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Research Article

Sugarcane Characteristics Preferred by the Farmers to Plant in the Philippines: Impact to Production

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ABSTRACT

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, accounting for up to 50% of the dry weight of a mature stalk. In the Philippines, the sugarcane industry is one of the major dollar income industries. The study aims to determine the different sugarcane characteristics preferred by the farmers to plant and their relation to the volume of production in the Philippines. The descriptive-correlation method was employed in the study. The instrument used was the validated survey questionnaire used by the group of Oñal in their study in 2021. The 320 sugarcane farmers were randomly identified at the seven locations in the Visayas area of the Philippines. Analysis of variance (ANOVA) implied that there's a significant difference in the production of sugarcane among the different locations in the Philippines. On sugarcane characteristics, the color of the stalks, stalk growth morphology, and the number of millable stalks at harvest implied a significant difference in production. The stalk color and number of millable stalks at harvest were strongly correlated with the volume of production. The study revealed that in the characterization of sugarcane varieties in the Philippines, the stalk color and number of millable stalks should be given an impetus before releasing the varieties to farmers. The results of the study will enhance the government's average national target of production to 75 tons/ha and sustain the Philippine sugar industry. The breeding program of the government agency should be aligned with the varieties preferred by the farmers to plant.

Keywords: *Sugarcane production, Rind color, Descriptive-correlation research, Trashing ability, Growth morphology, Production volume, Inflorescence, Agricultural economics, Varietal selection*

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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).

In the Philippines, the sugarcane industry is one of the major dollar income industries. Despite the modern technologies used in sugarcane breeding in the country, challenges still exist, especially in achieving the desired characteristics of the crop preferred by farmers to increase production.

To increase production, the best sugarcane varieties possess characteristics that maximize yield components like a high number of millable stalks, stalk diameter, height, and disease/drought resistance (Tena et al, 2016), combined with high sucrose content at harvest. These generic traits must be supported by optimal environmental and cultural management (Sumbele et al, 2018). Management components include selecting varieties with their trashing ability, stalk growing capacity, and the emergence of flowers.

Out of 275,000 hectares planted to sugarcane for Crop Year 2024-2025 in the Visayas area, around 32% of the area was planted with VMC 84-524. A green colored variety, fast grower, semi-trashing availability, moderate flowering with an average millable stalk of 2-3.

On the production side, the Philippines' total raw sugar production in the country is 1.92 million metric tons, with a total tonnage of 21.49 million or an average of 55.334 tons per hectare as of February 2025 (SRA, 2025), still below the targeted 75 tons per hectare.

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).

This study aims to determine the different sugarcane characteristics preferred by ordinary small sugarcane farmers at different locations. Furthermore, this study will focus on the 5 sugarcane characteristics prioritized by ordinary sugarcane farmers, in relation to the volume of production.

Furthermore, this study can be a good feedback system for the breeding program of the research institution to hasten the adoption of the variety dispersal program. This will also enhance the knowledge of the sugarcane farmers about the importance of changing their low-producing varieties to better ones.

Objectives

The general objective of the study is to measure the effect of knowing good sugarcane characteristics usually preferred by the farmers to plant in the Philippines, in relation to their production.

Specifically, it aims to;

- Gather data on the production of sugarcane farmers in seven locations;
- Re-calibrate the effect of sugarcane characteristics usually preferred by the farmers to plant at the seven locations in the Philippines in relation to their production, and
- Correlate the sugarcane production with the characteristics preferred by the farmers to plant.

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 the sugarcane characteristics personally preferred by the farmers to plant 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

