INNSPUB

Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 13, No. 2, p. 402-415, 2018
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

The economics of organic and conventional vegetables production in Northern Philippines

Vilma Du Conrado*

Cagayan State University, Caritan, Tuguegarao City, Philippines

Article published on August 30, 2018

Key words: Pinakbet, organic vegetables, organic agriculture, Philippines, economics, profitability.

Abstract

The study was conducted in the Cagayan Valley region of the Northern Philippines to generate baseline data and information on the profitability and economics of organic vegetable "pinakbet" production versus conventional vegetable production. A total of 64 organic and 52 conventional vegetable producers were taken as respondents. Data were gathered through field reconnaissance survey and interview using structured questionnaire. Descriptive statistics was used to analyze the data. The organic vegetable industry is in its infancy stage. The average area cultivated to organic vegetable was 508.55sq m and 2,972.19sq m for conventional vegetables. Organic vegetable farmer-respondents had higher yield per 1000sq m for okra (748kg), squash (545kg) and string beans (437kg) than the conventional farmers with 131kg, 261kg and 236kg per 1000sq m, respectively. Conventional farmers had higher yield/1000sq m on eggplant (1,239kg), ampalaya (1,080kg), tomato (2,054kg) and pepper (330kg) than the organic farmers. Organic farmers received higher average price and higher net farm income for all vegetables than the conventional farmers. Break-even yield per 1000sq m for conventional farmers was higher than the organic farmers in all vegetables. The organic vegetable farmers had lower capital-output ratio and land-output ratio for almost all the vegetables but higher labor-output ratio than the conventional farmers. Laborious, high cost of certification as organic farm, lack of financial support and limited market outlet for organic products were the problems encountered. Massive education and awareness campaign, continuous extension education services and other methods to increase effective demand for organically produce vegetables should be done.

***Corresponding Author:** Vilma Du Conrado ✉ vilmadconrado@yahoo.com

Introduction

With the increasing concerns on population growth, health, food security, increasing farmers income, improve living standards, and environment concerns all over the world encouraged the widespread adoption of organic products (Motor Intelligence, 2017, Amadou Binta BA and Bruno Barbier, 2015, Thippeswamy, 2013). Organic farming may seem to be the key in addressing these concerns (Crowder, 2015; Aquino 2013). Global sales for organic food and drink has been increasing which expanded to about 10% in 2015 compared to previous year. With the passing of the Organic Agriculture Act (RA 10068), organic agriculture has now arrived a strong concern in farming in the Philippines. The Philippines is one of the ten countries with the highest increase in organic agricultural land and the fifth country with the largest number of organic producers in 2015 (Helga and Lernuod, 2017). However, despite being an agricultural country, has yet to achieve the goal of National Organic Agriculture Program (NOAP), wherein five percent of the country's agricultural farms should have been converted to organic in 2016 (NOAP, 2012-2016). The NOAP serves as a guide for the implementation of organic agriculture activities in the country (NOAP, 2012-2016).

Several studies also determine the profitability of organic agriculture vis a vis conventional agriculture but found a great variability in the profitability (Tomekde Ponti 2012). There is high variation in yield gap of organic agriculture and relative yields differ between crops and regions. There are several factors that determine the profitability of organic vegetable production such as within system variation, physical characteristics, external factors, and unmeasurable influence, (Nemes, 2009), price, yield, production environment, location and management practices. Crowder (2015) analyzed the financial performance of organic and conventional agriculture from five continents found that, in spite of lower yields, organic agriculture was significantly more profitable than conventional agriculture and has room to expand globally (Shennan *et al*, 2017, Naglova, 2015, Amadou Binta BA and Bruno Barbier, 2015, Nemes, 2009, Crowder, 2015, Verena Seufert and Navin Ramankutty, 2017) found considerable evidence for environmental and social benefits. Generally it is hard to conclude that one system is more profitable than the other – it depends on site and crop specific factors, availability of marketing opportunities, labour availability, agronomic factors, etc. Several variables could impact overall farm performance, thus a multi-disciplinary approach that involves the whole farm (with livestock operations if there are) and takes into account the management skills and objectives of the farmers is a more favourable option. (Noémi, 2009). Rates of organic farming adoption are highly sensitive to the yield drop after switchover to organic techniques (Olabisi, 2015).

In the Philippines, Porciuncula (2015) concluded that the returns in organic vegetable (eggplant, tomato, ampalaya and stringbeans) in Central Luzon production in all sites is promising given the acceptable, at par and even better yield per 1000sq m, net income, and return to total operating expenses compared to conventional vegetable production. Studies on supply chain indicate that whole farm performance, yields, prices and costs matter most in the calculations of profitability (Lantican, 2011, and Lanndicho) and there is cost and margin differentials across players and across geographic locations indicating variations in the distribution of benefits among key factors (Cabrera and Wagney in NOAP report, 2016). The vegetable growers relied on their indigenous knowledge acquired from years of experience in vegetable farming, infusing additional knowledge and skills learned from trainings on the use of organic inputs and technologies.

To date, organic agriculture faces several challenges due to different factors. The shifting from conventional towards organic farming may still face a long way. However, data and information on organic vegetables production enterprises in the country are very few. Is organic farming more profitable then conventional farming is a question that need to be answered. Several studies found that there is variations and stability of profitability performance of organic

farming versus conventional farming because several dimensions have to be considered. An evaluation of the profitability and economics of the production of organic vegetables crops in Cagayan Valley region would assist the producers in choosing between organic productions versus the conventional production. The study aims to determine the profitability and economics of organic vegetables ("pinakbet type") vis-à-vis conventional vegetables production in Northern Philippine. It compares the costs of production, profitability, input utilization rations of organic and conventional vegetables production.

