ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 08, August, 2024

Gender Comparative Analysis of Profitability in Sugarcane Production: Evidence from Non-Cooperated Vuvulane Sugarcane Growers in Eswatini

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ABSTRACT— Sugarcane farming is an economically important agribusiness enterprise in developing countries and is used as a strategic development vehicle for household income generation and national economic growth. However, a literature gap exists in the effects of gender dynamics on profitability amongst non-cooperated growers. Therefore, this study conducted a gender comparative profitability analysis and identified the determinants of profitability amongst smallholder growers. Cross-sectional data were collected through interviews guided by a structured questionnaire from a sample of 173 growers. The budgetary technique and the gross rate of return (GRR) were adopted to assess the level profitability. Multiple regression was applied to analyze the determinants of profitability. The results revealed that sugarcane farming is profitable with an average profit per ha of E32,514.20 and GRR=1.47. Female-managed farms were more profitable (*profit/ha=E34,970.04; GRR=1.62*) compared to male-managed farms (*profit/ha=E30,845.17; GRR=1.38*) and the difference was statistically significant at $p \leq 0.10$. Farm-size, sucrose yield and total cost were found to be common drivers of profitability at $p \leq 0.01$ for male and female-managed farms. The grower's experience in business management and ratoon cropping were significant determinants of profitability amongst male-managed farms at $p \leq 0.01$ and $p \leq 0.1$, respectively. The study recommends that the growers should increase sucrose yield through capacitation on business management skills. Male growers must adopt strict cost minimization strategies to improve profitability. Policymakers should assist the growers to increase the scale of operation to improve profitability through economies of scale.

KEYWORDS: profitability, sugarcane, gross margin, multiple regression, Eswatini

1. INTRODUCTION

Sugarcane is an economically important cash crop due to the varied and immense household and industrial uses of sugar globally [1]. In developing economies, the sugar industry is used as a strategic development vehicle for household income generation and national economic growth and development. In Eswatini, the sugar subsector is the mainstay of the economy [2], generating an annual revenue of about E7.3 billion in the 2022/2023 production season, which accounted for about 4.6% of gross domestic product and 81.2% of the crop production [3]. Moreover, sugar accounted for 10.5% of total output of the manufacturing sector and 9.2% of national export earnings in 2022/2023. Currently, the sugar subsector employs over 11% of the total agriculture workforce and 6% of national labor force [3].

The viability and success of the industry is attributable to the organized structure of the sugar value chain, in which all actors (growers and millers) have equal administrative and policy responsibilities within the highest decision-making body, Eswatini Sugar Association (ESA). This arrangement allows for cooperated and

collaborated effort towards production, processing, warehousing and marketing operations as well as support service provision within the industry [3]. This form of integration promotes transparency as all actors are involved in the oversight function within the value chain. Furthermore, this system yields trust within vertically integrated production-processing-marketing systems and propagates collective innovation for superior performance through integrated problem solving, technology and skills transfer within a centralized extension services system. Hence, Eswatini's sugar value chain represents a united production-processing-marketing front that is founded on win-win conditions. The superiority of such economic integration optimizes sustainable stakeholder financial and economic performance and market efficiency.

1.2 SUGARCANE PRODUCTION IN ESWATINI

Recent statistics by the Eswatini Sugar Association [3] indicate that sugarcane was produced by a total of 469 active growers, out of which 95% (444) were smallholder growers (<50ha) that produced 29% of the national cane output. Medium-scale growers (50-1000ha) accounted for 9% of total cane crushed, while large-scale growers (>1000ha) produced 62% of the sugarcane. Over the past 10 years, an average of 5.6 million tons of sugarcane was produced from an average of 56.9 thousand hectares [3]. Although the total cane yield has been fluctuating over the years (Figure 1), the tonnage per hectare continued to increase between 2019 – 2023. The highest ever sugarcane yield was experienced in 2018/19 and the lowest in 2016/17, largely due to the drought that was experienced then. According to United States Department of Agriculture [4], sugarcane production in Eswatini is projected to increase by 1.5% in the marketing year 2023/24, subject to the increased availability of irrigation water and expanded planted area.

