INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY: APPLIED BUSINESS AND EDUCATION RESEARCH
2026, Vol. 7, No. 5, 2188 – 2198
http://dx.doi.org/10.11594/ijmaber.07.05.25

Research Article

Exploring the Relationships Between the Farmers Farm Expenses, Land Size, and Sugarcane Yield: Evidence from the Philippines

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Article history:
Submission 25 April 2026
Revised 14 May 2026
Accepted 23 May 2026

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ABSTRACT

Sugarcane *(Saccharum officinarum,* L.*)* is a perennial plant in the Poaceae family. In the Philippines, the industry is a major dollar source of income, contributing around Php 70 billion annually. The study aims to investigate the relationships between landholding size, average farm expenses, and sugarcane production volume in the Philippines. Employed in this study is the descriptive-correlation method. The instrument used was the validated survey questionnaire which is designed for correlating farmers' expenses, land size as well as the yield of sugarcane. The 320 sugarcane farmers were randomly identified at the seven locations in the Visayas area of the Philippines. Results indicate that the majority of the area is small (69.7%), with a very high expense (38.4%) and low production (53.9%) of <49 TC/ha. Analysis of variance (ANOVA) implied that there's a significant difference in the production of sugarcane among the different locations in the Philippines. Furthermore, results implied that the size of landholdings and average farm expenses significantly influence the production (alpha = 0.01). Relatively, the landholding size and average farm expenses strongly correlate with the volume of production (alpha = 0.01). The economies of scale are a very crucial parameter in the sugarcane growing business. The size of landholding and average expense have a direct contribution to the level of production. The government should now re-evaluate programs and projects related to downsizing farmers' area and subsidizing farm operations. Review of policy to support the sugarcane farmer in terms of financing and land distribution should be done immediately.

Keywords*: Descriptive-correlation, Farm expenses, Krustal-Wallis H test, Landholdings, Normality test, Sugarcane production, Variables relationship, Volume of production*

How to cite:
Oñal Jr., P. A., Yuan, B. J. M., & Oñal, P. M. M. (2026). Exploring the Relationships Between the Farmers Farm Expenses, Land Size, and Sugarcane Yield: Evidence from the Philippines. *International Journal of Multidisciplinary: Applied Business and Education Research*. *7*(5), 2188 – 2198. doi: 10.11594/ijmaber.07.05.25

Introduction

Sugarcane *(Saccharum officinarum,* L.*)* is a perennial plant in the Poaceae family. It is considered an important crop because it has the capacity to produce sucrose up to 50% of the dry weight of a mature stalk (Wickramasinghe et al, 2024).

The crop has significant implications for the rural economy, providing employment involved in its cultivation, processing, marketing, and related industries (Gawas et al, 2024). In the Philippines, the sugarcane industry is a major dollar industry. It contributes to an average income of Php 70 billion per year and provides jobs for over 700,000 farmers, excluding the more than 700,000 workers.

Despite the modern technologies, the amount needed to be spent on every farm operation and the size of area to be planted are the variables to be reckoned with. On average, operational farm size was already small in the 1970s, ranging from 1 hectare in Indonesia and Japan to 3 hectares or 4 in the Philippines and Thailand (Yamauchi, 2021).

On the other hand, to reduce labor costs, farmers need to substitute machines for labor. To operate machines more efficiently, the farm size must be expanded. Thus, larger farms become more efficient than smaller farms, and so the land must be transferred from smallholder farmers to the larger farms.

To increase production, the best management, coupled with strategies on cost reduction measures, must be employed. Organic farming must be practiced, and timing of farm operations from land preparation to harvesting, cultivation to weeding, fertilization to pests and diseases control, planting to replanting, drainage to irrigation, are some of the critical aspects in sugarcane growing, among others. The industry usually observes economies of scale to produce more.

On the production side, for Crop Year 2024-2025, the Philippines' total raw sugar production in the country is 2.085 million metric tons, with a total tonnage of 29.961 million or an average of 75.324 tons per hectare (SRA, 2026), a slight improvement from the target of 75 tons per hectare. Unfortunately, the average sugar rendement was only 1.62 LKg/TC, way below the target of 3.00 LKG/TC for the same year (2025), a difference of (-) 54.00 percent.

