INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 19, No. 6, p. 77-85, 2021

RESEARCH PAPER OPEN ACCESS

Vegetable seeds and seedlings production: an approach towards food sustainability

Maribel L. Fernandez*, Florante Victor M. Balatico

Cagayan State University, Lal-lo, Cagayan, Philippines

Key words: Vegetables, Seeds, Seedlings, Bayanihan, Covid19 pandemic

http://dx.doi.org/10.12692/ijb/19.6.77-85 Article published on December 18, 2021

Abstract

The study was conducted at San Mariano, Lal-lo, Cagayan, Philippines, from January 2021 to September 2021 to assess the immediate outcomes of massive seeds and seedlings production among vegetable growers affected with Covid-19 pandemic and determine their sociodemographic and socioeconomic statuses. Fifty (50) vegetable growers were selected and interviewed utilizing the structured questionnaires. Data collected were processed through available statistical software. Results revealed that vegetable farmers are predominantly male, aged 40-50, married, Ilokano, with elementary and tertiary educational attainment belonging to nuclear type family with 3-4 members. The majority of respondents are full-time members of the San Mariano Vegetable Growers Association, earning an average income of Php33, 480.39 from a 0.25 to 1.0-hectare vegetable-corn land. The majority of the beneficiaries are affected with a high cost of inputs, high labor cost and absence of hauling vehicles during harvesting and post-harvest operations and a very low price of products also exists during marketing. Furthermore, vegetable yields average to 3,520 kilograms with a net income of Php45, 306.40, and an ROI ranging from 20% to 247% per cropping season. The results imply that the *Bayanihan* II program significantly increased the income of vegetable farmers from Php33, 480.39 to Php45, 306.40. Hence, the project was recommended to provide additional funds, closed supervision, and proper management. The continuity is vital in the sustainable supply of safe and quality vegetables in the market, helping farmers generate income in a short period of time and providing immediate and alternative sources of healthy food during this time of the pandemic.

* **Corresponding Author:** Maribel L. Fernandez ✉ maribelfernandezcsu@gmail.com

Introduction

According to Organization for Economic Co-operation and Development, the COVID-19 pandemic is a worldwide health catastrophe that is already wreaking havoc on the global economy both directly and through the required steps to control the disease's spread. These effects are also being seen in the food and agricultural sectors. While the food supply has held up well to yet, in many countries, the precautions put in place to prevent the virus's spread are beginning to impair the supply of agro-food items to markets and consumers, both inside and beyond borders. The industry is also undergoing a significant transition in terms of composition and – for some goods – demand level.

Thus, the pandemic has decimated jobs and placed millions of livelihoods at risk. As breadwinners lose jobs, fall ill and die, the food security and nutrition of millions of women and men are under threat, with those in low-income countries, particularly the most marginalized populations, which include small-scale farmers and indigenous peoples, being hardest hit (ILO, FAO, IFAD and WHO, October 13, 2020).

Moreover, the *Bayanihan* to Recover as One Act, commonly known as *Bayanihan* 2, as Republic Act No. 11494, is a Philippine law adopted in September 2020 to battle the COVID-19 epidemic in the Philippines. It was enacted to promote a just and dynamic social order that will ensure the prosperity and independence of the nation and free the people from poverty, particularly in the aftermath of natural and man-made disasters. The established mechanisms under the said Act likewise aim to accelerate the recovery and bolster the resilience of the Philippine economy through measures grounded on socioeconomic inclusivity and collective growth through fiscal sustainability (Signed by Rodrigo Roa Duterte, Malacanang Palace, September 11, 2020).

In line with this, the Cagayan State University, in partnership with Department of Agriculture Regional Field Office 2 (DA-RFO 02), implemented the Plant, Plant, Plant Program" under DA's Massive Seeds and Seedlings Production Program. This is in support of *Bayanihan* Act 2 that was created to provide a response that will deal with the effects of the COVID-19 pandemic in the country. The study aimed to increase the availability of quality vegetable seeds and seedlings in the region, particularly in the Province of Cagayan and ensure food security and productivity during the COVID-19 pandemic.

