

# Consumption Pattern and Marketing Practices of Selected Vegetables and Root Crops

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## ABSTRACT

With the economic, ethical and environmental consequential effects of consumption pattern, understanding its dynamics is essential to set suitable development direction of industries and environmental related policies. The study was designed to determine the consumption and marketing practices and factors affecting consumption, and analyze the demand and supply situation of vegetables and root crops. Measures of central tendencies, correlation and regression analysis were used in analyzing the data. Results revealed that consumers preferred fresh and classified crops and willing to pay a higher price without pesticides. The per capita consumption of vegetables in Region I was greater than the national level but lower in root crops. The freshness, price, non-usage of chemicals and nutritional value of products had a significant influence on the consumption. There is an enormous market shortage by 2015 onwards for these agricultural commodities. Therefore, the promotion of organic farming for vegetables and root crops be intensified. The grading and standardization practices according to size, variety, color and freshness be adopted. The development of other value-added product forms for the utilization of the industrial market be developed. Finally the support systems in the form of trainings, marketing and financial assistance be provided.

**Keywords:** consumption pattern, marketing practices, descriptive survey, La Union, Philippines

## INTRODUCTION

Vegetables and root crops are essential components of one's diet leading towards good health. Since these are rich in vitamins, minerals and plant proteins, the adequate consumption could help ensure the intake of most micronutrients and dietary fibers. Low vegetable intake is estimated to cause about 31% of ischemic heart disease and 11% of stroke worldwide. The WHO International Agency for Research on Cancer (IARC) estimates that the preventable percentage of cancer that is due to low vegetable and fruit intake ranges from 5-12% of all cancers and 20-30% of upper gastrointestinal tract cancers (usa.healthnet.org). Based on the 2002-2003 World Health Survey of World Health Organization, mostly low and middle-income countries including the Philippines consume less than the minimum recommended five daily servings of vegetables and fruits (World Health Organization, 2005). Filipinos consume 163 grams of vegetables a day and is short of 107 grams based on the recommended per capita consumption (Peltzer and Pengpid, 2012).

Similarly, roots crops are good sources of carbohydrates and contain dietary fiber, Vitamin C, calcium, phosphorus, and iron (World Bank Atlas, 2007). In the Philippines, root crops that include taro, yam, sweet potato are grown in about half a million hectares and contribute roughly four percent of gross value added by agriculture. About 3-4 million poor people depend on root crops for livelihood because they cultivate marginal land where only these crops can grow and yield productively with minimal care and input. To these poor households, root crops are essential livelihood resources for food supply and cash income. Interestingly, the value-adding potential of root crops is now recognized as the industrial market expands rapidly considering the commercial product forms such as cakes, candies, pastries, and cookies.

Moreover, the consumption of these crops affects the industry. The Philippines roughly produces 717,000 metric tons (MT) of vegetables every year. The revenues in vegetable production reached almost P30 billion a year, making up 9 to 10 percent of the country's total crop sales in 2003. The Cordillera region brings in nearly a quarter of the total vegetable production, while Ilocos Region and Central Luzon contributed 20% and 15%, respectively. These vegetables are cultivated in about 130,000 hectares, a figure that varies erratically depending on current trends. On these lands, about 900,000 farmers grew vegetables, generate income and make a living. Among the vegetable crops, eggplant had the highest production level that reached at least 166,000 MT yearly or 18% of the total vegetable production (Batt, Concepcion, Dagupen, Lizada, Prior, 2007).

Likewise, the production of sweet potato, taro and yam in 2012 increased by 2.69 percent or 140.7 thousand metric tons in 2012. The supply of production of sweet potato alone in 2012 increased by 516,365 metric ton. The top root crops producers were Bicol Region and Eastern Visayas, with respective 29 percent and 22 percent shares in the country's total output (Bureau of Agricultural Statistics, 2012). However, the income elasticity of demand for root crops is small but positive (Bureau of Agricultural Statistics, 2012).

The consumption pattern as reflected in food preferences and buying habits, are related to values, interests, roles, activities and social-psychological orientation. It has consequential effects on economic, environmental and ethical conditions which are now gaining much attention due to the changing world climatic circumstances. The unsustainable pattern of consumption and production of vegetables and root crops contributes to the continued deterioration of the environment. As population increases, the demand for agricultural crops rises that impinge the volatility of market and climate change due to the alteration of landscapes, water sources and incidence of chronic diseases. The situation poses an impasse to rethink what product to eat and how these crops are produced, distributed, processed, sold, prepared and disposed (Strategy Unit, 2008).

Moreover, the consumption pattern affects the development of the industry that is also dependent on the market trend. Since the market trend depends on consumption preferences, it is therefore necessary to assess the affecting factors.

As the development of vegetables and the root crops industries is pursued primarily in La Union, it is essential to evaluate the consumption pattern of these crops as basis for formulating policies and programs dealing with industry development and climate change mitigation.

## **Objectives**

The study was conducted specifically to:

1. determine the consumption pattern of consumers of vegetables and root crops in terms of:
  - a. kind
  - b. per capita consumption
  - c. Buying attitude
2. determine the marketing practices;
3. trace the marketing channel;
4. determine the problems encountered by consumers and sellers.
5. determine the influence of buying factors for consumption; and
6. analyze the demand and supply situation of vegetables.

## **Framework for the Study**

There are variables that affect the development of vegetable and roots crops industry that are categorized in three parameters, namely: consumption pattern, market situation and socio-economic characteristics (Figure 1). These variables include consumption preferences, buying behavior, marketing practices, market channel, supply and demand situation, and, the socio economic characteristics of stakeholders. Information that could be drawn from the findings of the study could serve as benchmark data in framing policies and programs related

to projects about vegetables and root crop. These include food supply chain and mitigating activities to address the deteriorating climatic condition.