The vast sugarcane plantations in the Philippines are located in Regions 6, 7, and 8, specified as follows: 207,909 hectares for Region 6; 57,663 hectares for Region 7; and 10,200 hectares for Region 8, respectively. The total area of the three regions is 275,772 hectares or 71.01% of the total area of sugarcane plantation in the Philippines (Balita, 2024).

Outside the country, it is noteworthy that sugarcane productivity in the Eastern Brazilian Amazon showed a significant increase from 2012-13 to 2021-22 (Cardoso et al, 2024). For 2024-2025, the top sugar producers in the world are Brazil with 43.7 million MT, with a world share of 24.1%, and India with 28.0 million MT, which contributed 15.5% to the world, respectively.

This study aims to understand some important factors that could influence production, which are crucial for optimizing resource allocation and improving yields.

Furthermore, this study will further investigate the relationship between farm expenses, the size of landholdings, and sugarcane production.

Objectives

The general objective of this study is to investigate the relationship between the farmers' farm expenses, the size of landholdings, and sugarcane production.

Specifically, it aims to;

a. Gather data on sugarcane production of farmers in seven locations;
b. Re-calibrate the relationship between the farmers' farm expenses and the size of their landholdings on their sugarcane production, and
c. Correlate sugarcane production with the farmers' farm expenses and the size of landholdings

Methodology

The descriptive correlation method was used in this study. It focuses on the sugarcane farmers' areas, farm profile, and sugarcane production in tonnage in correlation with average farm expenses and size of land holdings at the seven locations in the Visayas, Philippines.

Research Environment

Areas planted with sugarcane were chosen as the sampling area. There are seven provinces in the Visayas where the majority of the sugarcane crops are planted. For this study, only six provinces are included, namely: Negros Occidental, Negros Oriental, Capiz, Iloilo, Cebu, and Leyte. As of Crop Year 2021-2022, the total area cultivated with sugarcane for the above-mentioned provinces was 271,622.89 hectares, and produced 15.58 million tons of cane with an average of 57.63 tons per hectare.

Specifically, the study covered the following locations, namely: CEB for Cebu province; LEY for Leyte; ILO for Iloilo; CAP for Capiz; Bayawan for Negros Oriental; San Carlos and Victorias for Negros Occidental. For the seven locations, the total area was 93,354.03 hectares and has produced a total of 5,073,484.90 tons as of Crop Year 2024-2025, with an average tonnage of 54.35 per hectare.

