

## Determinants of Sugarcane Profitability: The Case of Smallholder Cane Growers in Swaziland

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**Abstract:** The sugar industry is the backbone of Swaziland's economy, with annual revenue exceeding E1440 million (US\$ 160 million). As part of the agricultural as well as the manufacturing sector, industry, it accounts for 18% of the country's GDP. Therefore, the economy of Swaziland is to a great extent based on the sugar industry. This study presents empirical findings on the determinants of the profitability of sugarcane growers in the Swaziland sugar supply chain. The study is based on data collected in 2001 from 124 smallholder cane growers who supply sugarcane to the three sugar mills in Swaziland (Simunye, Ubombo (Bigbend) and Mhlume). The study used purposive sampling, which is most desirable when certain important segments of the target population are intentionally represented in the sample. The results of the study revealed that the performance of these farmers is affected by farming experience, change in sucrose quota, yield per ha, sucrose content and the distance from the farm to the mill. The implications of this study suggests, that smallholder farmers need to be trained and motivated in order to be commercially oriented. The Swaziland Government should play a role in providing smallholder cane growers with some training in business management skills and in addressing issues of concern to farmers as they develop in order to improve their yields. This should be done through the government extension agents, provided specifically to assist smallholder sugarcane farmers, and the various government departments involved in providing training in business and management skills. There is also a need to limit the production of sugarcane to areas, which are closer to the mills in order to reduce transaction costs.

**Key words:** Cane growers, profitability, smallholder farmers, sugarcane, sugar industry

### INTRODUCTION

The sugar industry is the backbone of Swaziland's economy, with annual revenue exceeding E1440 million (US\$ 160 million). As part of the agricultural as well as the manufacturing sector, industry, it accounts for 18% of the country's GDP. Therefore, the economy of Swaziland is to a great extent based on the sugar industry (Thompson, 2010). The Swaziland sugar industry is composed of three main actors, who include the Swaziland Sugar Association, the millers (Mhlume, Ubombo (Bigbend), and Simunye sugar mills) and the cane growers (Swaziland Sugar Association, 2007). The Swaziland sugar industry is regulated by the Swaziland Sugar Association (SSA) as mandated by the Sugar Act of 1967. The SSA regulates the functions of the industry, while the millers are responsible for producing sugar and the cane growers for producing sugarcane and delivering it to the mills. Apart from producing sugar, the millers also own sugar estates from which they produce sugarcane (UNCTAD, 2000; Westlake, 1995).

In accordance with the Sugar Act of 1967 the SSA operates a pooled payment system in which the annual revenue earned from the sales of sugar is distributed to the

millers and growers after deducting the industry obligation costs. This system of pooling revenues ensures that the payment per tonne of sugar produced by millers is not affected by the timing of their sugar production. It also ensures that payment to the growers, per tonne of sucrose delivered, is not affected by the timing of deliveries of cane through the season. Through the pooling system both millers and growers benefit from the best prices the industry receives from its preferential markets (UNCTAD, 2000).

The SSA divides the total net payment to the mills according to quota sugar and segregated sugar. Quota sugar is sugar produced during the year to the maximum aggregate of all quotas attached to the mill (the amount of brown and white sugar the mill should produce) plus any quota shortfall reallocated from another mill. The price the millers and growers receive for producing sugar and for producing sugarcane respectively is determined by the Sugar Association, which after identifying and projecting all the revenue from the sale of sugar and sugar by-products, such as molasses, and deducting all industry obligations it then passes the remainder to millers and growers. Millers and growers however, negotiate the ratio of the price split for sugarcane processing and

Table 1: Percentage price split between cane processing and production (1996-2001)

Season	Cane processing (%)	Cane production (%)
1996/97	35.0	65.0
1997/98	34.0	65.5
1998/99	34.5	66.0
1999/00	33.5	66.5
2000/01	33.0	67.0
2001/02	32.5	67.5

Revised Sugar Act of 1967 (2001)

production. The price split for the 2001/2002 season was set at 67.5% to growers (Growers in this case refer to cane growing farmers and cum-mill planters) and 32.5% to millers (Table 1). Millers are paid on the basis of their sugar output and payments are made a week after production. The millers in turn, pay the cane growers based on the amount of sucrose extracted from their cane. They are paid a week after delivering their cane to the mill. These payments are financed through a commercial bank overdraft since the season's sugar would not yet have been sold (Westlake, 1995; UNCTAD, 2000). This study, therefore, attempts to identify the determinants of profitability for smallholder cane growers within the Swaziland Sugar Industry.

