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Factors affecting profitability of small-scale vegetable production in the Visayas

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ABSTRACT

This study was conducted to assess the profitability of small-scale vegetable production in the Visayas, particularly in the islands Leyte, Samar and Bohol. The data used in the study was taken from baseline survey on vegetable production in the Visayas. Descriptive, correlation and multiple regression analyses were used in analysing factors that influence profitability. Results show that significant factors that affect profitability include cropping practices and market outlets. This suggests that profitability of small-scale vegetable production measured in terms of gross margins will tend to increase with the practice of multi-cropping and intercropping systems. With limited farm size, farmers can maximize the yield of vegetable production through intercropping and multi-cropping practice. In addition, primary market outlet affects profitability implying that better access to market translates to higher profitability. Results of the study suggest that to improve profitability of farmers in Leyte, Samar and Bohol, policy makers, researchers and technician should focus on optimizing cropping system. Farmers should be trained to identify vegetables that produces better yield in an intercropping and multi-cropping system. This should also be complemented with better access to market. Farm to market road should be improved so that farmers can easily link their production to the market.

Keywords: profitability, market access, vegetable farmers, cropping system

INTRODUCTION

Vegetables are loaded with vitamins and minerals that contribute to growth and the maintenance of good health. Vegetables may help reduce risk for heart disease, including heart attack and stroke. Most vegetables are naturally low in fat and calories. One of the main health benefits of vegetables is their high nutrient content, including potassium, dietary fiber, folate (folic acid), vitamin A, and vitamin C. Diets rich in potassium may help to maintain healthy blood pressure. Vegetable sources of potassium include sweet potatoes, white potatoes, white beans,

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tomato products (paste, sauce, & juice), beet greens, soybeans, lima beans, spinach, lentils, and kidney beans (Barrett 2006).

Despite the health benefits of vegetables, it's consumption in the Philippines is currently estimated at only 39kg per capita, well below the 146-182kg per capita recommended by the World Health Organization (WHO). Majority of fresh vegetables in the Philippines (75-85%) are sold through the traditional marketing system, where farmers sell their produce on the spot market to traders, consolidators, vegetable processors and wholesalers in the wet market. The supermarket share of the local vegetable market is just 10%, (Batt et al 2005).

The average farm size in the Philippines is just 2.02 hectares and it is very difficult for smallholder vegetable farmers to access institutional market. Inconsistent supply, poor quality, low prices, unfavorable terms of payment and penalties associated with non-compliance are some of the problems faced by small-scale vegetable farmers. Poor quality is a multifaceted problem that has root causes at the farm level and post-farm gate. This includes poor quality seed, poor cultural practices, excessive insect and disease damage, inappropriate post-harvest handling, the high cost of inputs and limited access to finance. Furthermore, most smallholder vegetable farmers are unaware of the quantities of vegetables planted, the customers' quality requirements, preferred varieties, the seasonality of production and the supply and demand situation in both domestic and export markets (Carating et al 2010).

Addressing the demands and the current problems of the industry requires resources. The Visayas region has the smallest area (approximately 56,606km^2) among the three major regions of the Philippines. The climatic conditions are unpredictable which needs to be considered especially in planting seasonal crops (Amongo 2011). In this regard, this study seeks to answer the following questions: (i) how profitable is the vegetable production of small-scale farmers in the Visayas? (ii) what were the factors that affect the profitability of their production? And (iii) what were the key determinants of the vegetable profitability? Specifically, this study will particularly evaluate the profitability of farmers growing the following selected vegetables: tomato, sweet pepper, eggplant and bitter gourd. These vegetables are commonly planted in the Visayas region.

METHODOLOGY

Data Used

The data used in the study was taken from the Australian Center for Intenational Agricultural Research (ACIAR) funded project conducted by Visayas State University on protected vegetable production. The study focuses on enhancing profitability of vegetable farmers in the Philippines using integrated crop management approach (McDougall & Rogers 2012). This is a project implemented by Visayas State University (VSU) together with several collaborating agencies. Area covered by the project includes the vegetable farmers from Samar, Leyte and Bohol. Small-scale vegetable farmers were the respondents of the study. The respondents were randomly selected from the farmers trained under the farmer field school (FFS) and other respondents were non-FFS or farmers that were not part of the training to serve as control group. The total number of respondents in different areas of Leyte, Samar and Bohol is 311 farmers. These 311 farmers are

composed of 221 FFS participants and 90 non-FFS farmers (Seriño et al 2017). Figure 1 shows the location of farmers included in the study.