Materials and methods

Locale and Research Design of the Study

The study was conducted in the Cagayan Valley region, Northern part of the Philippines where temperate lowland vegetables (ampalaya, eggplant and tomato, pepper, pole sitao or string beans, and okra are grown). It made use of the descriptive research design.

Data and Respondents

The study made used of the survey data of the PCAARRD funded project "Documentation of Organic Vegetables Production in Region 02" by Conrado *et al.* (2011). In the absence of a priori list of organic vegetable growers in the region, reconnaissance survey and key informants interview were undertaken to map out the whereabouts of organic vegetable producers. All identified organic vegetable growers (either full, in-conversion or traditional) were taken as organic respondents since there is no certified organic vegetable farm (third party) yet. A total of 64 organic farmers (22 full organic, 19 in-conversion and 23 traditional) and 52 conventional vegetable farmers were taken as respondents.

Data Analysis

Descriptive statistics was used to summarize descriptive data such as frequency counts, percentages and means. The ratios between production factors and output were determined to measure the extent of input utilization. The following ratios were used: a) Capital-Output Ratio (COR) is the ratio between total cost of production and the value of total output which implies how intensive capital was used; b) Labor-Output Ratio (LOR) is the ratio between total farm labor (in man-days) and total value of output which implies how intensive labor was used; and c) Land-Output Ratio (SOR) is the ratio between the total area cultivated (in ha) and total value of output which implies how productive land was used. Cost and return analysis and break-even yield were used to determine profitability.

Definition of Terms

Full organic respondents farmers who do not anymore used any inorganic chemical materials and follow the PNSOA although they are not yet certified organic but they were trying to apply for certification.

In-conversion farmers are those who have plans to convert their farms to organic, following the PNSOA but are still using partly inorganic.

Traditional farmers are those farmers who ever since they started growing vegetables had not used any inorganic inputs.

Conventional farmers those who used inorganic inputs.

Pinakbet (from the work pinakebbet meaning shrunk or shriveled) is an indigenous Filipino dish from the northern regions of the Philippines made from mixed vegetables which includes bitter gourd (ampalaya), eggplant, tomato, okra, string beans, chili peppers, parda, winged beans, and others

Result and discussion

Socio-Demographic Profile

Table 2 shows that majority of the respondents were females, 59.38 percent for organic and 51.92 percent for conventional farmers. Majority of the respondents, 71.88 percent and 75.51 percent of the organic and conventional vegetable farmer respondents, respectively belong to the Catholic sect. The rest belong to other religious groups. There is a higher percentage of female farmers in organic than conventional since the average farms is small and found in backyard gardens which is accessible to the housewives.

On the average, organic vegetable farmer-respondents were older (53 years old) by seven years than the conventional farmers (46 years old). Organic farmer-respondents are older on the average because it includes the traditional farmers. The traditional farmers are the older ones and they are habituated and more comfortable to the traditional practices. The household size for organic vegetable farmer-respondents was 5.5, a little bit larger than the conventional farmers, with a household size of 5.1 members. Conventional farmer-respondents had longer vegetable farming experience (14.93 years) than their organic counterpart with only 12.22 years.

The organic vegetable farming experience of the organic respondents was 6.22 year, half of their total vegetable farming experience. This can be explained by the new decisions to convert their farms from conventional to organic farming.

The traditional farmers had the highest organic farming experience among the three types of organic farmer respondents, which was the same with their total years of farming experience (11.68 years). As to education, organic vegetable farmer respondents had 9.5 years, higher than the conventional which was 7.65 years in school although both however are in the high school level.

Table 1. Profile of respondents by type of farmer-respondent, economics of vegetables production in Region 02, 2009-2010.

Particular	Type of Organic Farmer						All Organic (n=64)		Convent Ional	
	Full (n=22)		In Conversion (n=19)		Traditional (n=23)					
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Sex										
Male	9	40.91	9	47.37	8	34.78	26	40.63	24	48.08
Female	13	59.09	10	52.63	15	65.22	38	59.38	26	51.92
Religious Sect										
Catholic	16	72.73	16	84.21	14	60.87	46	71.88	37	75.51
Methodist	2	9.09	2	10.53	2	8.70	6	9.38	0	0.00
Born Again	0	0	1	5.26	2	8.70	3	4.69	4	8.16
Others	4	18.19	0	0	5	21.74	9	14.06	8	16.33
Average Age	56.5		45.5		51		53		45.89	
Household Size	5.5		4.5		5.5		5.5		5.1	
Farming experience (years)										
Total experience	16.17		9.94		11.68		12.22		14.93	
Organic	3.33		3.67		11.68		6.22			
Educ'l Attainment	9.5		9		10		9.5		7.65	

Table 3 shows that all of the organic vegetable respondents attended at least one training course related to vegetable production while only 7.69 percent for the conventional respondents. This is because organic vegetable respondents were usually assisted by non-government organizations (NGOs) promoting organic vegetable production such as the Bayombong Episcopal Center (BEC) in Bayombong, Nueva Vizcaya. They were trained on courses in organic farming, composting/organic fertilizer making, pest management and others. Respondents have different sources of income, from farm or non-farm sources as indicated in Table 4. The average household annual income from all sources of the organic vegetable respondents was ₱71,097 compared to the ₱87,140 for the conventional. Among the organic farmers, the in-conversion farmers had the highest income with P81,698 per annum where in their average income come from members of the family as overseas Filipino workers (OFWs).

The highest amount of income of the organic farmers came from regular employment with 34.11 present of total income while for conventional farmer-respondents was on vegetables production with 43.31 percent of their total average annual income or ₱37,740.