#### **ISSUES FACING SMALLHOLDER FARMERS IN THE SWAZILAND SUGAR INDUSTRY**

UNCTAD (2000), in a study on the policies for small-scale sugarcane growing in Swaziland, points out that farmers on Swazi Nation Land (SNL) are still subsistence and have minimal education, and thus unfamiliar with modern business practices and commercial agriculture. Although the sugarcane extension specialists provided by the Swaziland Government in conjunction with the industry's extension service provide assistance to smallholder farmers on production and crop husbandry, they are still not commercially oriented. This implies that smallholder cane growers still lack commercialisation skills (which involves more than just the marketing of output and product choice, but encompasses decisions on input use, which are based on the profit maximisation principle). Commercialisation skills in agriculture refer to the ability to move from subsistence-oriented to market-oriented patterns of production and use of inputs.

One characteristic of sugarcane farming is that harvesting must be done according to a schedule that allows all growers the possibility of delivering a predetermined daily quantity during the crushing season. Therefore, the lack of experience and business skills by smallholder sugarcane growers results in misunderstandings and conflict when it comes to enforcing the necessary disciplinary action on defaulters. This happens because the methods used to draw up the delivery schedules by the different participants in the

industry are not understood by these growers (UNCTAD, 2000). For example, some farmers fail to comply with the industry's agreement of implementing disease control measures because of the high costs involved. When the mill rejects the cane from such farmers as per instruction by the SSA, farmers tend to regard such discipline as an unfair treatment by the mill. This is further confirmed by farmers complaining of not being allowed to deliver their cane at the start of the season, while others want to deliver all their cane in the middle of the season when the sucrose content is high. However, a rateable mechanism has been devised, whereby each farmer is allowed to have repetitive deliveries throughout the crushing season. This makes the growers to go through all the stages of change in sucrose content as the season progresses.

#### **MATERIALS AND METHODS**

**Data collection and sources:** The study used cross sectional data collected in 2001 from a sample of 124 smallholder cane growers who supply sugarcane to the three sugar mills in Swaziland (Simunye, Ubombo (Bigbend) and Mhlume) and with a maximum land size of 100 ha/farmer. The study used purposive sampling, which is most desirable when certain important segments of the target population are intentionally represented in the sample. The sample incorporated 10% of members from those farmer associations with farmers operating individually and individual farmers. The sample was drawn from a list of all the farmers supplying all three sugar mills. This list was obtained from each sugar mill. A farmer was only interviewed if he/she had sold sugarcane to the mill at least once. Those farmers that had not yet sold sugarcane to the mill were not included in the sample.

Purposive sampling is a deliberate non-random method of sampling, which aims to sample a group of people, or settings with a particular characteristic such as where they live in society, or specific cultural knowledge. The power of purposive sampling lies in selecting those cases that are rich in information for the study, where such cases provide a great deal of insight into the issues of central importance to the research study (Patton, 1990).

Data were collected by means of personal interviews. The respondents included 12 representatives of farmers' cooperatives and associations and 112 individual farmers. This study sought the farmers' perceptions on their performance and the extent of their performance. Multiple regression analysis was employed to analyse the data using Statistical Package for Social Scientists (SPSS ver 10).

#### **CONCEPTUAL FRAMEWORK**

In order to analyse the determinants of the performance of cane growers in the sugar industry, the

farmers' gross margins were regarded as proxy for profit and were used as dependent variable. The independent variables include yield per ha, percentage change in the cane grower's quota (Quotachg), distance from the cane grower's farm and the processing mill (milldist), sucrose content in 2001 and farming experience (measured in years of sugarcane farming).

**Distance to the mill (Milldist):** The cost of transporting sugarcane from the farmers' loading zone to the mill is charged on per tonne per kilometre basis. Therefore, the difference in transport costs among farmers could be a result of farmers using transport that does not charge the same rate or in terms of distance between the farmer's loading zone and the processing mill. As a result of the differences in distance, farmers who are further away from the mill are likely to experience high transportation costs even if they use the same transport. Hence, a negative relationship is expected between distance and the performance of the farmer.