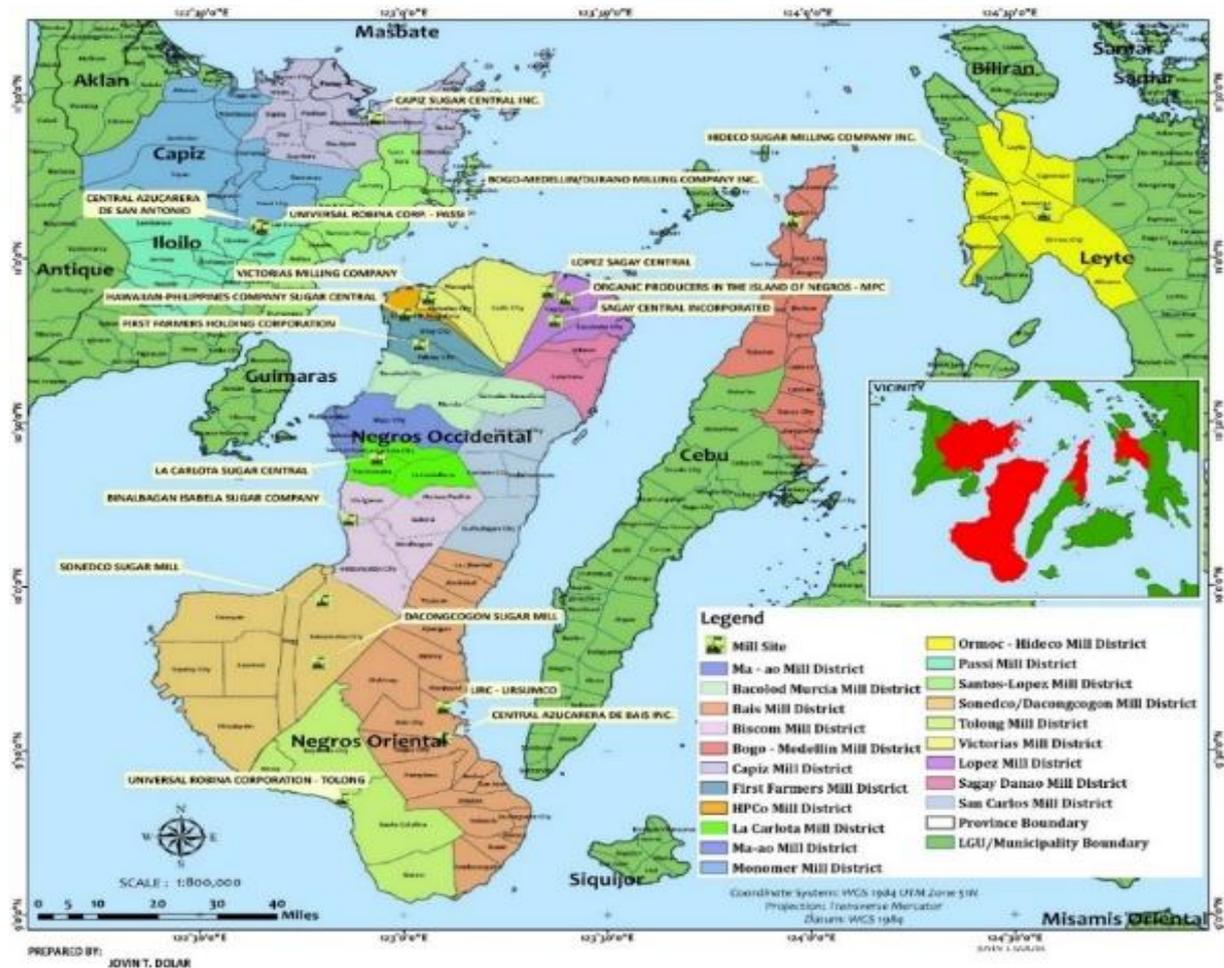


Fig. 2. Sugarcane areas in the Visayas, Philippines.

Distribution of the Respondents

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 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.

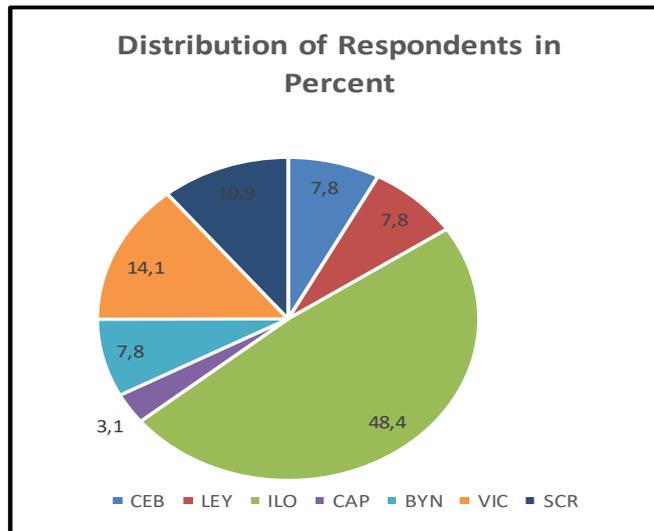


Fig 3. Distribution of respondents at seven locations in the Philippines

Research Instrument

The instrument used to gather data was the validated document used by the group of Oñal (2021) from their previous studies, which focuses as well on the sugarcane characteristics personally preferred by farmers to plant in their farm.

