### GROWTH, FRESH POD YIELD AND GENOTYPE X ENVIRONMENT INTERACTION OF NINE GARDEN PEA (*Pisum sativum* L.) GENOTYPES GROWN IN THREE LOCATIONS OF BENGUET

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## RATIONALE

### GARDEN PEA



- One of the most important vegetable cash crops in the country
- It is a versatile crop as source of protein in the diet having essential amino acids
- It is a cool season annual crop
- Grows best in cold and dry climate
- Longer cold helps in increasing the yield of garden pea (DAFF, 2011)
- Benguet is a major producing area in the country supplying around 80% of the total needs of the Philippines

- Benguet farmers are highly dependent on traditional varieties which are inferior in quality
- They keep on demanding for new improved varieties
- The BSU- IPB breeding team had developed and selected potential genotypes for commercialization
- These genotypes are needed to be evaluated in different production sites in Benguet
- To identify the most adapted and high yielding potential varieties for commercialization
- The selection of best adapted variety in specific location and observation of its performance across different sites can be achieved through systematic evaluation in a multi- locational trial

- The interaction of G x E makes it difficult to identify the best genotype
  - ➢ In the absence of G x E, superior genotype in one environment may be regarded as superior genotype in all
  - Whereas the presence of G x E interaction confirms particular genotype being superior in particular environment (Bondari, 2003)
- Information on the G x E interaction leads to successful evaluation of stable genotypes (Tariku *et al.*, 2013)
- A stable genotype is that one that performs consistently in all test locations
- Understanding the causes of G x E interaction can be used to
  - ➤establish breeding objectives
  - ≻identify ideal test conditions and
  - ➢ formulate recommendation for areas of optimum cultivar adaptation (Yan, 2001)

## **OBJECTIVES**

The study was conducted to:

- 1. Determine the growth and fresh pod yield of nine garden pea genotypes grown in three locations in Benguet,
- 2. Determine the best location for growing garden pea genotype,
- 3. Determine the genotype x environment interaction effect on the growth and yield of garden pea genotypes in the three locations in Benguet, and

**CGP 13** 

4. Determine the profitability of growing garden pea genotypes in the three locations of Benguet.

# TIME AND PLACE OF THE STUDY

The study was conducted from January to May 2016
Betag, La Trinidad, Benguet (1,316masl)





**CGP 13** 

#### Ambassador, Tublay, Benguet (1,445 masl)





#### Caliking, Atok, Benguet (1,668masl)





## METHODOLOGY

- Area: 116 m<sup>2</sup>/location
- Plot: 31 plots with 0.75 m x 5 m size
- Design: Randomized Complete Block Design (RCBD) with three replications in each location

**CGP 13** 

## TREATMENTS

Genotyp	e (G):		Environment (E):					
Code	Genotype	Source	Code	<u>Location</u>	Elevation			
G <sub>1</sub>	Betag	BSU- IPB- HCRS	E <sub>1</sub>	Betag, La Trinidad	1,316 masl			
G <sub>2</sub>	CGP 11	BSU- IPB- HCRS	E <sub>2</sub>	Ambassador, Tublay	1,445 masl			
G <sub>3</sub>	CGP 13	BSU- IPB- HCRS	E <sub>3</sub>	Caliking, Atok	1,658 masl			
G <sub>4</sub>	CGP 34	BSU- IPB- HCRS						
G <sub>5</sub>	CGP 59	<b>BSU-IPB-HCRS</b>						
G <sub>6</sub>	CGP 110	BSU- IPB- HCRS						
G <sub>7</sub>	CGP 154	<b>BSU-IPB-HCRS</b>						
G <sub>8</sub>	Chinese Light Green	BSU- IPB- HCRS						
	(CLG)							
G <sub>9</sub>	Taichung	<b>BSU-IPB-HCRS</b>						

• **Data** on growth and development were gathered per treatment per replication

### Data Analysis

- > ANOVA for RCBD with three replications
- DMRT at 5% for test of significant differences among treatment means per environment
- ≻Pooled/ Combined ANOVA was used to determine G x E interaction effects
- AMMI analysis was used to determine the stable and adapted genotypes per environment and across environments

### **RESULTS AND DISCUSSION**

Table 1.	The average daily temperature, relative humidity and rainfall amount from January to May 2016 at three locations in Benguet									
MONTH	TEMPERA	ATURE (°C)	RELATIVE HUMIDITY	RAINFALL AMOUNT						
MONTH	MIN.	MIN. MAX.		(mm)						
LA TRINIDAD <sup>*</sup> (1,316 masl)										
January	15.00	23.50	89.50	0.20						
February	15.35	22.85	81.50	1.84						
March	16.10	24.95	81.00	0.50						
April	15.80	25.50	84.00	1.60						
Мау	18.98	25.37	90.19	4.20						
<u>TUBLAY</u> (1,445 masl)										
January	15.00	19.00	88.00	0.00						
February	12.25	21.00	83.00	0.40						
March	14.50	22.33	81.00	0.00						
April	15.50	23.33	79.00	0.59						
Мау	18.00	25.20	83.00	2.00						
<u>ATOK</u> (1,658 masl)										
January	13.00	18.00	88.00	0.00						
February	11.67	18.84	82.00	0.50						
March	14.19	23.00	80.00	0.00						
April	15.75	24.00	78.00	0.00						
Мау	17.75	24.67	86.00	2.19						

\*Source: BSU, PAGASA, Agriculture Meteorology Research Station

Table 2.	Soil chemical	properties before	e planting and after	harvesting in three loc	ations in Benguet	
ENVIRONME	<b>NT</b> рН	ORGANIC MATTER (%)	NITROGEN (%)	PHOSPHORUS (ppm)	POTASSIUM (ppm)	
<u>BEFORE</u> <u>PLANTING</u>						
La Trinidad	5.18	10.12	0.51	155.00	37.00	
Tublay	6.09	3.00	0.15	84.00	466.00	
Atok	5.32	3.50	0.18	8.00	290.00	
<u>AFTER</u> <u>HARVESTING</u>						
La Trinidad	6.02	4.00	0.20	120.00	672.00	
Tublay	5.51	3.00	0.15	110.00	516.00	
Atok	5.15	2.50	0.13	57.00	416.00	
Analyzad by	<u>Soile Laborata</u>	my Paquio City				

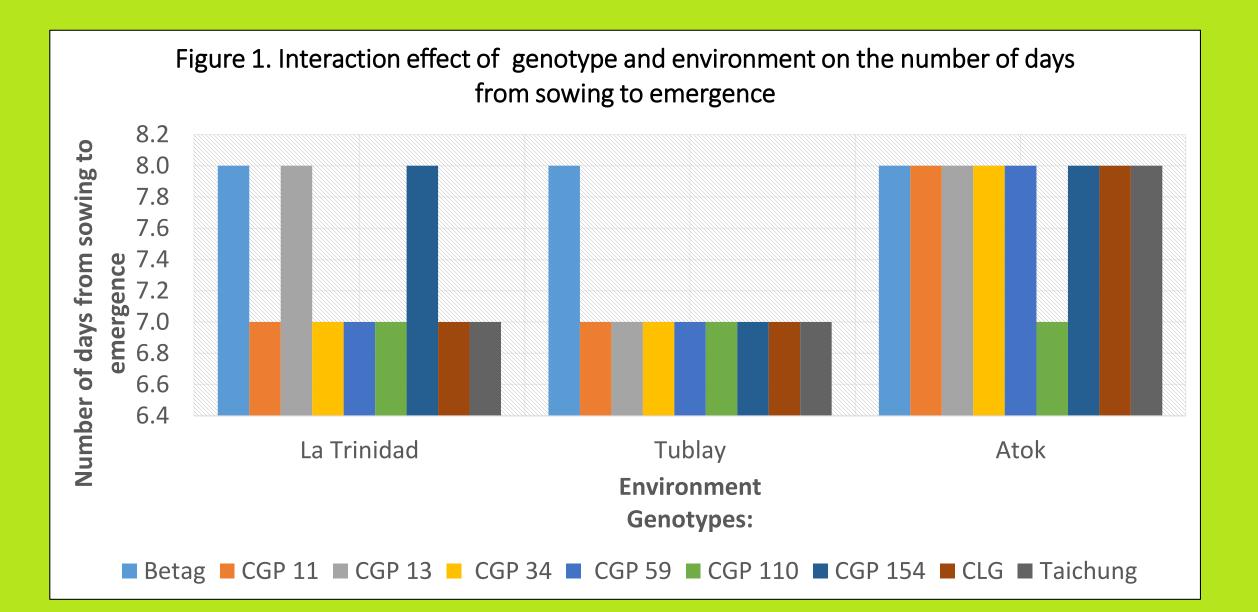
Analyzed by: Soils Laboratory, Baguio City