Table 2. Trainings attended by type of farmer-respondent, documentation of organic vegetables in Region 02, 2009-2010.

Particular	Type of Organic Farmer						All Organic (n=64)		Convent Ional	
	Full (n=22)		In Conversion (n=19)		Traditional (n=23)					
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Attended Trainings?										
Yes	22	100	19	100	23	100	64	100	4	7.69
No	0	0	0	0	0	0	0	0	48	92.31
Training Courses Attended										
Organic Farming	12	54.54	9	47.37	6	26.09	27	42.19	1	1.92
Composting & Organic Fertilizer Making	1	4.55	2	10.53	0	0	3	4.69	1	1.92
Others	4	18.2	6	31.56	3	13.05	13	20.31	2	3.85

Sources and Average Annual Household Income

The higher average annual household income of the conventional farmers can be attributed to the higher income on conventional vegetables production which is more than 43 percent of their annual average total income. It is worth mentioning that there are still organic farmers who still have income from conventional vegetables production. This means that they are not yet ready to convert all their farms into organic, since the stage of converting is risky. Based on the Philippine National Standards Specification for Organic Agriculture, conversion is the process of changing an agricultural system from conventional to organic. The period covered during this process is known as transition. This includes the total change of inputs of artificial fertilizer and/ or pesticide to inputs that conform to this standard.

Table 3. Average annual household income by source by type of farmer-respondents, economics of organic vegetables production in Region 02, 2009-2010.

Source of Income	Type of Organic Farmer						All Organic (n= 64)		Convent- Ional (n=52)	
	Full (n=22)		In conversion (n=19)		Traditional (n=23)					
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Regular employment	44,975	48.90	21,105	25.81	12,696	22.89	25,685	34.11	10,615	12.18
Rice and corn	11,647	12.66	16,339	19.99	16,509	29.76	14,889	19.77	25,272	29.00
OFW		13.05	29,053	35.53	3,548	6.40	14,090	18.71	1,846	2.12
Organic vegetable	14,767	16.61	8,373	10.31	6,423	11.47	9,712	13.11	-	
Conventional vegetable	1,167	1.60	332	0.41	5,124	9.24	2,379	3.29	37,740	43.31
Livestock and poultry	1,750	1.90	1,158	1.42	3,084	5.56	2,064	2.74	1,424	1.63
Driving	-		368	0.45	4,217	7.60	1,677	2.23	896	1.03
Hired labor-non farm	960	1.30	2,633	3.22	783	1.41	1,484	1.97	5,458	6.26
Business	-		-		2,109	3.80	782	1.04	2,845	3.26
Others	3,655	3.98	2,337	2.86	1,043	1.89	2,282	3.03	1,045	1.20
Total household income	78,921	100.00	81,698	100.00	55,535	100.00	71,097	100.00	87,140	100.00

Average Area Planted to Vegetable

The average area cultivated to vegetables by the conventional farmers was around six times (2,972.19sq m) the area for organic vegetable with only 508.55square meters. Among the three types of organic farmers, the traditional farmers had the smallest area with only 262.53sq m. (Table 5). As expected, the conventional vegetable production is in commercial scale and therefore they have bigger farms. Moreover, the lack of organic commercial inputs constrained the farmers to plant organic vegetables in large farm size since they still have to produce their own organic inputs such as bio-pesticides and fertilizers. Before expanding or converting to organic agriculture to larger area, the farmers have to try it first by themselves. In terms of the area planted to the different "pinakbet" vegetables under study, the largest average area cultivated to organic production was on pepper with 235.94 square meters. For the conventional farmer-respondents,

the largest area cultivated was on "ampalaya" (1,082.22sq m). Although the study is on the lowland vegetables, there were farmer-respondents who also produce high land vegetables (lettuce, sweet peas and carrots). These farmers are from the higher elevation areas of the study site.

Table 4. Average area cultivated by commodity by type of farmer-respondent, economics of organic vegetables production in, Cagayan Valley region.

Commodity	Type of Organic Farmer			All Organic (n=64)	Conventional (n=52)
	Full (n=22)	In conversion (n=19)	Traditional (n=23)		
Eggplant	138.89	128.08	53.37	93.86	991.97
Ampalaya	90.00	233.50	144.95	156.12	1,082.22
Tomato	70.93	61.11	36.76	52.04	1,029.14
Okra	82.78	156.63	32.37	74.45	356.88
Squash	92.92	11.00	128.17	91.01	674.20
String beans	234.30	122.95	32.54	119.40	527.52
Pepper	108.75	785.00	25.00	235.94	202.11
Others	439.44	1,289.38	300.00	672.32	
Lettuce	293.08	81.67		222.61	
Sweet pea	293.83			293.83	
Carrot	834.00			834.00	
Average (sq m)	494.08	822.37	262.53	508.55	2,972.17

Average Yield

Table 6 shows that among the different vegetables, organic vegetable had higher yield/1000sq m for okra (748kg), squash (545kg) and string beans (437kg) than conventional vegetable production with 131kg, 261kg and 236kg per 1000sq m, respectively. The yield of conventional farmers for the other vegetables was higher than organic production. However, based on BAS data, the average yield in the region is still higher with 8.3t/ha, 8.3t/ha and 9.26t/ha for okra, squash and string beans, respectively. The results indicate that vegetables grown organically have always higher yields cannot be concluded. There may be other factors in the production system that influenced the variations in yield which is beyond the scope of the study.

Table 5. Average yield (kg) per 1,000sq m by type of farmer-respondent, economics of organic vegetables in Cagayan Valley region, Philippines.

