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Research Article

Performance of Sugarcane Planted at Different Soil Types and Rainfall Duration in the Philippines

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ABSTRACT

The present status of sugarcane farming in the Philippines is very low at an average of 57.36 tons per hectare (TC/ha), way below the national target of 75 TC/ha For the seven location covered by this study the total area planted is 93,354.03 hectares with an average 54.35 TC/ha. This study used the descriptive method and in the gathering of data the instrument prepared by Oñal (2021) was utilized. For this study, 320 sugarcane farmers were randomly identify as respondents. High significant difference is shown with the level of production of sugarcane at the Visayas, Philippines when group by location with a mean of 2.28 (5%). Furthermore, the level of production as influence by the duration of rainfall was statistically significant at 1% level with a production mean of 2.26. Relatively, the level of production of sugarcane planted at different type of soil is statistically significant as well, at 1% level with a production mean of 2.43. The further revealed that there is a signification correlation between the sugarcane production and the duration of rainfall as well as the production and the type of soils at 1% level of significant respectively. The results of the study indicates that in order to increase the production of sugarcane it is best to plant the crop in a loamy or mixed soil. If the area has no irrigation-facilities, the timing of planting should be religiously observe so that sugarcane plant can receive the rainfall in a period of 5 months or more within its entire growing period.

Keywords: *Sugarcane production, Land topography, Correlation, Environmental challenge, Soil type, Rainfall duration*

Introduction

Sugarcane *(saccharum officinarum)* is a delicate crop and there's always a need for plenty of fertilizers, sufficient volume water, and a good soil type suitable for growing the crop. It is cultivated for centuries, primarily esteemed for its saccharine juice and sub-sequent sugar production for global consumption (Smith &

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Johnson, 2020). It belongs to a family *Poaceae,* a grass family. Sugarcane is cultivated on nearly 20 million hectares by more than 90 countries worldwide (Ullah, et al, 2020).

Sugarcane farming in the Philippines has a long story to unfold with. Long long time ago, the colonists brought almost 12 million West Africans to the Carribean in chains in the holds of slave ships during the four and half centuries, which was between 1450 and 1900 (Oñal, et al 2024).

In the Philippines, there is an absence of trading the slaves. Nicholas Lonney, a British business-man, was the first to recognize its potential as an export crop. In 1850's he brought in the machinery for sugar production. Originally based in Iloilo, he migrated to Negros Island later to take advantage of the fertile land and large *"indio"* workforce.

The opening of Visayas ports (Iloilo and Cebu) and the introduction of sugarcane as lucrative cash crops changes everything. By the 1860's, Negros Occidental is the leading sugar-producing province in the Philippines, known also as the "sugar bowl of the Philippines (Oñal, 2022)

On the production side, the Philippine raw sugar production for 2025 is projected to reach a volume of 1.85 million metric tons because of the improvement of weather conditions (e.g. rainfall) that could directly cater the expansion in harvest area (Pelonia, 2024). Relatively, as of February 2, 2025, the total raw sugar production in the country is 1,922,586 metric tons with a total tonnage of 21,490,581 or an average of 55.334 tons per hectare (TC/ha) (SRA, 2025) way below the targeted 75 tons per hectare.

In terms of area planted, the vast plantation 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).

On the number of farmers and laborers, statistics show that there are more than 80,000 farmers who are tilling the 388,378 hectares (out of the total land area of 30 million hectares devoted to agriculture), of sugarcane fields all over the country. Of the total number of sugarcane farmers mentioned-above the majority of them are considered small (farm holdings are 5 hectares or below). In Crop Year 2015-16: 79% are small farmers, in which 17% are cultivating an area of 5.01 to 50.00 hectares and only 4% have an area of 50.01 hectares and above (Overview of the Sugarcane Industry, 2017).

The total number of agricultural and industrial workers directly employed in the industry is about 700,000. Over and above, the total workers mentioned there is an additional 70,000 more or less seasonal plantation workers who are augmenting the laborers in sugarcane plantation and sugar estates nationwide. Relatively, the latest survey mentioned by Crisostomo (2018), indicates that sugarcane farms have 32,000 laborers, which is second to the banana plantation with 49,866 workers. Moreover, the agricsulture sector has a share of 24.3% in the country's total employment (PSA, 2019).