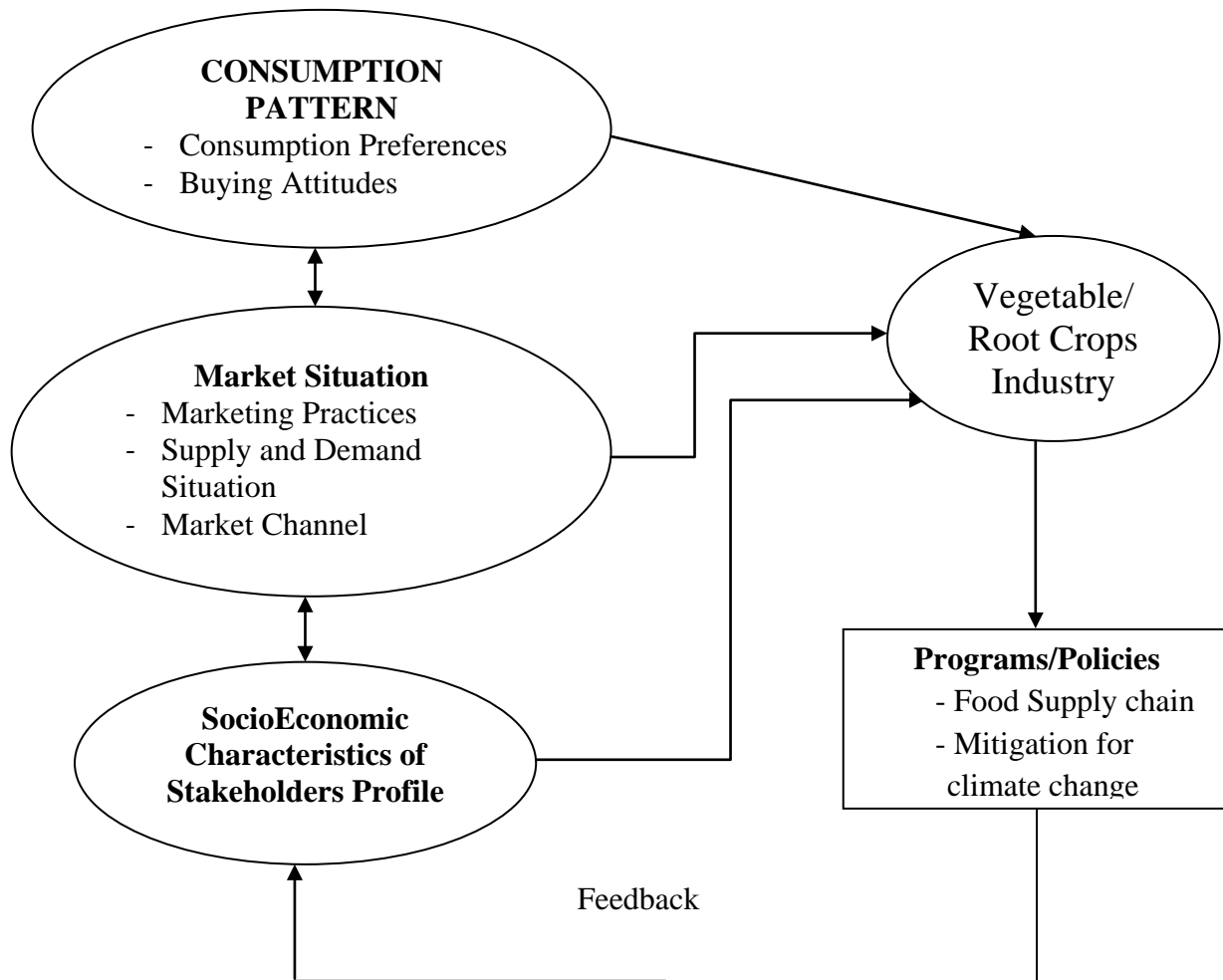


Figure1. Schematic Diagram of the Study

## METHODOLOGY

The descriptive research design and the stratified purposive random sampling was employed in gathering data with the aid of two sets of questionnaire schedules, one for consumers and one for sellers. There were three hundred respondents for vegetables and four hundred twenty respondents for root crops randomly selected from the top vegetable and root crops producing municipalities and commercial centers of La Union. Likewise, the respondents were selected from the list of registered sellers of each municipality.

The data were analyzed using frequency counts, percentages, weighted means, and ranks. A regression model was used in analyzing the demand and supply market condition. Likewise, the correlation analysis was used in determining the extent of effect of the buying behaviors on the level of consumption. The degree of seriousness of problems encountered by the sellers and consumers was determined using the descriptive evaluation and quantitative ranges of value noted below.

Quantitative Value	Range Value	Descriptive Evaluation
5	4.20 - 5.00	very serious/extreme effect
4	3.40 - 4.19	serious/high effect
3	2.60 - 3.39	moderately serious/effect
2	1.80 - 2.59	less serious/slightly effect
1	1.00 - 1.79	not serious/no effect

## RESULTS AND DISCUSSION

### Consumption Behaviors and Buying Attitudes

**Dietary vegetable consumption for meals.** The consumers claimed that vegetables were food next to rice in the dietary meals (Table 1). Vegetables are eaten especially for lunch and dinner but not so during breakfast as it registered as the fifth in rank among the foods taken. The findings reveal that consumers in La Union are vegetarian as vegetables were taken with all meals. The preference for vegetables could be accounted to its availability, convenience in cooking and price affordability.

Table 1. Percentage Rank and Proportion of Consumers by Commodity Consumption in Dietary Meals (Multiple Responses)

Item	Breakfast		Lunch		Dinner		Overall	
	%	Rank	%	Rank	%	Rank	Ave %	Rank
Rice	78	2	99	1	94	1	90	1
Vegetables	38	5	95	2	61	2	65	2
Fish	35	6	65	5	63	3	54	3
Meat	25	7	85	3	50	4	53	4
Fruits	50	4	66	4	38	5	51	5
Eggs	79	1	25	7	30	6	4	6
Other Cereals & bread	74	3	41	6	17	7	44	7

**Kind of commodity preferences.** Among the vegetables, the eggplant, bitter melon, squash, and string beans were the most preferred vegetables. As to variety of root crops, the sweet potato was the most preferred product and yam was the least preferred by the consumers probably because of its convenience in preparing it. These root crops are easily washed, cooked and served (Table 2).

Table 2. Rank of Commodity Preferred by Consumers in La Union, Philippines.