Research Locale

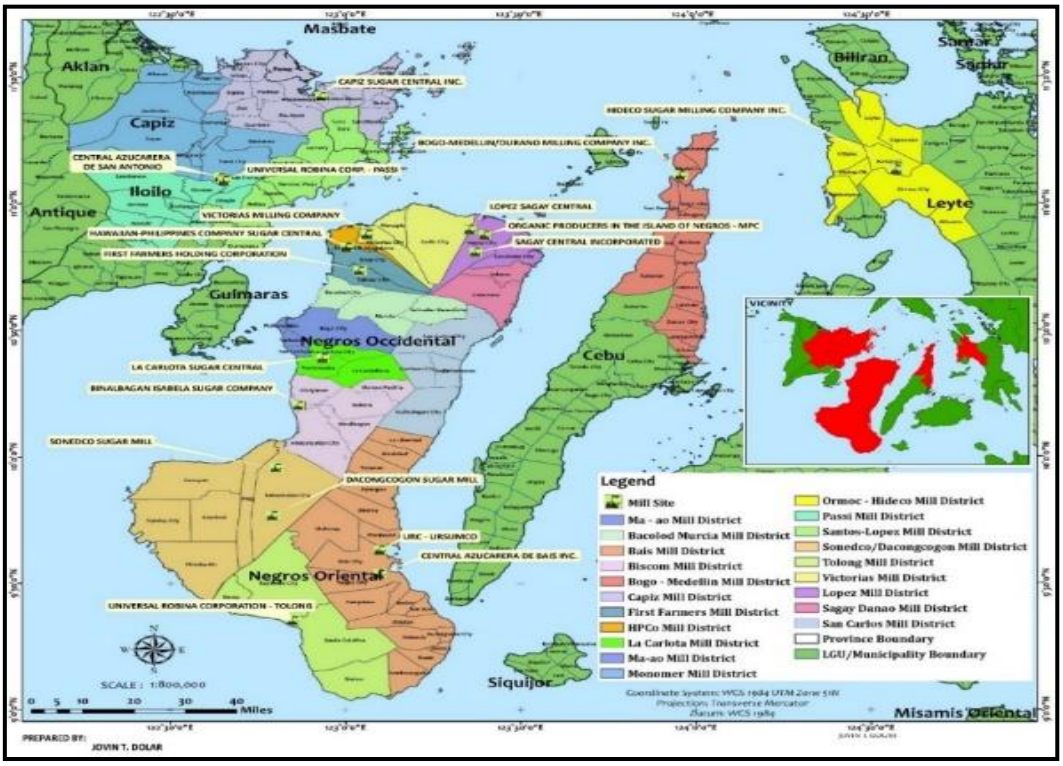

Fig. 1. Sugarcane areas in the Visayas, Philippines.

The respondents of the study were the sugarcane farmers in the Visayan area, Philippines. Employing *Slovin's* formula, out of 18,539 (Crop Year 2021-2022) sugarcane farmers from the seven locations covered by this study. Three hundred twenty sugarcane farmers were randomly selected as the actual respondents. The number of respondents was determined by computing percentages relative to the total number of sugarcane farmers in each location. The percent distribution of the respondents per location is shown in Figure 2.

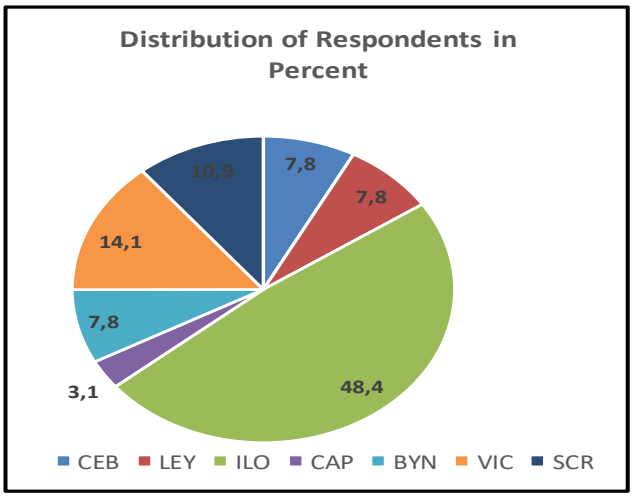

Fig 2. Distribution of respondents at seven locations in the Philippines

Research Instrument

The instrument used to gather data was the validated document from previous studies, which focuses as well on the average farm expense and size of landholdings.

Data Gathering Procedure

Instrument preparation

The researchers had personally prepared the questionnaire/instrument. The instrument had already undergone reliability and validation tests in 2021 and is being used in all its previous studies, including this one. The instrument had undergone a reliability test with a Cronbach's alpha of 0.86. before the distribution.

Distribution of the Instrument and Gathering of Data

The researchers conducted orientation on how to fill out the questionnaire with the field enumerators. It personally distributes the instrument to the enumerators. Thereafter, enumerators had commenced the gathering of data.

Retrieval of Instruments

The researchers had personally retrieved the instruments from the enumerators; others were sent through public courier.

Encoding and Statistical Analysis

Upon retrieval of the questionnaire, the researcher had tallied and analyzed the data using the Statistical Package for Social Sciences (SPSS) software under the close supervision and guidance of the statistician. The procedure is presented in Figure 3.