Reza, et al (2016) had found out on their study that almost 50 percent of the cost in sugarcane farming is spend in the hiring of laborers. It indicates that sugarcane is a labor-intensive crop in Bangladesh and on average 90-110 man-days labor is needed per acre of sugarcane production.

This study aims to determine effect of some of the environmental factors that could influence the volume of production of sugarcane crop in the Philippines viz-a-viz to the duration of rainfall and the type of soil at the seven locations being covered. The result of this study will further validate our work done in 2021 (Oñal, et al, 2022) which shows that the type of soil and average rainfall received has no significant difference on the productivity of sugarcane. The data were previously gathered at 10 locations in the Visayas.

For further validation of the previous result, Oñal, et al (2021) cited the findings of Alulod and Cerbo (2009) that climatic factors that can influence sugar yields are rainfall precipitation or duration (greatly affects soil moisture), temperature range, light intensity and its duration, photoperiod, and occurrence of typhoons or long drought. Amount of rainfall (whether high or low) can accelerate loss of valuable and productive soil from the farm.

It is a requirement that during the ripening stage of sugarcane crop high rainfall is not desirable because it can affect the quality of the juice. Moreover, for edaphic or soil factors are soil type, pH, and organic matter content. Relatively different soil types display different properties, including vulnerability to erosion, salinization, acidity and alkalinity

Thailand has experienced extreme climate variation that also account for the rainfall as one of the factor. Due to this challenge, Wongkhukaew, et al (2024) had conducted a study and had developed a master chart that could determine yield gap to be applied all over the country.

In Negros Occidental, Corsiga, et al (2018) conducted study on suitability assessment and done some constraints analysis on five soil series (Guimbalaon, Isabela, Luisiana, San Manuel and Silay) grown to sugarcane. Most of the soil belongs to clay or mixed type. Results indicates that soil ph, total N, %-organic C, and available K in Guimbalaon Isabela series. Exchangeable K in Guinbalaon series. On the other hand, its exchangeable Na, Ca, and Mg, extractable Fe, and CEC in San Miguel series as well as exchangeable Al in Luisiana series. The limitations on fertility and physical characteristics were consider moderate and manageable.

Among others the findings Kaur and Kaur of India (2018) had discussed on his study that public agricultural extension system is one of the largest knowledge and information dissemination institution. In the last 15 years, agricultural production has stagnated, and this calls for a system based on inter-disciplinary holistic approach not only to develop ecologically sound technologies for different areas, but also to facilitate their utilization at grass root level.

Objectives

The general objective of the study is to determine some of the environmental factors that could affect the yield of sugarcane crops in the Philippines.

Specifically, it aims to;

a. Gather data on the production sugarcane farmers in seven location;
b. Re-calibrate the effect on the production of sugarcane when planted at different type of soil in seven location:
c. Re-evaluate the minimum duration of rainfall needed by sugarcane plant that could increase its production in seven location, and;
d. Correlate production with some environmental factors included on this study.

Methodology

The descriptive correlational study was used in this study. It focuses on the sugarcane farmers' areas, farm profile, level of production in tonnage in correlation with the type of soils and duration of rainfall among others at the seven locations of the Visayas, Philippines.

Research Environment

There are seven provinces in the Visayas where majority of the sugarcane crops are planted. For this study only six provinces is 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 produces 15,581,054.06 tons of cane with an average of 57.63 tons per hectare (SRA 2025).

Specifically, the study covered the following location, namely: CEB or Cebu province; LEY or Leyte; ILO or Iloilo; CAP or Capiz; BYN or Bayawan in Negros Oriental; SCR or San Carlos and VIC or Victorias for Negros Occidental. For the seven location the total area planted is 93,354.03 hectares and had produced a total of 5,073,484.90 tons with an average tonnage of 54.35 per hectare.