Commodity	Type of Organic Farmer			All Organic	Conventional
	Full	In conversion	Traditional		
Production (kg) per 1,000sq m					
Eggplant	588.00	554.80	659.57	594.18	1,238.70
Ampalaya	669.14	153.32	216.78	256.72	1,080.29
Tomato	945.82	1,691.82	552.78	1,079.06	2,054.50
Okra	623.18	797.29	856.10	748.27	131.00
Squash	708.52	4,545.45	195.06	544.79	260.65
String beans	351.53	374.49	1,063.15	437.19	236.01
Pepper	704.60	34.71	347.50	128.48	329.65

Costs of Production

Labor inputs

The average labor inputs (man days and cost) per 1000 square meters by commodity by farmer type in Table 7 shows that except for pepper, organic farmers incurred higher labor days and therefore costs per 1000sq m for all commodities studied than the conventional farmers. This higher labor input in organic farming was due to the more visits made to their farms in taking care of their plants since they sparingly used chemicals. The organic farmers did not spray commercial chemicals which are easier to use but they did handpicking of worms or they prepared their own concoction of bio-pesticides which is more

laborious than using commercial pesticides. Likewise, hand weeding and watering were more frequently practiced by the organic farmers. Conventional farmers incurred higher costs of material inputs for all vegetables studied. Material inputs include seeds, pesticides, fertilizer and trellises for vine plants (Table 8). This can be explained by the fact that most of the organic farmers produce their own seeds from their own farm and prepare their own organic fertilizer and pesticide for their farm.

Table 6. Average labor inputs per 1000sq m by commodity by type of farmer-respondent, economics of organic vegetables in Region 02, 2009-2010.

Particular	Type of Organic Farmer			All Organic (n-64)	Conventional
	Full	In conversion	Traditional		
Labor Mandays					
Eggplant	30.82	34.62	55.80	39.03	29.13
Ampalaya	45.44	28.72	18.21	26.74	21.18
Tomato	52.96	63.65	48.71	55.79	19.84
Okra	41.50	42.77	47.39	43.28	40.86
Squash	41.76	73.48	27.26	35.59	19.94
String beans	20.23	34.66	81.81	31.45	29.90
Pepper	38.69	13.64	18.67	16.79	22.83
Labor Cost					
Eggplant	4,037.70	5,010.42	6,795.86	5,170.60	3,408.50
Ampalaya	6,376.51	4,119.64	2,450.10	3,745.59	2,600.59
Tomato	7,042.07	9,099.73	6,930.63	7,794.30	2,506.44
Okra	5,726.18	6,117.86	6,198.73	5,996.99	4,009.85
Squash	6,011.46	11,022.73	3,846.53	5,096.18	2,463.97
String beans	1,762.07	5,738.67	10,481.98	3,942.97	3,764.51
Pepper	5,042.64	1,721.99	2,436.30	2,142.48	3,082.11

The full organic farmers did not anymore apply any fertilizer in their farms while some in-conversion and traditional farmers applied fertilizers. However, conventional farmers still spend inorganic fertilizers in there. Only the conventional farmers had expenditures on pesticides. Okra and string beans had the highest pesticide costs, with ₱2964 and ₱2,414 per 1000sq m, respectively.

Table 7. Cost of material inputs per 1000sq m by commodity and by type of farmer-respondents, economics of organic vegetables production in Cagayan Valley Region, Philippines.

Commodity	Type of Organic Farmer			All Organic	Conventional
	Full	In conversion	Traditional		
Eggplant	1,464.00	294.29	2,807.05	1,334.59	5,813.72
Ampalaya	3,253.09	2,349.03	640.86	1,758.05	6,152.56
Tomato	3,766.36	972.73	1,165.80	1,924.84	4,752.09
Okra	181.21	147.64	971.87	329.19	11,379.92
Squash	1,542.60	23,636.36	714.40	1,598.88	2,995.51
Stringbeans	549.02	236.59	962.78	499.1	15,205.94
Pepper	2,551.72	25.48	2,225.00	433.11	3,857.82

Prices Received

Table 9 shows that among the vegetables, organic farmers received higher price for all vegetables except for pepper than the conventional farmers. The full organic farmers received higher average price for five commodities (eggplant, tomato, okra, squash, and string beans) out of the seven commodities under study while traditional farmers received the highest price for pepper and the in-conversion farmers received the highest price for ampalaya.

This can be explained by the fact that the full organic, received stable price throughout the year, that is, even prices went down as agreed with their buyer.

Another reason for the higher price received by the organic farmers was that the organic farmers due to the small volume of produce, they retailed their vegetables to the people in their own community which command higher price than wholesale price. The conventional farmers on the other hand, since

they have higher volume of produce due to higher production area and mono cropping, they sold their produce to wholesalers and therefore at a lower price.

Table 8. Average price received (₱/kg) by commodity and by type of farmer-respondent, economics of organic vegetables in Region 02, 2009-2010.

Commodity	Type of Organic Farmer			All Organic	Conventional
	Full	In conversion	Traditional		
Eggplant	26.71	14.45	25.72	21.68	9.53
Ampalaya	17.03	37.73	27.40	26.33	10.72
Tomato	31.45	28.04	21.80	27.93	4.07
Okra	22.71	9.05	13.87	14.18	12.33
Squash	19.87	16.00	22.60	19.68	13.07
String beans	43.32	15.45	20.75	29.95	25.81
Pepper	38.73	41.19	60.90	42.46	58.14

Marketing Practices

Table 10 shows the marketing practices of the farmer-respondents for their vegetables produced. Most (87.50 percent) of the organic farmers sold their produce at the farm and 73.44 percent brought to the market. For the conventional farmers on the other hand, all of the respondents brought their produce to the market and at the same time 67.31 percent had their produced picked-up by buyers from their farm. There were 46.15 percent who experienced both picked-up and brought to market.