Furthermore, this study helps the Lal-loquenos to recover vegetable farmers on COVID-19 pandemic, to have an immediate source of their food and income as well as to help them cope with the rising prices of basic commodities in the market, which doubled since the COVID-19 pandemic started (World Vision Development Foundation, 2021).

Hence, sociodemographic and socioeconomic profile and problems encountered by the farmers during the operation were determined as well as their outcomes in terms of yield, net income and return on investment after the distribution.

Materials and methods

Research design

The study was conducted at San Mariano, Lal-lo, Cagayan. This barangay is involved in agricultural projects that support the promotion and cultivation of vegetable production. Data were collected with a structured questionnaire largely comprising of close-ended questions. The collected data were processed through Statistical Package for Social Sciences software.

Research instruments

One (1) research instrument was used to gather the needed data. The Vegetable Growers' Questionnaire consisted of three parts. Part I elicited the sociodemographic profile of the respondents, including age, sex, civil status, ethnicity, religion, and highest educational attainment, For part II elicited the socioeconomic profile of the respondents such as occupation, family type, homeownership and condition, tenurial status, area cultivated, estimated net sales, highest income commodity, number of

cropping season and reasons why growing vegetables. Part III contains the problems encountered by the beneficiaries during production, harvesting and post-harvest operation, and marketing, other problems met and alternative sources of income.

Data gathering procedures

The survey/profiling was conducted with the assistance of Municipal Agriculture Office of the Local Government Unit of Lal-lo, Cagayan and barangay officials of San Mariano, Lal-lo, Cagayan. The gathering of data was done by the campus project team of Cagayan State University Lal-lo, Cagayan, particularly faculty researchers and extensionists.

During the gathering phase, fifty vegetable farmers were selected and identified as beneficiaries and interviewed. These vegetable beneficiaries are the original vegetable growers in the said barangay. The campus project in charge took responsibility for monitoring the project team, ensuring that the data collected were valid and reliable. The venue of the profiling/interview took place in their barangay gymnasium.

Data analysis

Data were encoded in the EXCEL file to have ease in data encoding, cleaning, and manipulation. After data cleaning, the file was imported into the Statistical Package for Social Sciences software. To categorize and describe the group, frequency count, mean, standard deviation and percentage were computed and ranking was done after.

Results and discussion

Sociodemographic profile of respondents

Table 1 shows the sociodemographic profile of the vegetable beneficiaries of Barangay San Mariano, Lal-lo, Cagayan. The fifty vegetable growers were composed of 27 male's equivalent to 54% and 23 female's equivalent to 46%. Data shows that participation of women in agriculture is increasing compared to the Census on Agriculture and Fisheries, 2002 wherein, the participation of females in agriculture has 39.1% and males were 69.9%. On the contrary, Mumbi *et al.* (2006) found that male farmers were taking the lead in the production and marketing of vegetables. In terms of age, vegetable beneficiaries are in their middle adult stage, where 30% of them are within the age range of 41 to 50 years, with an average age of 47.25 and a standard deviation of 10.78.

The youngest is 28, while the oldest is 68 years old. The age of vegetable farmers, as well as their years of farming experience, are essential in agricultural market participation (Ramoroka, 2012).

It can therefore be inferred that vegetable farmers are in their middle adulthood period and in their active ages and can conveniently carry out production operations and most likely demonstrate a high affinity for technology adoption. The result of this study is in agreement with the findings of Tijjani *et al.* (2015), who observed a similar age range for cowpea farmers in their study. Other ages of the farmers were as the following: both twelve (12) of them were ages from 31 to 40 and 51 to 60 years, which is 24%, seven (7) of them aged from above 60, which is 14% and the least were ages below 30 with a total of 8%. Such a trend is worrisome to the Department of Agriculture as this implies that young Filipinos are no longer interested in taking on farming as an industry (Inso, 2018).