Distribution of the Respondents

The respondents of the study were the sugarcane farmers in the Visayan area, Philippines. Employing the *Slovins* formula, out of 18,539 (Crop Year 2021-2022) sugarcane farmers from the seven locations covered by this study, the sample size of 320 farmers were selected randomly as the actual respondents. The number of respondent was determined by computing the percentages viz-a-viz to the total

number of sugarcane farmers per location. The distribution of the respondents and the sample population per location is shown on Table 1.

Table 1. Distribution of respondents per location

Location	Number of Respondents	Percentage
CEB	25	7.8
LEY	25	7.8
ILO	155	48.4
CAP	10	3.1
BYN	25	7.8
VIC	45	14.1
SCR	35	10.9
Total	**320**	**100.0**

Research Instrument

The instrument used to gather data was the validated document use Oñal, et al (2021). It includes the farmers' profile, farm profile, land topography, soil type, duration of rainfall, and level of production among others.

Data Gathering Procedure

Instrument Preparation

The researchers had personally prepared the questionnaire/instrument.

Distribution of Instrument and Gathering and Data

The researchers had done the actual orientation on how to fill-out the questionnaire with the field enumerators. The researchers had personally distributed the instrument per location.

Thereafter, data gathering started with the assistance of agricultural enumerators at the different location.

Retrieval of Instruments

The researchers had personally retrieved the instruments from the enumerators others were send thru 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 closed supervision and guidance of the statistician.

The procedure is presented on Figure 1.

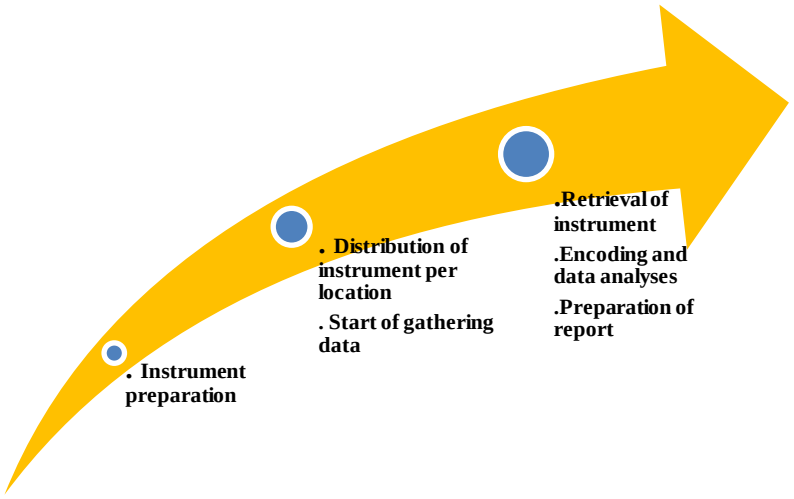

Fig. 1 Data gathering procedure

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 was use to describe the profile of the sugarcane farmers' and of the farms.

The mean was used to determine the level of production at different soils type and duration of rainfall.

One way Analysis of Variance (ANOVA) was used to determine the difference in the level of production, when respondents are grouped according to location, type of soil, topography of the area, and duration of rainfall.

Pearson r Moment Correlation was utilized to determine the significant relationship between the level of production, type of soil, and duration of rainfall.

Results and Discussions

Profile of farmers and the farms

Table 2 and 2.a revealed the farmers and farm profile at the seven location in the Visayas in terms of gender, age, level of education, number of years in sugarcane farming, average size of land holdings, the land topography, and the level of production.

The findings reveal that out of 320 farmers involved in the study, 69.7% are male 30.3% are female.

Furthermore, the findings revealed that the 51.2% of the farmers were 51 years old and above, 36.9% are between 36-50 years old, and 11.9% are those with age from 35 years old and below, respectively.

As to the educational attainment, 47.2% of the farmers were secondary level and 3.8% have undergone vocational courses.

The findings on Table 2 and 2a, implies that the farmers at the seven location in the Visayan area were majority male, aged 51 years old and above, secondary level, have been in sugarcane farming for more than 20 years, and had a small landholding area of 25 hectares and below. Majority of the land slope ranges from 6 to 24 degrees and the average production is less than 49 TC/ha.