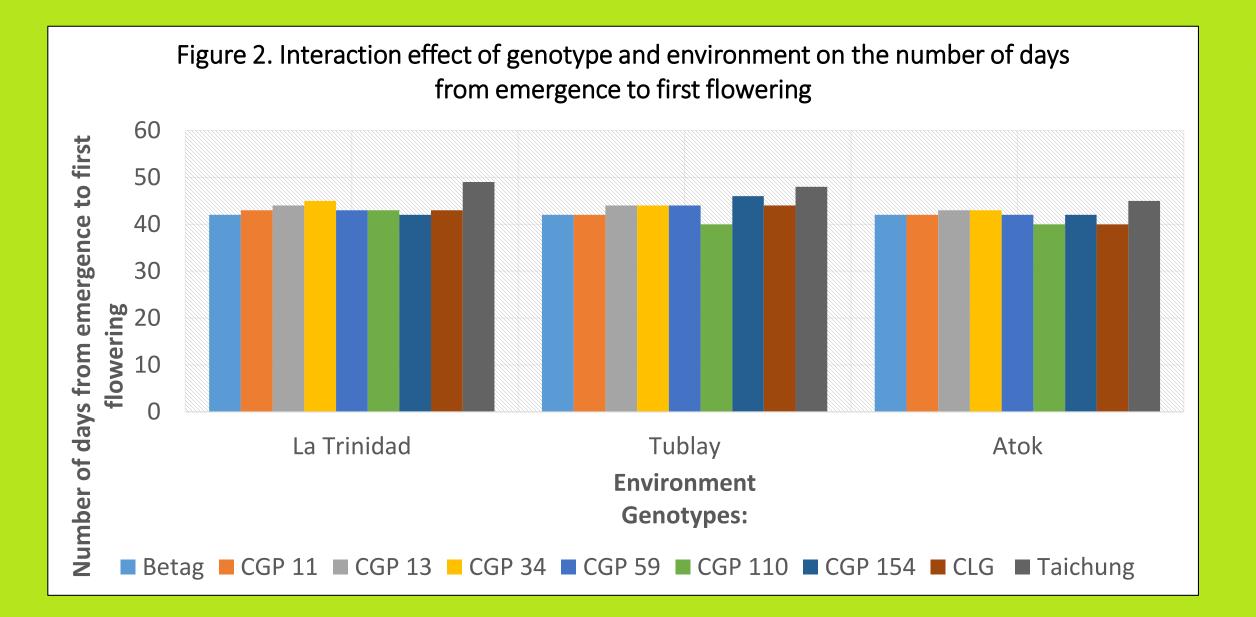
## Maturity Indices

- Differed significantly among genotypes tested in different environments
- Betag was the first to be harvested among the genotypes (48 DAP), one to six days earlier than the other genotypes
- Garden pea grown in Atok were harvested earliest at 50 DAP, 1 to 2 days earlier than those grown in La Trinidad and Tublay