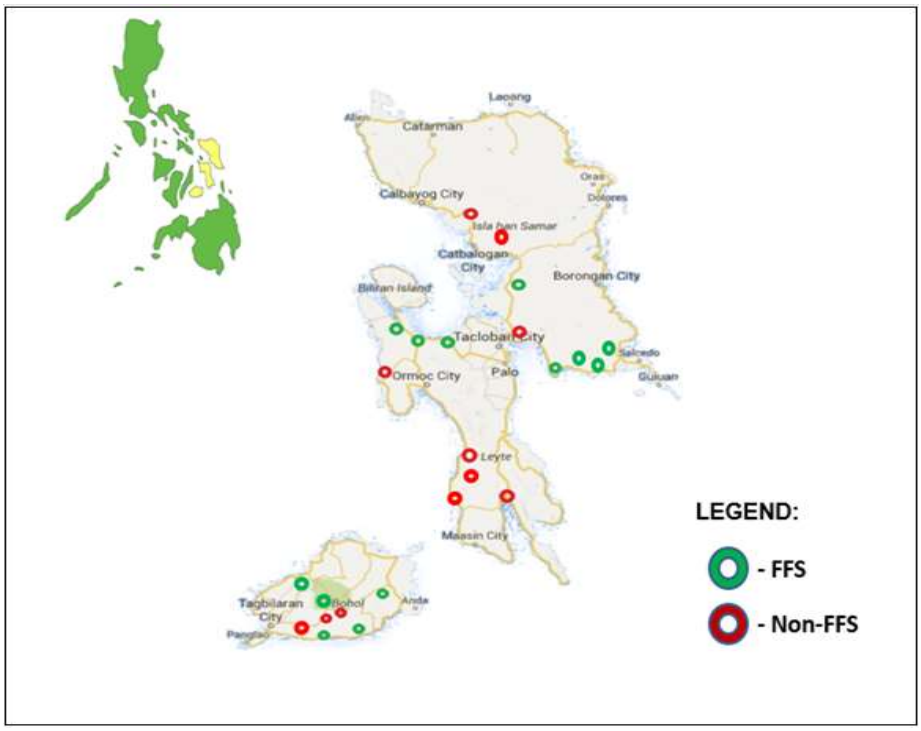

Figure 1. Location of the project sites
(Source: Seriño et al 2017)

Gross Margin (GM)

Gross margin analysis (GMA) is probably one of the most widely used method in assessing profitability. Gross margin is frequently used to calculate the profitability of different farm enterprises and technologies. It can be used to calculate the profitability of growing an entirely new crop if a farmer wishes to diversify production. It can be used to project future profitability as part of the farmers' planning (Jagelavicius 2013). However, computation of gross margin does not include fixed cost. It only accounts the variable cost. This approach is practical in assessing profitability of small-scale vegetable farmers because small-scale farmers do not have the capacity to invest in big production facilities and equipment. Small-scale production costs mostly include only variable costs. Gross margin is calculated as follows:

$$Gross\ Margin = Gross\ Income - Variable\ Cost \quad (1)$$

where:

gross income = product price multiplied by the quantity of produce vegetable
variable cost = total cost incurred such as labor cost, material cost, transport and others
gross margin = the profit after deducting expenses and costing incurred

Regression Approach

To analyze the profitability in vegetable production, the method of multiple regression analysis was employed. Regression analysis is a statistical technique that attempts to explore and model the relationship between a dependent variable and two or more independent variables. A regression is a statistical analysis assessing the association between two variables (Seriño 2017). It is to find the relationship between two variables. For this study, the profitability function of small-scale vegetable production is expressed as follows:

$$profitability = \beta_0 + \beta_1 age + \beta_2 hhsize + \beta_3 kid\_school + \beta_4 male + \beta_5 cropping + \beta_6 fert\_app + \beta_7 pesticide + \beta_8 educ\_attainment + \beta_9 civil\_stat + \beta_{10} topography + \beta_{11} farm\_size + \beta_{12} market\_outlet + \mu \quad (2)$$

where:

profitability	= captures total revenue minus total cost
age	= age of the household head measured in years
hhsize	= the household size of the respondents measured by the number of members
kid_school	= captures the number of kids currently in school
male	= dummy variable representing 1 for male and zero for female
cropping	= captures cropping system adopted
fert_app	= dummy variable for farmers applying fertilizers (1 for those applying fertilizer & 0 for those not applying fertilizers)
pesticide	= dummy variable for farmers applying pesticide (1 for those applying pesticide and 0 for those not applying pesticide)
educ_attainment	= educational level measured by years attended
civil_stat	= civil status of respondents
topography	= location of farm area whether in upland, lowland and hilly area
farm_size	= size of the vegetable farm measured in square meters
market_outlet	= dummy variables for the primary market outlet of vegetable farmers
μ	= remaining error term