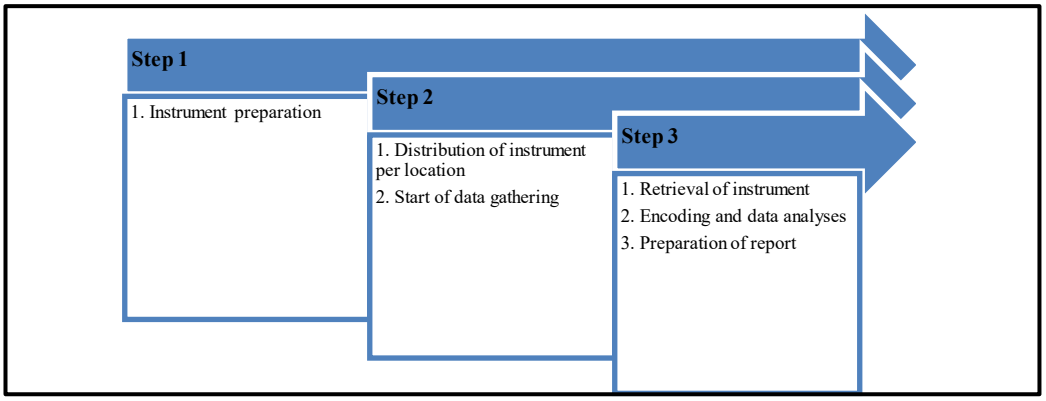

Fig 3. Data gathering procedure

Statistical Tool

In the analysis of data, the following statistical tools were used in accordance with the nature of the specific objectives.

Frequency and percentage were used to describe the profile of the sugarcane on the farms.

The mean was used to determine the level of production with farmers' farm expenses and the size of landholding.

A Likert scale was used to determine and describe the production mean.

ANOVA was used to determine the difference in the level of production by location.

Shapiro-Wilk test was employed to assessed the normality of the variables

Kruskal-Wallis H test was used to determine the difference in the level of production when respondents are grouped according to farmers' farm expenses, and the size of landholdings.

Spearman's rho correlation analysis was utilized to determine the significant relationship between the level of production versus the farmers' farm expenses, and the size of landholding.

Results and Discussions

Farm Profile

The farm profile of the farmers in terms of the size of their farm holdings and average farm expenses is shown in Table 2. The results implied that 69.7% of the respondents have a small area (25 hectares and below), while 6.6% have a large area (51 hectares or more).

In terms of their average expense per hectare, 38.44% have a very high expense (Php 70,001 and above), a little bit higher than farmers classified with high expense (Php 50,001-70,000), with 37.50%. Around 4.06% have a very low farm expense with an average amount of Php 29,999 and below.

The farmer's production profile is shown in Table 2.a. The result shows 53.9% of the area had low production (below 49 TC/ha), and 18.8% had an average of 56 to 64 TC/ha, respectively.

Table 2. Farm profile of the farmers at the different locations of the Visayas, Philippines

Variables	Number of Farmers	Percentage
Average Size of Land Holdings		
25 hectare & below (small)	223	69.7
26-50 hectares (medium)	76	23.8
51 hectare & above (large)	21	6.6
Farm Expenses per Hectare (Php)		
29,999 & below (very low expense)	13	4.06
30,000 – 49,999 (low expense)	39	12.19
50,000 (moderate expense)	25	7.81
50,001 – 70,000 (high expense)	120	37.50
70,001 & above (very high expense)	123	38.44
TOTAL	**320**	**100.0**

Table 2.a. Production profile of the farmers at the different locations in the Visayas, Philippines.

Variables	Number of Farmers	Percentage
Average Production		
>65 TC/ha (high production)	88	27.5
50-64 TC/ha (medium production)	60	18.8
<49 TC/ha (low production)	172	53.8
TOTAL	**320**	**100.0**

Difference in Sugarcane Production in the Visayas, Philippines, when Grouped by Location

The data in Figure 4 presents the difference in sugarcane production in the Visayas, Philippines, when grouped by location using One-way ANOVA. It further revealed that there is a significant difference in sugarcane production in the Visayas, Philippines, when grouped by location (M = 2.28), with an average production of 50-64 TC/ha. This means that sugarcane production in the Visayas, Philippines, when grouped by location, is not comparable (alpha = 0.05). This is due to different types of soil per region including precipitation, fertility level and management among others.

The results relate to the findings of the study by Oñal et al (2022), which construed that there's a significant difference in the level of productivity of sugarcane farms when grouped according to the location (alpha = 0.05)

Furthermore, the results implied that sugarcane farming correlates with economies of scale. A wider area with greater expense that could satisfy the needs of the sugarcane crop, including effective management, could increase the average production. Locations that have those mentioned parameters have a higher average production, so to speak.

The world average sugarcane yield of 71.28 TC/ha was recorded by ISO (2023), a 42.0% yield improvement from their previous record.