Commodity	Rank
<b>Vegetables</b>	
Eggplant/talong ( <i>Solanum melongena</i> )	1
Bitter gourd/ampalaya ( <i>Momordica charantia</i> )	2
Squash/kalabasa ( <i>Cucurbita maxima</i> )	3
String beans/sitaw ( <i>Phaseolus vulgaris</i> )	4
Tomato/kamis ( <i>Solanum lycopersicum</i> )	5
Malunggay ( <i>Moringa oleifera</i> )	6
Lady finger/Okra ( <i>Abelmoschus esculentus</i> )	7
Winged bean/cigarillos ( <i>Psophocarpus tetragonolobus</i> )	8
Lima bean/patani ( <i>Phaseolus lunatus</i> )	9
Hyacinth bean/bat au ( <i>Dolichos lablab</i> )	10
Finger pepper/sili ( <i>Capsicum annuum</i> var. longun)	11
<b>Root Crops</b>	
Sweet potato/camote ( <i>Ipomea batatas</i> )	1
Taro/gabi ( <i>Colocasia esculenta</i> )	2
Yam/ube ( <i>Dioscorea alata</i> )	3

**Per Capita Consumption of Commodity.** The per capita consumption (PCC) of vegetables in Region I and La Union was higher than the national level (Fig. 2a). The PCC on eggplant, bitter gourd, lady finger, tomato and squash in Region I were higher than the national level by 27%, 54%, 94%, 8%, respectively (Fig. 2b). Among the provinces in Region I, Ilocos Norte and Pangasinan registered as the highest and lowest, respectively (Appendix Table 1).

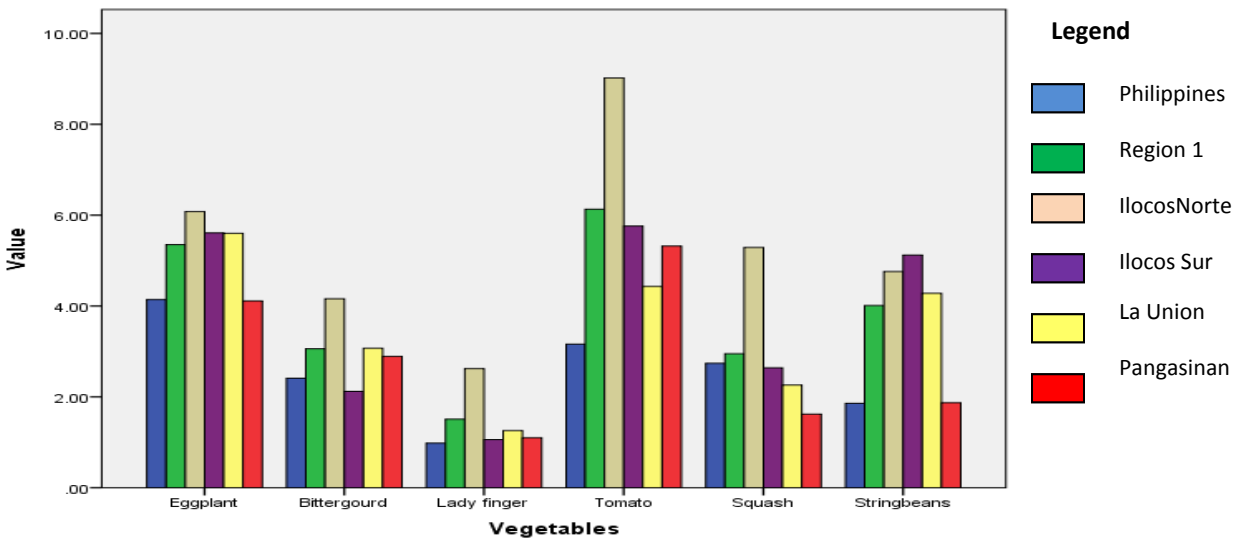


Figure 2a. Per Capita Consumption of Vegetables by Area Coverage (2012)

However, the PCC on root crops in Region I and La Union were lower than the national level (Fig. 2b). The PCC on sweet potato in Region I and La Union were less than the national level by 48% and 16%, respectively.

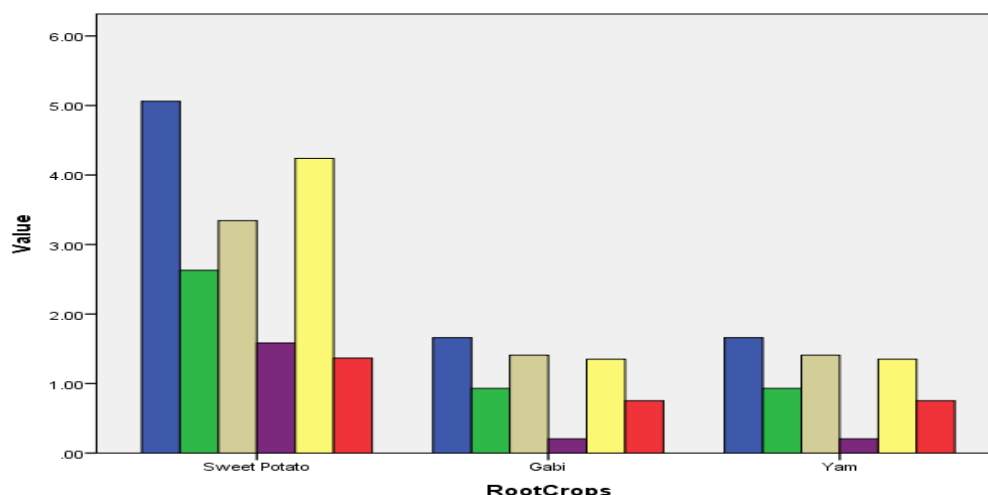


Figure 2b. Per Capita Consumption of Root Crops by Area Coverage (2012)

Likewise, the PCC of taro and yam were lower than the national level by 46 and 19% respectively. The PCC in La Union was registered as the highest among the provinces probably because it had higher productions that were utilized for different product forms.

