The financial sustainability and socio-economic contribution of small-scale sugar-cane growers in Mpumalanga Province

by

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DECLARATION

I, Riekie Cloete, declare that the dissertation, which I hereby submit for the degree MCom (Agricultural Economics) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

SIGNATURE: RIEKIE CLOETE

DATE: 18 MAY 2013

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ABSTRACT

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Study Leader: Professor J.F. Kirsten

ABSTRACT

Small-scale sugar-cane farming came to Mpumalanga Province in the 1990s. As result of the Nkomazi Irrigation Expansion Programme, 34 projects with farms of on average size of seven hectares were initially allocated by Government to potential farmers in rural areas. This was done to enable them to generate income from sugar-cane to support their families.

The initial expectations for the success of the programme were high, but they did not realise as anticipated. The yield results for the first decade of the 21st millennium showed a declining trend. Over the same period the large-scale sugar-cane growers (LSGs) performed better. This added impetus to the on-going debate on the relationship between farm size and efficiency in South Africa. It also raised the question whether small-scale farming has a future. Four hypotheses were formulated and tested with regard to the Mpumalanga sugar-cane growers' land productivity. Regression analysis on land productivity, stakeholders' inputs, production budget analysis and macro-economic analysis, by applying the Social Accounting Matrix of Mpumalanga, were used to address the hypotheses.

The first hypothesis states: 'There exits an inverse relationship between farm size and land productivity amongst sugar-cane growers in Mpumalanga.' It was rejected but qualifications

were added. For the sugar-cane cultivated until farm size groups of 4 000 ha in the 2009 season, there was a direct relationship between farm size and land productivity which was highly significant. If this study only focussed on farm sizes up to 7 ha, the hypothesis would have been accepted as there was a high significance of an inverse relationship of the small-scale growers (SSGs) until 7 ha. Despite the inverse relationship of certain larger farm size groups, of which regression analysis suggested no evidence of such a relationship, the LSGs average yield was still approximately 25 t/ha higher than SSGs yield of about 64 t/ha.

The second hypothesis, namely, that land productivity has declined amongst SSGs and not so amongst LSGs, was tested by observing partial productivity over different time periods. The LSGs had a negative growth rate during 2001–2005 but showed positive growth during 2005–2009. The whole period of 2001–2009 showed marginal positive growth for the LSG while the SSGs growth rate declined by 4.6%. For the SSGs the land productivity was about 20 t/ha lower compared to the LSGs, at the data points, 2002, 2007 and 2011, as well as over the period 2002–2011. This confirmed the second hypothesis.

The third hypothesis, namely that the performance of SSGs in the 2009 season indicated financial sustainability, was evaluated by means of production cost analyses for SSG farm size groups, individual farmers and a breakeven point scenario. If the net farm income (NFI) per hectare was the only consideration to measure financial feasibility, the hypothesis would have been accepted. The analyses however showed that the SSGs had much difficulty to cover their living costs from a farm of less than 6.29 ha, resulting in a rejection of the hypothesis.

Testing of the fourth hypothesis, namely that SSGs are an important and essential part of the Mpumalanga economy, and make a critical economic contribution to the region, revealed that SSGs' direct contribution in terms of agricultural production represents 20% of the involvement in the sugar-cane industry and 0.03% of the economy of Mpumalanga Province. Its economic contribution consisted of about R110 million of total GDP, about 2 800 total employment opportunities, and income distribution to households of almost R50 million. The fourth hypothesis can be rejected when considering the magnitude of the SSGs' production only constitutes 0.03% of the total economy of Mpumalanga. However, to assess the real importance of the SSGs, other factors besides production magnitude should also be considered. A major contribution of the SSG sector is the amount of labour opportunities they offer. If this is taken into account, there is reason enough to accept the hypothesis. When the focus shifts from Mpumalanga as a whole to the Nkomazi region, the contribution of the SSGs is substantial. It is therefore possible to confirm the hypothesis, especially due to the contribution to the Nkomazi region.

This study found that SSGs on the whole did not perform as well as LSGs. It however found that some of the SSGs performed sufficiently, and have potential for a sustainable future. Continued support from institutions such as local, provincial and national government, Tsb Sugar, the Cane Growers' Association and Akwandze Agricultural Finance will remain indispensable. With such aid it can be anticipated that the SSGs contribution to society will continue and should be with co-operative ventures as implemented at the irrigation project, Langeloop II, assist the SSGs in being more financially sustainable and providing an even greater economic contribution.

ACRONYMS

Akwandze	Akwandze Agricultural Finance
AUC	Area Under Cane
DBSA	Development Bank of Southern Africa
FSP	Farmer Support Programme
Lima	Lima Rural Development Foundation
LRAD	Land Distribution and Agricultural Development
LSG	Large-scale grower
MCGA	Mpumalanga Cane Growers' Association
MCP	Miller Cum Planter
MEGA	Mpumalanga Economic Growth Agency
NAM	National Accounting Matrix
NIEP	Nkomazi Irrigation Expansion Programme
RAP	Relocation Action Plan
RTO	Right to Occupy
RV	Recoverable Value
SAM	Social Accounting Matrix
SASA	South African Sugar Association
SACGA	South African Cane Growers' Association
SSG	Small-scale grower

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The debate regarding the future and sustainability of small-scale farming is still on-going and gained new impetus following a debate and workshop in Wye, England in 2005 and a set of papers edited by Wiggins, Kirsten & Llambí (2010) in *World Development*. The debate revolves around the efficiency and productivity of small farmers as well as the many structural changes in food supply chains globally which make it difficult for small-scale farmers to remain competitive. At the same time, small farmers are still considered to be important for rural development and rural livelihoods. Although there is general consensus on the role and importance of small-scale farmers in many countries, modernised farming systems bring into play many questions regarding their future sustainability.