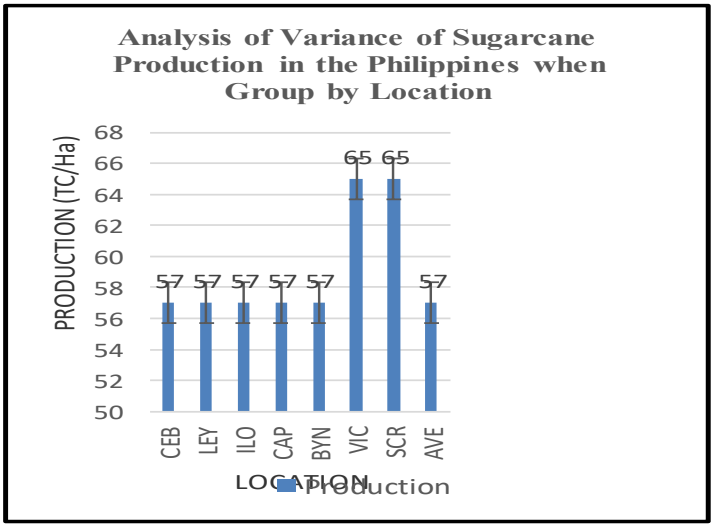

Fig 4. ANOVA of sugarcane production in the Philippines when grouped by location

Assessing the Normality of the Variables

Before conducting the inferential analysis, the normality of the variables was assessed using the Shapiro–Wilk test (Table 3). The results indicated that both variables significantly deviated from a normal distribution. Specifically, the average production based on landholding yielded a Shapiro–Wilk value of $W(320) = .804$, $p < .001$, while the average production based on expenses yielded $W(320) = .566$, $p < 0.001$. Since the significance values were less than the .05 level, the assumption of normality was violated. Therefore, a nonparametric statistical test was employed for further analysis.

The study utilized categorical coding for the key variables. Landholding size was categorized as follows: (1) 25 hectares and below, (2) 26–50 hectares, and (3) 51 hectares and above. Farm expenses were categorized into five levels: (1) ₱29,999 and below (very low expense), (2) ₱30,000–₱49,999 (low expense), (3) ₱50,000 (moderate expense), (4) ₱50,001–₱70,000 (high expense), and (5) ₱70,001 and above (very high expense). Meanwhile, the volume of production was classified into three levels: (1) < 49 TC/ha, indicating low production, (2) 50-64 TC/ha, indicating medium production, and (3) >65 TC/ha, indicating high production.

Table 3. Assessing the normality of variables using the Shapiro-Wilk Test

Variables	Statistic	df	Sig.
Average Production (land holding)	.804	320	.000
Average Production (expenses)	.566	320	.000

***highly significant at 1% level*

The Descriptive Statistics and Differences in Volume of Production of Sugarcane in the Visayas, Philippines, when Grouped by the Size of Landholdings

Descriptive statistics were computed to summarize the distribution of the variables. As presented in Table 4.a., the production level of the respondents (N = 320) had a mean of 1.88 (SD = 0.72), with values ranging from 1 to 3. Based on the established classification, this mean falls within the medium production category (1.67–2.33). On the other hand, the landholding size had a mean of 1.37 (SD = 0.60), with a minimum value of 1 and a maximum value of 3. This indicates that most respondents belonged to the small landholding category (25 hectares and below).

Table 4.a. Descriptive statistics for landholding size and production level

Variable	**N**	**M**	**SD**	**Min**	**Max**
Production Level	320	1.88	0.72	1	3
Landholding Size (ha)	320	1.37	0.6	1	3

To determine whether production levels significantly differed according to landholding size, a Kruskal–Wallis H test was conducted (Table 4.b.). The use of this nonparametric test was appropriate due to the violation of the normality assumption. The results revealed a statistically significant difference in production levels among the three landholding groups, $H(2) = 140.80$, $p < 0.001$.

Further analysis of the mean ranks revealed a clear pattern across landholding categories. Respondents with 25 hectares or less (n = 223) had the lowest mean rank (123.55), those with 26–50 hectares (n = 76) had a higher mean rank (236.64), and respondents with 51 hectares or more (n = 21) had the highest mean rank (277.31). This trend suggests that respondents with larger landholdings generally demonstrate higher levels of production.

Overall, the findings suggest that landholding size is significantly associated with production level, with larger landholdings generally corresponding to higher agricultural production. This implies that access to larger areas of land may provide farmers with greater capacity to increase their production output.