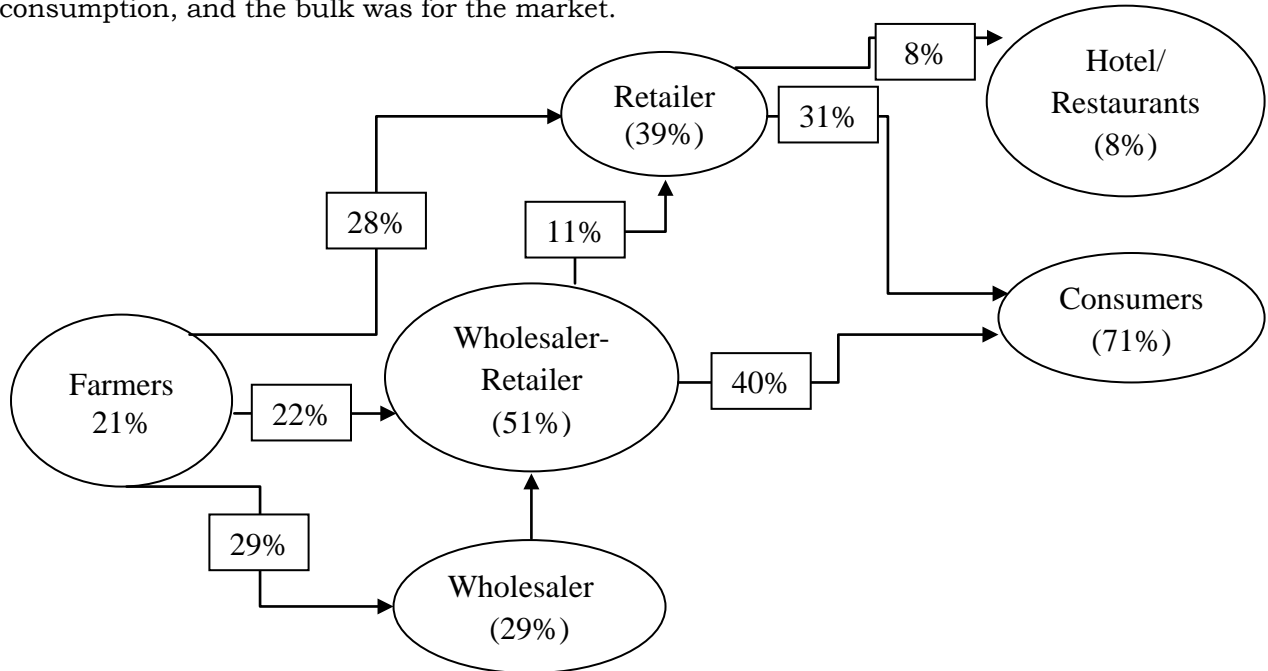
**Consumer's Attitude in Buying Commodity.** Most consumers preferred fresh, classified and without pesticides applied to these crops despite having higher price (Table 3). It implies that consumers were more sensitive to the quality than the price of products. It also indicates that the consumers were health conscious. This finding suggests that organic farming should be encouraged. Such implication jibes with the contention of Foster, Green, Bleda (2007) stressing that food consumption has environmental effects.

Table 3. Attitude of Consumers towards Price, Grading and Chemical Usage

Attitudes	Vegetables		Root Crops	
	f	%	f	%
Towards Price				
Fresh products with higher price	166	95	200	95
Not fresh with lower price	9	5	10	5
Towards Grading				
Classified	108	62	149	56
Unclassified	66	38	61	44
Towards Chemicals Usage				
Higher price without pesticide	145	83	162	77
Higher rate with pesticide	13	7	14	7
Lower price with pesticide	8	5	7	3
Does not mind at all	9	5	27	13
Toward General Appearance				
Products that appears to be fresh	106	61	168	80
Products without perforations	27	16	13	6
Classified/Sorted products	22	12	19	9
Unclassified/Unsorted products	20	11	8	4

## Marketing Practices

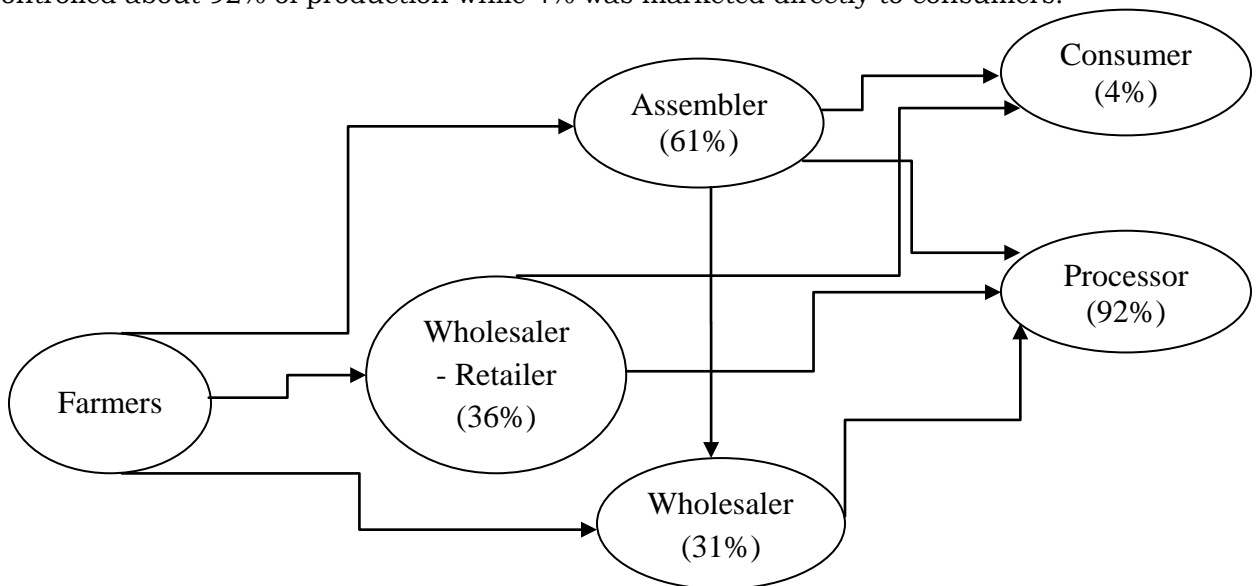
**Market Channel.** Vegetable production in La Union is distributed to different market intermediaries (Fig. 3). About 21% of the productions by the farmers were used for home consumption, and the bulk was for the market.