This study focuses specifically on small-scale sugar-cane farmers and especially those in the Mpumalanga Province of South Africa. The construction of the Driekoppies Dam by the Komati Basin Development Programme in the early nineties was the main driver for rural and farming development in the area. The KaNgwane administration initiated the Nkomazi Irrigation Expansion Programme (NIEP) for development of skills with the communities experiencing high unemployment. Responsibilities were transferred to the Department of Agriculture in Mpumalanga in 1994 (Brown and Woodhouse 2004:17) and land was made available for sugar-cane cultivation. During the nineties, local communities were identified and extension programmes were provided to prepare them for sugar-cane farming. Around 7 200 ha were allocated to small-scale growers (DBSA, 1999). This area was initially divided into 34 projects. Each of the emerging farmers in a project was provided on average with seven hectares. Their harvested cane is delivered to the Komati and Malelane sugar mills, owned by Tsb Sugar (formerly known as Transvaal Suiker Beperk). Small-scale growers have thus been producing sugar-cane in the Mpumalanga Province since the 1990s.

1.2 PROBLEM STATEMENT

Small-scale sugar-cane farmers in Mpumalanga received considerable assistance from government as well as from the private sector in establishing their sugar enterprises. This was in the form of land, equipment and implements, financial assistance, training programmes and extension services (Kirsten, 1994:33). These programmes and services continue today, but despite these efforts there has been a gradual downward trend in sugar-cane average yields on these farms, as shown in Figure 1.1 below.

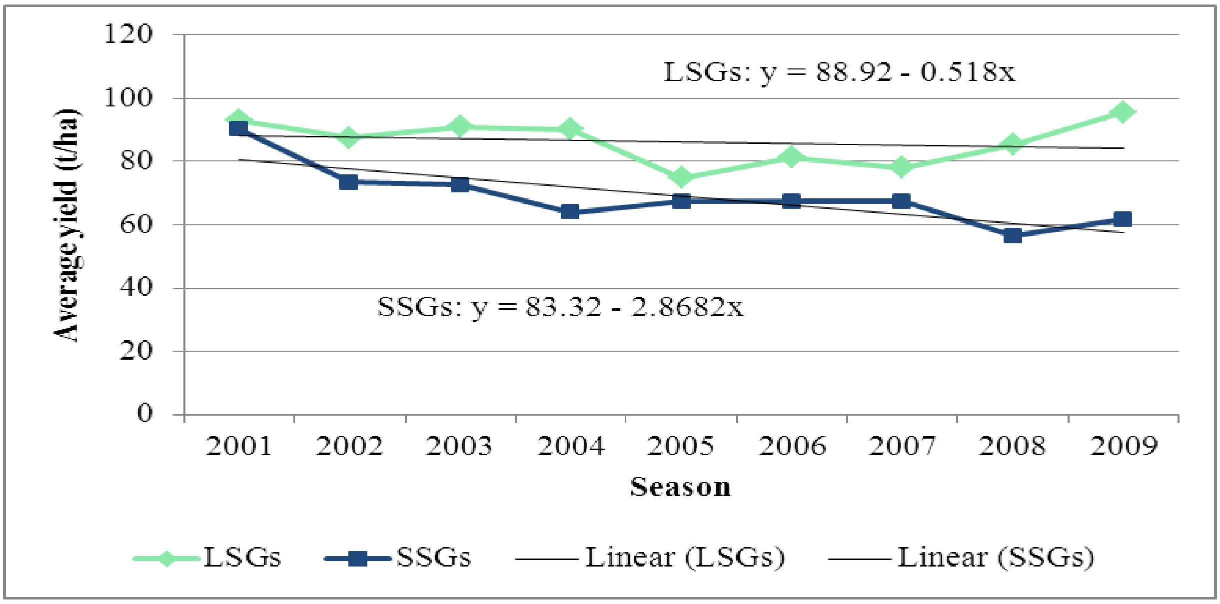

Figure 1.1: Trends in sugar-cane average yields for large-scale growers (LSGs) and small-scale growers (SSGs) in Mpumalanga, 2001–2009 seasons

Source: SACGA, 2011a

Various factors are responsible for the declining yields and declining profitability amongst these farmers. This state of affairs is rather worrying, given that the initial successes of these sugar-cane growers were identified (DBSA, 1999). Their declining productivity will affect the future competitiveness of these farmers and therefore needs to be investigated. Poor literacy, poor record keeping, poor soil management and poor management of irrigation water scheduling and maintenance of the irrigation system, are possible causes of the declining yields.

Understanding the current and past trends in the productivity of these farmers and assessing their financial status could therefore help in directing interventions to secure the future of these farmers, given the critical role they play in the local economy. Getting some sense of the profitability of these small farms will thus be essential to understand whether the small-scale sugar-cane growers have a future and whether they will continue to be one of the important sources of household income and economic growth in the region.

1.3 HYPOTHESES

In light of the debate and concern over the capability of the SSGs to produce and contribute economically and sustainably to the economy, four hypotheses will be tested in the study:

1. There exists an inverse relationship between farm size and land productivity amongst sugar-cane growers in Mpumalanga.
2. Land productivity has declined amongst small-scale sugar-cane growers in Mpumalanga and not so amongst large-scale growers (LSGs).
3. The performance of SSGs in the 2009[1] season indicates financial sustainability.
4. The small-scale growers (SSGs) are an important and essential part of the Mpumalanga economy and make a critical economic contribution to the region.

These hypotheses will not only be tested, but possible reasons will be provided why they can be accepted or rejected. Intervention measures for addressing the hypotheses will also be discussed.