Relatively, studies of Onal et al (2021) implied that there's a significant difference in production when farms were grouped by the average size of farms (F = 40.857, alpha = < 0.05)

Furthermore, data indicate that in India, there are 600,000 farmers with an average area of 1 hectare only, and Thailand has 300,000 farmers classified as small holders with an average of 2 hectares (Voora et al, 2023).

However, India is the second-largest sugar producer in the world with 28.0 million MT in 2024-2025, while Thailand is fourth with 10.0 million MT, respectively.

Table 4.b. Kruskal–Wallis H Test summary for production level by landholding size

Landholding Group	**N**	**Mean Rank**	**H**	**Df**	**P**
25 ha and below	223	123.55	140.8	2	< .001
26 – 50 ha	76	236.64			
51 ha and above	21	277.31			

***highly significant at 1% level*

The Descriptive Statistics and Differences in Volume of Production of Sugarcane in the Visayas, Philippines, when Grouped by the Farm Expenses per Hectare

Descriptive statistics were computed to summarize the respondents' average production and farm expenses per hectare. As shown in Table 5.a., the volume of production of the respondents (N = 320) had a mean of 2.67 (SD = 0.63), with values ranging from 1 to 3. Based on the established classification of production levels—1.00–1.66 (low production), 1.67–2.33 (medium production), and 2.34–3.00 (high production)—the overall mean indicates that respondents generally experienced high production levels (>65 TC/ha).

In terms of farm expenses per hectare, the respondents had a mean of 3.94 (SD = 1.15), with values ranging from 1 to 5. The expense categories were coded as follows: (1) ₱29,999 and below (very low expense), (2) ₱30,000–₱49,999 (low expense), (3) ₱50,000 (moderate expense), (4) ₱50,001–₱70,000 (high expense), and (5) ₱70,001 and above (very high expense). The mean value of 3.94 suggests that, on average, respondents' expenditures fall within the high expense category, indicating that a considerable amount of financial resources is invested in farm production.

Table 5.a. Descriptive statistics for volume of production and farm expenses per hectare

Variable	N	M	SD	Min	Max
Average Production	320	2.67	0.63	1	3
Farm expenses per hectare	325	3.94	1.15	1	5

To determine whether the volume of production differs significantly across levels of farm expenses per hectare, a Kruskal–Wallis H test was conducted. This nonparametric test was used due to the previously identified violation of the normality assumption. The results (Table 5.b.) revealed a statistically significant difference in average production across the five expense groups, $H(4) = 208.50$, $p < 0.001$.

Further examination of the mean ranks indicated a clear increasing trend. Farmers with very low expenses (₱29,999 and below) had the lowest mean rank (37.88), followed by those with low expenses (₱30,000–₱49,999) with a mean rank of 44.27. Respondents with moderate expenses (₱50,000) had a higher mean rank of 115.08, while those with high expenses (₱50,001–₱70,000) had a mean rank of 180.53. The highest mean rank (200.00) was observed among farmers with very high expenses (₱70,001 and above).

This pattern suggests that higher farm expenditures per hectare are associated with higher levels of production. Farmers who invest more in agricultural inputs such as seeds, fertilizers, labor, and farm technologies may achieve greater productivity compared to those with lower levels of expenditure.

Overall, the results indicate that farm expenses per hectare significantly influence production levels, highlighting the important role of financial investment in improving agricultural productivity.

In Karnataka, India, an ROI of 1.91 was classified as profitable (Honyal et al., 2023). Furthermore, the study indicates that an average production of 150.24 TC/ha (converted from acre) was realized from a farm expense of Php 145,450.53/hectare (converted from Rs.)

Significant difference in the level of production was also observed by Oñal et al (2021) when farms were grouped in terms of expenses per hectare (F = 6.864, alpha = < 0.05).

Table 5.b. Kruskal–Wallis H Test summary for volume of production by farm expenses per hectare

Farm expenses per hectare	n	Mean Rank	H	df	P
29,999 and below (very low)	13	37.88	208.50	4	0.000
30,000 - 49,999 (low expense)	39	44.27			
50,000 (moderate expense)	25	115.08			
50,001 - 70,000 (high expense)	120	180.53			

Farm expenses per hectare	n	Mean Rank	H	df	P
70,001 and above (very high expense)	123	200.00			

***highly significant at 1% level*

Relationship Between the Size of Landholding (ha) and the Volume of Production

The relationship between the volume of production and the size of land holding was determined using Spearman's rho correlation analysis.