The findings of the study is related with the study of Gallen (2015) which is using Danish matched employer-employee data, the paper estimates the relative productivity of men and women. The result found out that gender "productivity gap" is 8 percent implying that just under two thirds of the residual wage gap can be account for by productivity differences between men and women. The productivity gap was measured by estimating the efficiency units lost in a firm-level production function if a worker is female, holding other explanatory covariates such as age, education, experience, occupation, and hours worked constant. Furthermore, both mothers and non-mothers were paid less than the male but the (low) relative pay of mothers is completely explained by productivity for women without children.

In India women perform a crucial role in agricultural either directly or indirectly starting from producing, processing and ultimately marketing of agricultural produce (Mallick & Anshuman, 2023)

Furthermore, Hyland, et al (2020) found out the global picture of gender discriminations especially on law that affects women's economic opportunity. They had find a positive correlations between a more equal laws pertaining to women workforce and more equal labor markets outcomes such as higher female labor participation and a smaller wage gap between men and women.

In the Philippines, employment in agricultural sector by gender in the year 2019 was 28.70% male and 13.60% are female

Table 2. Farmers' profile at different location of the Visayas, Philippines

Variables	Number of Farmers	Percentage
Gender		
Male	223	69.7
Female	97	30.3

Variables	Number of Farmers	Percentage
Age		
35 years old & below	38	11.9
36-50 years old	118	36.9
51 years old & above	164	51.2
Level of Education		
Elementary	54	16.9
Secondary	151	47.2
College	103	32.2
Vocational	12	3.8
TOTAL	**320**	**100.0**

For the number of years in sugarcane farming as shown on Table 2.a. 38.4% have been in sugarcane farmers for more than 20 years, while only 26.6% have been doing it for 10 years and less.

For size of the farm holdings 69.7% of the respondents have an area below 25 hectares while 6.6% have an area of 51 hectares or more.

As to the land topography, 65.3% of the area has a soil gradient of 6-24 degrees while 15.9% have a slope gradient of less than 5 degrees.

Around 53.8% of the area had an average production of less than 49 TC/ha and 18.8% have an average production of 56 to 64 TC/ha.

Table 2.a. Farm Profiles at different location in the Visayas, Philippines.

Variables	Number of Farmers	Percentage
Number of Years in Sugarcane Farming		
10 years & below	85	26.6
11-20 years	112	35.0
20 years & above	123	38.4
Average Size of Land Holdings		
51 ha and above	21	6.6
26-50 hectares	76	23.8
25 ha and below	223	69.7
Land Topography		
>25 degrees	60	18.8
6-24 degrees	209	65.3
<5 degrees	51	15.9
Average Production		
>65 tons/ha	88	27.5
50-64 tons/ha	60	18.8
<49 tons/ha	172	53.8
TOTAL	**320**	**100.0**

Soil profile per location

Table 3 indicates the profile of the type of soil at different locations in the Visayas.

The findings revealed that 43.1% of the farms of the area being covered have a mixed type of soil, 30.3% are sandy, 20.0% are clayey soil (f=64, 20.0%), and 6.6% are loamy soil, respectively.

As to the type of soils per location, majority of farms in BOG are sandy 56.0%, mixed type for ORM with 68.0% ILO 52.9%, CAP 90.0%, BYN 56.0%, and SCR with 40.0%, respectively. It is clayey type for VIC with 64.4 %.

Findings on table 3 further revealed that majority of soil type in seven location are mixed, it includes LEY, ILO, CAP, BYN, and SCR except for BOG whose majority of the soil are sandy and clayey for VIC.

The findings is related to the study in Ethiopia, sugarcane has been cultivated for almost 20 years already hence changes in soil physicochemical properties are expected to occur (Wakgare, et al, 2020). Their study indicates that clay content of the land under sugarcane was higher as compared to the adjacent area. This phenomena lead to some degree of compaction and affect soil fertility, a constraint for sustainable sugarcane production.