1.4 OBJECTIVES OF THE STUDY

Since the SSGs showed a declining average yield over time in relation to that of the LSGs', some objectives which will act as guidelines to address the various hypotheses regarding the SSGs' situation will be addressed. The objectives are:

[1]All production seasons will be written as '2009' for '2008/09'.

1. To analyse the relationship of farm size and land productivity of a sample of Mpumalanga growers in 2009.
2. To discuss the relationship between the average yield of land productivity and farm size over a specified period of time.
3. To analyse the relationship of labour and land size to establish the importance of the optimal use of irrigation labour of SSGs.
4. To analyse the relationship of fertiliser application and average yield of Mbunu B irrigation project.
5. To analyse the effect of improved irrigation technology of Mbunu B irrigation project block E.
6. To compare the Mpumalanga SSGs with the Mbunu B growers by comparing their production budgets and to determine their profitability levels for the 2009 season.
7. To compare the income of small-scale farming to the income of other employment options and to determine whether alternative employment should rather be considered.
8. To determine the economic contribution of the SSGs and LSGs to Mpumalanga, expressed in terms of the gross domestic product (GDP), the number of full-time equivalent employment opportunities created and the distribution of the generated income to households.

1.5 RESEARCH METHODOLOGY AND DATA

To test the hypotheses, various methods will be used. Partial analyses of land productivity, labour productivity, fertiliser productivity and irrigation system efficiency will be performed (Chapter 3). In addition, net farm income levels of different farm sizes of the Mpumalanga SSGs in 2009 will be analysed, as well as the net farm income levels of individual growers of the Mpumalanga SSGs compared to those of the Mbunu B irrigation project. A production costs analysis of a sample of Mpumalanga SSGs in the 2009 season will be performed. A breakeven analysis comparing net farm income of SSGs against employment opportunities with minimum wage in other sectors will also be conducted (Chapter 4). The final method used will be a macro-economic study to determine the impact the SSGs have on Mpumalanga Province regarding GDP, labour and disposable income to households (Chapter 5).

Data was gathered from literature studies, internet searches and annual reports. Interviews with stakeholders in the sugar-cane industry in Mpumalanga were important sources of data and also provided useful directives, especially when considering priorities in assessing flaws in and improvements of the situation of the SSGs.

The South African Cane Growers' Association (SACGA) was an important source of information regarding the LSGs and SSGs. Confidentiality of the data was an obstacle in obtaining the datasets and had to be negotiated carefully. Once permission was received and a confidentiality agreement signed with SACGA, the available data were provided. Data made available was a grower survey of the SSGs production budgets compiled by the SACGA for the 2009 season. Table 1.1 below indicates the representation of the data surveyed of the Mpumalanga SSGs during the 2009 season in the Malelane and Komati regions.

Table 1.1: Representation of surveyed data of Mpumalanga SSGs (2009 season)

Grower information	Mpumalanga Province	Malelane Region	Komati Region
Number of irrigation projects surveyed	16	8	8
Number of irrigation projects	37	15	22
% of irrigation projects surveyed	43.2%	53.3%	36.4%
Average number of growers in irrigation projects	5	5	5
Number of growers surveyed and data obtained	82	43	39
Total number of growers	1 306	409	897

Source: SACGA, 2012a; Tsb Sugar, 2012a

As far as possible the growers have been randomly selected. Where growers could not be located due to the nature of the SSGs, another grower would be identified and information captured. Data on the cane harvested and the annual average yield from all of the sugar-cane growers was easier to obtain, as the mills maintain records and the information is also made available by the South African and Malelane Sugar-cane Associations. The data of the LSGs was also provided and utilised for comparative analysis purposes. The author regrets that these data couldn't diversify between the different ages of the sugar-cane to determine whether it was in its first year of planting or at a specific ratooning year.

Additional data was provided by Tsb Sugar for a specific exercise that had been performed by Tsb Sugar to determine the fertiliser usage of the Mbunu B irrigation project in the 2009 season when the prices increased by 100% (The Cane Grower, June 2008). The quantity, in kilograms, of the different fertilisers used was captured and evaluated by means of a fertiliser table which was used as guideline for maximum average yield potential when applying fertiliser.

The methodology and modelling techniques for analysing the economic contribution, as addressed in Chapter 5, were used with the courtesy of Conningarth Economists.

As the literacy skills of the SSGs are low and the accuracy of their financial statements is not at a high reliability level, additional interviews were conducted with key role players involved with the small-scale sugar-cane growers in Mpumalanga. Face-to-face interviews, telephonic and electronic communications were also used. Follow-up communication was conducted when necessary. Interviews with SSGs were also performed to a lesser extent, but key questions such as cost of living, number of dependents, main concerns and their requests for better farming options were provided by completing a questionnaire serving as primary information.

The secondary data and supporting opinions from SACGA, Tsb Sugar, contractors and consultants, provided guidelines for a realistic financial statement of the small-scale sugar-cane growers that was used in Chapter 5 for the macro-economic analysis.

1.6 ORGANISATION OF THE STUDY

Whereas Chapter 1 addressed the rationale and methodology of the study, Chapter 2 discusses the small-scale agriculture situation in Mpumalanga and Chapter 3 will focus on partial productivity measurements. Chapter 4 will analyse the financial sustainability of the SSGs, Chapter 5 will provide information on their economic contribution and Chapter 6 will summarise the study and provide recommendations.

CHAPTER 2

SMALL-SCALE SUGAR-CANE GROWERS IN MPUMALANGA

2.1 INTRODUCTION

Edmund Morewood planted the first sugar-cane on his farm Compensation, near Durban, in 1847 (Osborn (1964) cited in Lewis, 1990). Cultivation of sugar-cane was not limited to his farm, but expanded throughout the country where the climate was suitable. Sugar-cane is currently one of the main agricultural crops produced in South Africa. The main producers of sugar-cane are based in KwaZulu-Natal, Mpumalanga and the Eastern Province where a suitable climate for sugar-cane production can be found. In these areas growers provide sugar-cane to the mills that is crushed and processed into sugar, molasses and other by-products which are then sold on the domestic as well as the export market. Sugar-cane growing later evolved into two groups of cane growers, namely the large and small-scale growers.