**Fig. 3. Market Channel of Vegetables in La Union**

The wholesaler handled 29% of the total production, 51% by the wholesaler-retailer and 39% by the retailer. The final consumers composed of service establishments such as hotels and restaurants consumed about 8% of the production while the largest parts were for direct customers.

Likewise, root crops productions in La Union were distributed to different market intermediaries (Fig.4). About 4% of the productions by the farmers were used for home consumption, and the bulk was for the market. The wholesaler handled 31% of the total output, 36% by the wholesaler-retailer and 61% by the assembler-retailer. The processors controlled about 92% of production while 4% was marketed directly to consumers.



**Fig 4. Market Channel of Root Crops in La Union.**

**Marketing Practices of Crops.** Majority of the sellers purchased these commodities from La Union probably because these crops are readily available and affordable. Few (5%) of them bought the vegetables while 3% of them purchased root crops from other provinces that indicated that the production in the province is not sufficient. Likewise, majority of them bought their products from the farmers most likely because they were more or less guaranteed at a lower price. The findings revealed that some sellers were not entirely dependent on market intermediaries but their farm as a buffer stock in case of limited supply.

There were activities undertaken by the sellers in purchasing and disposing of product. Majority of the products sold were all delivered to the market, bought on pakyaw term, sorted and paid on a cash basis (Table 4).

Table 4. Marketing Practices of Vegetable Sellers in Purchasing the Products.

Marketing Practices	Percent of Purchase (%)	
	Vegetable	Root Crops
Area Coverage		
La Union	95	97
Outside Region 1	5	3
Source of Supply		
Own Farm	23	17
Farmer	77	83
Mode of Purchasing		
Delivered in the market	90	87
Direct from the farm	10	13
Tenurial Term		
On Contract Basis	45	45
Pakyaw Basis	55	55
Mode of Payment		
Cash Basis	78	92
Credit Basis	22	8
Grading & Standardization		
In securing products		
Sorted	84	87
Unsorted	16	13
In disposing of products		
Sorted	70	91
Unsorted	30	9

**Consideration in the Consumption of Commodity.** Among the considerations in the consumption of crops that were perceived to have effects on the consumption pattern, the freshness and tenderness and health and benefits were the foremost (Table 5).



Table 5. Consideration in the Consumption Pattern of Consumers.

Consideration	Vegetable			Root Crops		
	Weighted Mean	Rank	Description	Weighted Mean	Rank	Description
Freshness and tenderness	4.5	1	Extreme Effect	3.4	6	High Effect
Price (affordability)	4.0	2	High Effect	3.6	5	High Effect
Free of chemicals	3.9	3	High Effect	3.7	4	High Effect
Convenience to buy (readily available)	3.8	4	High Effect	3.2	7	Moderate Effect
General Appearance	3.6	5	High Effect	3.8	3	High Effect
Variety	3.4	6	High Effect	3.9	2	High Effect
Health benefits / nutritional value	3.3	7	Moderate Effect	4.2	1	Extreme Effect
Mean	3.78		High Effect	3.73		High Effect

The other secondary considerations which also had a high impact on the buying attitude of consumers include price, general appearance, variety, chemical usage and convenience in buying.

### Problem Encountered by Sellers

The sellers encountered several marketing problems which were considered serious in the case of vegetables and moderately serious in root crops (Table 6). The lack of knowledge of post harvest practices and insufficient capital were considered as the foremost serious problems. Other problems regarded as serious problems for vegetables include: poor storage facilities, limited suitable display areas, seller-buyer relationship and inadequate transportation. In the case of root crops, limited control of price, insufficient capital, and poor quality of products and limited supply are regarded as serious problems. The “limited of supply” problem could be traced to the fact that farmers are planting only for home consumption and not tapping the market demand. To address this issue, the sellers need to devise marketing strategy for providing incentive to farmers who would guarantee a regular supply of root crops.

Table 6. Problems Encountered by Sellers.

Problems	Vegetables			Root Crops		
	Weighted Mean	Rank	Descriptive Equivalent	Weighted Mean	Rank	Descriptive Equivalent
Lack of knowledge of post harvest practices	3.9	1	Serious	3.1	4	Moderately Serious
Inadequate storage facilities	3.8	2	Serious	2.9	6	Moderately Serious
Limited suitable display areas	3.7	3	Serious	2.8	8	Moderately Serious
Seller-buyer relationship (Suki)	3.6	4	Serious	2.6	9	Moderately Serious

Inadequate Transportation	3.5	5	Serious	3.0	5	Moderately Serious
Oversupply	3.4	6	Serious	1.8	10	Less Serious
Limited control of price	3.3	7	Moderately Serious	3.2	3	Moderately Serious
Insufficient Capital	3.1	8	Moderately serious	3.4	1	Serious
Poor quality	3.0	9	Moderately serious	2.7	7	Moderately Serious
Limited supply	2.8	10	Moderately serious	3.3	2	Moderately Serious
Mean	3.41		Serious	2.88		Moderately Serious

### Factors Affecting Production and Consumption

**Socio-economic factors.** Among the socio-economic factors, income and education were found to have significant influence on the consumption of bitter gourd, eggplant, string beans and tomato (Table 7). It implies that as income increase and education moves to a higher level, the consumption of these crops increases. Likewise, age and household size were found to have significant influence only in the consumption of sweet potato. It implies that there is no difference in the consumption of vegetables between young and old consumers. The result jibes with the findings of Verbeke and Lopez (2005) citing that income and education are significant factors on food consumption. The findings reflects the changing consumption pattern attributed to the changes in lifestyles as reported by Drewnowski (1997). He stressed that the changes in diets often referred to as “nutrition transition” is affected by the interaction of complex factors which change at an accelerating pace such as beliefs, traditions, social and economic factors.

