51	98.44
Error (a)	2	0.988	0.494			
Sub-plot (B)	4	12.880	3.220	10.15**	3.01	4.77
AxB	4	0.702	0.175	0.55[ns]	3.01	4.77
Error (b)	16	5.075	0.317			
TOTAL	29	19.942				

[ns]= Not significant CV (a) = 29.84
**= Highly significant CV (b) = 23.91

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Appendix Table 9. Total weight of non- marketable ears harvested per plot

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	0.45	0.9	0	1.3	0.45
Kaneco	0.45	0.75	1.2	2.4	0.8
Glutinous	0.7	0.5	1.15	2.35	0.78
KY Bright Jean	0	0.4	0	0.4	0.13
Ipbhy576	0.7	0.65	0	1.35	0.45
Sub Total	2.3	3.2	2.35	7.85	2.62
Intercrop					
Bighani	0	0.3	0.55	0.85	0.28
Kaneco	0.5	0.9	0.4	1.8	0.6
Glutinous	2.2	0.3	0.9	3.4	0.13
KY Bright Jean	0.2	0	0	0.2	0.07
IPBHy576	1.7	0.4	0.4	2.35	0.78
Sub Total	4.6	2.25		8.6	2.87
TOTAL	6.9	5.55	4.60	16.45	5.48

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	0.45	0.28	0.73	0
Kaneco	0.80	0.60	1.40	1
Glutinous	0.78	0.13	0.91	1
KY Bright Jean	0.13	0.07	0.20	0
IPBHy576	0.45	0.78	1.23	1
TOTAL	2.62	2.78	4.47	
MEAN	1	1		1

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	0.307	0.154	0.43^{ns}	19.99	99.00
Main plot (A)	1	0.019	0.019	0.05^{ns}	18.51	98.44
Error (a)	2	0.722	0.361			
Sub-plot (B)	4	2.579	0.645	2.74^{ns}	3.01	4.77
AxB	4	0.440	0.110	0.47^{ns}	3.01	4.77
Error (b)	16	3.771	0.236			
TOTAL	29	7.837				

^{ns}= Not significant

CV (a) = 109.54
CV (b) = 88.54

Appendix Table 10. Weight of 1000 kernels (g)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	250	259	268	777	259
Kaneco	248	257	278	783	261
Glutinous	327	303	298	928	309.33
KY Bright Jean	235	238	248	721	240.33
Ipbhy576	247	238	256	741	247
Sub Total	1307	1259	1348	3950	1316.67
Intercrop					
Bighani	226	238	241	705	235
Kaneco	259	266	285	810	270
Glutinous	299	306	278	883	289.33
KY Bright Jean	239	250	226	715	238.33
IPBHy576	250	257	227	734	244.67
Sub Total	1273	1417	1257	3984	1315.67
TOTAL	2580	2712	2605	7897	2632.33

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	259	235	494	247
Kaneco	261	270	531	267
Glutinous	309.33	289.33	603.66	302
KY Bright Jean	240.33	238.33	478.66	239
IPBHy576	247	244.67	491.67	246
TOTAL	1316.67	1315.67	2632.33	
MEAN	263	263		260

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Replication	2	51.667	25.883	0.08^{ns}	19.99	99.00
Main plot (A)	1	340.033	340.033	1.03^{ns}	18.51	98.44
Error (a)	2	661.267	330.663			
Sub-plot (B)	4	15545.00	3886.250	26.30**	3.01	4.77
AxB	4	993.800	248.450	1.68**	3.01	4.77
Error (b)	16	2364.400	147.775			
TOTAL	29	19956.167				

^{ns}= Not significant CV (a) = 7.00

**= Highly significant CV (b) = 4.68

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Appendix Table 11. Computed yield per hectare (tons)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Monocrop					
Bighani	3.65	2.80	2.45	8.90	3.00
Kaneco	2.20	1.75	2.50	6.45	2.15
Glutinous	3.05	2.50	3.00	8.55	2.85
KY Bright Jean	3.65	3.20	4.05	10.90	3.63
Ipbhy576	2.60	3.60	3.50	9.70	3.23
Sub Total	15.15	13.85	15.50	44.50	14.83
Intercrop					
Bighani	2.50	2.30	2.20	7.00	2.33
Kaneco	2.50	2.20	2.10	6.80	2.67
Glutinous	3.50	2.50	3.00	9.00	3.00
KY Bright Jean	4.00	3.50	3.20	10.70	3.57
IPBHy576	3.45	3.45	2.40	9.30	3.10
Sub Total	15.95	13.95	12.90	42.80	14.27
TOTAL	31.10	27.55	28.40	87.30	29.10

TWO - WAY TABLE

TREATMENT	MONOCROP	INTERCROP	TOTAL	MEAN
Bighani	3.00	2.33	5.33	3
Kaneco	2.15	2.67	4.82	2
Glutinous	2.85	3.00	6.85	3
KY Bright Jean	3.63	3.57	7.20	4
IPBHy576	3.23	3.10	6.33	3
TOTAL	14.83	14.27	30.53	
MEAN	3	3		3

ANALYSIS OF VARIANCE

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F 0.05	TABULATED F 0.01
Replication	2	618	309	0.96[ns]	19.99	99.00
Main plot (A)	1	96.33	96.33	0.30[ns]	18.51	98.44
Error (a)	2	644.67	322.33			
Sub-plot (B)	4	6612.83	1653.21	10.05**	3.01	4.77
AxB	4	592.83	148.21	0.90[ns]	3.01	4.77
Error (b)	16	2632.33	164.52			
TOTAL	29	11197				

[ns]= Not significant CV (a) = 19.51

**= Highly significant CV (b) = 13.94

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Appendix Table 12. Total weight of marketable and non- marketable pods of bush bean (kg)

TREATMENT	REPLICATION			TOTAL	MEAN
	I	II	III		
Intercrop					
Marketable	5.90	5.60	7.75	19.25	6.42
Non- marketable	5.20	2.60	4.60	12.40	4.13

ANALYSIS OF VARIANCE (Marketable Pods)

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	1.4025	0.350	1.445^{ns}	3.48	5.99
Error	10	2.4211	0.242			
TOTAL	14	3.8236				

^{ns}- Not significant

ANALYSIS OF VARIANCE (Non- marketable Pods)

SOURCES OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULATED F	
					0.05	0.01
Treatment	4	0.38	0.095	0.28^{ns}	3.48	5.99
Error	10	3.43	0.343			
TOTAL	14	3.81				

^{ns}- Not significant