Furtherance, the group of Amorin (2022) had done a study on the impact of soil types on sugarcane development by remote sensing. They concluded that soil types and their properties have a significant impact on sugarcane development. They further discussed that soil variability have the most diverse combinations of physical and chemical characteristics that can influence the crop growth and productivity.

Table 3. Profile of farms with the corresponding type of soil at different location of the Visayas, Philippines

Location	Soil Type							
	Clayey		Sandy		Loamy		Mixed	
	No. of Farms	Percent	No. of Farms	Percent	No. of Farms	Percent	No. of Farms	Percent
BOG	10	40.0	14	56.0	0	0.0	1	4.0
LEY	4	16.0	4	16.0	0	0.0	17	68.0
ILO	11	7.1	51	32.9	11	7.1	82	52.9
CAP	1	10.0	0	0.0	0	0.0	9	90.0
BYN	4	16.0	2	8.0	5	20.0	14	56.0
VIC	29	64.4	14	31.1	0	0.0	2	4.4
SCR	5	14.3	12	34.3	4	11.4	14	40.0
TOTAL	**64**		**97**		**21**		**138**	
%	20.0		30.3		6.6		43.1	

Average duration of rainfall received per location

Table 4 reveal the average duration of rainfall received by farms in seven location of the Visayas.

The findings indicates that 66.9% of the farms covered by the seven location have a rainfall duration of 3-4 months. Around 21.3% have a rainfall duration of more than 5-months, while 11.9% have a short rainfall duration of 3-months or less.

On a per location basis, findings revealed that five locations have experienced a rainfall duration that ranges from 3 to 4 months, namely: 67.7% the area in ILO, 80.0% in CAP, 80.0% in BYN, 97.8 % in VIC, and 77.1% in SCR, respectively. The findings further indicates that 72.0% of area in BOG and 84.0% in LEY have experience a long duration of rainfall that occurred 5 months or more annually.

Findings on table 4 revealed that majority of the farms in seven location have experience an occurrence of rainfall that ranges from 3 to 4 months while only two locations have experienced the occurrence of rainfall of more than 5 months.

The findings correlate with the record of PAGASA in 2022, the Philippines experienced a mean rainfall of 2,966.5 millimeters which rank as the 7th wettest year since 1991. For the month of January-March, Eastern Visayas rainfall was above normal. Relatively, Negros Occidental as well as the Central and Eastern Visayas also received patches of above normal rainfall conditions for the month of July-August (PAGASA, 2022)

Table 4. Profile of farms with the corresponding rainfall duration at different location of the Visayas, Philippines

Location	Rainfall Duration per Annum					
	Short duration		Medium duration		Long duration	
	<than 3 months	Percent	3-4 months	Percent	>than 5 months	Percent
BOG	1	4.0	6	24.0	18	72.0
LEY	0	0.0	4	16.0	21	84.0
ILO	24	15.4	105	67.7	26	16.6
CAP	0	0.0	8	80.0	2	20.0
BYN	5	20.0	20	80.0	0	0.0
VIC	0	0.0	44	97.8	1	2.22
SCR	8	22.8	27	77.1	0	0.0
TOTAL	**38**		**214**		**68**	
%	11.9		66.9		21.3	

Difference on the level of production of the sugarcane farms in the Visayas when group by location

The data in table 5 presents the difference in the level of production of sugarcane in the Visayas when grouped by location using One-way ANOVA. The findings revealed that there is a significant difference in the production of sugarcane in the Visayas when grouped by location with a mean of 2.28 (5%).

Specifically, production mean of each location are; CEB has a production mean of 1.88, LEY has 2.31, ILO has 2.20, CAP has 2.13, and BYN with 2.22), respectively. The other two with high production are; VIC with a mean of 2.63 and SCR with 2.60.

Table 5. Analysis of Variance of sugarcane production in the Visayas, Philippines when grouped by location.