The type of buyer could either be direct consumer, wholesaler, retailers, institutional buyers or combination of two or more of these buyers. Around 80 percent of the organic farmers sold directly to consumers and 29.69 percent sold to institutional buyers. The conventional farmers however all sold to wholesalers and 92.31 percent sold directly to buyers/consumers. The organic vegetable farmer-respondents mentioned that the community people prefer to buy their vegetables from them because they are sure that their vegetables were free from chemicals and pesticides.

Around 97% of organic farmers and all conventional farmers sold their produce cash on delivery. There were also around 13 percent each of the organic and conventional farmer-respondents who were paid in advance for their produce. For the organic farmers, there were 25 percent who sold on credit/consignment and 11.5 percent for the conventional farmers. Sold on credit means that the farmer was paid only several days after the delivery of the produce.

Table 9. Respondents' marketing practices on vegetables by type of farmer-respondent, economics of organic vegetables in Region 02, 2009-2010.

Particular	Type of Organic Farmer						All Organic		Conventional	
	Full (n=22)		In conversion (n=19)		Traditional (n=23)					
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Place of Sale										
Picked-up from the farm	17	77.27	16	84.21	23	100.00	56	87.50	35	67.31
Picked-up from the farm and Brought to market	2	9.09	5	26.32	7	30.44	14	21.88	24	46.15
Picked-up from the farm and others	0	0	0	0.00	6	26.09	6	9.38	0	0
Brought to market	16	72.73	14	73.68	17	73.91	47	73.44	52	100.00
Brought to org'n.	5	22.73	0	0.00	15	65.22	20	31.25		
Type of buyer										
Consumer	22	100.00	6	31.58	23	100	51	79.69	48	92.31
Wholesaler	0	0	19	100.0	6	26.09	25	39.06	52	100.00
Retailers	0	0	6	31.58	3	13.04	9	14.06	12	23.08
Institutional buyers	11	50.00	4	21.05	4	17.39	19	29.69	0	0.00
Others (a,b,c)	0	0	0	0	1	4.35	1	1.56	7	13.46
Others (a,c,d)	0	0	0	0	6	26.09	6	9.38	0	0.00
Others (b,c)	0	0	0	0	1	4.35	1	1.56	0	0.00
Others	0	0	0	0	12	52.17	12	18.75	0	0.00
Mode of payment										
Cash on delivery	20	90.91	19	100.0	23	100	62	96.88	52	100.00
Cash/credit	0		4	21.05	9	39.13	13	20.31	16	30.77
Cash Advance	1	4.55	7	36.84	0	0	8	12.50	7	13.46
Credit	12	54.55	0	0.00	4	17.39	16	25.00	6	11.54
Consignment	0	0.00	0	0.00	13	56.52	13	20.31	5	9.62

Multiple responses

Cost and Return Analysis

Table 11 shows the costs and returns of the different vegetables.

Eggplant

The gross income in eggplant was highest among the traditional vegetable farmer-respondents with ₱16,967 per 1000 square meters. This is because they had higher yield and got comparable price than the full organic and in-conversion farmer-respondents. Although the conventional farmer-respondents had the highest average yield per 1000sq m (1,239kg), they had lower gross income (₱11,807) than the organic farmers. This is because the conventional farmers received lower price of their produce which was only ₱9.53/kg compared to the ₱21.68/kg for the organic farmers.

On the average, the organic farmers therefore had higher net farm income which was ₱6,501/1000sq m than the conventional farmers which was ₱2,096/1000sq m. Consequently, the return to total expenses was highest among the full organic farmer-respondents with 210.61 percent. This means that for every ₱100 pesos spent on full organic vegetable production, the return would be ₱210.61 or a one peso invested on organic vegetable, the return would be ₱2.11.

Ampalaya

Despite conventional farmers received lower price per kilogram of their ampalaya, they had higher gross income (₱11,582) than the organic farmers due to their higher yield compared to the organic farmers. In terms of the total costs of production, the conventional farmers however incurred higher cost with ₱10,432 than the organic farmers which was only ₱5,059/1000sq m. This made the organic farmer-respondents had higher average net income which was ₱1,623/1000sq m than the conventional farmer-respondents which was ₱1,149/1000sq m.

Table 10. Summary of cost and return per 1000sq m by commodity by type of farmer-respondent, economics of organic vegetables in Region 02, 2009-2010.

Item	Type of Organic Farmer			All Organic	Conventio nal
	Full	In conversion	Traditional		
Eggplant					
Gross income	15,704	8,014	16,967	12,882	11,807
Total costs	5,056	6,048	8,804	6,381	9,835
Net farm income	10,648	1,967	8,163	6,501	1,971
Return to total cost (%)	210.61	32.52	92.72	101.89	20.04
Ampalaya					
Gross income	11,395	5,785	5,940	6,682	11,582
Total costs	8,637	5,858	2,866	5,059	10,432
Net farm income	2,758	(73)	3,074	1,623	1,149
Return to total costs (%)	31.94	(1.25)	107.26	32.09	11.02
Tomato					
Gross income	29,742	14,707	12,053	18,614	8,357
Total costs	7,357	10,557	8,139	8,755	7,327
Net farm income	22,384	4,151	3,915	9,859	1,030
Return to total costs (%)	304.24	39.32	48.10	112.61	14.05
Okra					
Gross income	14,151	7,218	11,876	10,612	2,038
Total costs	6,074	7,114	6,599	6,471	16,186
Net farm income	8,077	104	5,276	4,140	(14,148)
Return to total costs (%)	132.97	1.46	79.95	63.98	(87.41)
Squash					
Gross income	14,081	19,091	4,408	9,641	3,408
Total costs	7,270	12,603	4,616	6,350	5,787
Net farm income	6,810	6,488	(208)	3,291	(2,380)
Return to total costs (%)	93.67	51.48	(4.50)	51.83	(41.12)
String beans					
Gross income	16,311	5,787	22,062	13,536	6,091
Total costs	2,367	6,392	9,981	4,580	10,621