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 Instrument and Gathering of Data

The researchers had done the actual 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.

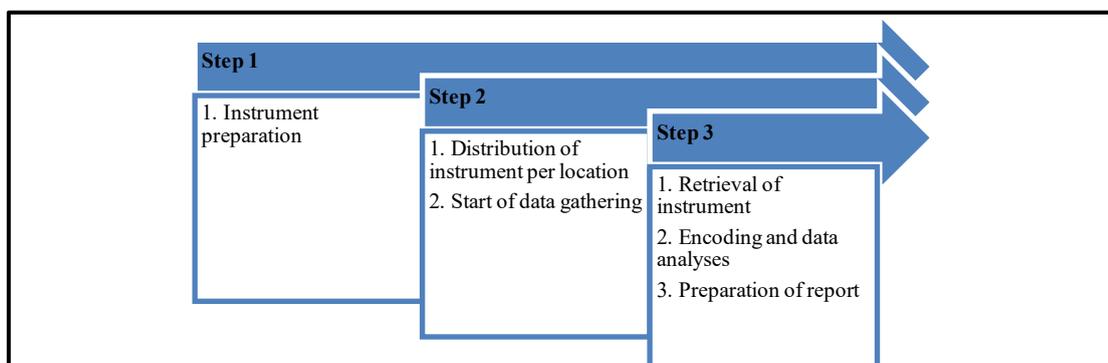


Fig 3. Data gathering procedure

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 farmers, the farm profile, and the different sugarcane characteristics preferred by farmers to plant in their farms.

Likert's Scale was used in segregating and describing the results of the different characteristics of sugarcane.

The mean was used to determine the level of production of sugarcane, as well as the sugarcane characteristics preferred by the farmers to plant.

One-way Analysis of Variance (ANOVA) was used to determine the difference in the production of sugarcane when respondents were

grouped according to location and sugarcane characteristics personally preferred by the farmers to plant.

Pearson's r Moment Correlation was utilized to determine the significant relationship between the different sugarcane characteristics personally preferred by the farmers to plant in their farm and the direct effect on the total volume of sugarcane production in terms of tons per hectare.

Results and Discussions

Farmers Profile

Figure 4 revealed the farmers and farm profile at the seven locations in the Visayas in terms of gender, age, level of education, number of years in sugarcane farming, average size of land holdings, and sugarcane production.

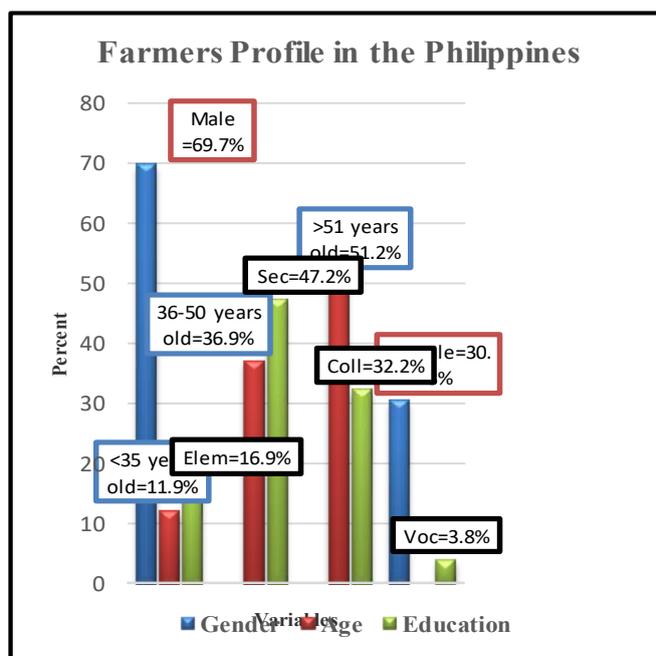


Fig 4. Farmers' profile in the Philippines

The findings reveal that out of 320 farmers involved in the study, there were more males (f=223, 69.7%) than females (f=97, 30.3%).

Furthermore, the findings revealed that the majority of the farmers were elderly or 51 years old and above (f=164, 51.2%), followed by medium age farmers or those between 36-50 years old (f=118, 36.9%), and young farmers or those aged 35 years old and below (f=38, 11.9%), respectively.