**Percentage change in quota (quotachg):** A production quota is the tonnes of sucrose a particular farmer is contracted to supply to the specific mill as per agreement. A higher quota means the farmer can deliver more sucrose at the prevailing quota price compared to a farmer with less quota. However, farmers are allowed to deliver up to their quota level, beyond that they are penalized by being paid a segregated price. Therefore, farmers with large quota, if they deliver their entire quota, are likely to have higher income than those with small quota. Therefore, a positive change in a quota is expected to have a positive relationship with the farmer's performance.

**Yield per hectare and sucrose content:** Sugarcane yields may vary widely according to the physical environment, farm infrastructure (such as irrigation system and amount of water), crop management and varieties used. The average yield in Swaziland is 96t/ha. However, there may be a variation from farmer to farmer. High sugarcane yield per ha contribute to high income on condition the sucrose content is also high.

The amount of money paid to cane growers is a function of the sucrose content in the sugar cane. High sucrose content per tonne of sugarcane is related to high income per tonne of sugarcane delivered. Therefore, farmers with high yields and high sucrose content in their sugarcane are expected to get better payment and thus will be successful in their business.

**Farming experience:** The number of years a farmer has been involved in sugarcane farming is a proxy of the duration of the relationship between the farmer and the miller to which the farmer is attached. It is expected to have an influence in the farmer's management skills as

well as improved interaction with the mill where he delivers his sugarcane. Through the interaction, the farmer may develop some confidence in sugarcane farming and to the mill. Such behaviour is expected to breed trust and cooperation, which further improves the farmers' performance. Thus, farmers who had been involved in the sugarcane farming for several years are expected to perform better than relatively new farmers or rather the same.

## ESTIMATION PROCEEDURE

The factors that affect the performance of smallholder cane growers can be modeled as follows:

Performance = f (yield per ha, quotachg, milldist, farming experience, and sucrose content)

Regression analysis was used to estimate the relationship between the independent factors ( $X_i$ ) and performance (PF). The least-squares technique was used to estimate the regression coefficients ( $b_i$ ) in an equation form:

$$PF = b_0 + b_1X_1 + b_2X_2 + \dots + b_nX_n + u$$

PF = Performance of farmers measured in gross margins of the  $i$ th farmer per ha

$b_0$  = Constant of the regression

$b_i$  = regression coefficient and it represents the expected change in the performance indicator associated with a unit change in the independent variable

$X_i$  = yield per ha, quota change, distance to the mill, farming experience, and sucrose content respectively

$U$  = Random disturbance term.

The backward stepwise regression method was used to determine the independent variables that affect the farmers' performance. Backward stepwise regression method starts by putting all the independent variables in the equation and then deletes one at a time in order to remain with those that reduce the sum of the squared errors.

## RESULTS AND DISCUSSION

**Description of cane growers' performance and indicators:** The success of contractual relationships differs in spite of equal conditions in object and time based aspects. The objective of any contractual relationship is to increase the quality of the product and the benefits that accrue to each partner, while minimising the total costs associated with adding value incurred by both the buyer and the supplier. A contractual relationship

Table 2: Farmers' perceptions on their economic performance (profit) and the factors affecting performance (N =124)

Item	Do you make profit					
	Mean for Yes	Std dev	N	Mean for No	Std dev	N
Transport cost per tonne (Emalangeni)	523.78	642.25	95	614.51	1080	16
Irrigation water (cusecs)	36.12	20.98	82	26.76	14.55	14
Percent change in quota	0.71	3.06	95	0.10	0.44	17
Distance to the mill (km)	20.41	16.92	95	20.91	24.49	16
Total value of assets per ha (Emalangeni)	1229.36	1901.91	95	1094.07	1915.40	17
Total value of assets leased per ha (Emalangeni)	4075	7585.93	95	4369.61	8893.50	17
Farm size (ha)	24.16	33.29	95	9.05	8.54	17
Yield per ha (tonnes)	96.12	22.79	92	78.31	25.44	16
Average sucrose content (%)	13.92	0.97	90	13.77	0.87	15