The analysis revealed a significant positive correlation between the average size of landholding (in hectares) and the volume of production, $r_s = .664$, $p < 0.01$. This result (Table 6) indicates a moderately strong positive relationship, suggesting that respondents with larger landholdings tend to achieve higher levels of production.

In India, the area and production were highly consistent and stable, with an increasing trend of 0.8% and 2.04%, respectively (Honyal et al., 2023).

Fernandez and Nuthall (2012) found that small farms appear not to be economically efficient and have lower production as compared to the larger farms.

Table 6. Spearman's Rank-Order correlation analysis between the size of landholding (ha) and the volume of production

Variables Compared	Spearman r_s	Sig	Strength of Relationship
Size of land holding Sugarcane production	0.664	0.01**	(+) Moderate relationship

***correlation is highly significant at 1% level (2-tailed)*

Relationship Between the Average Farm Expense per Hectare and the Volume of Production

Similarly, a significant positive correlation was found between farm expenses per hectare and the volume of production, $r_s = .698$, $p < 0.01$. This finding indicates a strong positive relationship, implying that higher farm expenditures per hectare are associated with higher levels of agricultural production (Table 7).

The significance level ($p < 0.01$, two-tailed) indicates that the observed relationships are statistically significant at the 1% level, suggesting that the likelihood that these relationships occurred by chance is very small.

Fernandez and Nathall (2012) observed in their study that higher expenses, especially on inputs, tend to increase production and higher profits. Alcasid and Lopez (2025) study indicates that despite a higher expense of some cooperative farmer-members in Davao, Philippines, a slight increase in production and income was observed.

Table 7. Spearman's Rank-Order correlation analysis between the average expense per hectare and the volume of production

Variables Compared	Spearman r_s	Sig	Strength of Relationship
Average expense per hectare Sugarcane production	0.698	0.01**	(+) Strong relationship

***correlation is highly significant at 1% level (2-tailed)*

Conclusion and Recommendation

Overall, the results suggest that both landholding size and farm expenses per hectare are important factors associated with production levels. Larger landholdings and greater financial investment in farm inputs appear to contribute to higher agricultural productivity.

The economies of scale are a very crucial parameter in sugarcane growing. The results implied that the size of landholdings that the farmers operate and their average expenses spent in the various farm operations directly affect the volume of production.

The government is encouraged to review policies related to downsizing the farmers' average landholdings. They should also put on the table and study once more the assistance or subsidies given to the farmers. Consolidation of land already distributed should once again be studied for a possible corporate farming strategy, including the management of the same.

Conflict of Interest

No other group is involved in this study. No monetary contribution is given to this study.

Ethical Considerations and Data Privacy

The researcher takes responsibility for securing the sanctity and confidentiality of all information/data generated through the instrument. Data will be used for academic/research and in designing programs/projects for the industry.

The respondents had agreed to publish all the generated data.

Acknowledgement

Our sincere gratitude to the sugarcane farmers and the technical enumerator who were involved during the data gathering and processing of the same.

References

Alcasid, C. J. A & Lopez, H. G. (2025). Analysis on the Resource Use Efficiency of Block Farm and Cooperative Schemes in Sugarcane Production. *Journal of Interdisciplinary Perspective*. 3(7)936 – 947. *https://doi.org/10.69569/jip.2025.409*

Balita, C. (2024). Area planted/Harvested of Sugarcane for Raw Sugar Philippines 2023: by Region. *https://www.statista.com*

Cardoso, L. A. S., Farias, P. R. S., Soares, J. A. C., & De Oliveira, J. (2024). Planted Area, Productivity, and Sugarcane Production in the Eastern Brazilian Amazon. *Bulgarian Journal of Agricultural Science.* 30(4): 686-701. *https://www.agrojournal.org/30/04-18pdf*

Dotaniya, M. L., Datta, S. C., Biswas, D. R., Dotaniya, C. K., Meena, B. L., Rajendiran, S., Regar, K. L., & Lata, M. (2016). Use of Sugarcane Industrial By-products for Improving Sugarcane Productivity and Soil Health. *International Journal of Recycling of Organic Waste in Agriculture.* 5:185-194. *https://doi.org/10.1007/s40093-016-0132-8 https://wwww.academia.net/publication/29358366*