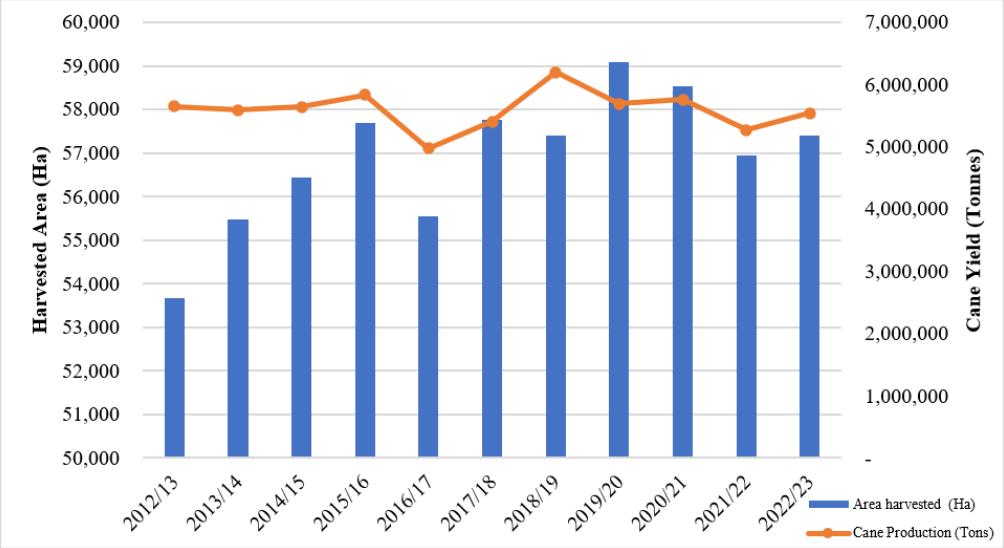

Figure 1: Sugarcane production in Eswatini (2012 – 2023)
Source: Adapted from Eswatini Sugar Association [3]

The level of sugarcane yield is largely influenced by the interplay between the level of investment in hectarage under production and prevalent climatic conditions. Compared to 2018/19, investment in land area planted in the production season 2019/2020 was 2% higher, yet the sugarcane harvested per hectare was 11% lower. This indicates that besides the variation in climatic conditions, productivity is also influenced by investment and managerial factors. By extension, these factors further affect the profitability of the growers. These drivers of profitability in sugarcane farming have, in recent times, received attention from researchers and agribusiness practitioners. In Eswatini, studies have been done to assess determinants of profitability amongst cooperated smallholder farmers' associations [5]. However, these studies missing out on the gender effects

ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 08, August, 2024

on profitability and missed non-associated growers at the production stage. Therefore, this paper sought to close this gap by conducting a gender comparative analysis of the profitability of sugarcane production and its determinants amongst non-cooperated smallholder sugarcane growers.

1.3 PROFITABILITY AND ITS MEASUREMENT

Like all types of entrepreneurs, agribusiness practitioners such as sugarcane growers are rational economic agents that seek profit maximization through output optimization from a given set of inputs [6], [7]. Here, agricultural profitability measures the level of net profit per unit of input, i.e., profit per hectare. The profit maximization agripreneur model depicts peasant farming as a household that employs its technical-economic expertise for utility maximization [7]. Such households not only focus on profit maximization, but optimize farm earned income through reducing risk, thereby, forgoing alternative activities that may potentially undercut profitability.

Several studies have used the budgetary technique to determine the profitability of farm-firms [8- 10]. Net Farm Income per hectare is used as a proxy of profitability of farm-firms [11], [12]. In this case, Net Farm Income captures the variation between total revenue and total costs [1]. Total revenue is the product of total quantity of output that the agripreneur sells at the market and unit price of the marketed output. The unit price is a sum value of the cost of production per unit plus the mark-up. This mark-up is the profit component receivable by the agripreneur. Alternatively, profit is realizable through cost efficiency that is achievable through good supply chain management and/or exploitation of comparative advantage that reduces the cost of production per unit significantly below the market price per unit. On the other hand, total cost is a sum value of variable costs (costs that vary with the scale of production) and total fixed costs (costs that do not change with the scale of production).