RESULTS AND DISCUSSION

Socio-Demographic Characteristics

Table 1 presents the selected demographic characteristics of the 311 vegetable farmers in the Visayas. Majority of the respondents in three provinces were aged 41 – 60 years old with an average age of 49 years old for Leyte and 50 years old for Samar and Bohol. About 80% of the farmer respondents were males. In Leyte, 84.6% of the respondents are married while for Bohol are 87.3% and Samar farmers are close to 95%. Most of the respondents finished either elementary education or secondary level of education. The average households' size of the farmers in Bohol and Leyte is five (5) while for Samar the average household size is six (6). Table 1 shows the summary of socio-demographic characteristics of farmers included in the study.

Table1. Socio-demographic characteristics of 187 vegetable farmers in the Visayas

Characteristics	Leyte		Samar		Bohol	
	n	%	n	%	n	%
a. Age						
20 and below	0	0.0	1	1.0	0	0.0
21-40	21	27.3	19	19.6	21	16.7
41-60	43	55.8	62	63.9	86	68.3
61 and above	13	16.9	15	15.5	19	15.1
Total	77	100.0	97	100.0	126	100.0
Mean (years)	48.71		49.93		49.96	
b. Gender						
Male	60	76.9	81	76.4	104	81.9
Female	18	23.1	25	23.6	23	18.1
Total	78	100.0	106	100.0	127	100.0
c. Civil status						
Single	3	3.8	4	3.9	1	0.8
Married	66	84.6	89	87.3	120	94.5
Widowed	4	5.1	5	4.9	4	3.1
Separated	2	2.6	0	0.0	1	0.8
Live-in	3	3.8	4	3.9	1	0.8
Total	78	100.0	102	100.0	127	100.0
d. Educational attainment						
No grade completed	0	0.0	0	0.0	1	0.8
Elementary Level	39	52.7	45	47.9	58	49.2
Secondary Level	26	35.1	35	37.2	40	33.9
College Level	8	10.8	8	8.5	9	7.6
Degree Holder	1	1.4	6	6.4	10	8.5
Total	74	100.0	94	100.0	118	100.0
e. Household size						
1-3	17	21.8	15	14.2	31	24.4
4-6	47	60.3	55	51.9	69	54.3
7-9	12	15.4	28	26.4	22	17.3
>10	2	2.6	8	7.5	5	3.9
Total	78	100.0	106	100.0	127	100.0
Mean	4.81		5.73		5.00	

Farm Area of Vegetable Production

Table 2 shows the average farm area measured in square meter per farmer. On average, Bohol farmers have the smallest land area devoted for planting vegetables compared to Samar and Leyte areas. For tomato, Bohol has the lowest farm area with an average close to 325m^2. Leyte and Samar both have more than 500m^2 average farm area allocated for planting tomato. For sweet pepper, Leyte farmers had the largest land area (945m^2) and again Bohol had the smallest land area of 390.03m^2. For eggplant production, Samar farmers had the largest farm area of 1372.53m^2 while Bohol is still had the smallest area. On average, the farm area allotted for bitter gourd in Samar is 1238.48$m^2$and still the highest of all provinces.

Table 2. Estimated average farm area of vegetable (m^2) per farmer in Leyte, Samar and Bohol

Area (m^2)	Leyte	Samar	Bohol
Tomato	507.50	571.43	324.36
Sweet pepper	945.00	767.00	390.03
Eggplant	1154.00	1372.53	470.01
Bitter gourd	953.74	1238.48	566.76
Average	890.06	987.36	437.79

Input Costs

Vegetable farmers were aware that one way of increasing the quantity of their production is by applying the right amount of fertilizer. Essential nutrients which are presently absent in the soil could be supplemented. Most vegetable farmers usually use the following fertilizers: complete, vermicast, chicken dung, manure, urea, and calcium nitrate. For those who applied fertilizers, Table 3 shows the estimated average cost of fertilizer application per cropping by crop. It appears that Sweet pepper has higher fertilizer cost compared to other crops.