Location	Mean	Description
CEB	1.88	Medium production
LEY	2.31	Medium production
ILO	2.20	Medium production
CAP	2.13	Medium production
BYN	2.22	Medium production
VIC	2.63	High production
SCR	2.60	High production
Mean	**2.28**	Medium production
F	2.816	
Sig	0.011*	

**significant at 5% level*

Difference in the level of production of sugarcane in the Visayas, Philippines in terms of soil type

The data in table 6 presents the difference in the level of production of sugarcane in the Visayas when grouped by soil type using One-way ANOVA. The results revealed that there is

a significant difference in the production of sugarcane in the Visayas when grouped by soil type with a mean of 2.43.

Specifically, the production per soil indicated clayey soil had a production mean of 2.24 and 2.11 for sandy soil. Higher production on the other hand, is observe on sugarcane planted on loamy soil with 2.78 and mixed soil with a mean of 2.42.

The results of this study are related to the study of Kusumaningrum, et al (2024) which found out that the production of sugarcane crop planted at sandy soil in Purworejo District, in Central Java were classify as productive with an average of 5-6 tons per hectare.

Furthermore the study of Hongthong and Patanothai (2017) done at Hin Kong Village in Thailand revealed that sandy soils had a significant effect on the yield of sugarcane specifically on its 3rd and 4th ratoon.

The results also relate to the study of Barth (2022) shows that the average production of sugarcane was 75.12 TC/ha with a dry weight of 61.46 tons per hectare of 184 old-day cane at loamy soil.

Table 6. Analysis of Variance of sugarcane production at the different locations in the Visayas, Philippines when grouped by soil type

Soil Type	Mean	Description
Clayey	2.24	Medium production
Loamy	2.78	High production
Sandy	2.11	Medium production
Mixed	2.42	High production
Mean	**2.43**	High production
F	22.394	
Sig	<0.001**	

***significant at 1% level*

Difference in the level of production of sugarcane in the Visayas, Philippines in terms of rainfall duration

The data in table 7 presents the difference in the level of production of sugarcane in the Visayas when grouped by duration of rainfall using One-way ANOVA. It further revealed that there is a significant difference in the production of sugarcane in the Visayas when grouped by duration of rainfall with production mean of 2.26 (1%)

This explain that the production of sugarcane in the Visayas when grouped by rainfall duration are not comparable. Specifically, the production mean for that received of less than 2 months rainfall is 2.01, for those that has a rainfall duration of 3-4 has a production mean of 2.29. Highest production mean of 2.58, is realize on sugarcane who experience a long rainfall duration, which is more than 5-rainy months.

The findings correlate with the study of Garcia, et al (2019). They affirmed that sugarcane productivity is severely influence by the occurrence of water deficit in the field. Thus causing the inhibition of growth and sugar production. The two varieties they used shows that the absence of water on the sugarcane leaf, leads to the reduction of sugar production because of lower CO2 assimilation that directly affect the photosynthetic rate.

Table 7. Analysis of Variance of sugarcane production at different locations in the Visayas, Philippines when grouped by rainfall duration.

Rainfall Duration	Mean	Description
<2 rainy months (short duration)	2.01	Medium production
3-4 rainy months (medium duration)	2.29	Medium production
>5 rainy months (long duration)	2.58	High production

Mean	**2.26**	Medium production
F	6.615	
Sig	<0.001**	

***significant at 1% level*

Differences in the level of production of sugarcane in the Visayas, Philippines in terms of topography

The data in table 8 presents the difference in the level of production of sugarcane in the Visayas when grouped by land topography One-way ANOVA. It further revealed that there is a significant difference in the production of sugarcane in the Visayas when grouped by topography of the land with a production mean of 2.27 (1%).

This indicates that the production of sugarcane in the Visayas when grouped by land topography are not comparable. Specifically, production mean of 2.04 is observe to the sugarcane who have a topography gradient of more than 25 degree. Those that were planted, in 6-24 soil gradient have realized a production mean of 2.28. Higher production mean of 2.51 on the hand are revealed, by sugarcane who are planted on soil with topography of less than 5 degrees.

The results is related to the study done by Wand, et al (2023) which determined the impact of different slope gradients and rainfall intensities on soil erosion and nutrient loss. Accordingly, results indicates that runoff increases on the four slope gradients and it showed a positive correlation with rainfall intensity and has a negative correlation with slope gradient. Slope gradient had a significant positive correlation with soil surface runoff.