Other studies employed the gross margin per hectare as a proxy for profitability [2], [5], [13]. Gross margin is the difference between total revenue and total variable costs. This is commonly used amongst smallholder farmers that neither own assets nor employ permanent labor. Such farmers often keep limited records and lack the necessary skills to ascertain fixed cost parameters. Hence, the total variable cost is near equal to total cost. These characteristics hold true for the smallholder growers in the study area, hence, the use of gross margin per ha as a proxy for profitability.

1.4 DETERMINANTS OF PROFITABILITY

In an attempt to identify the determinants of profitability amongst farmers, studies used a combination of famer and farm characteristics, output per ha and the value of production inputs as independent variables. Production related factors such as the costs of fertilizer, labor, seed-cane, transport, tillage and harvesting have been found to be significant drivers of profitability in sugarcane production [14], [15]. The relationship between production costs and profitability is negative and significant, implying that an increase in the level of costs will reduce the level of profit attainable by the farmers [11].

Farm characteristics such as farm size was found to be a significant factor affecting profitability amongst farms [6], [16]. In addition, agronomic practices such as ratoon farming [17], irrigation system and time of planting have been used in models of determinants of profitability in cash crop farming [5]. Onoja and Herbert [18] conducted a study in Kogi State, Nigeria and found institutional factors such as access to credit to be significant determinants of profitability amongst farmers.

Empirical evidence also reveals socioeconomic characteristics of the farmers to be significant determinants of profitability amongst cash crop production [6], [19]. The farmer characteristics serve as a proxy for the

farmer's demand or appetite for profit and their skills and capacity to manage the production and marketing processes, thereby, influencing the level of investment and profitability. Farmer's experience in the production process has been found to be a significant determinant of profitability [2], [20]. Experience is a critical factor that allows for good decision-making in the use of inputs in the production process [11]. In addition, Onoja and Herbert [18] found the farmer's level of education to be a significant factor affecting profitability. Education is deemed necessary to impart skills and promote innovation in the agricultural production process [16]. In another study, [20] revealed that household size has a significantly positive effect on profitability. Household size depicts the level of family labor availability and/or the demand for profit-making in agripreneurship endeavors. Other studies have revealed empirical evidence of a strong positive relationship between the level of farm output and profitability [2].

2. METHODS

2.1 Study Area

The study was conducted in Vuvulane, which is one of the locations designated for sugarcane production in the lowveld of the Lubombo region in Eswatini. The area has rich and fertile soils and experiences warm temperature ranging from 8°C up to 27°C in winter and 18oC to 32oC in the summer. The agroecological climatical conditions are highly suitable for sugarcane growing and there is an irrigation system in place for the production of sugarcane. The study area was purposively selected due to the homogeneity of the farm and farmers' characteristics (small-scale and non-cooperated), climatic and infrastructural conditions within the population of the study.

2.2 Population and Sampling

The population of the study consisted of a total of 304 smallholder sugarcane growers at Vuvulane that were not affiliated to any primary farmers' cooperatives at the production stage. These farmers produce sugarcane as individuals and rely on the support (technology, extension services, etc.) from the apex organisations (Eswatini Sugar Association). The study employed simple random technique to select the research participants after determining the sample size through Yamane's formula as follows [21]:

$$n = \frac{N}{(1+Ne^2)} = \frac{304}{1+304(0.05^2)} = 173 \qquad (1)$$

Where: n = sample size; N = population of sugarcane growers; e = margin of error (5%).

2.3 Data Collection and Analysis

Cross-sectional primary data were collected through personal interviews guided by a validated and pre-tested structured questionnaire. This minimized the interviewer biasness and allowed for clarifications in cases where the respondents failed to understand the questions [22]. The questionnaire consisted of three sections. Part 1 collected data on the farmers' socio-economic characteristics, while Part 2 was designated for production information and Part 3 collected marketing information.