Table 7. Correlation Analysis of Factors Affecting Consumption

Demographic Factors	CROPS				
	Bittergourd	Eggplant	String beans	Tomato	Sweet Potato
Age					
P-value	.223	.364	.319	.272	.0493*
Income					
P-value	.001**	.04*	.001**	.003**	.274
Household size					
P-value	.235	.245	.476	.254	.012*
Gender					
P-value	.356	.11	.309	.449	.018*
Education					
P-value	.048*	.036*	.045*	.003**	.329

**Legend:** \*/\*\* - Significant ns - not significant

Similarly, age has no significant influence on the consumption of root crops except sweet potato (Table 7). In the case of root crops, regression analysis reveals that age significantly affect consumption of sweet potato but not on gabi. It implies that there is no

difference in the consumption of young and old consumers in the consumption of vegetables, taro and yam root crops.

**Buying behavior factors.** Among the buying behaviors, freshness, price, general appearance, chemical usage and nutritional value of products were the factors that affect consumption of some vegetables and root crops (Table 8).

Table 8. Correlation Analysis of Buying Factors on the Consumption of Commodity.

Factors	Vegetable			Root Crops	
	Bitter-gourd	Finger pepper	Lady-finger	Malunggay (Young Pod)	Sweet Potato
	p-value	p-value	p-value	p-value	p-value
freshness and tenderness	.021*				
price (affordability)		.000*			.001*
General appearance				.009*	
Not sprayed with chemicals		.001*			.038*
Health benefit/nutritional value			.016*		
Convenience to buy (easily available)					.001*
Texture					.029*

Legend : \* -significant                      ns – not significant

Among the root crops, the price, convenience and non-usage of chemicals were the significant buying factors in sweet potato but not to other root crops. It implies that consumers were more crucial in sweet potato than taro and yam root crops which were bought regardless of the condition.

### Supply and Demand Analysis of Commodity

**Supply.** There was an increasing trend of production in eggplant, bitter gourd and squash while decreasing trend in tomato and erratic trend in okra, from 2006-2010 (Table 9). Similarly, there was an increasing trend of production in sweet potato and taro from the year 2003-2008 (Table 10)

Table 9. Historical Production of Vegetables (tons)

Year	Production (tons)				
	Eggplant	Bittergourd	Squash	Tomato	Okra
2006	190,097	89,210	306,305	170,754	25,058
2007	193,880	95,009	324,591	169,968	25,131
2008	197,739	101,184	343,969	169,186	25,204
2009	201,674	107,761	364,504	168,408	25,277
2010	205,687	114,766	386,265	167,633	25,350

Source: International Monetary Fund-2011 World Economic Outlook

Table 10. Historical Production of Sweet Potato and Taro

Year	Production of sweet potato (mt.)	Production of taro (mt.)	Production of yam (mt.)
2003	546,971	100,705	100,705
2004	545,147	102,274	102,274
2005	574,629	109,700	109,700
2006	566,773	111,942	111,942
2007	573,734	113,954	113,954
2008	572,655	115,958	115,958

Source: International Monetary Fund-2011 World Economic Outlook

Regression analysis using the linear model reveals that there is a significant increasing production trend of vegetables except tomato (Fig. 5a-5e) and of root crops (Fig. 5f-5h). With the increasing trend, it is projected that the production of these crops will increase except for tomato (Table 11).