As to the educational attainment, the majority of the farmers were at secondary level (f=151, 47.2%), and the least were those who have a vocational attainment (f=12, 3.8%).

The study of Mavaliya et al (2025) on the influence of sugarcane farmers' knowledge on some variables indicates that the age and level of education have no significant impact on the knowledge of farmers.

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 (Gallen, 2015).

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

In the Philippines, employment in the agricultural sector by gender in the year 2019 was 28.70% male and 13.60% female. For the number of years in sugarcane farming, 38.4% have been in sugarcane farming for

more than 20 years, while 26.5% have been doing it for 10 years or less.

Farm Profile

For the size of farm holding, 69.7% of the respondents have an area below 25 hectares, while 6.6% have an area of 51 hectares or more, as indicated in Table 1.

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 53.9% of the area had an average production of less than 49 TC/ha, and 18.8% had an average production of 56 to 64 TC/ha.

Table 1. Farm Profiles at the different locations in the Visayas, Philippines.

Variables	Number of Farmers	Percentage
Average Size of Land Holdings		
51 ha & above	21	6.6
26-50 hectares	76	23.8
25 ha & 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 TC/ha	88	27.5
50-64 TC/ha	60	18.8
<49 TC/ha	172	53.8
TOTAL	320	100.0

Characteristics of selected sugarcane varieties released for commercial planting in the Philippines.

The characteristics of 15 sugarcane varieties that were selected and released for commercial planting in the Philippines are pre-

sented in Table 2. The table implied that the average potential production is 141.59 tons per hectare (TC/ha), 46.67% have red stalk color, 86.66% are fast growing, all have self-trashing ability, 2.21 average stalks, and 93.33% are non-flowering.

Table 2. Summary of selected sugarcane varieties released for commercial planting in the Philippines.

Phil Variety	Potential Tons/ha	Stalk Color	Stalk Growth	Trashing Ability	No. of Stalk	Flowering (NF/FL)
1999-1793	170.69	Red	Fast	Self	2.37	NF
2000-0791	136.92	green	Fast	Self	3.20	NF
2003-1389	135.84	green	Fast	Self	2.13	NF

Phil Variety	Potential Tons/ha	Stalk Color	Stalk Growth	Trashing Ability	No. of Stalk	Flowering (NF/FL)
2004-1011	152.99	Red	Fast	Self	2.35	FL
2006-1899	148.29	white	Fast	Self	2.02	NF
2006-2289	129.92	green	Fast	Self	1.88	NF
2007-0359	140.40	white	medium	Self	2.03	NF
2008-0161	108.90	white	Fast	Self	1.98	NF
2008-0909	112.90	Red	Fast	Self	2.58	NF
2009-1969	182.74	Red	Slow	Self	2.12	NF
2009-0919	140.46	Red	Fast	Self	2.00	NF
2010-0107	146.26	Red	Fast	Self	2.48	NF
2010-0149	127.82	Red	Fast	Self	1.95	NF
2012-0483	149.66	green	Fast	Self	1.94	NF
2012-1269	140.12	green	Fast	Self	2.15	NF
Mean	141.59	46.67% (Red) 33.33% (green) 20.00% (White)	86.66% (Fast) 6.67% (medium) 6.67% (slow)	100% (self-trashing)	2.21	93.33% NF (non-flowering) 6.67% FL (flowering)

Sugar Regulatory Gallery

Characteristic indicators of sugarcane crop preferred by the farmers in the Visayas, Philippines

The data in Table 3 shows the mean analysis of sugarcane characteristics preferred by farmers to plant at different locations in the Visayas area of the Philippines. The table specifically revealed that the majority of the farmers preferred to plant sugarcane varieties that have the largest number of millable stalks (m = 4.19).

Aside from long and bigger stalks, the number of millable stalks is of great importance for higher sugarcane production (Oñal et al, 2023), specifically in terms of tonnage. This character-

istic has a more evident effect on the population and the number of tillers (Chand, 2018) during the tillering stage of the cane setts.

Relatively, those parameters may directly affect production in terms of tons per hectare, juice quality, and sugar content if there’s a delay in the delivery of harvested stalks of 4 days or more (Muhtadi, 2024).

The trashing ability is a good preference for farmers. The separation of sugarcane leaves, being classified as trash from the stalk, is a crucial component in the sugar production process (Huo et al, 2023). Trash affects the quality of sugarcane juice and yield (Desalgen et al, 2023).