STATA Version 15 was used to run descriptive and inferential statistics. The descriptive statistics (means, standard deviation, minimum and maximum) and frequency counts and percentages were used the describe the variables used in the model. The budgetary technique and the gross rate of return were adopted to assess the level of profitability of sugarcane production amongst the respondents. Like most of the similar studies [5], [12], multiple regression was applied to assess the determinants of profitability. The same model of profitability was run separately for male and female sugarcane growers so as to allow for the gender

ISSN: 18158129 E-ISSN: 18151027
Volume 20, Issue 08, August, 2024

comparative analysis of the determinants of profitability amongst the sugarcane growers.

2.4 Theoretical and Conceptual Frameworks

Profitability is addressed under the theory of profit maximization, which describes the major aim of any agribusiness enterprise. In this case, profit maximization is postulated to occur within the parameters of perfect competition, where standardized farm-firm output exists under similar price levels for all producers that freely join or exit the market [7]. However, empirical evidence conceptualizes profit maximization as a function of both the entrepreneurial appetite (motivation and attitude of the farm-household towards profit accumulation) and the technical-economic performance of the farm-firm [23]. The theory of profit maximization is most relevant to smallholder sugarcane growers as it expresses the farm-firm as both family farm and an enterprise, thus, accounting for profit accumulation for both business and family consumption [7].

For the sugarcane growers to optimize profit, they strive to balance costs and returns. Investment and production decisions, that have cost bearing, must take into consideration the market price such that the production cost becomes lower than the market price. In this regard, the budgetary tool of cost and return analysis becomes useful in the analyze farm-firm profitability. Here, the production costs are disintegrated into variable and fixed costs. Over and above the production-related costs, farm-firm profitability is influenced by a set of marketing, institutional and socioeconomic factors. Therefore, the conceptual framework for this study was expressed as:

$$Y_i = f(SC, PF, MF, IF) \quad (2)$$

Where: Y_i = profitability of the i^{th} grower; SC = a vector of socioeconomic characteristics of the i^{th} grower; PF = a vector of productions factors that are used by the i^{th} grower; MF = a vector of marketing factors that are used by the i^{th} grower; and IF = a vector of institutional factors that influence the production and marketing of sugarcane by the i^{th} grower.

2.5 Analytical Framework

Unlike other studies that applied the Net Farm Income to ascertain the level farm profitability [1], [10], [18], this study adopted the gross margin analysis as a proxy for farm-firm profitability [5], [11], [16], [24]. This was because the sugarcane growers in the study area did not own assets that accrue fixed costs e.g., tractors, implements, harvesters, etc. In this case, the profitability analysis was conducted using the following formulae:

$$GM_i = TR_i - TV_i \quad (3)$$

$$TR_i = \sum_{i=1}^{n} P_y Q_y \quad ; \quad TV_i = \sum_{i=1}^{n} P_x Q_x$$

$$Therefore, GM_i = \sum_{i=1}^{n} P_y Q_y - \sum_{i=1}^{n} P_x Q_x$$

$$GMM = \frac{GM}{TVC} \quad (4)$$

Where: GM_i = gross margin of the i^{th} grower; TR_i = total revenue of the i^{th} grower; P_y = price of output per ton received by the i^{th} grower; Q_y = Quantity of output sold in tons by the i^{th} grower; TVC_i = total variable cost incurred by the i^{th} grower; P_x = price of inputs used by the i^{th} grower; Q_x = Quantity of inputs used by the i^{th} grower; GRR = gross rate of return, measuring the return per Lilangeni invested of

gross margin on total variable costs [8], [9], [25].

The criterion used for decision-making was that, if GM > 0 the farm-firm is profitable; but if GM ≤ 0, the firm-firm is not making profit [11]. The general formula of the multiple regression, used for examining the determinants of farm profitability, was expressed as:

$$y = \alpha + \beta_1 X_1 + \ldots \beta_n X_n + \varepsilon \quad (5)$$

Where: y = dependent variable; X = a set of independent variables; α = y-intercept (constant term); β = a set of the slope of the coefficients for the independent variables; ε = error term.