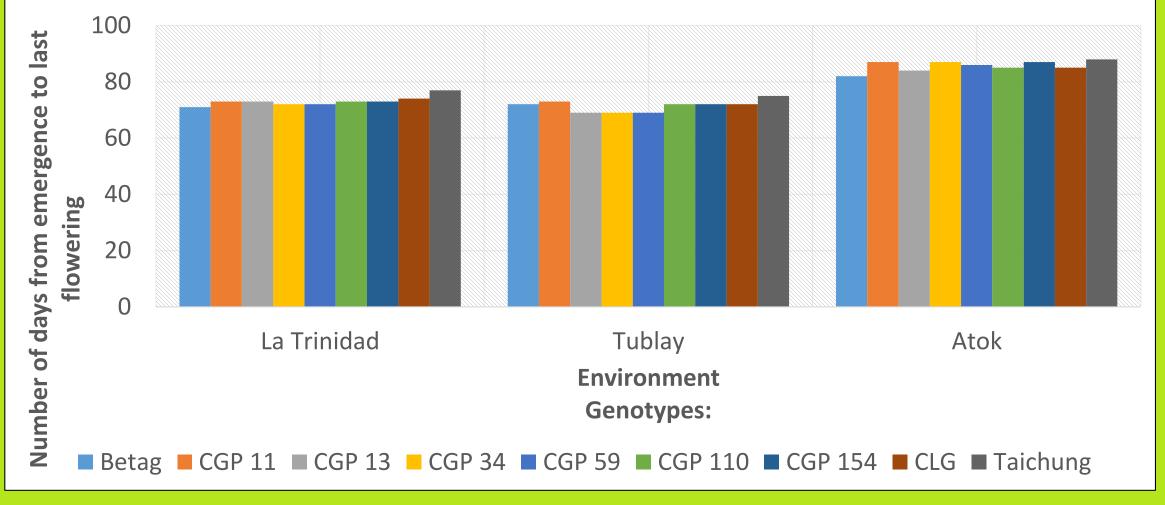


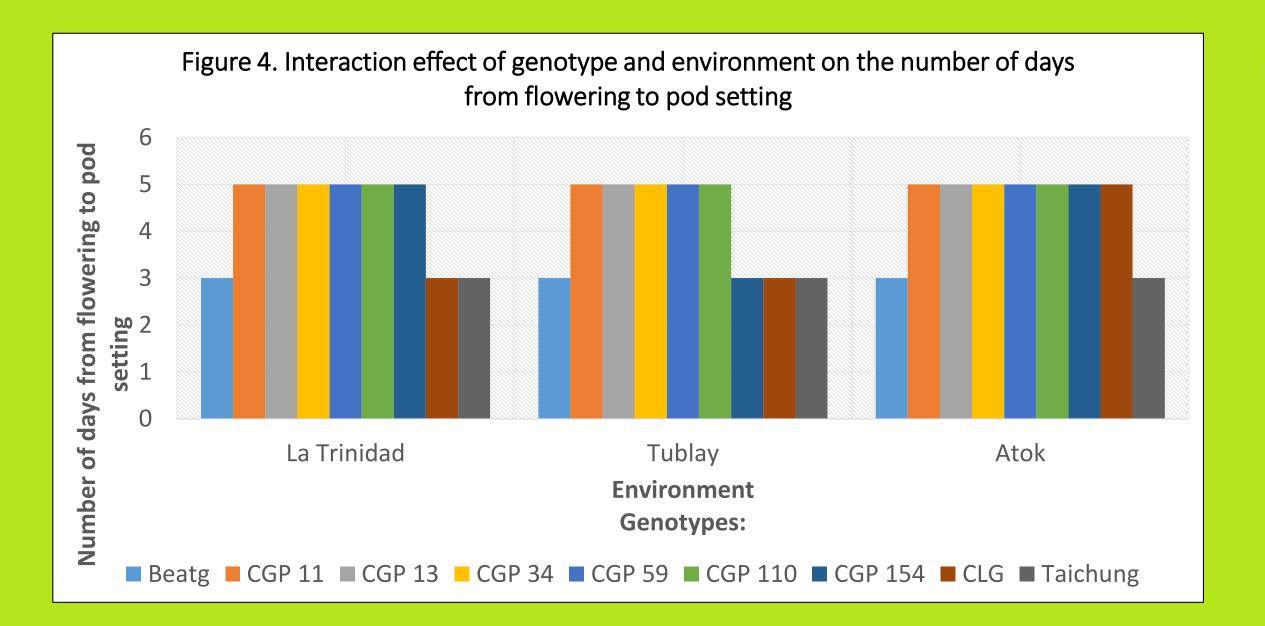


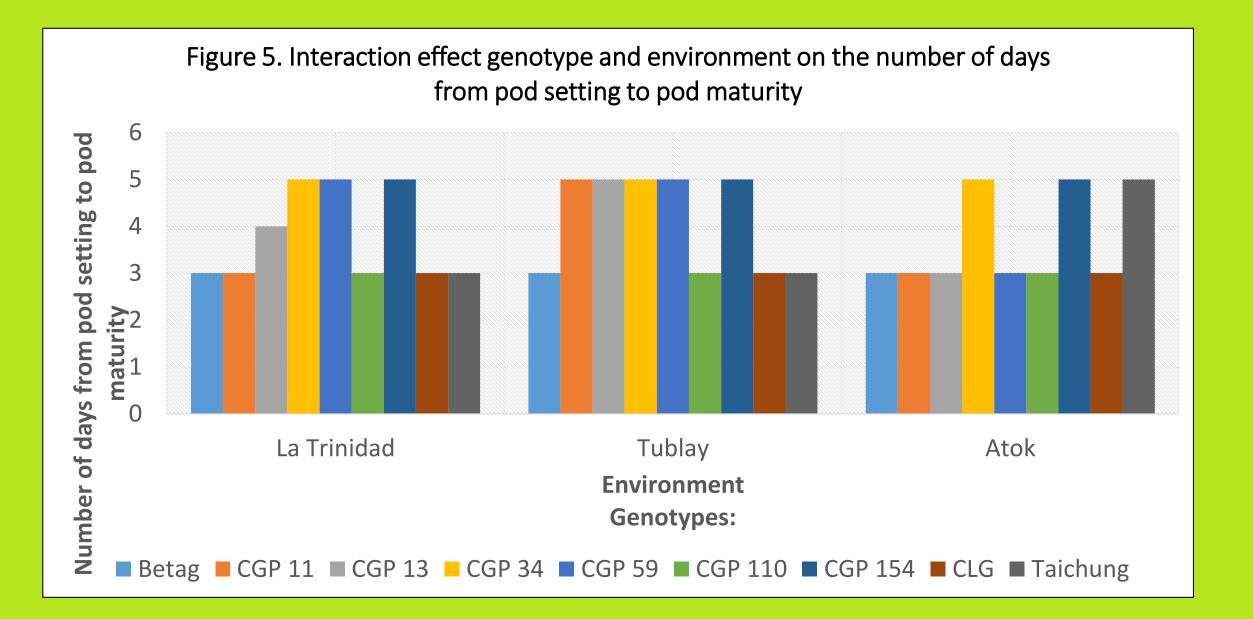


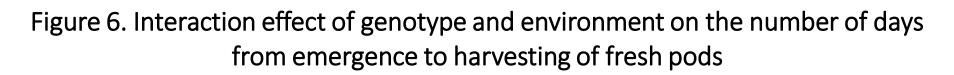


# Figure 3. Interaction effect of genotype and environment on the number of days from emergence to last flowering









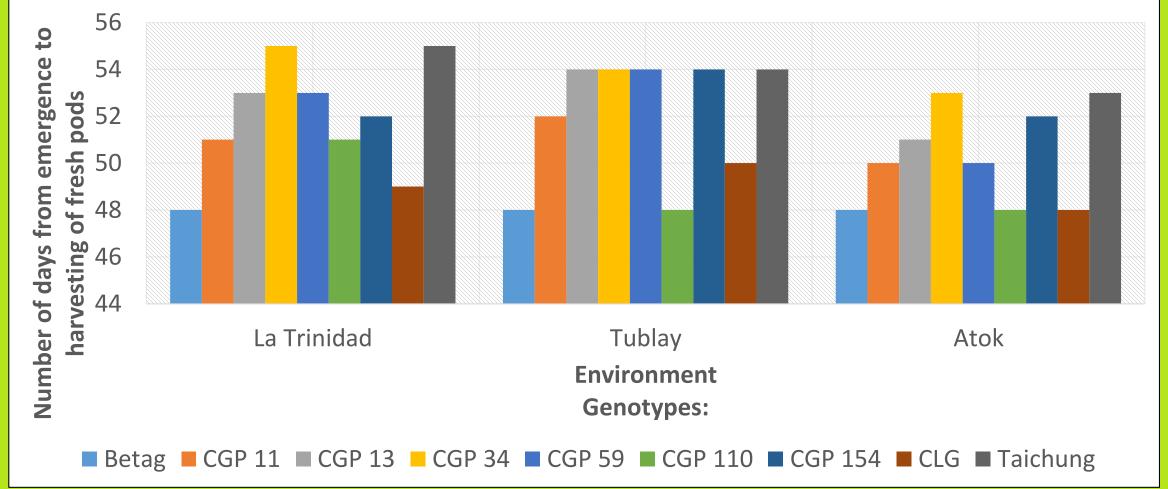


Table 5.		umber of flower per cluster and flower per plant of the nine garden pea genotypes grown in three												
	env	nvironments in Benguet												
		NUMBER OF FLOWER PER												
GENOTYPE			CLU	STER			PLA	NT						
		LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN					
Betag		1.43 <sup>c</sup>	1.40 <sup>cd</sup>	1.37 <sup>bcd</sup>	1.40 <sup>c</sup>	19.33	15.00 <sup>cde</sup>	19.67	18.00 <sup>bc</sup>					
CGP 11		1.40 <sup>cd</sup>	1.43 <sup>c</sup>	1.40 <sup>bc</sup>	1.41 <sup>c</sup>	20.00 14.00 <sup>de</sup>		22.33	18.78 <sup>bc</sup>					
CGP 13		<b>1.77</b> ª	1.70 <sup>ab</sup>	1.70 <sup>a</sup>	1.72 <sup>a</sup>	18.33	13.33 <sup>e</sup>	19.33	17.00 <sup>c</sup>					
CGP 34		1.70 <sup>a</sup>	1.73ª	1.73ª	1.72 <sup>a</sup>	21.67	16.33 <sup>c</sup>	23.00	20.33 <sup>ab</sup>					
CGP 59		1.57 <sup>b</sup>	1.53 <sup>bc</sup>	1.47 <sup>b</sup>	1.52 <sup>b</sup>	19.33	15.67 <sup>cd</sup>	18.33	17.78 <sup>bc</sup>					
CGP 110		1.30 <sup>de</sup>	1.40 <sup>dc</sup>	1.27 <sup>de</sup>	1.32 <sup>d</sup>	18.67	15.67 <sup>cd</sup>	19.33	17.89 <sup>bc</sup>					
CGP 154		1.27 <sup>e</sup>	1.23 <sup>de</sup>	1.33 <sup>cd</sup>	1.28 <sup>d</sup>	17.67	16.00 <sup>c</sup>	18.67	17.45 <sup>c</sup>					
CLG		1.00 <sup>f</sup>	1.00 <sup>f</sup>	1.00 <sup>f</sup>	1.00 <sup>e</sup>	22.67	22.33ª	21.33	<b>22.11</b> ª					
Taichung		1.37 <sup>cde</sup>	1.20 <sup>e</sup>	1.20 <sup>e</sup>	1.26 <sup>d</sup>	20.00	18.33 <sup>b</sup>	20.67	19.67 <sup>abc</sup>					
MEAN		1.42	1.40	1.39	1.40	19.74ª	16.30 <sup>b</sup>	20.30 <sup>a</sup>	18.78					
G x E					ns				ns					
CV (%)		7.59	6.41	5.75		15.20	5.86	9.93						

\*Means with same letter are not significantly different at 5% DMRT

\*Legend: ITR- La Tripidad Benguet: TR- Tublay Benguet: AR- Atok Benguet

Table 6.	Number of pods per cluster and pod per plant of nine garden pea genotypes grown in three environments in													
	Benguet													
		NUMBER OF PODS PER												
GENOTYPE			CLU	STER				ANT						
		LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN					
Betag		1.40 <sup>b</sup>	1.37 <sup>d</sup>	1.33 <sup>bc</sup>	1.37 <sup>c</sup>	9.33 <sup>b</sup>	8.33	12.33	10.00 <sup>c</sup>					
CGP 11		1.37 <sup>b</sup>	1.37 <sup>d</sup>	1.33 <sup>bc</sup>	1.36 <sup>c</sup>	9.67 <sup>b</sup>	8.33	12.33	10.11 <sup>c</sup>					
CGP 13		1.73 <sup>a</sup>	1.63 <sup>ab</sup>	1.63 <sup>a</sup>	<b>1.66</b> <sup>a</sup>	8.00 <sup>b</sup>	7.33	12.67	9.33 <sup>c</sup>					
CGP 34		1.67ª	1.77 <sup>a</sup>	1.63ª	1.69 <sup>a</sup>	15.33ª	9.33	13.00	12.55 <sup>ab</sup>					
CGP 59		1.47 <sup>b</sup>	1.57 <sup>bc</sup>	1.43 <sup>b</sup>	1.49 <sup>b</sup>	10.67 <sup>b</sup>	9.67	11.00	10.45 <sup>c</sup>					
CGP 110		1.27 <sup>b</sup>	1.43 <sup>cd</sup>	1.33 <sup>bc</sup>	1.34 <sup>c</sup>	10.67 <sup>b</sup>	8.33	11.33	10.11 <sup>c</sup>					
CGP 154		1.27 <sup>b</sup>	1.27 <sup>d</sup>	1.37 <sup>bc</sup>	1.30 <sup>c</sup>	8.00 <sup>b</sup>	9.00	10.67	9.22 <sup>c</sup>					
CLG		1.00 <sup>c</sup>	1.00 <sup>e</sup>	1.00 <sup>d</sup>	1.00 <sup>d</sup>	15.33ª	13.33	11.33	13.33ª					
Taichung		1.30 <sup>b</sup>	1.27 <sup>d</sup>	1.27 <sup>c</sup>	1.28 <sup>c</sup>	11.00 <sup>b</sup>	10.67	11.00	10.89 <sup>bc</sup>					
MEAN		1.39	1.41	1.37	1.39	10.89ª	9.37 <sup>b</sup>	11.74ª	10.67					
G x E					ns				*					
CV (%)		4.46	7.49	5.15		19.99	20.77	12.56						