For their religion, 37 of them were Roman Catholic, six (6) were Born Again, three (3) were Union Espiritista, two (2) were the Church of Christ, and one (1) was both Iglesia Ni Cristo and free believer of Christ. This means that, in their place, Roman Catholics have a higher participation rate in vegetable farming than other religions. For the ethnicity of the beneficiaries, the majority of them were Ilokano with a total of 38, 10 of them were Kalinga and two (2) were Agta. The result implies the same as what Wikipedia says that Ilocanos eat a relatively healthy diet that consists primarily of boiled or steamed vegetables. Pinakbet (mixed veggies) is one staple diet of the Ilocano; that is why they enjoy growing vegetables in their backyards and gardens so that they can easily access them anytime they wish to eat.

Table 1. Distribution of the respondents in terms of personal information.

Variable	Frequency (n=50)	Percentage	Rank
Age			
30 and Below	4	8	4
31 to 40	12	24	2
41 to 50	15	30	1
51 to 60	12	24	2
Above 60	7	14	3
Mean=47.25	SD=10.78		
Gender			
Male	27	54	1
Female	23	46	2
Religion			
Roman Catholic	37	74	1
Born Again	6	12	2
Union Espiritista	3	6	3
Church of Christ	2	4	4
Free Believers of Christ	1	2	5
I.N.C.	1	2	5
Ethnicity			
Ilocano	38	76	1
Kalinga	10	20	2
Agta	2	4	3
Type of Family			
Nuclear	44	88	1
Extended	6	12	2
Family Size (DF)			
1 to 2	6	12	3
3 to 4	27	54	1
5 to 6	13	26	2
7 to 8	3	6	4
9 to 10	1	2	5
Mean=4.29	SD=1.55		
Civil Status			
Married	44	88	1
Single	3	6	2
Widow	3	6	3
Highest Educational Attainment			
College graduate	10	20	1
College level	9	18	2
Vocational	1	2	5
High school graduate	6	12	4
High school level	7	14	3
Elementary graduate	7	14	3
Elementary level	10	20	1

For the type of family, the beneficiaries have a total of 44 nuclear families and 6 extended families. Furthermore, in terms of the household size, the most numbered beneficiaries were found at 3 to 4 members with a total of 27 (54%). Household size could play an important role in farming as it can be an important source of family labour. Thus, the mean of 4.29 household size indicates that family labour was still a common practice among farmers in order to reduce the cost of hiring labour. (https://www.worldometers.info/demographics/philippines-demographics) Most of them are married with a total of 44 beneficiaries, three (3) are single, and three (3) are widowed. The results imply that those who were married formed the largest proportion than those who were singled or widowed. The results are in agreement with those reported by Baba *et al.* (2010), who found that married farmers participated more in vegetable farming in order to support their families.

In terms of educational attainment, ten (10) of them were college graduates and elementary level, nine (9) were college level, seven (7) were high school level and elementary graduate, six (6) were high school graduates, and one (1) was a vocational course graduate, respectively.

This implies that no matter what level of education you have, you may engage in vegetable farming if you are interested.

Table 2. Distribution of the respondents in terms of socioeconomic profile.