This study focuses on one of the major areas, namely the Mpumalanga Province (MP). Although there was sugar-cane farming since the 1960's, efforts for the development of the rural community in the Nkomazi area were initiated by the Farmer Support Programs. From the start of the 1990s the Nkomazi Irrigation Expansion Programme (NIEP), which was part of the Komati Basin Development Programme, was initiated giving particular attention to small-scale commercial sugar-cane cultivation. A profile of the grower and the environment will be provided in order to understand the situation a sugar-cane grower finds himself or herself in. The discussion on support systems will include a review of the enhancement of water supply with the building of the Driekoppies Dam in the rich agricultural area of Nkomazi, also part of the Komati Basin Development Programme. A review of the role of the institutions that were involved in the whole development of the small-scale sugar-cane grower in the Mpumalanga Province and institutions that are still playing a leading role in the sugar-cane growing community will also be discussed.

2.2 THE SUGAR-CANE INDUSTRY OF SOUTH AFRICA IN BRIEF

Sugar-cane production in South Africa started in the middle of the nineteenth century. A European emigration phase occurred and as KwaZulu-Natal (formerly known as Natal) was a colony of England it had the effect that English families settled there. They experimented with different crops but in the end sugar-cane was found to be the most suitable crop to cultivate (Richardson (1986) cited in Green, 2007).

The cultivation of sugar-cane and the resulting sugar production blossomed since its beginning in 1847. Around 1860 there were 4 953 ha under sugar-cane, primarily on the North Coast, with twenty-three sugar mills in operation. Large mill companies were formed around the turn of twentieth century, namely Tongaat Estates, Huletts and the Reynolds Brothers (Christopher (1977) cited in Lewis, 1990). In 1900, the sugar production increased to 16 000 tonnes from 30 mills in production and 2 600 ha of sugar-cane being cultivated.

A sugar mill was opened at Pongola in 1954 for farmers in that area (SASJ (1979a) cited in Lewis, 1990). Sugar-cane production came to Mpumalanga in the 1960s as a result of a government irrigation scheme whereby 6 189 ha were provided consisting of 159 plots. For aid in financial funding the Small Grower Development Trust was launched in 1992. An additional funding scheme came with the launch of Umthombo Agricultural finance in 2001.

The 2003 season was the industry's best year with record figures in cane crushed and sugar produced, with 23 million tonnes and 2.7 million tonnes respectively. Although production figures have decreased since 2003, the overall picture still shows a well-established industry with almost 19 million tonnes of sugar-cane crushed in the 2010 season.

Figure 2.1 below shows sugar-cane performance in South Africa from the turn of the 21st century with production outputs from 2000 to 2010. The sugar-cane crushed in South Africa varied between 18 and 24 million tonnes with a negative growth rate of 1.28 %. The average yield of area harvested over the eleven-year period decreased slightly by 0.01 %.

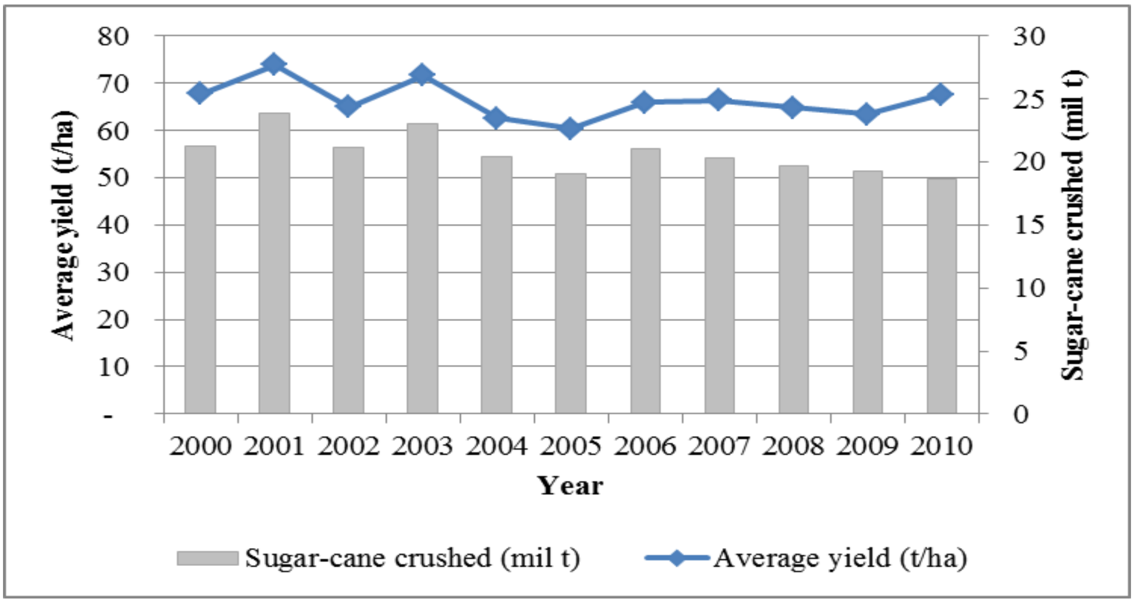

Figure 2.1: Area harvested and sugar-cane crushed in South Africa, 2000–2010

Source: Adapted from SASA, 2012b:26

After the sugar-cane is crushed, it is further refined to sugar products that will either be used domestically or be exported. South Africa is one of the world's top ten exporters of sugar-cane (DAFF, 2011). The sugar-cane represented 17.4% of the total gross annual field crop production value in 2010 in South Africa (DoA, 2011). There were six sugar milling companies producing sugar and other products from sugar-cane, namely Tsb Sugar Holdings (Pty) Limited, Umfolozi Sugar Mill (Pty) Limited, Tongaat Hulett Sugar Limited, Gledhow Sugar Company (Pty) Limited, Illovo Sugar Limited and UCL Company Limited. Most mills belong to Tongaat Hulett Sugar Limited and Illovo Sugar Limited, with four mills each. There are two sugar mills in Mpumalanga Province (SASA, 2012b:18).