\*Means with same letter are not significantly different at 5% DMRT

\*Legendy ITR- La Tripidad Benguety TR- Tublay Benguety AR- Atok Benguet

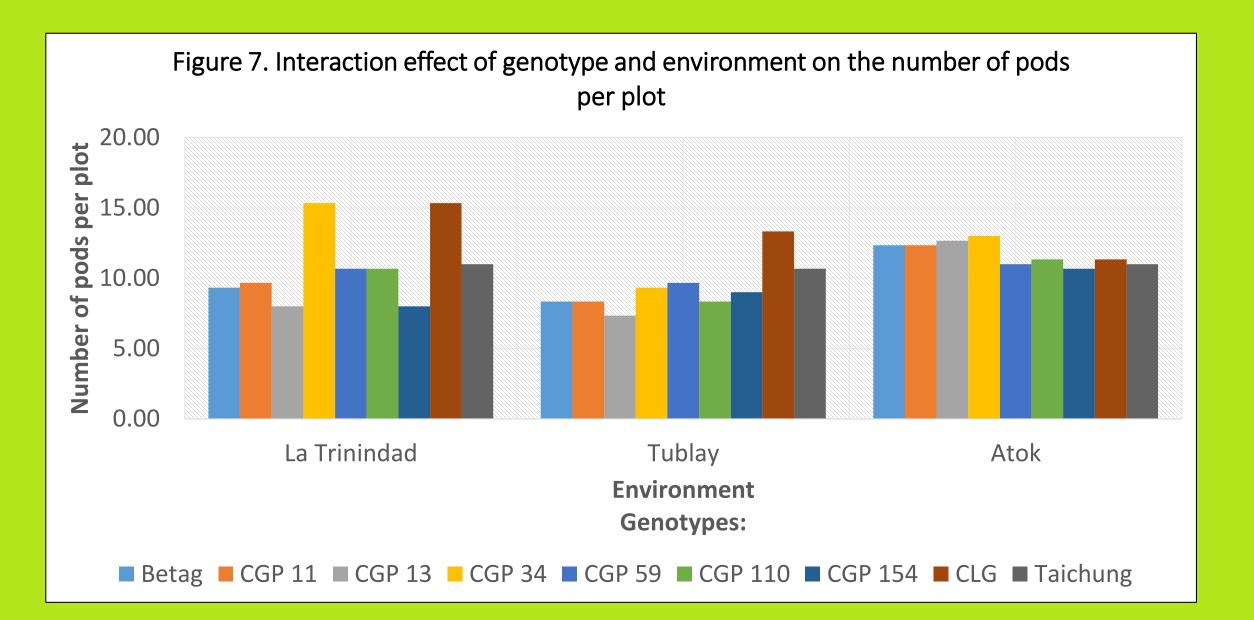
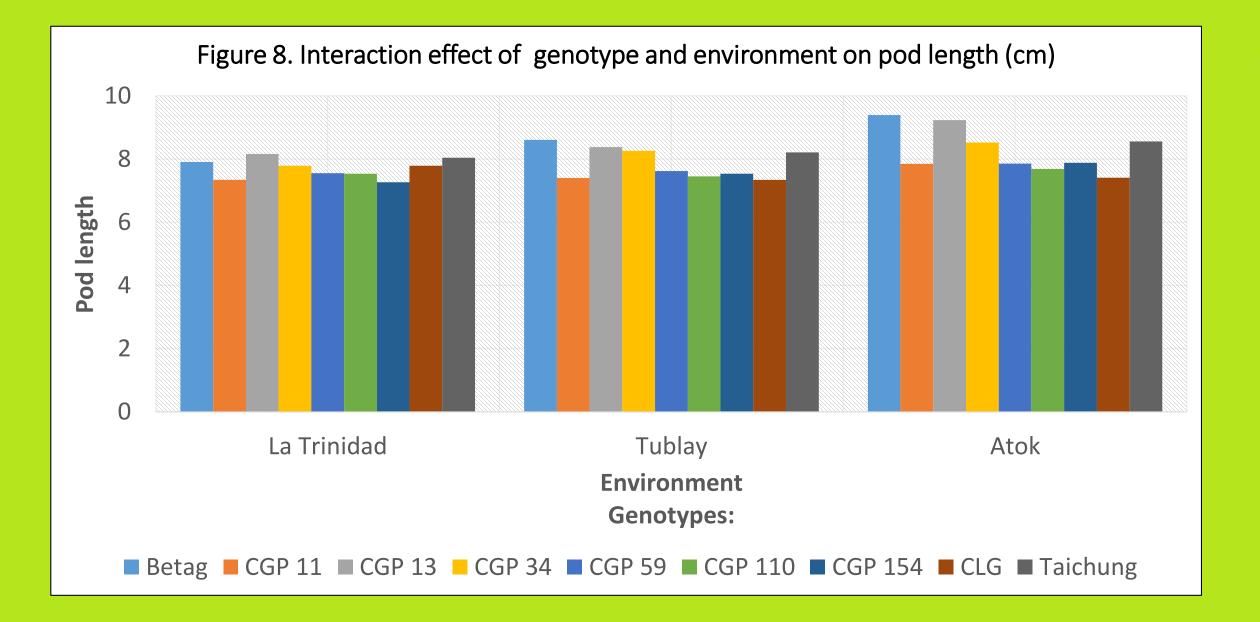


Table 7.	Poc	l length and p	ood width of	the nine garde	en pea genoty	pes grown in	three enviro	nments in Ben	guet		
GENOTYPE			POD LEN	IGTH (cm)		POD WIDTH (cm)					
		LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN		
Betag		7.91 <sup>ab</sup>	8.61ª	9.39 <sup>a</sup>	<b>8.64</b> <sup>a</sup>	1.42 <sup>b</sup>	1.50 <sup>ab</sup>	<b>1.67</b> <sup>a</sup>	1.53 <sup>a</sup>		
CGP 11		7.34 <sup>cd</sup>	7.40 <sup>b</sup>	7.85 <sup>c</sup>	7.53 <sup>c</sup>	1.39 <sup>bcd</sup>	1.34 <sup>cd</sup>	1.54 <sup>cde</sup>	1.42 <sup>cd</sup>		
CGP 13		8.16 <sup>a</sup>	8.38 <sup>a</sup>	9.23ª	8.59ª	1.47 <sup>a</sup>	1.51 <sup>ab</sup>	1.65 <sup>ab</sup>	1.54ª		
CGP 34		7.79 <sup>abc</sup>	<b>8.26</b> <sup>a</sup>	8.52 <sup>b</sup>	8.19 <sup>b</sup>	1.41 <sup>bc</sup>	1.53 <sup>a</sup>	1.57 <sup>cd</sup>	<b>1.50</b> ª		
CGP 59		7.55 <sup>bcd</sup>	7.62 <sup>b</sup>	7.86 <sup>c</sup>	7.68 <sup>c</sup>	1.38 <sup>bcd</sup>	1.43 <sup>bc</sup>	1.58 <sup>bc</sup>	1.46 <sup>b</sup>		
CGP 110		7.54 <sup>bcd</sup>	7.45 <sup>b</sup>	7.69 <sup>cd</sup>	7.56 <sup>c</sup>	1.36 <sup>d</sup>	1.36 <sup>cd</sup>	1.50 <sup>de</sup>	1.41 <sup>cde</sup>		
CGP 154		7.27 <sup>d</sup>	7.54 <sup>b</sup>	7.88 <sup>c</sup>	7.56 <sup>c</sup>	1.35 <sup>cd</sup>	1.36 <sup>cd</sup>	1.48 <sup>ef</sup>	1.40 <sup>de</sup>		
CLG		7.79 <sup>abc</sup>	7.34 <sup>b</sup>	<b>7.41</b> <sup>d</sup>	7.51 <sup>c</sup>	1.37 <sup>bcd</sup>	1.33 <sup>d</sup>	<b>1.43</b> <sup>f</sup>	1.38 <sup>e</sup>		
Taichung		<b>8.04</b> <sup>a</sup>	8.21ª	8.56 <sup>b</sup>	8.27 <sup>b</sup>	1.39 <sup>bcd</sup>	1.41 <sup>cd</sup>	1.53 <sup>cde</sup>	1.44 <sup>bc</sup>		
MEAN		7.71 <sup>c</sup>	7.87 <sup>b</sup>	<b>8.27</b> <sup>a</sup>	7.95	1.39°	1.42 <sup>b</sup>	1.55ª	1.45		
G x E					**				**		
CV (%)		3.15	4.12	2.51		1.90	3.47	2.46			
*Means with sam	e let	tter are not si	gnificantly di	ifferent at 5%	DMRT						