Table 3. Estimated cost of fertilizer application per cropping season

Crops	Leyte	Samar	Bohol
Tomato	1203.29	248.00	610.75
Sweet pepper	2668.92	1904.50	1043.14
Eggplant	2072.33	971.77	832.02
Bitter gourd	1384.00	557.90	1155.88
Average	1832.14	920.54	910.45

Labor includes man-days for hired labor and family labor. Labor cost considers the labor associated with soil preparation, seed-bed preparation, transplanting, fertilizer application, weeding control, pesticide application and harvesting. Table 4 shows the estimated labor cost in the production per crop. For growing tomato, the 3 provinces have incurred different cost. Leyte has relatively higher cost compared Samar and Bohol. Eggplant in For sweet pepper, Bohol and Leyte have lower

expenses compared to Samar. For eggplant, Leyte has higher labor cost comparing to others. This is because of high labor cost, high fertilizer cost and cost associated with weed control. Meanwhile for bitter gourd, results showed that Leyte has relatively higher labor cost with PHP4175.73 compared to Samar and Bohol with PHP2432.46 and PHP2152.38 respectively.

Table 4. Average labor cost (Philippine peso) of four crops in Leyte, Samar and Bohol

1. Tomato	Leyte	Samar	Bohol
Seed bed preparation	675.00	442.86	270.45
Land preparation	571.55	750.00	356.10
Transplanting	585.97	364.29	190.51
Fertilizer application	297.03	303.57	224.13
Weeding control	789.16	317.86	256.26
Pesticide application	160.73	256.25	154.78
Harvesting	435.82	366.67	289.22
Total	3515.26	2801.5	1741.45
2. Sweet pepper			
Seed bed preparation	376.36	595.45	261.93
Land preparation	394.84	684.62	480.53
Transplanting	227.80	283.59	234.08
Fertilizer application	348.47	296.59	298.69
Weeding control	326.86	252.73	273.79
Pesticide application	175.23	169.64	181.69
Harvesting	206.81	525.00	343.83
Total	2056.37	2807.62	2074.54
3. Eggplant			
Seed bed preparation	627.41	517.30	277.33
Land preparation	651.43	904.65	439.90
Transplanting	421.29	335.09	260.56
Fertilizer application	725.07	442.96	331.29
Weeding control	1031.70	496.42	344.88
Pesticide application	195.08	225.63	155.28
Harvesting	530.56	555.42	568.72
Total	4182.54	3477.47	2377.96
4. Bitter gourd			
Seed bed preparation	493.55	249.52	367.45
Land preparation	689.90	608.15	410.13
Transplanting	502.32	262.41	241.72
Fertilizer application	955.28	433.25	360.12
Weeding control	955.28	433.25	360.12
Pesticide application	206.49	109.89	161.62
Harvesting	372.91	335.99	251.22
Total	4175.73	2432.46	2152.38

Transport costs include all the expenses in transporting inputs, materials and produce between farm and market. Table 5 shows the average transport cost from market to farm and vice versa. In Samar, the average transport cost is about PHP134 which is the highest among the three provinces. It is followed by Leyte with transport cost around PHP122. Bohol has relatively lower transport cost with an average of PHP78.54. The average distance from point of production to the market for Leyte is approximately 10km and the average travel time is approximately 38 minutes (Table 6). For Samar the traveling time is around 22.13min with a distance of 6.48km. The distance and travel time for Bohol is 7.36 and 25.25 respectively. In most of the three areas, their mode of transportations include "habal-habal", jeep, tricycle, truck and van, depending on the produce' amount and capacity. Others carry their produce by hand and deliver it to the buyer and this can explain why on average the travelling time is long even if it is only in a short distance.