Table 3. Mean average of sugarcane characteristic indicators preferred by the farmers to plant in the Visayas, Philippines

Sugarcane Characteristic Indicators	Mean	Description	SD
1. Stalk color	3.29	Moderately preferred	1.46
2. Stalk growth morphology	1.77	Least preferred	0.79
3. Trashing ability	3.47	More preferred	0.91
4. Number of millable stalks	4.29	Most preferred	0.88
5. Flowering habit	2.16	Less Preferred	1.19
Mean	3.00	Moderately preferred	

Preference Mean: 1.00-1.80 least preferred; 1.81-2.60 less preferred; 2.61-3.40 moderately preferred; 3.41-4.20 more preferred; 4.21-5.00 most preferred

Profile of sugarcane characteristics preferred by the farmers to plant in the Visayas, Philippines

The results of farmers’ preferences on the different sugarcane characteristics as a basis for planting on their farm are revealed in Table 5. Farmers’ main preferences are the color of the stalk, the stalk growth morphology, trashing ability, flowering habit, and the number of millable stalks at harvest.

The farmers preferred sugarcane stalks with red or green color, with 55.0%. Farmers thought that sugarcane with red or purple stalks was sweeter than white-colored stalks (Ekpelikpeze et al, 2016).

Relatively, red or purple colored stalks are referred to as “chewing cane” due to their softer peel or rind. Yellow and green stalks normally have a hard rind and hold up well in the juicer, hence they are suitable for the production of table sugar.

Fast-growing sugarcane varieties were preferred by 78.4% of the farmer-respondents. Fast-growing cane can help farmers eradicate

weeds because the early closure of the canopy can suppress weed growth and conserve soil moisture.

The majority (59.7%) of the farmers preferred the self-trashing variety. Early trashing favors the early maturity of the sugarcane due to natural exposure of the bud-eye. Trashing improved the sugarcane yield by conserving water, soil carbon, and soil N (Antwerpen et al, 2002).

The farmers preferred varieties that don’t bear flowers with 71.9%. Flowering is an undesirable trait of sugarcane due to its adverse effect on juice quality (Singh et al., 2020; Sandhu et al., 2019).

More millable stalks are a top priority of the farmers with 85.0%. More stalks mean high tonnage (Oñal et al, 2022) and sucrose (Wingramasinghi et al, 2024).

The sugarcane farmers in the Visayas area, Philippines, preferred to plant red or purple in color, fast-growing, self-trashing, non-flowering, and have more millable stalks.

Table 4. Profile of sugarcane characteristics preferred by the farmers to plant.

Characteristics of Sugarcane	Frequency	Percent
Stalk Color		
Red/purple	176	55.0
Yellow/green	22	6.8
Any color	122	38.2
Stalk Growth Morphology		
Fast grower	251	78.4
Slow grower	14	4.4
Not so particular	55	17.2
Trashing Ability		
Self-trashing	191	59.7
Normal trashing	56	17.5
Not so particular	73	22.8
Flowering Habit		
Non-flowering	230	71.9
Flowering	24	7.5
Not so particular	66	20.6
Millable Stalks		
>5 stalks	272	85.0
3-4 stalks	17	5.3
<3 stalks	31	9.7
Total	320	100.0

Difference in volume of production in the Visayas, Philippines, when grouped by the characteristics of the sugarcane crop preferred by the farmers

The data in Table 5 presents the difference in sugarcane production in the Visayas, Philippines, when grouped by the characteristics preferred by farmers to plant using One-way ANOVA. It further revealed that there is a significant difference in sugarcane production in the Visayas, Philippines, when grouped by characteristics preferred by farmers to plant, specifically on stalk color (F=4.29), trashing ability (F=4.13), and stalk growth morphology (F=3.62), respectively.

This means that sugarcane production in the Visayas, Philippines, when grouped by characteristics preferred by the farmers to plant, is not comparable (alpha=0.05).

Farmers preferred black, red, and yellow colored stalks (Ekpelikpeze et al, 2016) with high biomass or a greater number of millable stalks at harvest (Tena et al, 2016). Sugarcane, being a C4 plant, can approximately produce 10-15 tons of biomass per hectare or 10-12% weight of cane harvested (Sharma et al, 2025).

The perception of the farmers that dark-colored sugarcane is sweeter, hence it produces more than light-colored sugarcane, still exists in some farms.