\*Legend: LTB= La Trinidad, Benguet; TB= Tublay, Benguet; AB= Atok, Benguet



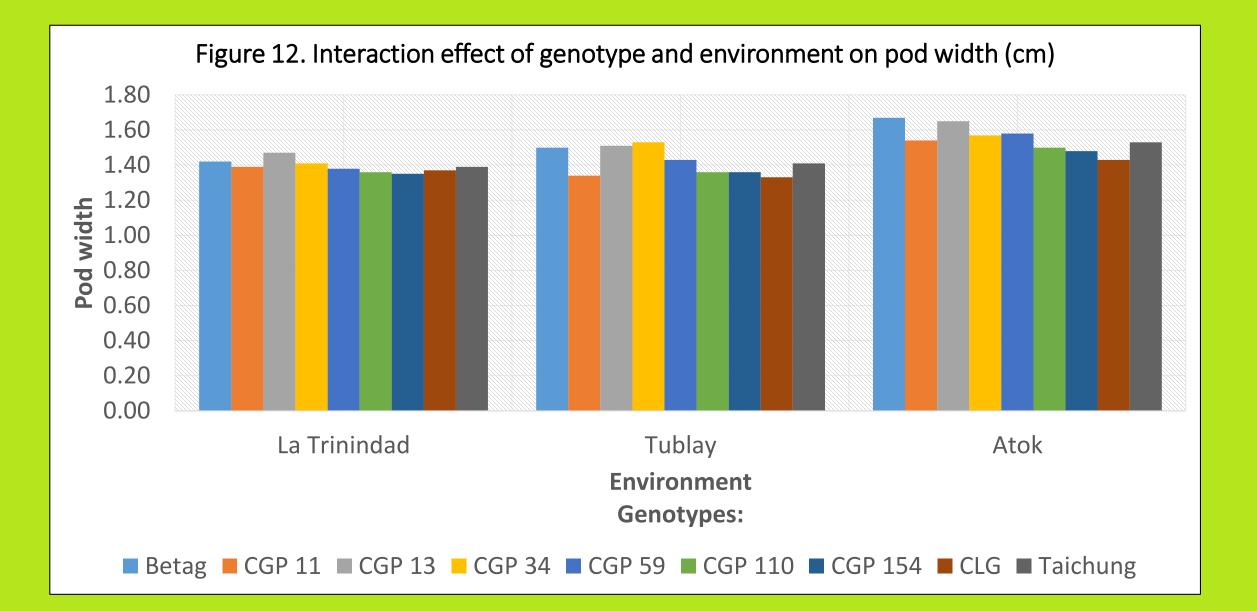
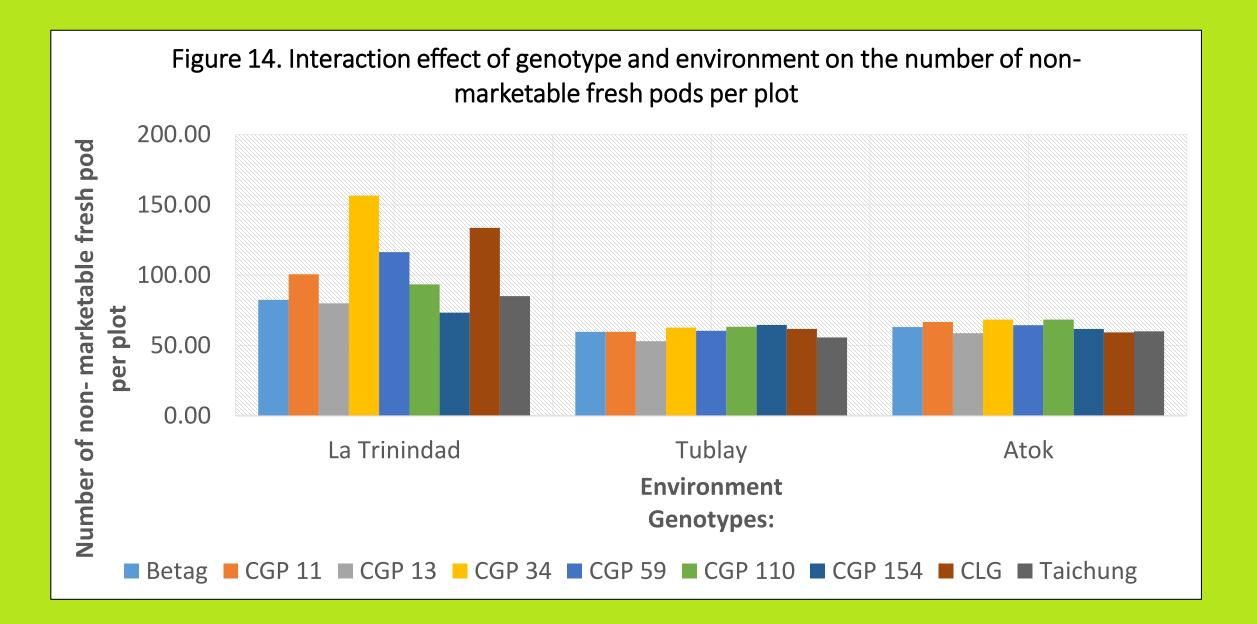


Table 8.	Number of marketable, non- marketable and total fresh pod per plot (3.75 m <sup>2</sup> ) of the nine garden pea genotypes grown in three environments in Benguet												
GENO-					NUMBER	OF PODS	PER PLOT	(3.75 m <sup>2</sup> )					
TYPE		MARKE	TABLE			NON- MA	RKETABLE			TO	TAL		
	LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN	
Betag	476.00 <sup>cde</sup>	420.67	752.33	549.67 <sup>cd</sup>	82.33 <sup>d</sup>	59.67	63.00	68.33 <sup>cd</sup>	558.33 <sup>def</sup>	480.33	815.33	618.00 <sup>de</sup>	
CGP 11	655.00 <sup>bcd</sup>	503.33	847.33	668.55 <sup>ab</sup>	100.67 <sup>cd</sup>	59.67	66.67	75.67 <sup>bcd</sup>	755.67 <sup>cde</sup>	563.00	914.00	744.22 <sup>bc</sup>	
CGP 13	428.00 <sup>de</sup>	373.00	828.33	543.11 <sup>dc</sup>	80.00 <sup>d</sup>	53.00	58.67	63.89 <sup>d</sup>	508.00 <sup>ef</sup>	426.00	887.00	607.00 <sup>e</sup>	
CGP 34	920.33ª	591.33	824.67	<b>778.78</b> <sup>a</sup>	156.67ª	62.67	68.33	95.89 <sup>a</sup>	1077.00 <sup>a</sup>	654.00	893.00	874.67 <sup>a</sup>	
CGP 59	707.33 <sup>abc</sup>	507.67	740.00	651.67 <sup>bc</sup>	116.33 <sup>bc</sup>	60.33	64.33	80.33 <sup>bc</sup>	823.67 <sup>bc</sup>	568.00	804.33	732.00 <sup>bcd</sup>	
CGP 110	692.33 <sup>abc</sup>	561.67	779.00	677.67 <sup>ab</sup>	93.33 <sup>cd</sup>	61.33	68.33	74.33 <sup>bcd</sup>	785.67 <sup>bcd</sup>	623.00	847.33	752.00 <sup>bc</sup>	
CGP 154	404.33 <sup>e</sup>	475.00	655.67	511.67 <sup>d</sup>	73.33 <sup>d</sup>	64.67	61.67	66.56 <sup>d</sup>	477.67 <sup>f</sup>	539.67	717.33	578.22 <sup>e</sup>	
CLG	886.33 <sup>ab</sup>	674.00	685.33	748.55 <sup>ab</sup>	133.67 <sup>ab</sup>	61.67	59.33	84.89 <sup>ab</sup>	1020.00 <sup>ab</sup>	735.67	744.67	833.45 <sup>ab</sup>	
Taichung	645.67 <sup>bcde</sup>	609.00	641.00	631.89 <sup>bc</sup>	85.00 <sup>cd</sup>	55.67	60.00	66.89 <sup>d</sup>	730.67 <sup>cdef</sup>	664.67	701.00	698.78 <sup>cde</sup>	
MEAN	646.15 <sup>b</sup>	523.96 <sup>c</sup>	750.41 <sup>a</sup>	640.17	102.37 <sup>a</sup>	59.85 <sup>b</sup>	63.37 <sup>b</sup>	75.20	748.52 <sup>b</sup>	583.82 <sup>c</sup>	813.78ª	715.37	
G x E				**				**				**	
CV (%)	20.09	20.71	13.16		17.04	7.50	10.25		18.27	18.86	12.52		

\*Means with same letter are not significantly different at 5% DMRT

\*Legend: ITR= La Trinidad Benguet: TR= Tublay Benguet: AR= Atok Benguet

#### Figure 13. Interaction effect of genotype and environment on the number of marketable fresh pods per plot 1000.00 per Number of marketable fresh pod 800.00 600.00 400.00 plot 200.00 0.00 La Trinidad Tublay Atok **Environment Genotypes:** ■ Betag ■ CGP 11 ■ CGP 13 ■ CGP 34 ■ CGP 59 ■ CGP 110 ■ CGP 154 ■ CLG ■ Taichung