Table 5. Transport cost for materials used and fertilizers

Crop	Leyte	Samar	Bohol
Tomato	111.67	200.00	83.76
Sweet pepper	54.44	100.00	80.83
Eggplant	133.44	79.00	77.80
Bitter gourd	189.57	156.67	71.76
Average	122.28	133.92	78.54

Table 6. Distance and travel time to market from production

	Leyte	Samar	Bohol
	Mean	Mean	Mean
Distance in kilometers	10.14	6.48	7.36
Travel time (minutes)	39.80	22.13	25.25

Average yield per crop

Table 7 shows the yield of the different crops standardized to output per 1000m^2. Yield in Leyte and Bohol for tomato is relatively higher than in Samar. The total yield for tomato in Leyte is around 716kg per 1000m^2 and 1636.53kg per 1000m^2 for Bohol while for Samar production is relatively low at 265.43kg per 1000m^2. For sweet pepper, Bohol has lowest yield per 1,000m^2 farm area. For eggplant, Bohol have relatively higher yield compared to other provinces with an average of 2489.28kg per 1000m^2 per cropping. For bitter gourd, Samar farmers have lowest average yield compared to bitter gourd yield in Leyte and Bohol.

Table 7. Production yield per 1,000m^2 of the 4 crops in Leyte, Samar and Bohol

Yield per Crop	Leyte (kg)	Samar (kg)	Bohol (kg)
Tomato	716.20	265.43	1636.53
Sweet pepper	1236.78	1426.83	1013.56
Eggplant	794.71	649.24	2489.28
Bitter gourd	1882.25	1314.89	1409.19

Gross Margin Analysis

For gross margin analysis, the yield per cropping was standardized to yield per 1000m^2. Table 8 presents the gross margin analysis of tomato. The gross revenue is estimated using the market price of tomato multiplied by production (in kg). To reduce variation in revenue, the prices used in the computation is based on the published prices of vegetables available in the Philippine Statistics Authority. The publish price for tomato as of February 2018 is PHP40 per kilo. Yield of tomato in Samar is on average 352.56kg. This yield is relatively low compared to Leyte 836.69kg and Bohol with relatively higher yield of 1210.71kg.

The results show that the gross margin of tomato for Samar is the lowest among three provinces at PHP6,675.16 per 1,000m^2. Leyte has an average gross margin of PHP17,961.40 per 1,000m^2 while Bohol farmers have the highest gross margin on tomato at PHP32,112.68 per 1,000m^2.

On a per hectare basis, the gross margin analysis for 1,000m^2 was multiplied by 10 to get a per hectare value. On a very small-scale level, the gross margin was also computed on 50m^2 farm area. Gross margin analysis was also conducted for sweet pepper, eggplant and bitter gourd.

Table 8. Gross margin analysis for tomato in Leyte, Samar and Bohol per cropping

Items	Leyte	Samar	Bohol
A. Yield (kg)	836.69	352.56	1210.71
Price*	40	40	40
Revenue	33,467.60	14,102.40	48,428.40
B. Variable cost			
Labor	10736.14	6875.71	13536.27
Materials	4347.82	251.53	1638.91
Transportation	111.67	200	83.76
Marketing	310.57	100	1056.78
TOTAL	15,506	7,427	16,316
C. Gross Margin (GM)			
(A-B) per 1000 m^2	17,961.40	6,675.16	32,112.68
GM per 50m^2	898.07	333.758	1605.634
GM per hectare	179,614.00	66,751.60	321,126.80

*Price was based from Philippine Statistics Authority as of February 2018.

Regression Results in Analyzing Factors Affecting Profitability

Regression analysis was conducted to determine significant factors that influence profitability of small-scale vegetable productions. Due to inherent differences in practices, separate regression analysis was conducted for tomato, sweet pepper, eggplant and bitter gourd.

Table 9 presents the regression results for the profitability analysis of small-scale tomato production. Results show that the only significant variable that affects profitability of tomato is when the produce of the farmer has a regular buyer.

Profitability measured in terms of gross margin will be a positively influenced by the presence of a regular buyer. This means that the tomato farmers would have significant increase in profit if they have an outlet for their produce as compared to farmers who have no market outlet for their produce. Vegetable farmers are at an advantage if they can market their produce. Hence in order to improve profitability in vegetable production, it is important that there is a good market access. Table 9 presents the summary results of the regression analysis for tomato.

Table 9. Regression analysis of factors affecting profitability of tomato

Variables	Coefficients	Standard Error
Household size	-0.123	0.585
Children in school	0.374	0.765
Married	2.414	4.823
Age	-0.0321	0.077
Male	-0.984	2.823
Area planted	0.0015	0.0015
Intercrop	-3.260	3.597
Multicrop	-0.558	2.230
Apply fertilizer	-3.043	5.006
Education attained	-0.130	0.206
Upland	0.914	3.790
Hilly	-0.418	1.549
Apply pesticides	1.118	1.676
Leyte	-1.248	3.378
Bohol	0.776	2.360
Market place	2.933	1.881
Regular buyer	4.174*	2.386
Traders	0.761	3.200
2017	-3.426	2.695
Constant	8.511	9.852

Note: n=53, R-square=0.266, ***Significant at 1% level, ** significant at 5% level and * significant at 10% level.