Item	Type of Organic Farmer			All Organic	Conventio nal
	Full	In conversion	Traditional		
Net farm income	13,944	(605)	10,081	8,957	(4,531)
Return to total costs (%)	589.00	(9.46)	121.03	195.57	(42.66)
Pepper					
Gross income	7,287	7,879	21,161	10,819	19,165
Total costs	5,298	2,799	2,800	2,900	7,650
Net farm income	1,990	5,080	18,361	7,919	11,515
Return to total costs (%)	37.56	181.46	655.68	273.03	150.53

Tomato

The average gross income of organic farmers on tomato was ₱18,614/1000sq m with the full organic farmer-respondents having the highest which was ₱29,742/1000sq m. The conventional vegetable farmer-respondents had an average gross income of ₱8,357/1000sq m. Although the conventional farmers had higher yield (2,055kg/1000sq m) than their counterpart (1,079kg/1000sq m), they had lower gross income because they received lower average price of their produce. The average total cost of production per 1000sq m for the organic farmers was ₱8,755, higher than the conventional farmers which was ₱7,327. The average net farm income/1000sq m of the organic vegetable farmer-respondents was ₱9,859/1000sq m. The average net farm income was highest among the full organic farmer-respondents with 22,384/1000sq m. Because of the lower value of produce by the conventional farmers, their net farm income from tomato was only ₱1,030/1000sq m.

Okra

The average gross income per 1000sq m of the organic farmer-respondents was ₱10,612, higher than the conventional farmers which was only ₱2,038. . This is because of the lower yield of okra (158kg/1000sq m) of the conventional farmers in addition to the average lower price they received for their product which was ₱12.91/kg. The highest gross income from okra were the full organic farmer-respondents with ₱14,151/1000sq m. The average net farm income of the organic vegetable farmer-respondents from okra production was ₱4,140/sq m while the conventional vegetable farmer-respondents incurred a net loss of ₱14,148/1000sq m. This net loss happened because of the low yield, lower price received and high cost of production.

Squash

The conventional farmer-respondents had higher average gross income (₱19,091/1000sq m) than the organic vegetables farmer-respondents with ₱9,641/1000sq m. The high gross income of the in-conversion farmers is due to the higher yield/1000sq m which was 1,045kg. The average total cost of production for the organic farmers was a little higher (₱6,350/1000sq m) than the conventional farmer-respondents which was ₱5,787/1000sq m. The organic farmers on the average had a net farm income of ₱3,291/1000sq m from squash production while the conventional farmers incurred a net loss of ₱2,380/1000sq m. The full organic farmers had the highest net income with ₱8,810/1000sq m.

String beans

On the average, the organic farmer-respondents had a gross income of ₱13,536/1000sq m higher than the conventional with a gross income of ₱6,091/1000sq m. On the average, the organic farmers incurred a total cost of ₱4,580/1000sq m in their string bean production lower than the conventional farmers which was ₱10,621/1000sq m. Hence, the organic farmers obtained a higher net farm income of ₱8,957/1000sq m than the conventional farmer-respondents which incurred a net loss of ₱4,531/1000sq m. Among the organic farmers, the full organic farmer-respondents had the highest net farm income (₱13,944/1000sq m).

Pepper

The average gross income of conventional farmers was higher, which was ₱19,165, than the organic farmers with ₱10,819/1000sq m. The average total costs/1000sq m of the conventional vegetable farmer-respondents was ₱7,650 while the organic farmer, the average total cost was ₱2,900.

The organic farmers had lower net farm income per 1000sq m (₱7,919) than the conventional farmers (₱11,515). However, the return to total cost for the organic farmers was higher (273 percent) than the conventional farmers with only 150 percent. Among the organic farmers, the traditional farmer-respondents had the highest net farm income with ₱18,36.

In summary, the results indicate that organic farmer-respondents had higher net farm income per 1000sq m for all commodities except pepper where the conventional farmers had higher net farm income than the organic farmers. The full organic farmers had the highest net farm income for eggplant, tomato, okra, squash and string beans while the traditional farmers had the highest net farm income in ampalaya and pepper. Conventional farmers incurred a net loss in okra, squash and string beans.

Average Production Cost per Unit

The average production cost per unit is an important guide for every producer in deciding the price of the output. Table 12 shows the average production cost per unit of produce of the different vegetables under study. Among the different vegetables, the organic farmer-respondents had higher cost of production per kilogram for eggplant, ampalaya and tomato while conventional farmers had higher cost perkg for the other vegetables (okra, squash, string beans and pepper). Of the three types of organic farmer-respondents, the full organic farmers produced eggplant, ampalaya, squash, string beans and pepper at lower cost than the in-conversion and traditional farmers.

Table 11. Average production cost per unit by commodity by type of farmer-respondent, economics of organic vegetables in Region 02, 2009-2010.