The model used for the estimating the determinants of profitability amongst the sugarcane growers in this study was specified as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon_i \quad (6)$$

Where:

$Y_i = Gross\ margin\ per\ ha\ (Emalangeni)$
$X_1 = Farmer's\ age\ (Years)$
$X_2 = Formal\ schooling\ (Years)$
$X_3 = Business\ management\ experience\ (Years)$
$X_4 = Farm\ size\ (Hectares)$
$X_5 = Ratoon\ (Number)$
$X_6 = Sucrose\ yield\ (Tons\ per\ ha)$
$X_7 = Extension\ visits\ (Number)$
$X_8 = Farming\ experience\ (Years)$
$X_9 = Total\ input\ cost\ (Emalangeni)$
$\varepsilon_i = Error\ term$
$\beta_0\ is\ the\ constant\ and\ \beta_1\ to\ \beta_9\ are\ the\ coefficients\ for\ each\ explanatory\ variable.$

Like other similar studies [11], [16], [24], this study adopted the gross margin per hectare as a proxy of profitability, measured in Emalangeni per hectare. It is assumed that the dependent variable is influenced by the independent variables included in the model. Based on empirical evidence from literature [2], [11], [13], [17], [19], [20], [24] the a priori expectations of the explanatory variables on the dependent variable are presented in Table 1.

Table 1: Hypothesized signs of the explanatory variables on profitability

Variable	Measurement	Hypothesized sign
Farmer's age	Number of years	+/-
Formal schooling	Number of years	+
Business management Experience	Number of years	+
Farm size	Number of hectares	+
Ratoon	Number of years	+/-
Sucrose yield	Tons per hectare	+
Extension visits	Number of visits	+
Farming experience	Number of years	+

ISSN: 18158129 E-ISSN: 18151027
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Total input cost	Emalangeni	-

The study conducted the variance inflation factor (VIF) analysis to identify and eliminate sources of multicollinearity. The VIF test indicated that all variables had values ≤ 2.68, with a mean of 1.66. This means that multicollinearity was not a problem for the model. The robust standard error was applied to curb potential heteroscedasticity within the error term.

3. RESULTS AND DISCUSSION

3.1 Descriptive statistics

Table 2 shows the frequency distribution of respondents according to their gender (group variable) in the study area.

Table 2: Descriptive statistics of the group variable (n = 172)

Gender	Frequency	Percentage
Male	103	59.54
Female	70	40.46
Total	**173**	**100**

The comparative descriptive statistics for the variables used in the study is presented in Table 3. On average, the sugarcane growers are aged 60 years, implying that the farmers may have a considerable level rigidity towards adjustment to new farming techniques. Moreover, the average age is leaning towards the pensioner age, indicating that the growers may not be dynamic enough to react quickly to changes in the market conditions. The average years of formal education is about 10 years, suggesting that the growers have considerable cognitive capacity to implement acquired skills and knowledge in the production and marketing processes for profit maximization.

The farmer's average experience in business management and sugarcane production are about 8 years and 20 years, respectively. This implies that the farmers are well experienced and capable of good corporate governance and timeous decision-making during the sugarcane production process for profit maximization.

Table 3: Summary statistics of the variables used in the study (n=173)

Variable	Males (S_1=103)	Females (S_2=70)	Overall (n=173)	Min.	Max.
Age	60.38(11.40)	58.80(10.69)	59.74(11.11)	29	79
Formal schooling	10.89(2.98)	11.016(3.65)	10.94(3.26)	1	16
Business management experience	8.70(9.74)	7.263(8.00)	8.12(9.08)	0.50	39
Farming experience	22.38(10.19)	18.30(10.85)	20.73(10.62)	3	59
Farm size	5.826(5.882)	5.25(2.03)	5.59(4.72)	2.50	62
Ratoon	7.19(3.73)	7.61(4.12)	7.36(3.89)	1	17
Extension visits	8.17(0.63)	8.20(0.47)	8.18(0.57)	6	10
Total input costs	117,887.90 (56,792.25)	111,546.70 (53,010.45)	115,322.10 (55,224.69)	27,378.40	328,64
Sucrose yield	12.555(4.87)	13.29(5.23)	12.85(5.02)	1.94	32.04

Note: Standard Deviation in parentheses.