Regression analysis for profitability of sweet pepper is shown in Table 10. Results show that significant factors affecting profitability of sweet pepper include dummy variables for Bohol farm areas and gender. This implies that vegetable farmers from Bohol are more profitable than vegetable farmers from Samar. Another significant variable that influences profitability is gender, if the vegetable farmer is male, the profitability of the vegetable would likely be higher compared to female farmers. This may be biased for female sweet pepper growers, though this can be observed in a typical agricultural setting where men are more likely to be engaged into farming than women.

Table 10. Regression analysis of factors affecting profitability of sweet pepper

Variables	Coefficients	Standard Error
Household size	0.230	0.357
Children in school	0.508	0.735
Married	-2.022	2.789
Age	0.00301	0.0679
Male	3.514**	1.634
Area planted	-0.0001	0.0006
Intercrop	-1.052	2.155
Multicrop	-1.361	1.521
Apply fertilizer	-2.347	1.589
Education attained	0.0214	0.155
Upland	0.948	3.067
Hilly	1.286	1.336
Apply pesticides	0.588	1.239
Leyte	3.949	2.407
Bohol	2.968*	1.561
Market place	0.656	1.586
Regular buyer	2.745	2.674
Traders	1.465	2.364
2017	-2.543	2.134
Constant	0.366	6.399

Note: n = 65, R-square = 0.214, *** Significant at the 1% level, ** Significant at the 5% level and *Significant at the 10% level.

Results show that the significant variables that affect profitability for eggplant production includes household size, multi-cropping practice, dummy variables for Samar farm areas and farmers who were reinterviewed during the follow-up survey. Household size shows that it could negatively affect profitability of vegetable production. This may be attributed to the fact that families with more members tends to consume more. Accordingly, farmer with more members may favourably utilize their produce for home consumption instead of selling it, hence lessening their likelihood of gaining profit if marketed. Farm areas in Samar also implies that profitability of eggplant is significantly higher compared to Bohol and Leyte. Baseline respondents who were reinterviewed during the follow-up survey also indicates positive profitability on eggplant production. Another significant variable displaying a positive impact to profitability is the practice of multi-cropping. The practice of multi-cropping suggests that it will result to a higher profitability as compared to mono cropping and intercropping, hence multi-cropping system can maximize the profit that can be derived with limited farm size. Table 11 shows the summary of regression results for eggplant production.

Table 11. Regression analysis of factors affecting profitability of eggplant

Variables	Coefficients	Standard Error
Household size	-0.564**	0.272
Children in school	0.179	0.390
Married	0.715	1.625
Age	0.0102	0.039
Area planted	-0.0002	0.0002
Intercropping	-0.967	2.362
Multicropping	1.632*	0.947
Apply fertilizer	2.345	2.703
Education attained	-0.016	0.110
Upland	1.219	1.734
Hilly	-0.833	0.894
Apply pesticides	0.526	0.839
Leyte	1.421	1.162
Samar	1.684*	0.997
Market place	-0.575	0.972
Regular buyer	-0.470	1.218
Traders	-1.629	1.411
2017	2.445*	1.361
Constant	0.811	3.938

Note: n = 135, R-square = 0.134, *** Significant at the 1% level, ** Significant at the 5% level and *Significant at the 10% level.

Table 12 shows the regression results for profitability analysis of bitter gourd production. Results show that the significant variables that affect profitability of bitter gourd includes intercropping practice, fertilizer application, market outlets, and dummy variable for Samar farm areas. Profitability is significantly higher if vegetable farmers apply fertilizer in their crop. This implies that with the use of fertilizer, production of vegetables will increase, translating to higher profit. Farm areas in Samar also implies positive profitability in bitter gourd production. Having market outlets show a positive impact on profitability. If there is a trader and a regular buyer of the produce, it infers that the vegetable farmers would have significant increase in his profit compared to farmers who has no link to market outlets for their produce. Another significant factor is the practice of intercropping. Practice of intercropping shows that it will result to a higher profitability as compared to mono cropping. Hence, intercropping system can also help maximize the profit that can be derived with smaller farm areas.