Item	Type of Organic Farmer			All Organic	Conventional
	Full	In conversion	Traditional		
Eggplant	8.60	10.90	13.35	10.74	7.94
Ampalaya	12.91	38.21	13.22	19.71	9.66
Tomato	7.78	6.24	14.72	8.11	3.57
Okra	9.75	8.92	7.71	8.65	102.41
Squash	10.26	12.06	23.67	13.39	22.20
String beans	6.73	17.07	9.39	10.33	45.00
Pepper	7.52	80.65	8.06	22.57	23.21

Break-even Analysis

The break-even analysis used in this study is the break-even yield (BEY) which refers to the yield required to recover the variable costs incurred in the production of the vegetable at the given input and output prices (Table 13). This result shows that higher yields are required for the conventional farmers than the organic farmers in order to recover the cost of production in all vegetables under study. This is because generally, the conventional farmers used commercial inputs which are more costly and they received lower price of their outputs.

Table 12. Break-even yield of the different vegetables by commodity and type of farmer-respondent, economics of organic vegetables in Region 02, 2009-2010.

Item	Type of Organic Farmer			All Organic	Conventional Full
	Full	In conversion	Traditional		
Eggplant	189.29	418.52	342.31	294.33	1,032.05
Ampalaya	507.15	155.27	104.60	194.35	973.17
Tomato	233.97	627.09	373.24	371.96	1,800.29
Okra	267.46	786.11	475.79	456.36	1,253.74
Squash	365.83	690.17	204.25	312.37	442.80
String beans	51.05	413.63	481	150.07	411.52
Pepper	136.79	63.25	45.98	66.40	131.58

Input Utilization Ratios

Capital-Output Ratio

The capital-output ratio (COR) is the ratio between total cost of production and the value of total output which implies how intensive capital was used (Table 14). Low COR values implies a relatively high input productivity. The organic farmers had capital-output ratio of less than one for all vegetables. This means that organic farming has high input productivity. Among the vegetables, pepper had the lowest capital-output ratio (0.251) which means that it has the highest input productivity among the vegetables in organic farming. Ampalaya on the other hand had the highest capital-output ratio with 0.757 among the organic vegetables studied. This means that ampalaya production requires 75.7 centavos as capital to have an output value of ₱ 1.0. Generally, the organic vegetable farmers had lower capital-output ratio for all the vegetables than the conventional farmer-respondents.

Three vegetables (okra, squash and string beans) had more than one COR for the conventional farmer which means that they are less input productive. These results indicate that the organic vegetables respondents were more input productive than the conventional farmers.

Labor-Output Ratio

Low labor-output ratio (LOR) implies the low man-labor intensity required in production process. The low man-labor intensity implies that very low quantity of labor was required in the production process. In general, organic farmer-respondents had higher LOR for eggplant, ampalaya and tomato than the conventional farmers (Table 14). This indicates that the organic farmers had higher labor intensity on these vegetables than the conventional farmers. Okra, squash and string beans in the conventional farmers had higher LOR with 0.02, 0.006 and 0.005, respectively than the organic farmers. This means that conventional production of these vegetables was more labor intensive than organic farming.

Table 13. Input utilization ratios by commodity by type of farmer-respondents, documentation of organic vegetables in Region 02, 2009-2010.

Input Utilization Ratios	Type of Organic Farmer			All Organic	Conventional
	Full	In conversion	Traditional		
Capital-Output Ratio					
Eggplant	0.322	0.755	0.519	0.495	0.832
Ampalaya	0.758	1.013	0.482	0.757	0.812
Tomato	0.247	0.718	0.675	0.470	0.741
Okra	0.429	0.986	0.556	0.610	7.349
Squash	0.516	0.660	1.047	0.659	1.758
String beans	0.145	1.105	0.519	0.338	1.821
Pepper	0.727	0.355	0.132	0.251	0.510
Labor-output Ratio					
Eggplant	0.002	0.004	0.003	0.003	0.002
Ampalaya	0.004	0.005	0.003	0.004	0.002
Tomato	0.002	0.004	0.004	0.003	0.002
Okra	0.003	0.006	0.004	0.004	0.020
Squash	0.003	0.004	0.006	0.004	0.006
String beans	0.001	0.006	0.004	0.002	0.005
Pepper	0.005	0.002	0.001	0.002	0.002
Land-output Ratio					
Eggplant	0.064	0.125	0.059	0.078	0.085
Ampalaya	0.088	0.173	0.168	0.150	0.086
Tomato	0.034	0.068	0.083	0.054	0.120
Okra	0.071	0.139	0.084	0.094	0.606
Squash	0.071	0.052	0.227	0.104	0.293
String beans	0.066	0.173	0.045	0.076	0.164
Pepper	0.037	0.699	0.047	0.183	0.052

Land-Output Ratio

The land-output ratio (FOR) shows the productivity of land. Low FOR means that the land was productive, that is more output for a given size of land cultivated to vegetables. Organic vegetable respondents had lower land-output ratio for eggplant, tomato, okra, squash and string beans than the conventional farmers. This means that the organic farmers had higher land productivity in these vegetables than the conventional farmers. The land productivity of the conventional farmers on the other hand was higher in ampalaya and pepper with FOR of 0.085 and 0.052, respectively.

Acknowledgement

The author wholeheartedly acknowledge the financial support of the Philippine Council for Agriculture, Aquatic, Forestry and Natural Resources Research and Development (PCAARRD) for the completion of the whole project where the data of this study was generated. Likewise, the support of Cagayan State University in the completion of this research is very much appreciated. Gratitude is also extended to Lina Antonio and Jezreel Pattaguan, all the respondents, key informants and all persons who in one way or another provided significant assistance in the conduct of this research.