Variable	Frequency (n=50)	Percentage	Rank
Occupation			
Vegetable and Corn Farmer	27	54	1
Vegetable and rice farmer	9	18	2
Vegetable, Rice Farmer and Corn Farmer	8	16	3
Vegetable farmer	2	4	4
Corn, Carabao and vegetable Farmer	1	2	5
Rubber tree and vegetable farmer	1	2	5
Vegetable, Corn, and fruit-bearing trees Farmer	1	2	5
Vegetable, and other plantation crops Farmer	1	2	5
Community Organization			
San Mariano Vegetable Growers Association	33	66	1
Tribal Alliance of Indigenous People (TAIP) and San Mariano Vegetable Growers Association	10	20	2
Agrarian Reform Beneficiaries Cooperative and San Mariano Vegetable Growers Association	4	8	3
Rural Improvement Club and San Mariano Vegetable Growers Association	3	6	4
Homeownership			
Owner	43	86	1
Staying with parent	6	12	2
Occupying/rent for free	1	2	3
Home condition			
Concrete	16	32	1
Concrete and wood	16	32	1
Concrete and light materials	11	22	2
Wood and light materials	6	12	3
Light materials	1	2	4
Area Cultivated			
0.25 -1 ha	33	66	1
1.25-2 ha	15	30	2
2.25 to 3 ha	2	4	3
Net Sales			
10,000 and Below	6	11.8	4
10,001 to 20,000	9	17.6	2
20,001 to 30,000	11	23.5	1
30,001 to 40,000	6	11.8	4
40,001 to 50,000	8	15.7	3
50,001 to 60,000	5	9.8	5
More than 60,000	5	9.8	5
Mean=33,480.39	SD=20,684.53		
Number of Cropping per Year			
1	6	12	2
2	43	84	1
3	1	2	3
Mean=1.94	SD=0.47		
Tenurial Status			
Tenant	26	52	1
Owner	22	44	2
Owner/ Tenant	2	4	3
Highest Income Commodity (multiple responses)			
Corn and Vegetables	39	78	1
Rice and vegetables	8	16	2
Fruit-bearing trees	1	2	3
Rubber tree and vegetables	1	2	3

Carabao and vegetables	1	2	3
Reasons in Vegetable Growing (multiple responses)			
Source of food and income	26	52	1
Source of food	19	38	2
Ease to sell	1	2	3
Growing vegetables lesser food expenses	1	2	3
High price of vegetables in the market	1	2	3
It is the prime commodity	1	2	3
Gives sufficient food supply	1	2	3
Why discouraged? (multiple responses)			
Drought	29	58	1
High cost of inputs	9	13.7	2
Lack of water	8	16	3
Climate change	2	4	4
Attacked by rodents	1	2	5
The soil is not suited to the crops	1	2	5

Socioeconomic profile of respondents

Table 2 shows the socioeconomic profile of the vegetable growers. In terms of their occupation, 27 of them were vegetable and corn farmers (54%), nine (9) were vegetable and rice farmers (18%), eight (8) were vegetable, rice and corn farmer (16%), two (2) were pure vegetable farmers (4%), while both one (1) farmer engaged in corn, carabao and vegetable farming, rubber tree and vegetable farming, vegetable, corn, and fruit-bearing trees, and vegetable and other plantation crops (2%). Moreover, most of them are engaged full time in San Mariano Vegetable Growers Association with a total of 33 or 66%, homeowners living in a concrete house and combination of concrete-wood (64%), cultivated from 0.25 to 1-hectare vegetable and corn land and with a net sales of 20,001 to 30,000. Most of them used two cropping seasons in planting their farms and tenants with a total of 43 or 86% and 26 (52%). Their highest income commodities were corn and vegetables (78%). The reason in vegetable growing is as their sources of food and income with a total of 26 or 52%., and they are discouraged from engaging in vegetable farming because of drought with a total of 29 or 58%, high inputs and others.

Problems encountered

Table 3. shows the problems encountered by the beneficiaries. For their problems in their production, harvesting, and post-harvest operations, the majority of them suffered from high inputs, high labor cost, absence of hauling vehicles, and very low price of products during marketing.