Table 12. Regression analysis of factors affecting profitability of bitter gourd

Variables	Coefficients	Standard Error
Household size	-0.0447	0.383
Children in school	-0.202	0.474
Married	-0.347	2.481
Age	-0.046	0.047
Male	1.046	1.601
Area planted	0.0001	0.0004
Intercropping	4.989**	2.019
Multicropping	0.349	1.239
Apply fertilizer	8.556**	3.58
Education attained	-0.171	0.145
Upland	1.292	1.763
Hilly	1.033	1.156
Apply pesticides	0.220	1.173
Leyte	-0.150	1.581
Samar	3.149**	1.409
Market place	1.939	1.406
Regular buyer	3.045*	1.634
Traders	3.974**	1.979
2017	-0.323	1.394
Constant	-3.671	5.341

Note: n = 79, R-square = 0.310, *** Significant at the 1% level, ** Significant at the 5% level and *Significant at the 10% level.

SUMMARY AND CONCLUSION

The study was conducted to assess the profitability of small-scale vegetable production in the Visayas particularly in the islands of Bohol, Leyte and Samar. Specifically, it aimed to provide baseline information on farm practices that affects profitability of small-scale vegetable farmers, determine the gross margin of selected vegetables such as, tomato, sweet pepper, eggplant, and bitter gourd and identify factors that affect the profitability of vegetable production.

To address the objectives of the study, data from 311 farmer respondents in Bohol, Leyte and Samar was used. This study focuses on the four main vegetable such as tomato, sweet pepper, eggplant and bitter gourd. These vegetables are the most common vegetables planted in Bohol, Leyte and Samar. Profitability of vegetable production was assessed using gross margin analysis while regression analysis was used to determine the factors that influence profitability of vegetable production in Bohol, Leyte and Samar.

The profitability of vegetable farming is dependent on appropriate cropping practices, marketing and management practices. Results from regression analysis show that cropping practices and market outlets are the significant factors affecting productivity. Results suggest that holding other factors constant, cropping practices such as intercropping and multi-cropping can help increase profitability. Since the analysis focused on small-scale vegetable production, the challenge is to identify which vegetables would perform better in a multi-cropping

and intercropping set-up. With multi-cropping and intercropping, farmers can maximize the yield from their small farms. In addition to these cropping strategies, presence of a regular market outlet significantly affects profitability. This suggests that if farmers have better access to market, vegetable profitability is relatively higher compared to those farmers who were not able to link their production to the market.

The descriptive analysis shows that on average vegetable farmers are relatively far from market. The longer the distance from the site of productions to market or poor access roads negatively affects the quality of perishable produce like tomato, sweet pepper, eggplant and bitter gourd. Hence, improving farm to market road is a good policy option the government can offer. It will help boost the profitability of small-scale vegetable farmers.

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REFERENCES

Barrett DM. 2006. Maximizing the Nutritional Value of Fruits & Vegetables Review of literature on nutritional value of produce compares fresh, frozen, and canned products and indicates areas for further research. Department of Food Science and Technology, University of California

Batt PJ, Concepcion S, Dagupen K, Lizada MC & Murray-Prior R. 2007. The Vegetable Industry in the Philippines (pp63). Final Report, published by ACIAR GPO Box 1571 Canberra ACT 2601Australia

Carating RB, Fernando M, Abrina Y & Tejada SQ. 2010. State of Organic Agriculture In The Philippines: The Philippine Country Report. Paper presented during the Workshop on ANSOFT of AFACI PAN-ASIAN Project 29-30 November 2010, Suwon, the Republic of Korea

Jagelavicius G. 2013. Gross Margin Management Framework for Merchandising Decisions in Companies with Large Assortment of Products, Gediminas Kaunas University of Technology, Lithuania. http://dx.doi.org/10.5755/j01.em.18.1.4116

McDougall S and Rogers G. 2012. Integrated Crop Management to Enhance Vagetable Profitability and Food Security in the Southern Philippines and Australia. *Project Proposal HORT 2012/020*

Seriño MN, Castillo G & Ruales JH. 2017. Survey on practices of small-scale vegetable farmers in the Southern Philippines. *Annals of Tropical Research* 39 (Supplement B): 1-21

Seriño MN. 2017. Effects of Affluence on Rising Household Carbon Emission in the Philippines: An Application Using Quantile Regression Approach. *DLSU Business & Economics Review* 26(2):147-157