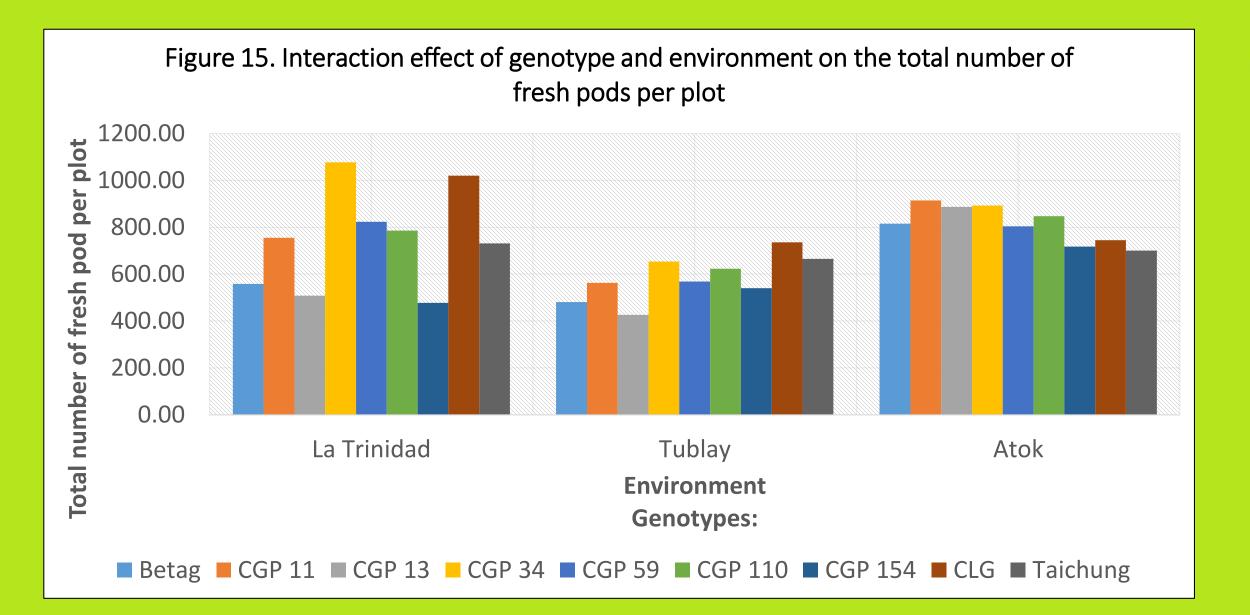


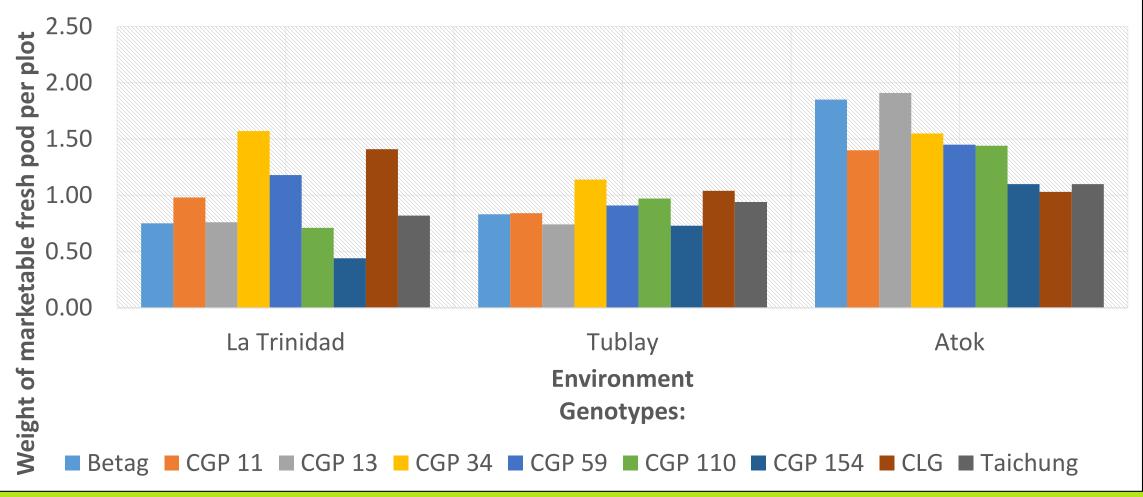
Table 9.Weight of marketable, non- marketable and total fresh pod per plot (kg/3.75 m²) of the nine garden pea genotypes<br/>grown in three environments in Benguet

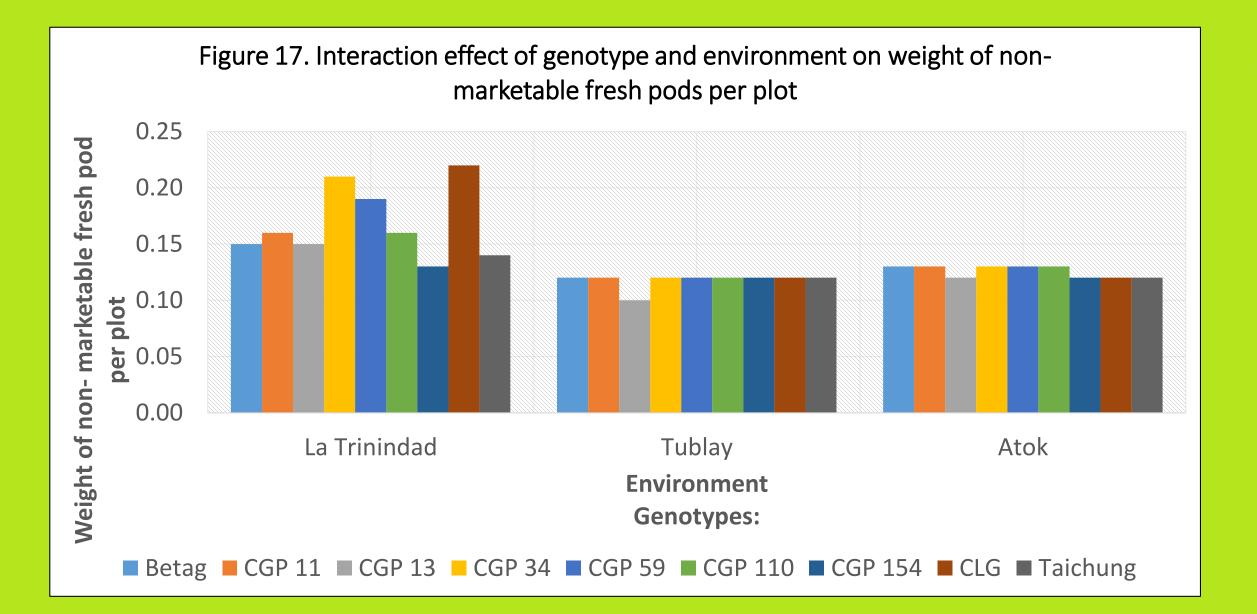
		WEIGHT OF PODS PER PLOT (kg/3.75 m <sup>2</sup> )													
GENOTYPE		MARK	ETABLE			NON- MARKETABLE				TOTAL					
	LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN	LTB	ТВ	AB	MEAN			
Betag	0.75 <sup>cd</sup>	0.83	1.85 <sup>ab</sup>	1.14 <sup>b</sup>	0.15 <sup>c</sup>	0.12	0.13	0.13 <sup>bc</sup>	0.90 <sup>cd</sup>	0.95	1.98 <sup>ab</sup>	1.28 <sup>b</sup>			
CGP 11	0.98 <sup>bc</sup>	0.84	1.40 <sup>bcd</sup>	1.07 <sup>b</sup>	0.16 <sup>bc</sup>	0.12	0.13	0.14 <sup>abc</sup>	1.15 <sup>bc</sup>	0.95	1.53 <sup>bcd</sup>	1.21 <sup>b</sup>			
CGP 13	0.76 <sup>cd</sup>	0.74	1.91 <sup>a</sup>	1.14 <sup>b</sup>	0.15 <sup>bc</sup>	0.10	0.12	0.12 <sup>c</sup>	0.92 <sup>cd</sup>	0.85	2.03 <sup>a</sup>	1.27b			
CGP 34	1.57 <sup>a</sup>	1.14	1.55 <sup>abc</sup>	1.42 <sup>a</sup>	0.21 <sup>a</sup>	0.12	0.13	0.15 <sup>a</sup>	1.78 <sup>a</sup>	1.26	1.68 <sup>abc</sup>	1.57 <sup>a</sup>			
CGP 59	1.18 <sup>abc</sup>	0.91	1.45 <sup>bcd</sup>	1.18 <sup>b</sup>	0.19 <sup>ab</sup>	0.12	0.13	0.15 <sup>a</sup>	1.37 <sup>abc</sup>	1.03	1.58 <sup>abcd</sup>	1.33 <sup>ab</sup>			
CGP 110	0.71 <sup>cd</sup>	0.97	1.44 <sup>bcd</sup>	1.04 <sup>b</sup>	0.16 <sup>bc</sup>	0.12	0.13	0.14 <sup>abc</sup>	0.87 <sup>cd</sup>	1.09	1.58 <sup>abcd</sup>	1.18 <sup>b</sup>			
CGP 154	0.44 <sup>d</sup>	0.73	1.10 <sup>cd</sup>	0.76 <sup>c</sup>	0.13 <sup>c</sup>	0.12	0.12	0.12 <sup>c</sup>	0.57 <sup>d</sup>	0.85	1.22 <sup>cd</sup>	0.88 <sup>c</sup>			
CLG	1.41 <sup>ab</sup>	1.04	1.03 <sup>d</sup>	1.16 <sup>b</sup>	0.22 <sup>a</sup>	0.12	0.12	0.15 <sup>a</sup>	1.63 <sup>ab</sup>	1.16	1.14 <sup>d</sup>	1.31 <sup>b</sup>			
Taichung	0.82 <sup>cd</sup>	0.94	1.10 <sup>cd</sup>	0.95 <sup>bc</sup>	0.14 <sup>c</sup>	0.12	0.12	0.13 <sup>c</sup>	0.96 <sup>cd</sup>	1.06	1.22 <sup>cd</sup>	1.08 <sup>bc</sup>			
MEAN	0.96 <sup>b</sup>	0.90 <sup>b</sup>	1.43 <sup>a</sup>	1.10	0.17 <sup>a</sup>	0.12 <sup>b</sup>	0.13 <sup>b</sup>	0.14	1.13 <sup>b</sup>	1.02 <sup>b</sup>	1.55 <sup>a</sup>	1.23			
G x E				**				**				**			
CV (%)	28.11	26.18	17.08		13.28	8.82	11.01		24.71	23.26	16.15				