For the other problems encountered, most of them experienced drought, insect and pest infestation and low yield. Their reason in engaging vegetable farming is to serve as their source of food and income with a total of 24, source of income with a total of 20, get more knowledge with a total of three (3), and two (2) other beneficiaries answered to try and try until you become a millionaire. Among the beneficiaries, 34 had no alternative source, both three (3) answered buy and sell and laborer, both two (2) answered corn farming, planting corn and rice, and raising animals, and other beneficiaries answered carpenter, charcoal production, doormat making and sari-sari store as their alternative source of income.

Gross margin analysis (ROI) of the five vegetable demonstration area

Table 4 shows the result of the five (5) vegetable demonstration areas of CSU Lal-lo Bayanihan II: Massive seeds and seedlings production project with a total area of 50,100 square meter area (5.1 ha) planted with nine (9) commodities such as tomato, eggplant, pole sitao, bush sitao, sweet pepper, bitter gourd, bottle gourd, squash, and okra. As we can see in the table below, the highest yield was obtained in tomato with a total of 11,500 kilograms and the least was obtained in okra vegetables with a total of 900 kilograms.

Table 3. Distribution of the respondents in terms of problems encountered.

Variable	Frequency (n=50)	Percentage	Rank
Production			
High price of seeds, fertilizer and pesticide	20	40	1
High price of seeds, fertilizer, pesticide, labor cost and experienced scarcity of water	13	26	2
High price of seeds, fertilizer, pesticide and scarcity of water	9	18	3
High price of seeds, fertilizer, pesticide and cost of machinery rentals	8	16	4
Harvesting			
High labor cost	25	50	1
Scarcity of labor	17	34	2
Absence of hauling vehicle	8	16	3
Post-harvest			
Absence of hauling vehicle	27	54	1
Limited drying area	10	20	2
Limited drying area, absence of hauling vehicle, and high hauling cost	7	14	3
High hauling cost	3	6	4
Very low price of product	3	6	4
Marketing			
Very low price of product	45	90	1
Low market absorption resulting to waste	5	10	2
Other Problems			
Drought, Insect and pest infestation	25	50	1
Low yield	16	32	2
Low income	5	10	3
Irrigation	2	4	4
Low market price of product	2	4	4
Continue in farming?			
Yes	50	100	
Reasons			
Source of food and income	24	48	1
Major source of income	20	44	2
Get more knowledge	4	8	3
Try and try until you become a millionaire	2	4	4
Alternative Source			
No Response	34	67	1
Buy and sell	3	6	2
Laborer	3	6	2
Corn farming	2	4	3
Planting corn/rice	2	4	3
Raising animals	2	4	3
Carpenter	1	2	4
Charcoal production	1	2	4
doormat making	1	2	4
Sari sari store	1	2	4

The highest net income was obtained in eggplant vegetables with a total amount of Php 129,088, followed by tomato with a total amount of Php 118,405, bush sitao with a total amount of Php 46,800, bottle gourd with a total amount of Php 46,125, bitter gourd with a total amount of Php 43,000, pole sitao with a total amount of Php 25,000, okra with a total amount of Php 22,500, squash fruit and sweet pepper with a total amount of Php 21,000, and the least was produced in squash flower with a total amount of Php 13,000, respectively. The result revealed that eggplant was the best vegetable in terms of Return on Investment (247%). This implies that in every peso invested in the study, there was a corresponding return of 2.47 pesos. Results show that tomato and eggplant produced the highest yield because they can be harvested for a longer period of time compared to other crops that were easy to mature and deteriorate.

Moreover, as to the results of production of different vegetable crops, this was increased from 1.018% to 1.279% compared to the findings of Conrado *et al.*, 2016.

Table 4. Gross margin analysis of five (5) demonstration areas planted with different vegetable crops for one cropping season.