Table 3: Determinants of cane growers' gross margins per ha

Item	Coefficient	SE	t-value	Sig.
Intercept	- 13415	2117.302	40.14	0.0000
Yield per ha	166.738	4.418	1424.24	0.0000
Farming experience(years in farming)	- 726.422	280.467	6.710	0.0110
Sucrose content (%)	0.993.968	147.807	45.220	0.0010
Quotachg (tonnes)	1081.225	166.846	42.00	0.0001
Mildist (km)	- 219.569	46.191	22.60	0.0001

Adj R<sup>2</sup> = 0.756; F = 31.09; SE = Standard error

must guarantee and communicate ex-ante that the contracting partners have higher benefits with the relationship than without. Also the benefits of remaining in the contractual relationship must be higher than the costs of coordinating the actions. Therefore, the economic performance of the cane growers may be affected by several transaction costs incurred during the exchange process.

Table 2 suggest that respondents who indicated that they make a profit from the sale of sugarcane have less transportation costs (E523.78 and one Lilangeni (E) is equal to US\$7) per tonne compared to those who reported that they were not making a profit (E642.25), they also had more irrigation water (36.12 cusec) as opposed to those who claimed not to be making a profit (26.76 cusec) and they have high percentage change in their quota (71%). The results show that the distance between the farmers' production site and the mill is important for cane growers to realize a profit. Even if farmers could use the same type of transport and obtain the same yields, the difference in their location (specificity) would result in differences in profit. The results show that farmers who reported to be making a profit are closer to the mill to which they supply (20.41 km) compared to those who do not make a profit (20.91 km).

The availability of assets in any business is regarded as important in production because farmers are able to use these assets at their convenience time and at a lower cost than when leasing such assets. Farmers who reported making a profit were found to have high value of assets per ha (E 1,229.36) than those who reported to be not making a profit (E1, 094.07). Relatedly, such farmers also have less value of leased assets per ha (E4075), while those who reported to be not making a profit had high value of leased assets per ha (E4,369.61). The results

further indicate that farmers who reported making a profit have more land under sugarcane production (24.16 ha), high yield per ha (96.12 tonnes) and high sucrose content (13.92%) compared to 9.05 ha, 78.31 tonnes and 13.77%, respectively for those respondents who reported to be not making profit.

Further analysis of the performance factors based on the smallholder farmers indicate that the performance of smallholder farmers is also dependent on transport cost, distance to the mill, percentage change in production quota, yield per ha, farming experience (years in sugarcane farming). The results imply that these factors are important for the farmers to realise profit from the sugar industry

**Determinates of cane growers' profit:** Cane growers' profit was measured using their gross margins per ha. The results of the factors affecting the cane growers' profit are presented in Table 3. The results indicate that the farmers' gross margin is significantly ( $p < 0.01$ ) and positively affected by yield per ha, sucrose content in the sugarcane and the change in grower's quota. The coefficient of yield per hectare was 166.74, that of sucrose content was 0.993.97, and quotachg was 1081.23, implying that these factors have a positive contribution to the performance of the farmers. This means that an increase by one unit in these factors would potentially improve the farmers' performance by their respective coefficients. On the contrary, the coefficient of farming experience was - 727.42 and that of distance to the mill (mildist) was - 219.57. All the specified variables had their expected signs except for farming experience, which had a negative sign. It was expected that more farming experience would be associated with increase in gross margins. The negative relationship could be attributed to that, farmers who had

been in farming for many years tend to be complacent as they realise that they have the knowledge of farming sugarcane. As a result they ignore some of the important crop husbandry, thus obtaining low yields and ultimately low revenues. The results reveal that 96% of the variation in the performance of the farmers is explained by these factors.

### **CONCLUSION**

This study investigated the determinants of profit for smallholder cane growers. The results of this study provide considerable insights regarding the factors affecting the performance of smallholder farmers in the sugar industry. Profitability of the sugarcane farmers is affected by the yield per ha, the farmer's experience, sucrose content on the sugarcane, the change in the production quota of the farmers and the distance between the farm and the mill.

### **RECOMMENDATION**

The study indicates that for farmers to improve their performance there is a need to consider the distance between the mill to which they deliver their cane and the loading zone. The performance of smallholder farmers can be further squeezed if production costs increase, productivity declines and output prices fall. As the preferential prices that the country used to receive from the European Union and the US has phased out, farmers need to improve their profit by improving production

efficiency and reducing costs by using optimal levels of inputs and producing within an optimal distance to the mill.

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