Table 2.1 indicates the number of tonnes of sugar-cane crushed by the different mills in the 2010 season and also the distribution of LSGs and SSGs.

Table 2.1: LSGs and SSG profiles per region (2010 season)

Region	LSGs (number)	SSGs (number)	Total (number)	LSG % of total number of growers	Tonnes of sugar-cane harvested
Mpumalanga	179	1 242	1 421	12.6	5 064 538
Zululand	326	13 793	14 119	2.3	3 997 914
Tugela	128	8 357	8 485	1.5	1 288 510
North Coast	346	4 620	4 966	7.0	3 189 621
Midlands	362	2 368	2 730	13.3	3 392 653
South Coast	236	3 362	3 598	6.6	3 010 363
Industry	**1 577**	**33 742**	**35 319**	**4.5**	**18 655 089**

Source: SACGA, 2010b:4; SASA, 2012b:28

Despite the small number of growers in Mpumalanga, the region produced the most by far with more than five million tonnes of sugar in the 2010 season. At 12.6% the percentage of LSGs is substantially higher than the national average of 4.5%. Although land size effects will be analysed in more depth in later chapters, Table 2.1 does vaguely indicate that production performance favours the large-scale grower. This trend can also be seen in Table 2.2.

Table 2.2: South Africa LSG and SSG of sugar-cane production in 2001 and 2010

Season	Grower group	Total yield	Area harvested	Average yield
2001	LSG	20.3 mil t	255 804 ha	79.4 t/ha
	SSG	3.63 mil t	65 910 ha	54.1 t/ha
	Total	**23.93 mil t**	**321 714 ha**	**74.2 t/ha**
2010	LSG	17.03 mil t	239 666 ha	70.7 t/ha
	SSG	1.63 mil t	38 467 ha	40.4 t/ha
	Total	**18.53 mil t**	**278 133 ha**	**71.9 t/ha**
Growth Rate (2001–2010)	LSG	−1.9%	−0.7%	−1.2%
	SSG	−8.5%	−5.8%	−2.9%
	Total	**−2.8%**	**−1.6%**	**−1.2%**[2]

Note: LSG includes Millers Cum Planters (MCPs)

Source: SACGA, 2002; SACGA 2011a

Table 2.2 indicates a decline over the past decade by both small-scale and large-scale growers in South Africa. The harvested sugar-cane area indicates a 5.8% decline in the nine-year period, during which the decline in growers was less than one percent. Although the decrease for all the growers was 1.6% in area harvested, the SSGs had by far the lowest growth rate of −5.8% of harvested cane. Observing the total yield and average yield of the two grower

[2]*Mpumalanga growers growth rate of the average yield were -0.89 %.*

groups, the small-scale growers performed the worst and this declining trend has caused major concern in the industry. A decline in production occurred regardless of various development approaches that were followed in the different regions. Where milling companies' extension services have been withdrawn, there has been an even greater decrease in production, such as at Amatikulu and Felixton, operated by Tongaat Hulett Sugar Limited. Although the yields of all the SSGs have declined, this was not so severe in the Mpumalanga region due to a climate more favourable than that of other regions and also due to farm size units more profitable and viable for sugar-cane farming. Factors that also had an influence on changes of production of the SSGs were a decline of financial support, increased production costs and declining income, tenure type and factors such as urbanisation, HIV/Aids and access to other off-farm employment (SASA, 2012a).

The next section addresses the study area and explores the history and emergence of small-scale sugar-cane growers of Mpumalanga Province. The nature of their farming systems as well as the services assisting them will be discussed to determine the challenges they are facing in aiming for financial sustainability and an increased economic contribution to Mpumalanga Province and the sugar industry itself.

2.3 SUGAR-CANE PRODUCTION IN MPUMALANGA

2.3.1 History

The area in Mpumalanga that boasts sugar-cane plantations is known as the Onderberg or Nkomazi with an area of 3 500 square kilometres. The main towns in the region are Malelane and Komatipoort. It was in this part of the province where sugar-cane development in Mpumalanga started in the 1960s with Tsb Sugar, founded in 1965 as TSB (Transvaal Suiker Beperk, now trading as Tsb Sugar) and still part of the Remgro group. In 1965 the Central Sugar Board granted the then TSB 11 518 ha for the cultivation of sugar-cane. Tsb Sugar was also granted permission by the government of that time to construct the Malelane Sugar Mill. The mill was completed, and produced its first sugar in 1967 and expanded over the next decades (Tsb Sugar, 2012b). There were other crops planted in that area such as vegetables, but marketing problems proved to be very difficult at that stage. There was a small market at Nelspruit, but farmers usually had to transport their crops to the Pretoria fresh produce market, about 400 km from their farms. The result was that many started to convert to sugar-cane as the demand for sugar-cane manufacturing also grew and provided an easier way to market crops as the mill was much closer and was prepared to buy the sugar-cane produced (Slabbert, 2011b).