Commodity	Production Area (m2)	Relief Goods (Kgs/Bundle)	Sales(Kgs/Bundle)	Price (Kgs/Bundle)	Total Yield (Kgs/Bundle)	Gross Sales (Php)	Production Costs (Php)	Net Income (Php)	ROI (%)
TOMATO	5,500	500	11,000	15	11,500	172,500	54,094.98	118,405	219
EGGPLANT	5,500	250	7,000	25	7,250	181,250	52,162	129,088	247
POLE SITAO	5,000	200	1,100	30	1,300	39,000	20,000.00	19,000	95
BOTTLE GOURD	5,600	300	1,300	15	1,600	24,000	20,000.00	4,000	20
SQUASH FRUIT	6,000	350	1,650	25	2,000	50,000	34,724.58	15,275	44
SQUASH FLOWER		350	750	10	1,100	11,000	8,000	3,000	38
SWEET PEPPER	5,500	200	1,800	30	2,000	60,000	34,724.58	25,275	73
OKRA	6,000	300	600	25	900	22,500	15,000.00	7,500	50
BUSH SITAO	6,000	300	1,250	20	1,550	31,000	20,000.00	11,000	55
BITTER GOURD	5,000	250	1,650	30	6,000	180,000	59,479.50	120,521	203
TOTAL	50,100				35,200	771,250	318,185.64	453,064	

Conclusion

Based from the results of the study, most of the respondents are full-time members of the San Mariano Vegetable Growers Association, earning an average income of Php 33,480.39 from a 0.25 to 1.0-hectare vegetable-corn land. The majority of the beneficiaries are affected with a high cost of inputs, high labor cost and absence of hauling vehicles during harvesting and post-harvest operations and a very low price of products also exists during marketing.

Recommendation

Based on the result of the study, the project was recommended to provide additional funds, closed supervision, and proper management. The continuity is vital in the sustainable supply of safe and quality vegetables in the market, helping farmers generate income in a short period of time and providing immediate and alternative sources of healthy food during this time of the pandemic.

References

Castillo J, Martin A, Rocha L, Sabio V. 2017. Assessment of farmers' knowledge, attitude and perceptions towards organic farming in Cagayan Valley. Philippine Journal of Crop Science **42,** p 131-132.

Conrado VD, Antonio A, Pattaguan JM. 2013. Profitability of Vegetables Production in Region 02. CSU Research Journal **7(1).**

Masuku MB, Xaba B. 2013. Factors Affecting the Productivity & Profitability of Vegetables Production in Swaziland. – Journal of Agricultural Studies **1(2),** 37-52.

Mavengahama S, McLachlan M, De Clercq W. 2013. The role of wild vegetable species in household hood security in maize subsistence cropping systems. – Journal of food Science **5(2),** 227-233.

Mérel PR, Sexton RJ, Suzuki A. 2006. Transportation cost and market power of middlemen: A spatial analysis of agricultural commodity markets in developing countries. Available at SSRN: https://ssrn.com/abstract=944167 or http://dx.doi.org/10.2139/ssrn.944167.

Milagrosa M. 2007. Institutional Economic Analysis of Vegetable Production and Marketing In Northern Philippines: Social Capital, Institutions And Governance.ISBN 90-8504-597-5.

Oyekale AS, Mphafi K, Ndou P. 2019. Effect of Enterprise Development Support Program on Market Participation and Profit Efficiency of Indigenous Vegetable Production In South Africa. Applied Ecology and Environmental Research **17(3),** 6853-6864.

Nemes N. 2009. Comparative analysis of organic and non-organic farming systems:A critical

assessment of farm profitability, Food and Agriculture Organization of the United Nations, Rome.

Orifah MO, Ehien AE, Muktar BG, Ijeoma MC, Idris MA. 2020. Analysis Of Cowpea Farmers' Utilisation Of Purdue Improve Cowpea Storage Technology In Dutse Lga, Jigawa State, Nigeria.Dutse Journal of Agriculture and Food Security (DUJAFS) **7 (1),** 101-107.

Wang KH, Duponte M, Chang K. 2013. Use of Korean Natural Farming for Vegetable Crop Production in Hawai'i. Hānai'Ai Newsletter, p 1-7.