The results indicate that the average farm size is about 5.6ha, which is reflective of a small-scale production system. Economic theory postulates that small-scale operators realize low profit margins due to lack in the

benefits of economies of scale. The variable ratoon shows that the seed-cane is getting older with an overall average of about 8 years and a maximum of 17 years. Theoretically, older seed-cane has low tillering ability and growth vigor, therefore, reduced yield and sucrose content [17]. With about 31% of the growers having been ratooning the same seed-cane for ≥10 years, the seed-cane productivity per unit of all inputs is not maximized. The average sucrose yield is 12.85 tons/ha and the frequency of extension visits is relatively the same between the two gender groups, indicating that both gender groups receive the same level of extension support.

The average total input cost shows a E6,341.20 deviation, with the male group reflecting a higher average cost (E117,887.90) compared to the females (E111,546.70). The results further indicate that about 17.9% of the males experience total input cost above the overall sample average of E115,322 compared to 9.8% of the females. The implication is that, compared to females, male growers spend more money in the production process for the same unit area, thereby, expected to realize lower profit levels.

3.2 Profitability analysis of Vuvulane smallholder sugarcane growers

Table 4 presents the indicators of costs, returns and profitability of the non-cooperated smallholder sugarcane growers in Vuvulane. In line with studies by [5], [26], the results indicate that sugarcane farming in the study area is a profitable agribusiness enterprise, with the overall sample revenue of E285,315.26 and an average gross margin per ha of E32,514.20. The gross rate of return of 1.47 implies that for every one Lilangeni invested on farm operations in sugarcane production, the growers earn a profit of E1.47.

The results further indicate that female growers are about 4% more profitable (E34,970.04) compared to the males (E30,845.17). The difference in gross margin showed statistical significance at $p \leq 0.10$ ($t = 1.26$). The results are contrary to a study by [11] that found males to be more profitable than females growers in cash crop farming. The results also reveal that female growers earn more profit per one Emalangeni invested into the sugarcane production process compared to males ($GRR_{Females}$ = 1.62; GRR_{Males} = 1.38)

Table 4: Costs, returns and profitability analysis (n = 173)

Cost/Return Item	**Value (Emalangeni)**		
	Males (S_1=103)	**Females (S_2=70)**	**Overall (n=173)**
Total Revenue	280,385.42	292,569.17	285,315.26
Labor cost	9,764.06	7,743.10	8,946.33
Insecticide cost	6,629.60	5,455.62	6,154.58
Herbicide cost	9,752.71	9,038.56	9,463.75
Irrigation cost	19,620.73	17,696.43	18,842.11
Fertilizer cost	66,141.22	66,044.36	66,102.03
Transport cost	5,979.56	5,568.65	5,813.30
Total variable cost	117,887.88	111,546.73	115,322.10
Total variable cost/ha	22,236.73	21,235.76	21,831.71
Gross margin	**162,497.54**	**181,022.44**	**169,993.17**
Gross margin/ha	**30,845.17**	**34,970.04**	**32,514.20**
Gross rate of return	**1.38**	**1.62**	**1.47**

The average total variable costs amount to E115,322.10, which is about 40% of the total average revenue. Male growers have a higher level of total variable costs (E117,887.88) compared to female growers. The major contributors towards total costs are fertilizer (E66,102.03), irrigation (E18,842.11), herbicide (E9,463.75) and labor (E8,946.33). Given that most growers are into advanced ratoon cropping, the cost of

ISSN: 18158129 E-ISSN: 18151027
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fertilizer is justifiably high due to the high demand for nutrient supplementation to promote the growth vigor of the sugarcane. In addition, ratoon farming depends on minimum tillage that is susceptible to weed coverage, therefore, the need for more herbicides to control the weeds. For all these major costs, the male growers have higher levels compared to the females, which justifies the higher level of profitability amongst female growers.