Initially, malaria was a threat to health, but due to measures by the health services, the problem was soon under control and land could be harvested with less of a health risk than initially (Poulton, 2012). Furthermore, sufficient water for the irrigation of cane was available at that stage in the Nkomazi area and land was available for cultivation. As the Malelane mill was being built and contracts (or as it is referred to, cessions) to the farmers were offered by Tsb Sugar, more farmers planted sugar-cane. Further quotas for sugar-cane cultivation were later granted, necessitating the construction of a second mill. This second mill was dedicated to the small-scale sugar-cane development in the former homeland of KaNgwane. This mill was constructed in 1994 near Komatipoort and named the Komati Sugar Mill. It was built to reduce the transport distance and to provide sugar processing facilities for the increasing production of sugar-cane in the region (Slabbert, 2011b). The area was mainly farmed by white farmers since the 1960s and this has continued until the present. They are, however, considered as large-scale farmers.

2.3.2 Location of SSGs in Mpumalanga

The majority of both the small and large-scale sugar-cane growers of Mpumalanga reside in the Nkomazi Local Municipality area. See Figure 2.2 below.

Figure 2.2: Nkomazi Local Municipality

Source: Ehlanzeni District Municipality in Nkomazi Municipality IDP 2011/2012, 2012:18

In 2007 the municipality of Nkomazi had a population of about 340 000 and those employed or looking to be included in the work force were around 94 000. It was established that about 58% of the population was employed and the balance of 42% unemployed. The community survey of 2007 further identified that almost 130 000 had no income. About 10 000 who were employed had an income of below R400 a month and 14 800 had an income of R800 per month. These statistics indicate an impoverished area with a high unemployment rate and in some cases where there is employment, the income is very small. (Conningarth, 2010:3). Furthermore, Lorentzen (2009:50) added that the Nkomazi area is one of the poorest areas in the country with an unemployment rate of forty percent. Forty-four percent of persons twenty years or older had no or very little formal schooling. Life expectancy has also declined rapidly since the 1980s, from 63 to 58 years in 2001, mainly due to the impact of HIV/Aids. These figures suggest that despite the sugar-cane development that started in 1990s, the situation has not quite lived up to all the expectations to alleviate the community from severe poverty. The education level of those living in the Nkomazi Local Municipality boundary in 2007 is shown below.

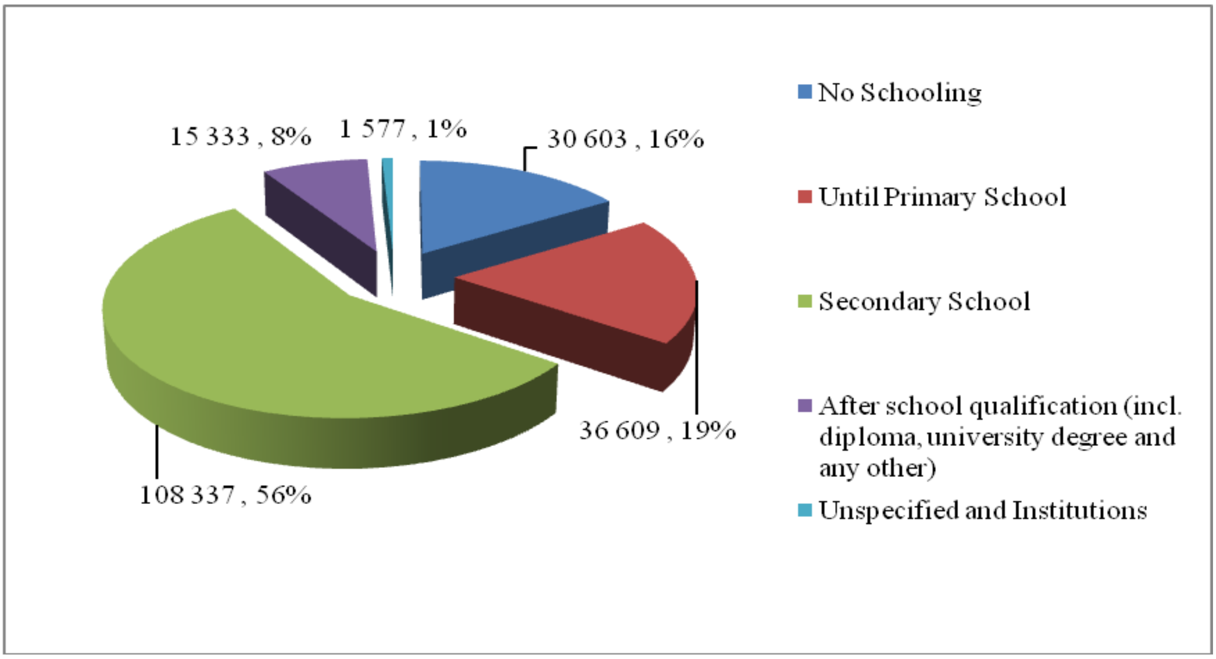

Figure 2.3: Education levels in the Nkomazi Local Municipality, 2007 (Number,%)

Source: Adapted from StatsSA, Community Survey 2007

Figure 2.3 represents the education level within the borders of the Nkomazi Local Municipality. It indicates that 16% of all those living in the area during 2007 had no schooling. About 145 000 or 75% of the population of the municipality only have primary or secondary education. It does indicate that some level of literacy did exist. However, only about 8 % received any additional after school education. In this municipality 98% of the population were classified as African by Statistics South Africa. This Black African population and most of them SiSwati's were living on tribal land mostly owned by the State and controlled by the tribal authorities (Thomson, 2010:132).