\*Means with same letter are not significantly different at 5% DMRT

\*Lagand ITR- La Trinidad Banguat TR- Tublay Banguat AR- Atak Banguat

# Figure 16. Interaction effect of genotype and environment on the weight of marketable fresh pods per plot





#### Figure 18. Interaction effect of genotype and environment on the total weight of fresh pods per plot 2.50 per plot 2.00 Total weight of fresh pod 1.50 1.00 0.50 0.00 La Trinindad Tublay Atok **Environment Genotypes:** ■ Betag ■ CGP 11 ■ CGP 13 ■ CGP 34 ■ CGP 59 ■ CGP 110 ■ CGP 154 ■ CLG ■ Taichung

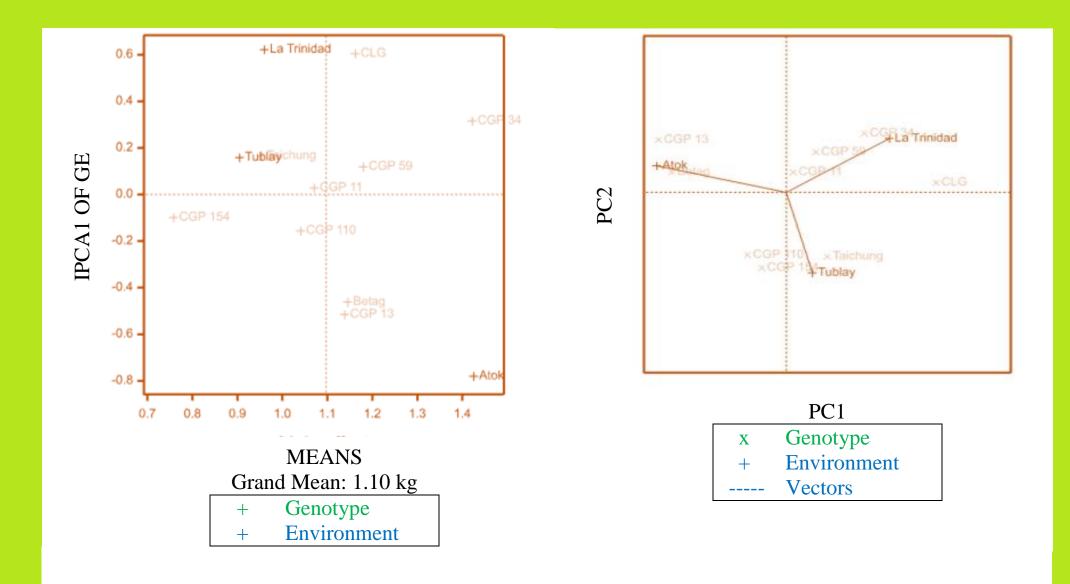


Figure 19. AMMI 1 and AMMI 2 biplot of nine garden pea genotypes evaluated for weight of marketable fresh pod per plot yield grown in three environments in Benguet

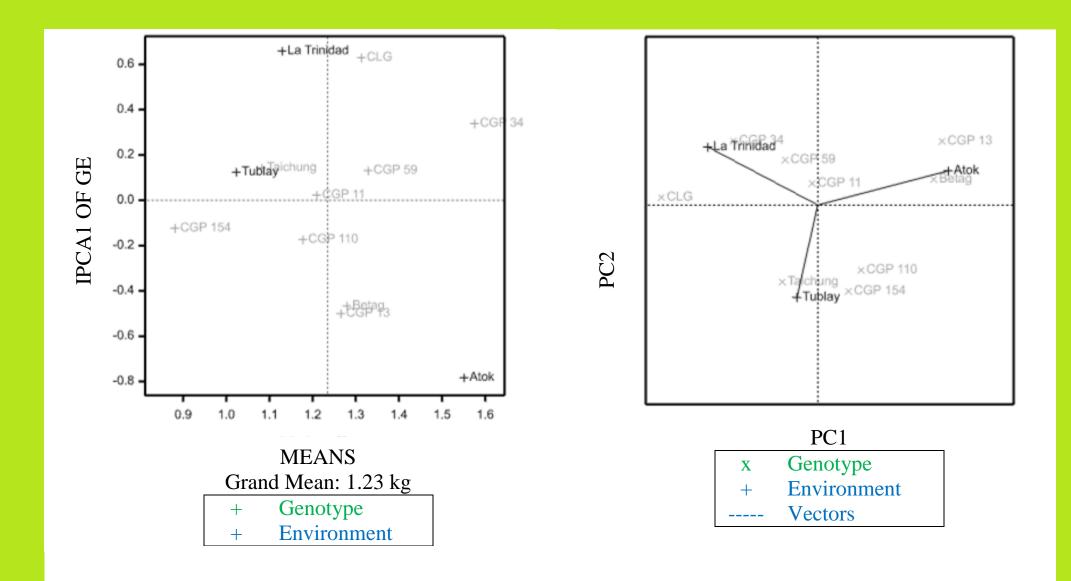


Figure 20. AMMI 1 and AMMI 2 biplot of nine garden pea genotypes evaluated for total weight of fresh pod yield per plot grown in three environments in Benguet

lable 10.	Rea	action on field	l incidence of	leaf miner on	the nine gard	en pea genoty	pes grown in				
	thr	nree environments in Benguet									
		INCIDENCE TO LEAF MINER AT									
GENOTYPE			45 DAP		60 DAP						
		LTB	ТВ	AB	LTB	ТВ	AB				
Betag		MR	MR	MR	HR	HR	HR				
CGP 11		MR	MR	MR	HR	HR	HR				
CGP 13		HR	MR	MR	HR	HR	HR				
CGP 34		HR	MR	MR	HR	HR	HR				
CGP 59		HR	HR	HR	HR	HR	HR				
CGP 110		HR	HR	MR	HR	HR	HR				
CGP 154		MR	MR	MR	HR	HR	HR				
CLG		HR	MR	HR	HR	HR	HR				
Taichung		HR	MR	HR	HR	HR	HR				
*Legend: LTB=	La T	rinidad, Beng	uet; TB= Tublay	, Benguet; AB=	= Atok, Bengue	t; HR= Highly ı	resistant; MR=				

Modoratoly registant

Table 11.	Rea	Reaction on field incidence of powdery mildew on the nine garden pea genotypes grown											
	in t	three environments in Benguet											
		INCIDENCE TO POWDERY MILDEW											
GENOTYPE			45 DAP		60 DAP			75 DAP					
		LTB	ТВ	AB	LTB	ТВ	AB	LTB	ТВ	AB			
Betag		HR	MR	HR	MR	MR	HR	S	S	MR			
CGP 11		HR	MR	HR	MR	MR	HR	S	S	MR			
CGP 13		HR	MR	HR	MR	MR	HR	S	S	MR			
CGP 34		HR	MR	HR	MR	MR	HR	S	S	MR			
CGP 59		HR	MR	HR	MR	MR	HR	S	S	MR			
CGP 110		HR	MR	HR	MR	MR	HR	S	S	MR			
CGP 154		HR	MR	HR	MR	MR	HR	S	S	MR			
CLG		HR	MR	HR	HR	MR	HR	MR	I	MR			
Taichung		HR	MR	HR	MR	MR	HR	MR	I	MR			

\*Legend: LTB= La Trinidad, Benguet; TB= Tublay, Benguet; AB= Atok, Benguet

HP- Highly resistant, MP- Mederately resistant, I- Intermediate, S- Suscentible

Table 12.	Rea	Reaction on field incidence of leaf spot on the nine garden pea genotypes grown in three											
	en۱	vironments in Benguet											
		INCIDENCE TO LEAF SPOT AT											
GENOTYPE			60 DAP		75 DAP			90 DAP					
		LTB	ТВ	AB	LTB	ТВ	AB	LTB	ТВ	AB			
Betag		HR	MR	HR	HR	I	MR	MR	I	MR			
CGP 11		HR	MR	HR	HR	I.	MR	MR	I	MR			
CGP 13		HR	MR	HR	HR	I	MR	MR	I	MR			
CGP 34		HR	MR	HR	HR	I	MR	MR	I	MR			
CGP 59		HR	MR	HR	HR	I	MR	MR	I	MR			
CGP 110		HR	MR	HR	HR	T	MR	MR	I	MR			
CGP 154		HR	MR	HR	HR	I	MR	MR	I	MR			
CLG		HR	MR	HR	HR	I	MR	MR	Ι	MR			
Taichung		HR	MR	HR	HR	I	MR	MR	Ι	MR			