3.3 Determinants of profitability amongst Vuvulane sugarcane growers

The model fit statistics indicate that the models had good explanatory power (R-squared values), 94%, 99% and 95% for males, females and the overall sample, respectively. The values of F-statistics (*Males = 231.07, Females = 514.49, Overall sample = 481.29*) were significant at 1% level of statistical significance. The results of the determinants of profitability amongst the growers are presented in Table 5.

Farm size, sucrose yield and total costs are statistically significant at $p \leq 0.01$ for both males and female growers as well as the overall sample. A one hectare increase in the land under sugarcane production has a potential of increasing the growers' profit per ha by E1,078.24 for the overall sample. Comparatively, a unit increase in farm size has more potential for improved profitability for female growers (E3,757.61) than males growers (E956.84). Similarly, a one-ton increase is sucrose yield has the potential of increasing growers' overall profit per ha by E4,160.15. The results also suggest a higher profitability benefit for females (E4,255.12) over males (E4,057.65).

Table 5: Determinants of profitability amongst Vuvulane sugarcane farmers (n=173)

	Males (S_1=103)		Females (S2=70)		Overall Sample (n=173)	
Variable	**Coefficient**	**t-value**	**Coefficient**	**t-value**	**Coefficient.**	**t-value**
Age	-8.65(67.73)	-0.13	-47.73(48.38)	-0.99	-2.58(53.72)	-0.05
Formal Schooling	301.77(192.56)	1.57	-109.93(113.23)	-0.97	-92.41(120.53)	-0.77
Business Management Experience	141.69(47.72)	2.97***	1.05(50.80)	0.02	113.38(36.77)	3.08***
Farm size	956.84(205.35)	4.66***	3757.61(361.71)	10.39***	1078.24(318.29)	3.39***
Ratoon	240.00(140.87)	1.70*	116.99(76.48)	1.53	205.70(113.89)	1.81*
Sucrose yield	4057.65(113.19)	35.85***	4255.12(75.10)	55.99***	4160.15(77.64)	53.58***
Extension visits	2907.82(1792.88)	1.62	-122.46(775.80)	-0.16	1655.41(1333.07)	1.24
Farming Experience	-6.12(101.29)	-0.06	-6.88(42.02)	-0.16	-6.97(60.81)	-0.11
Total cost	-0.14(0.02)	-8.60***	-0.18(0.01)	-14.35***	-0.13(0.01)	-10.17***
Constant	-38814.94(15687.93)	-2.47**	-16752.16(8519.09)	-1.97*	-27241.49(11886.9)	-2.29**
R-squared	0.94		0.99		0.95	
F-value	231.07***		514.49***		481.29***	

Notes: Robust standard error in parentheses. Significance levels: $* p \leq 0.1$, $** p \leq 0.05$, $*** p \leq 0.01$.

Total cost per ha is negatively and significantly related to the level of profitability amongst the growers. The results are in line with several studies that found negative effect of cost variables on profitability [11], [20]. This means that a one Lilangeni increase in the average total cost induces a decline in the profit per by E0.14 for male growers, E0.18 for female growers and E0.13 for the overall sample.

Business management experience is significant for male growers at $p \leq 0.01$, indicating that a one-year increase in business management increases the males' profitability by E141.69. Moreover, the results indicate that male growers stand to benefit from ratoon farming at 10% level of significance. A one-year increase in the age of the seed-cane induces an increase in the profitability of male growers by E240.00.

4. RECOMMENDATIONS

The study recommends that the growers must strive to increase their level of sucrose yield through investment in their capacitation on business management skills. Such skills are crucial in running a farm-firm for profit maximization. The study also recommends that there is need for increase in farm size so as to derive the benefits of economies of scale for improved gross margins and gross rate of return. As much as the male growers stand to gain the benefit of ratoon farming, it is important for them to embark on cost minimization strategies so as to reduce the cost of production. This is vital for improved profitability given their small scale of production. Lastly, a similar gender comparative analysis should be conducted to unearth the effects of gender dynamics on the profitability of sugarcane growers' associations.

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