2.3.3 The emergence of small-scale sugar-cane growers

The need for more sugar-cane for milling activities provided impetus to the development of the SSGs (Honeyborne, 2011). Those targeted for development were part of the rural community in the Nkomazi area, which is mainly tribally based. They resided in the KaNgwane homeland until inclusion into the Mpumalanga Province and more specifically, the Nkomazi Municipality in 1994. The emergence of the small-scale sugar-cane growers in Mpumalanga originates from the use of quota land made available for development (Honeyborne, 2011). It was initiated from the fifth phase of the Farmer Support Programmes

(Kirsten, 1994:186). Sugar-cane was identified as an easy crop to cultivate (Brown & Woodhouse, 2004:17). The reasons included the fact that there was water available from the rivers and also from the dams that were proposed to be built. The sugar price was high, and that favoured the income potential of the farmer. A market for sugar-cane was immediately available via Tsb Sugar. About 7 200 ha were provided to the SiSwati's and was divided into farms of about seven hectares each, which in the 1990s was a good farm size for sugar-cane cultivation as shown in feasibility studies done by the DBSA. With the expectation of improving the extension services to the growers, the projections were viable for Tsb Sugar (DBSA, 1999:21). It therefore provided the rural community with upliftment options through the Nkomazi Irrigation Expansion Programme (NIEP).

The small-scale sugar-cane grower in Mpumalanga is predominantly a person that has lived in a traditional tribal system in the regions of KaNgwane for generations. However, those that were previously given the right to cultivate arable land for grazing were not the poorest of the poor (Murray, 2011). The families were selected by the traditional leader (or chief, as known in the local community) and land was made available and a once-off fee was paid (Mavimbela, 2011b). A Right to Occupy (RTO) was given by the traditional authority, which they could use but not own for cultivation (Thomson, 2010:124).

The advantage for the emerging sugar-cane grower was that most of the operational farming activities requiring capital assets, such as tractors, rippers and hand hoes, were provided by contractor services, including the planting of cane and the application of pesticides and herbicides. The ripener spray that assists in increasing the recoverable value through quality is applied by aeroplane services which the sugar mill facilitated. The mill partly subsidised these costs. The SSG cane is also transported by contractors to the mill (Slabbert, 2011b).

Although there still is massive poverty and low education levels, as identified in the 2007 community survey, NIEP created economic spin-offs. From a total rural community with limited products and services, the community developed towards a peri-urban status, where in the town Mzinti, for example, businesses such as wholesalers, spaza-shops and taxi transport facilities developed. There was a positive change in the rural area, the driver of which was sugar-cane development. The institutional development also improved over time. With large business enterprises providing job opportunities, it also motivated the government to improve the service delivery for basic needs, such as electricity and water provision to individual dwellings. Roads were also improved and more bridges were built to facilitate the transport of sugar-cane to the mills due to the NIEP (Ogg, 2011).

These SSGs, as well as the millers cum planters (MCPs) and large-scale farmers are part of the sugar-cane community in Mpumalanga. Table 2.3 below shows the distribution, number of hectares and farmers in the 2007 season.

Table 2.3: Sugar-cane grower groups in Mpumalanga Province (2007 season)

Grower	AUC	Number of growers	Average farm size per grower
Miller cum planter	4 966	3	1 655
Large-scale	33 609	212	159
Small-scale	9 048	1 391	7
Total	**47 623**	**1 606**	**N/A**

Source: SACGA 2008; Adapted from SACGA, 2011a

Small-scale cane growers in 2007 had about seven hectares each on average, whereas large-scale farmers on average had 159 ha. The MCPs had 1 655 ha per farm to cultivate, which land is managed by Tsb Sugar, the owner of the sugar mills. The table below shows the number of SSGs who delivered sugar-cane to Tsb Sugar mills in 2011.

Table 2.4: SSG region in Mpumalanga (2011 season)

SSG Area	AUC (ha)	Number of growers	Average farm size per grower
Komati	5 831	810	7.20
Malelane	2 127	354	6.01
Total	**7 958**	**1 164**	**6.84**

Source: SACGA 2010b; SACGA, 2011a

During the 2011 season the SSGs land available were 8 000 ha and each farmer cultivated sugar-cane on in a farm size with average just below seven hectares.

2.3.4 The profile of the SSGs

Small growers are typical elderly women, some widowed, with farm sizes of between 2 ha and 10 ha. Most of them are full-time farmers who depend on the cane sales income, but some of them farm only part-time (Schoeman, 2012c). The part-time farmers who have other full-time jobs are difficult to reach by the extension service officers for consultation and advice (Mavimbela, 2011b). For some of the households of part-time farmers it is more of a status symbol to have a sugar-cane farm, whether it is sustainable or not, since they have other means of income. This causes friction between the full-time farmers and part-timers as the dependency of the success of the harvest differs. If, for example, parts of the irrigation system are stolen and need to be replaced, the urgency for arrangements to order new equipment is not the same for the part-time growers. This type of problem makes it difficult to maximise sugar-cane production (Le Roux, 2012d).

At present there are 37 irrigation projects producing sugar-cane for the Komati and Malelane mills. Although Mbunu B is the project irrigation project that will be the focus of much of the analysis, other projects that are part of the small-scale development are Shinyokana and Walda in the Komati Region. In the Malelane area there are, for example, projects such as Nhlangu-West, Nhlangu-East and Ngogolo. A description of the irrigation projects is given below.

In the Komati region, Mbunu B is characterised as a group of dedicated farmers who share an irrigation pump. However, they have poor soils and mining activities nearby with a dam that causes leakage, making the fields overflow (Mbunu B growers, 2012). Mbunu B currently has a good chairperson of the committee (Schoeman, 2012c).

The Shinyokana irrigation project has good soils with an average farm size of 10 ha. This project has a mixed group of farmers who have individual water pumps. There is unhappiness with the new chairperson who replaced an elderly man who acted as chairperson, and this has driven the community apart (Schoeman, 2012c).

The Walda irrigation project is a large project, originally part of the initial seven projects, with a number of political problems. The community has been supporting each other recently, as the new generation of owners starts to understand the requirements but also the potential of sugar-cane farming. A neutral and dedicated chairman has brought about the development of a depth of community coherence. However, recent open-cast mining developments nearby are threatening the sugar-cane growers (Schoeman, 2012c).