\*Legend: LTB= La Trinidad, Benguet; TB= Tublay, Benguet; AB= Atok, Benguet

HD- Highly resistants MD- Mederately resistants I- Intermediate

Table 13.	Rea	action on	field inci	dence of	pod bore	r on the I	nine gard	en pea ge	notypes	grown in		
	thr	ree environments in Benguet										
		INCIDENCE TO POD BORER AT										
GENOTYPE			45 DAP			55 DAP			65 DAP			
		LTB	TB	AB	LTB	ТВ	AB	LTB	ТВ	AB		
Betag		MR	MR	HR	MR	MR	MR	I.	MR	MR		
CGP 11		MR	MR	HR	MR	MR	MR	I.	MR	MR		
CGP 13		MR	HR	HR	MR	HR	MR	I.	MR	MR		
CGP 34		MR	MR	HR	I	MR	MR	I.	MR	MR		
CGP 59		MR	MR	HR	I	MR	MR	I.	MR	MR		
CGP 110		MR	MR	HR	MR	MR	MR	I.	MR	MR		
CGP 154		MR	HR	HR	MR	MR	MR	I	MR	MR		
CLG		MR	MR	HR	I	MR	MR	S	MR	MR		
Taichung		MR	MR	HR	MR	MR	MR	I	MR	MR		

\*Legend: LTB= La Trinidad, Benguet; TB= Tublay, Benguet; AB= Atok, Benguet

HP- Highly resistant, MP- Mederately resistant, I- Intermediate, S- Suscentible

Table 14. Resul	t of sensory evaluation and general acceptability rating of nine garden pea genotypes grown in three environments in Benguet								
GENOTYPE	AROMA	COLOR	SHAPE	SIZE	TASTE	GENERAL ACCEPTABILITY			
LA TRINIDAD									
Betag	LM	LM	LM	LM	LM	Liked moderately			
CGP 11	LM	LM	LM	LM	LM	Liked moderately			
CGP 13	LM	LM	LM	LM	LM	Liked moderately			
CGP 34	LM	LM	LM	LM	LM	Liked moderately			
CGP 59	LM	LM	LM	LM	LM	Liked moderately			
CGP 110	LM	LM	LM	LM	LM	Liked moderately			
CGP 154	LM	LM	LM	LM	LM	Liked moderately			
CLG	LM	LM	LM	LM	LM	Liked moderately			
Taichung	LM	LM	LM	LM	LM	Liked moderately			
TUBLAY									
Betag	LM	LM	LM	LM	LM	Liked moderately			
CGP 11	LM	LM	LM	LM	LM	Liked moderately			
CGP 13	LM	LM	LM	LM	LM	Liked moderately			
CGP 34	LM	LM	LM	LM	LM	Liked moderately			
CGP 59	LM	LM	LM	LM	LM	Liked moderately			
CGP 110	LM	LM	LM	LM	LM	Liked moderately			
CGP 154	LM	LM	LM	LM	LM	Liked moderately			
CLG	LM	LM	LM	LM	LM	Liked moderately			
Taichung	LM	LM	LM	LM	LM	Liked moderately			
ATOK									
Betag	LVM	LVM	LVM	LVM	LVM	Liked very much			
CGP 11	LVM	LVM	LVM	LVM	LVM	Liked very much			
CGP 13	LVM	LVM	LVM	LVM	LVM	Liked very much			
CGP 34	LVM	LVM	LVM	LVM	LVM	Liked very much			
CGP 59	LVM	LVM	LVM	LVM	LVM	Liked very much			
CGP 110	LVM	LVM	LVM	LVM	LVM	Liked very much			
CGP 154	LVM	LVM	LVM	LVM	LVM	Liked very much			
CLG	LVM	LVM	LVM	LVM	LVM	Liked very much			
Taichung	LVM	LVM	LVM	LVM	LVM	Liked very much			
*Legend: 1- Dislike extremely (DE)	2- Dislike moderately (D	(1) 2 Noithor like por di	islika (NUND) 4 Likad	modoratoly (IM)	and E. Likod yory muc				

\*Legend: 1- Dislike extremely (DE). 2- Dislike moderately (DM). 3- Neither like nor dislike (NLND). 4- Liked moderately (LM). and 5- Liked very much (LVM)

Table 15.	Retur	n on cash expenses of nine garden pea genotypes grown in three environments in Benguet									
GENOTYPE		MARKETABLE YIELD (kg/ 3.75m <sup>2</sup> )	COST OF PRODUCTION (Php) <sup>a</sup>	GROSS SALES (Php)	NET INCOME (Php)	ROCE (%)					
LA TRINIDAD											
Betag		0.75	46.97	90.00	43.03	91.61					
CGP 11		0.98	46.97	117.60	70.63	150.37					
CGP 13		0.76	46.97	91.20	44.23	94.17					
CGP 34		1.57	46.97	188.40	141.43	301.11					
CGP 59		1.18	46.97	141.60	94.63	201.47					
CGP 110		0.71	46.97	85.20	38.23	81.39					
CGP 154		0.44	46.97	52.80	5.83	12.41					
CLG		1.41	46.97	169.20	122.23	260.23					
Taichung		0.82	46.97	98.40	51.43	109.50					
TUBLAY											
Betag		0.83	47.48	99.60	52.12	109.77					
CGP 11		0.84	47.48	100.80	53.32	112.30					
CGP 13		0.74	47.48	88.80	41.32	87.03					
CGP 34		1.14	47.48	136.80	89.32	188.12					
CGP 59		0.91	47.48	109.20	61.72	129.99					
CGP 110		0.97	47.48	116.40	68.92	145.16					
CGP 154		0.73	47.48	87.60	40.12	84.50					
CLG		1.04	47.48	124.80	77.32	162.85					
Taichung		0.94	47.48	112.80	65.32	137.57					
АТОК											
Betag		1.85	47.98	222.00	174.02	362.69					
CGP 11		1.40	47.98	168.00	120.02	250.15					
CGP 13		1.91	47.98	229.20	181.22	377.70					
CGP 34		1.55	47.98	186.00	138.02	287.66					
CGP 59		1.45	47.98	174.00	126.02	262.65					
CGP 110		1.44	47.98	172.80	124.82	260.15					
CGP 154		1.10	47.98	132.00	84.02	175.11					
CLG		1.03	47.98	123.60	75.62	157.61					
Taichung		1.10	47.98	132.00	84.02	175.11					
<sup>a</sup> Cost of production includes c	cost of s	seeds, labor and inputs and Fresh pods were solo	d at Php 120/ kg								

#### CONCLUSION

- The nine genotypes of garden pea differed significantly in growth and yield in the three locations
- Betag was the earliest maturing genotypes across environments
- CGP 34 and CLG are the best genotypes when grown in La Trinidad. They produced the highest marketable and total fresh pod yield per plot.
- In Tublay, CLG had the highest number of flower per plant and pods per plant.
- In Atok, Betag and CGP 13 had the highest fresh pod yield.
- Across environments, CGP 13 and CGP 34 had the highest number of flower and pods per cluster. CGP 34 and CLG had the highest number of marketable and total fresh pods per plot. CGP 34 had the heaviest marketable and total fresh pod yield per plot.

- Atok is the best environment for garden pea production. Garden pea grown in Atok were moderately resistant to powdery mildew at 75 DAP and less incidence of leaf spot and pod borer. Garden pea grown in Atok produced higher fresh pod yield than grown in La Trinidad and Tublay.
- Significant interaction effect of genotype and environment were observed on number of days from sowing to emergence, emergence to first and last flowering, flowering to pod setting, pod setting to pod maturity, emergence to harvesting, number of pods per plant, pod length and width, and number and weight of marketable, non- marketable and total fresh pod per plot.

### **Result of AMMI Analysis**

- CGP 11 was the most stable among the genotypes in terms of weight of marketable and total fresh pod yield per plot
- Betag, CGP 13, CGP 34, CGP 59 and CLG had weight of marketable and total fresh pods per plot greater than the grand mean indicating that they are high yielding garden pea genotypes in all environments
- CGP 11, CGP 34, CGP 59 and CLG had specific adaptability in La Trinidad
- CGP 110, CGP 154 and Taichung in Tublay
- Betag and CGP 13 in Atok.
- Garden pea production is most profitable in Atok

## RECOMMENDATION

• In terms of productivity, acceptability and profitability

✓ Betag, CGP 13, CGP 34, CGP 59 and CLG are recommended across environments
 ✓ In a specific environment



La Trinidad, Benguet



Tublay, Benguet



Atok, Benguet



• But in terms of stability, CGP 11 is recommended

 Atok is best recommended environment for garden pea production because garden pea when grown in Atok is high yielding and more profitable than when grown in La Trinidad and Tublay.







a. La Trinidad

b. Tublay



Hilling- up and trellising of the nine garden pea genotypes grown at three environments (a- c) in Benguet







#### Other cultural management done







Harvesting of the nine garden pea varieties

# Thank you for your kind attention! ③