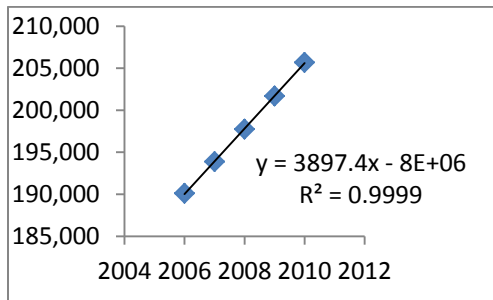


Fig. 5a Scatter diagram of eggplant production

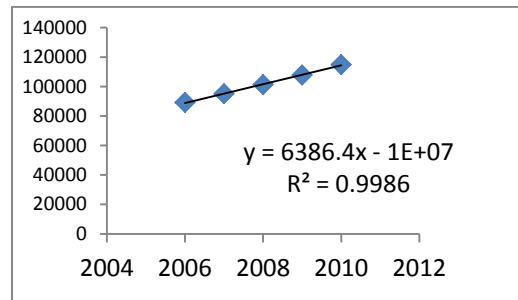


Fig.5b Scatter diagram of bittergourd production

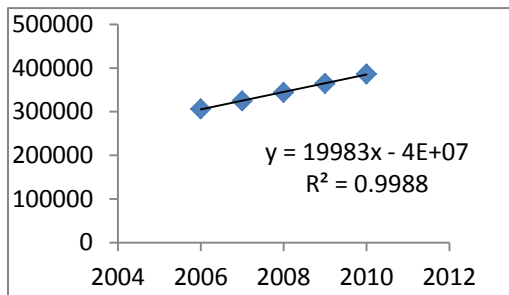


Fig. 5c Scatter diagram of squash production

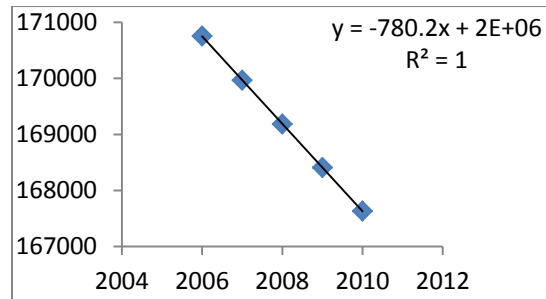


Fig. 5d Scatter diagram of tomato production

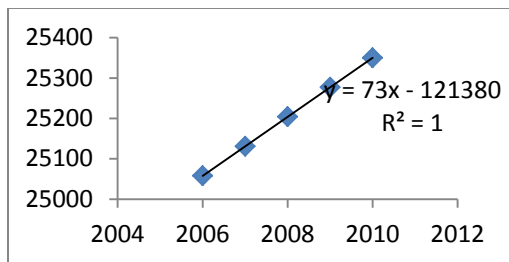


Fig. 5e Scatter diagram of okra production

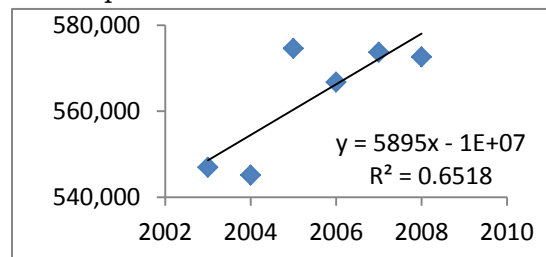


Fig. 5f Scatter diagram of sweet

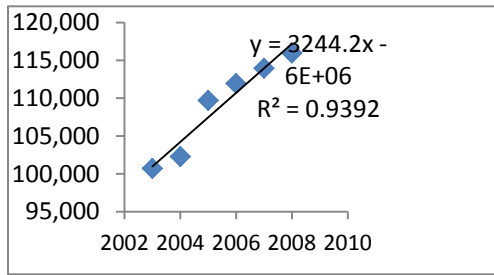


Fig. 5g Scatter diagram of taro production

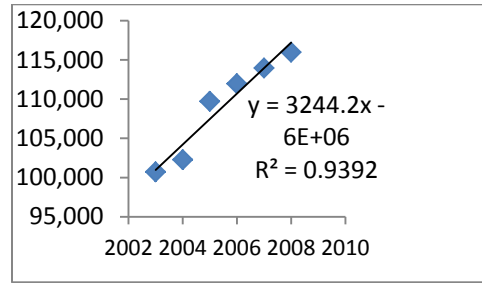


Fig. 5h Scatter diagram of yam production

Table 11. Projected Production of Crops in the Philippines.

Year	Production (mt)							
	Eggplant	Bittergourd	Vegetable Squash	Tomato	Lady- finger	Sweet Potato	Root Crops Taro	Yam
2015	7,852,461	2,867,790	265,745	427,897	134,957	1,878,42	536,660	536,660
2016	7,856,358	2,874,176	285,728	427,117	135,030	1,884,32	539,904	539,904
2017	7,860,255	2,880,562	305,711	426,337	135,103	1,890,21	543,148	543,148
2018	7,864,152	2,886,948	325,694	425,556	135,176	1,896,11	546,392	546,392
2019	7,868,049	2,893,334	345,677	424,776	135,249	1,902,00	549,636	549,636

**Demand.** With the increasing population, it is projected that the consumption of vegetables and root crops increases. Considering the per capita consumption for these crops, the demand for vegetables and root crops increases in 2015 to 2019 (Table 12).

Table 12. Projected Demand Consumption of Crops in the Philippines

**Supply and Demand Analysis.** From the projected production and demand, there is a huge market shortage by 2015 onwards for vegetables and root crops (Table 13a and Table 13b). The

Year	Consumption (mt)							
	Eggplant	Bittergourd	Vegetable Squash	Tomato	Ladyfinger	Sweet Potato	Root Crops Taro	Yam
2015	70,547,950	395,428,000	46,732,400	215,688,000	197,714,000	4,103,255	1,346,127	1,346,127
2016	70,750,480	396,563,200	46,866,560	216,307,200	198,281,600	4,115,035	1,349,992	1,349,992
2017	70,953,010	397,698,400	47,000,720	216,926,400	198,849,200	4,126,815	1,353,856	1,353,856
2018	71,155,540	398,833,600	47,134,880	217,545,600	199,416,800	4,138,594	1,357,721	1,357,721
2019	71,358,070	399,968,800	47,269,040	218,164,800	199,984,400	4,150,374	1,361,585	1,361,585

production of these vegetables is not sufficient to satisfy the increasing demand. With the trend, the average market shortage is about 89%, 92%, 99%, 99%, 54%, 60% and 60% in eggplant, bitter gourd, squash, tomato, okra, sweet potato, taro and yam from 2015 to 2019, respectively. There is a substantial shortage of these crops by 2016 (Fig 6.). It implies that there is a high potential of these products. It suggests that vegetables and root crop enterprises promise agribusiness enterprise to engage. However, product development needs to be undertaken to exploit the value added potential of these crops.

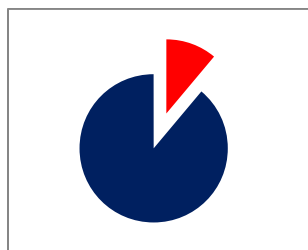
Table 13a. Projected Demand and Supply of Crops.

Year	MARKET CONDITION							
	Eggplant	Bittergourd	Vegetables (mt) Squash	Tomato	Ladyfinger	Sweet Potato	Root Crops (mt) Taro	Yam

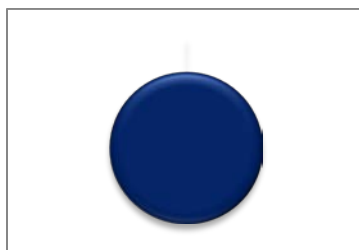
2015	-62,695,489	-392,560,210	-46,466,655	-215,260,103	-197,579,043	-2,224,830	-809,467	-809,467
2016	-62,894,122	-393,689,024	-46,580,832	-215,880,083	-198,146,570	-2,230,715	-810,088	-810,088
2017	-63,092,755	-394,817,838	-46,695,009	-216,500,063	-198,714,097	-2,236,600	-810,708	-810,708
2018	-63,291,388	-395,946,652	-46,809,186	-217,120,044	-199,281,624	-2,42,484	-811,329	-811,329
2019	-63,490,021	-397,075,466	-46,923,363	-217,740,024	-199,849,151	-2,248,369	-811,949	-811,949

Table 13b. Percent Market Shortage of Vegetables and Root crops

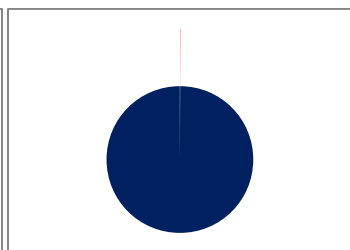
Year	Market Shortage (%)							
	Eggplant	Bittergourd	Squash	Tomato	Lady-finger	Sweet Potato	Taro	Yam
2015	88.87	99.27	99.43	99.80	99.93	54.22	60.13	60.13
2016	88.90	99.28	99.39	99.80	99.93	54.21	60.01	60.01
2017	88.92	99.28	99.35	99.35	99.93	54.20	59.88	59.88
2018	88.95	99.28	99.31	99.80	99.93	54.18	59.76	59.76
2019	88.97	99.28	99.27	99.81	99.93	54.17	59.63	59.63
Average	88.92	99.28	99.35	99.71	99.93	54.20	59.88	59.88