References

Amadou Binta BA, Bruno Barbier. 2015. Economic and environmental performances of organic farming system compared to conventional farming system: A case farm model to simulate the horticultural sector of the Niayes Region in Senegal. Journal of Horticulture **2,** 152.
DOI: 10.4172/2376-0354.1000152

Aquino Albert P, Jamaica Angelica P, Deriquito, Meliza A. Festejo. (Organic Agriculture Act Towards a Greener Philippines
http://ap.fftc.agnet.org/files/ap_policy/93/93.215_1.pdf).

Cabrera and Wagney. 2016. Supply Chain Analysis of Selected Organically Grown Temperate Vegetables, In: (NOAP, report 2016). http://organic.da.gov.ph/index.php/2016-12-06-07-53-57/2016-12-06-07-59-21/supply-chain-analysis-of-organically-grown

Conrado Vilma D, Avelina Antonio, Jezreel Pattaguan. 2011. Documentation of Organic Vegetables in Region 02. Unpublished Research Report, Cagayan State University, Tuguegarao City.

Crowder, David W, John P. Reganold. 2015. Financial competitiveness of organic agriculture on a global scale. In Proceedings of the National Academy of Sciences (PNAS) of the United States, June 16, 2015, 112 (24).
https://doi.org/10.1073/pnas. 1423674112 Edited by M. S. Swaminathan, Centre for Research on Sustainable Agricultural and Rural nt, Madras, India.

Helga, Willer and Julia Lernuod (Eds). 2017. The World of Organic Agriculture Statistics and Emerging Trends 2017 Research Institute of Organic Agriculture (FiBL), Frick and IFOAM, edited by- Organics International, Bonn, Version 1.1 of February **8,** 2017.

IFOAM & FiBL. 2006. Brief Overview of Organic Farming. www.intracen.org/ Organics/Country- Profile-Philippines. htm.

Landicho, Leila D, Roselyn F, Paelmo, Rowena D. Cabahug, Roberto G. Visco and Maryanne G, Abadillos. 2014. Prospects and Challenges in Promoting Organic Agriculture in the Upland Communities in the Philippines: Implications to Food Security and Nutrition. International Conference on Food Security and Nutrition, IPCBEE vol.67 (2014) © (2014) IACSIT Press, Singapore,
DOI: 10.7763 /IPCBEE. 2014. V67. 12. 60 – 65.

Lantican FA. 2011. Supply chain analysis of high value vegetables in the Philippines [2011] in FAO-AGRIS from The Journal of Issaas [International Society For Southeast Asian Agricultural Sciences] (Philippines) ISSN : 0859-3132.
http://agris.fao.org/agrissearch/search.do?recordID =PH2013000516

Mordo Intelligence. 2017. Market Entry - Organic Food Market in Philippines: Analysis of Growth, Trends and Progress (2017 - 2022). 5th Floor, Brigade Towers, Financial District, Gachibowli, Hyderabad - 500032, India. https://www.mordorintelligence.com /industry-reports/market-entry-organic-food-market.

Nemes, Noémi. 2009. Analysis Of Organic And Non-Organic Farming Systems: A Critical Assessment Of Farm Profitability. A Report in the Food and Agriculture Organization of the United States.
www.fao.org/tempref/docrep/fao/011/ak355e/ak355 e00.pdf

NOAP. 2012-2016, http://organic.da.gov.ph/images /Documents/NOAPDocument.pdf.

Olabisi, Laura Schmitt Olabisi, Ryan Qi Wang and Arika Ligmann-Zielinska. 2015. Why Don't More Farmers Go Organic? Using A Stakeholder-Informed Exploratory Agent-Based Model to Represent the Dynamics of Farming Practices in the Philippines. Land **4,** 979-1002
DOI: 10.3390 /land4040979

Porciuncula Fe L, Luzviminda M, Galang, Rex S, Parayno. 2015. Going organic: Understanding the organic vegetables production environment in Central Luzon, Philippines, Journal of Agricultural Technology **11(2),** 341-366. ISSN 1686-9141.

Republic Act. 10068. Organic Agriculture Act of the Philippines. https://www.lawphil.net/statutes/repacts /ra2010/ra_10068_2010.html

Rijk, Tomekde Ponti Bert, Martin K. van Ittersum. 2012. The crop yield gap between organic and conventional agriculture, Agricultural Systems **Vol 108,** April 2012, page 1-9, Elsevier.
DOI: 10.1016/J.AGSY.2011.12.004

Shennan, Carol, Timothy J, Krupnik, Graeme Baird, Hamutahl Cohen, Kelsey Forbush, Robin J, Lovell, Elissa M, Olimpi. 2017. Organic and Conventional Agriculture: A Useful Framing? Annual Review of Environment and Resources Vol. **42,** 317-346 (Volume publication date October 2017)
https://doi.org/10.1146/annurev-environ-110615-085750

Thippeswamy E, Comparative analysis of organic and inorganic food. 2013. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372.Volume 4, Issue 6 (Sep. - Oct. 2013), pp 53-57

Verena Seufert, Navin Ramankutty. 2017. Many shades of gray—The context-dependent performance of organic agriculture. Science Advances **3(3),** 2017. Sci. Adv. 2017; 3: e1602638 10 March 2017 p 1 – 14. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5362009/

Villegas, Pablito and Custodio, Henry. 2014. Socio-Economics and Policy Support Towards Enhancing the Organic Vegetables Industry in the Philippines. Paper in: IFOAM Organic World Congress 2014, Istanbul, Turkey, 13-15 October 2014.

Vlašicová E, Náglová Z. 2015. Differences in the financial management of conventional, organic, and biodynamic farms*. Scientia agriculturae bohemica **46(3),** 106–111.
DOI: 10.1515/sab-2015-0024