Table 5. Analysis of Variance of sugarcane production in the Visayas, Philippines, when grouped by characteristics preferred by the farmers to plant.

Sugarcane Characteristics	Mean	F	Sig
Stalk color	3.00	4.20	0.003*
Stalk growth morphology	2.61	3.62	0.004*
Trashing ability	2.29	3.16	0.015
Number of millable stalks	2.96	4.13	0.003*
Flowering habit	2.10	2.88	0.023

*significant at 5% level

Difference in sugarcane production in the Visayas, Philippines, when grouped by location

The data in Figure 5 presents the difference in sugarcane production in the Visayas, Philippines, when grouped by location using the One-way ANOVA. It further revealed that there is a

significant difference in sugarcane production in the Visayas, Philippines, when grouped by location (F=2.816). This means that sugarcane production in the Visayas, Philippines, when grouped by location, is not comparable (alpha=0.05).

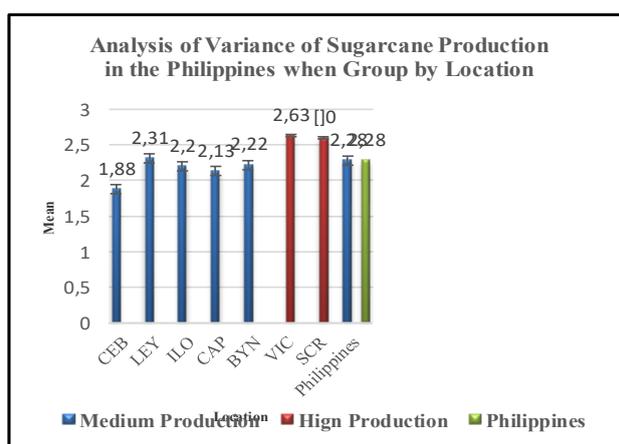


Fig 5. ANOVA of sugarcane production in the Philippines when grouped by location

The results relate to the findings of the study by Oñal et al (2022), which found that there is a significant difference in the level of

productivity of sugarcane farms, also when grouped by location (alpha =0.05).

Sugarcane varieties have specific requirements, especially with the type of soil and rainfall. Hence, average production varied per location.

Relationship between the characteristics of sugarcane crops preferred by the farmers to plant and the volume of production

The data in Table 7 showed the relationship between the sugarcane characteristics preferred by the farmers to plant and the volume of production in the different locations of Visayas using Pearson’s r. Specifically, it could be deduced from the data that there was a strong

relationship between the number of millable stalks and the volume of production (r=0.531), as well as the stalk color and volume of production (r=0.546), respectively. Therefore, the red color stalks and the number of millable stalks affect the volume of production (alpha=0.01).

Stalk colors of sugarcane, including the prominent wax characteristics of the crop, are a critical measurement of the cane quality in the breeding program (Phuphaphud, 2019).

More stalks, more biomass (Tena et al, 2016), and a great capacity to store sucrose up to 50% for greater sugar production (Wickramasinghe et al, 2024).

Table 7. Correlation analysis between the sugarcane characteristics preferred by the farmers to plant and the volume of production

Variables Compared	Pearson r	Sig	Strength of Relationship
Number of millable stalks	0.523	<0.001**	Strong relationship
Stalks color	0.546	<0.001**	Strong relationship

Conclusion

This study aims to determine the sugarcane characteristics preferred by the farmers to plant at the seven locations in the Visayas, Philippines, and their relationship to sugarcane production in terms of tons per hectare.

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

Analysis revealed that there’s a significant difference in the 3 characteristics preferred by farmers to plant, specifically the stalk color, fast-growing variety with more millable stalks has an effect on the volume of production.

The study indicates that on per location realized a medium production of 50-64 TC/ha, especially in five locations, while two locations have a high production of more than 65 TC/ha.

The stalk color and number of millable stalks have a strong relationship with the volume of production.

In view of the results that stalk color and number of millable stalks are the characteristics with a strong relationship with production,

breeders must give importance to the production of new varieties.

Agricultural extension should be aware of the characteristics of sugarcane preferred by farmers.

The government and the academe should unify their effort in conducting more research and development undertakings to further improve productivity to fulfill global market demand and low or erratic sugar prices.

The government agencies will be guided by the results, especially on their breeding program and distribution of sugarcane varieties that are preferred by farmers to plant.

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 this instrument. Data will be used for academic/research and in designing programs/projects for the industry.

The respondents agreed to publish all 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.

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