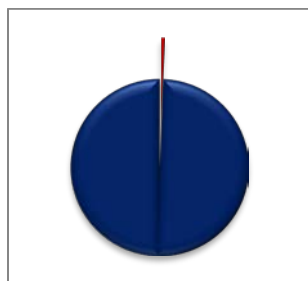
**Eggplant**



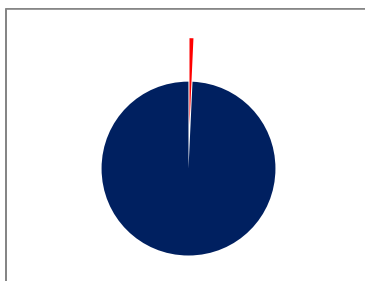
**Tomato**



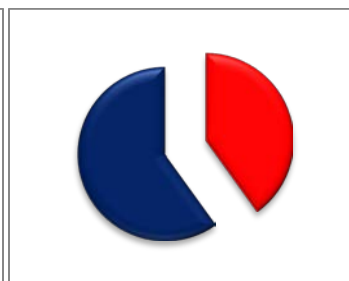
**Ladyfinger**



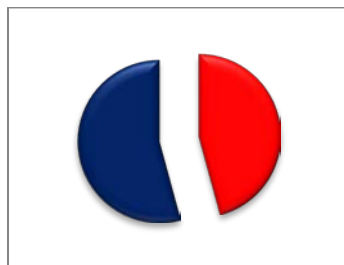
**Squash**



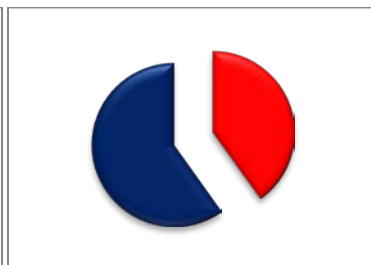
**Bittergourd**



**Taro**



**Sweet Potato**



**Yam**

Legend:

- supply

- shortage

## Figure 6. Market Situation of Crops in 2016

### CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn: Vegetables were considered as foods next to rice in the dietary meals. Eggplant, bitter melon and squash as most preferred vegetables. Among root crops, sweet potato was the most preferred. Consumers of vegetables and root crops preferred fresh, classified despite higher price and willing to pay a higher price for products without pesticides. The per capita consumption for vegetable consumption in Region I was greater than the national level but lower in root crops. Among the provinces in Region I, Ilocos Norte and Pangasinan had the highest and lowest PCC, respectively. Majority of sellers sourced vegetables and root crops from the farmers in La Union, delivered in the market, classified, purchased and sold on per kilo basis. Lack of knowledge of post harvest practices and insufficient capital were considered as the foremost serious problems of sellers. Age is a significant factor in the consumption of hyacinth bean and sweet potato. The freshness, price, non-usage of chemicals and nutritional value of products had a significant influence on the consumption of vegetables and root crops. There is an enormous market shortage by 2015 onwards for the vegetables and root crops. Thus, intensify the promotion of organic farming for these crops since the consumers preferred products without chemicals despite having premium prices. Adopt grading and standardization practices. Intensify the development of other value-added product forms for the utilization of the industrial market. Support systems are provided in the form of trainings, marketing and financial assistance to enhance the development of these crops industries. Further study on the supply chain of these crops is conducted.

### LITERATURE CITED

- Batt, P., Concepcion, S., Dagupen, K., Lizada, M. C., & Murray-Prior, R. (2007). The vegetable industry in the Philippines. *Australian Center for International Agricultural Research, Canberra, Australia.*
- Bureau of Agriculture Statistics (2012). Statistics on Agriculture 2012. Available at <https://psa.gov.ph/sites/default/files/Statistics%20on%20Agriculture%202012.pdf>  
Date Retrieved: January 20, 2013
- Drewnowski, A. (1997). Taste preferences and food intake. *Annual review of nutrition*, 17(1), 237-253. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/9240927> Date Retrieved: February 1, 2012
- Food and Agriculture Organization of the United Nations (FAO) and the Information Network on Post-Harvest Operations (INPhO) (1998) *Roots, tubers, plantains and bananas in human nutrition*. Retrieved: January 23, 2014 from <http://www.fao.org/docrep/t0207e/T0207E00.htm>
- Food and Nutrition Research Institute (2003). 6<sup>th</sup> Annual Nutrition Survey.
- Foster, C., Green, K., & Bleda, M. (2007). Environmental impacts of food production and consumption: final report to the Department for Environment Food and Rural Affairs. Available at: <http://www.eolss.net/sample-chapters/c07/e5-17-02-03.pdf> Date Retrieved: January 20, 2012



Peltzer, K., & Pengpid, S. (2012). Fruits and vegetables consumption and associated factors among in-school adolescents in five Southeast Asian countries. *International journal of environmental research and public health*, 9(10), 3575-3587.

Strategy Unit (2008). Food Matters Towards a Strategy for the 21<sup>st</sup> Century. Cabinet Office, United Kingdom of Great Britain. Available at: [goo.gl/07RSKO](http://goo.gl/07RSKO) Date Retrieved: January 20, 2012

Verbeke, W., & Poquiviqui Lopez, G. (2005). Ethnic food attitudes and behaviour among Belgians and Hispanics living in Belgium. *British Food Journal*, 107(11), 823-840.

World Bank Atlas (2007). 2007 World Development Indicators. The International Bank for Reconstruction and Development/World Bank. Available at: [goo.gl/sqQTXv](http://goo.gl/sqQTXv) Date Retrieved: January 20, 2012

World Health Organization (2005). World Health Statistics 2002-2004. Available at [www.who.int/healthinfo/en/](http://www.who.int/healthinfo/en/) Date Retrieved: January 20, 2012