Fernandez, D. P. and Nuthall, P. L. (2012). Farm Size and Its Effect on the Production Efficiency of Sugarcane Farms in Central Negros, Philippines. *Journal of the International Society of Southeast Asian Agricultural Sciences.* 18(1); 49-61. *htpps://researchgate.net/publication/289783313.*

Gawas, O. M., Naik, V. G., Jachak, R. S., Malave, D. B., & Borate, H. V. (2024). Economic Analysis of Sugarcane Cultivation in Sinhhudurg District of Maharashtra State. *International Journal of Agriculture Extension and Social Development.* 7(10; 155 – 161. *https://doi.org/1033545/26180723.2024.v710C.1204*

Honyal, A. S., Mitrannavar, D. H., & Gunadal, N. M. (2023). Dynamics of Sugarcane: Growth, Instability, Cost, and Returns. *The Pharma Innovation Journal.* 12(6); 4740-4743. *https://www.thepharmajournal.com*

International Sugar Organization. (2023). Inputs, Costs, and the World Sugar Industry. *MECAS* (23) 05. page 2. *https://www.isosugar.org*

Mavaliya, M., Jahanara, Khakhal, A. & Chopra, B. (2025). Relationship Between the Selected Independent Variables of Sugarcane Growers and Their Level of Knowledge About the Recommended Package of Practices. *International Journal of Agriculture Extension and Social Development.* 8(5):205-207. *https://www.doi.org/10.33545/26180723.2025.v8,i5c.1889*

Oñal, P. A. Jr., Buenafe, O. B., & Eraldo, V. M. (2022). Farm Profile of Sugarcane Farmers in the Visayas, Philippines, and Their Productivity Level. *Revista Review Index Journal of Multidisciplinary.* 2(1): 01-09. *https://doi.org/10.31305/rrijm2022.v02.n01.001*

Oñal, P. A. Jr., Juntilla, C. J., & Ortega, C. O. (2021). Degree of Farming Innovations and the Level of Productivity of Sugarcane Farmers in the Visayas, Philippines. *European Journal of Agricultural and Rural Education* (EJARE). 2(12): 57-67. https://scholarzest.com/index.ph/ejare/article/view/1555

Oñal, P. A. Jr., Panes, N. P., & Neri, V. A. (2021). Level of Productivity of Sugarcane Farmers and Farm Profile in the Visayas, Philippines. *European Journal of Agricultural and Rural Education* (EJARE). 2(12): 16-24. https://scholarzest.com/index.ph/ejare/article/view/1527

Oñal Jr., P.A., Andrade, F.E., & Oñal, P.M.M. (2025). Farmers' Aspirations, Happiness, and Sugarcane Production in the Visayas, Philippines. *International Journal of Multidisciplinary: Applied Business and Education Research.* 6(9), 4364-4376. https://dx.doi.org/10.11594/ijmaber.06.09.12

Oñal, P. A., Neri, V. A., & Jinon, R. J. (2022). Challenges in Sugarcane Extension: The Current Guide in Increasing Productivity at a Lower Cost. Lambert Academic Publishing. Republic of Moldova, Europe.

Sugar Regulatory Administration (2026). Philippine Sugar Statistics for Crop Year 2024-2025. Quezon City, Philippines. http://sra.gov.ph/view_file/sugar_statistics/OvXbQG2fPOceZOu

Voora, V., Bermúdez, S., Le, H., Laurea, C., & Luna, E. (2023). Sugarcane Prices and Sustainability. (Global Market Report). page 2. *https://IISD.org/ssi*

Wickramasinghe, K. P., Kong, C. Y., Lin, X. Q., Zhao, P. F., Mehdi, F. L., X. J., Liu, X. L., Mao, J., & Lu, X. (2024). Photoperiodic and Lighting Treatments for Flowering Control and Its Genetic Regulation in Sugarcane Breeding. Heliyon. 10(7); e28531. *https://doi.org/10.1016/j.heliyon.2024.e28531*

World Bank (2019). Employment in Agriculture (% of total employment). Modeled ILO Estimate. https://www.data.worldbank.org/indicator

Yamauchi, F. (2021). Changing Farm Size and Agricultural Productivity in Asia. A Background Report of Asian Development Bank Outlook 2021 Update. ADB Workshop, May 25-26, 2021. https://www./adb.org