Table 8. Analysis of Variance of sugarcane production at different locations in the Visayas, Phillipines when group by land topography

Land Topography	Mean	Description
<5 degree (low)	2.51	High production
6-24 degree (medium)	2.28	Medium production
>25 degree (high)	2.04	Medium production
Mean	**2.27**	Medium production
F	5.859	
Sig	<0.001**	

***significant at 1%*

Relationship between the level of sugarcane production and environmental variables

The data in table 9, showed the relationship on the sugarcane production and type of soil in the different locations of the Visayas using *Pearson's r*. The findings in table 9 implied that the sugarcane production is significantly influence by the type of soil at the different locations.

Table 10 shows the relationship on the sugarcane production and rainfall duration in the different locations of the Visayas using *Pearson's r*. The findings implied also that rainfall duration had a very strong correlation with sugar production at the different locations.

In relation to the findings of this study, Thibane, et al (2023) had found out on their study that drought stress due to insufficient amount of rainfall received by the sugarcane area is one of the limiting constraints that affect the sugarcane production of smallholder farmers in South Africa.

The demand of water including rainfall by sugarcane plant is very high. Low production is expected in some sugarcane area because the occurrence of rainfall is very erratic, unpredictable and uneven (Srivastica & Kai, 2012).

Soil texture and percent water capacity values of the soil from sugarcane farms with

clayey textured soil has a water holding

capacity that ranges from 54.24 to 76.30 percent (Labayo & Pabiona, 2022). The study further explained that clayey soils have a lesser number of pore spaces fit between them, which usually restrict root growth and formation.

Table 9. Correlation analysis between the type of soil and sugarcane production

Variables Compared	Pearson r	Sig	Strength of Relationship
Type of soil Sugarcane production	-0.042	0.001**	Very strong correlation

***correlation is significant at 0.01 level*

Table 10. Correlation analysis between rainfall receive and sugarcane production

Variables Compared	Pearson r	Sig	Strength of Relationship
Rainfall received Sugarcane production	-0.184	<0.001**	(-) Very strong correlation

***correlation is significant at 0.01 level*

Conclusion and Recommendation

This study aims to determine the level of production sugarcane as planted at different type of soils and duration of rainfall at the seven locations in the Visayas, Philippines.

The study indicate that there is a strong significant correlation between sugarcane production and soil type as well as to the duration of rainfall receives by sugarcane at the different locations in the Visayas, Philippine.

General Recommendations

The authors recommends that planting of sugarcane at loamy or mixed type soil and time them to receive a rainfall of 5 months or more could increase the sugarcane production in terms of tonnage specifically in the Visayan area of the Philippines.

For Policy Recommendations

There were 320 respondents involved in the study. It covers the six provinces within the four regions of the Philippines. Majority of the respondents were male, 51 years old and above, with secondary education, has been in sugarcane farming for more than 20 years and are tilling an average area of 25 hectares and below.

Most of sugarcane farms involved were almost flat with a soil gradient that ranges from 6 to 24 degree and had an average low production of less than 49 TC/ha. Majority of the area have loamy soil and receive medium rainfall duration for the entire year.

The study indicates that on per location it realized an average production especially in five locations while the two locations have a higher production.

In terms of soil type the sugarcane production is high especially on mixed soil and loamy one. Average production is revealed on clayey and sandy soil.

In relation with duration of rainfall, the production is average, same likewise for those area that have a short and medium rainfall duration, while areas which has a long duration of rainfall had realized a higher production.

In relation to the topography of the land the average sugarcane production in general, same for those with high and medium land slope, high production is realize on areas that were somewhat flat or low soil gradient.

Presenting the present status of the sugar industry in the Philippines, specifically at the area in the Visayas which has low productivity, there is a need to improve the agricultural research and be package of the same into a technology that can be extend to the farmers. Hence, the study will give us a solid background on the relation of factors that affects the sugarcane production in relation to some of the environmental variables.

Conflict of Interest

No other group is involved in this study

Ethical Consideration and Data Privacy

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

The respondents agreed for publishing all generated data.

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