In the Malelane region, the Nhlangu-West irrigation project is composed of farms of around 2 ha each where production inputs are bought in bulk and the irrigation pump is shared. However, the water allocation is not enough for the number of growers. In Nhlangu-East there are mostly elderly people with about 2 ha each of below average soil quality. Water allocated to this project is also less than required. The Ngogolo irrigation project has farmers that have good soils and there are a number of individual farmers who share a water pump (Mavimbela, 2010).

To summarise, the small-scale sugar-cane grower's average age is 56 years (Thomson 2010:125). They represent different types of farmers that are either elderly and dedicated or young people with a tendency to go to the city to earn additional livelihood. This results in different objectives for growing sugar-cane. These farmers have either good or poor soil quality. The hectare size varies from 2 ha to 10 ha. Irrigation pump management is either individual or shared. The diverse nature of growers and projects therefore presents an enormous difficulty for extension services and other role players to identify the needs and implement solutions to allow the small growers to become more sustainable.

2.3.5 Nature of the Farming Systems

The SSGs live and farm in the Nkomazi area and are grouped in development projects where each project has a supporting infrastructure that includes a resource centre, irrigation system, roads and other structures relating to farming activities (Le Roux, 2012a). The farms are mostly close to the Nkomati River or Lomati River. No or very little groundwater is used. The farms are still grouped together even when individual pump systems are used. Almost all of the sugar-cane is irrigated, but different irrigation systems are used. The soils on the Komati side are often poor and cycle times with overhead systems are generally too far apart to be as productive and sustainable as on the Malelane side. Where good soils exist in the Komati region, the system type matters less, for example Lugedlane and the different Figtree irrigation projects (Schoeman, 2012c). The funding for inputs to the farms are mostly either from loans or the retention option provided by Akwandze Agricultural Finance.

2.3.6 Irrigation Technology

In South Africa, the types of infield irrigation technology used in these irrigation schemes are flood, overhead sprinklers, centre pivots, and micro irrigation. The most prominent type of small-scale irrigation system is by sprinkler, at 55%, followed by flood irrigation at 34% and the rest amounting to 11% (Denison & Manona 2007:12). However, in Mpumalanga's small-scale sugar-cane development, most of the growers make use of sprinklers, specifically draglines. The system which the SSGs prefer is micro irrigation, in particular drip irrigation (Mbunu B growers, 2012).

The Agricultural Research Council, specifically the Institute for Agricultural Engineering (ARC-ILI) (ARC, 2003:2) classified the different irrigation groups that a scheme can use into flood, static and moving systems. The flood irrigation systems consist of furrow, border and basin irrigation systems. SSGs initially made use of them but most of them have gone over to dragline irrigation systems. The flood irrigation system has the lowest capital costs of all the systems with R5 000–R9 000/ha (2003 prices), and its application efficiency can be between 60% and 80%. It is advised to use one labourer for 10–15 ha.

The sprinkler system is a more efficient application. However, it is a more difficult system to manage. Reasons contributing to this are difficulty in gathering the correct information on what equipment to select and what the design of the field must be when laying out the system (Tlou, *et al.* 2006:85). When draglines are operating to full capacity, the system cost (R/ha) in 2003 was about R10 000–R12 000/ha. The efficiency of dragline water use is about 75%; the hectare/labour ratio is 25, but in Mpumalanga a ratio of 15 ha/labour unit is used (Le Roux, 2012c). The life expectancy of the system is 10 years before it must be replaced (ARC, 2003:19). The other system that is also used by the growers is that of drip irrigation.

Figure 2.4: Drip irrigation system used by a SSG in Mpumalanga

Source: Photo taken by Author

In drip irrigation system the water is delivered close to the stems (Figure 2.4). It is a highly efficient irrigation system. The establishment cost in 2003 was R18 000–R20 000/ha, which is more than double the cost of dragline irrigation. The drip irrigation application efficiency is 90% and labour requirements of 30 ha/labourer ratio is slightly higher than that of dragline with of 75% and 25 ha/labourer ratio. The life expectancy of a drip irrigation system is 5–15 years (ARC, 2003:19). The most important maintenance issue of this system is to ensure that pipes are not clogged. Any obstruction or hole in the piping means that the water will not be pumped to the desired area and the pipe needs to be flushed or repaired in order to be working at its full capacity (Le Roux, 2012d).

The information above shows that the relationship between capital cost, application efficiency and especially the labour requirements of each system differs. For a farmer with low literacy skills and education levels, it is difficult to understand which system is the best and what the requirements are to maintain the system. Therefore, sound advice from the extension officers and other government or private institutions is required in order to assist the growers in making the correct decision. The situation around funding and how much financial institutions are willing to lend also is a decisive factor in the type of irrigation system the irrigation group can buy, as drip irrigation systems are about R8 000 per hectare (2003 prices) which is more expensive than dragline irrigation technology. Growers who intend to convert to drip irrigation can apply to government for subsidising the capital expenditure (Le Roux, 2012d).

2.4 KOMATI BASIN DEVELOPMENT PROGRAMME (SOUTH AFRICA)

The Komati Basin Development Programme was launched between Mozambique, South-Africa and Swaziland for agreement of sharing the water resources. In 1992 the Treaty on the Development and Utilisation of the Water Resources of the Komati River Basin was signed between South Africa and Swaziland, which led to the building of the Driekoppies Dam on the Lomati River in South Africa (InWEnt, KOBWA & ACWR, 2009:12-13). From this programme the Nkomazi Irrigation Expansion Programme (NIEP) evolved, which focussed on developing 7 200 ha for irrigated sugar-cane cultivation (DBSA, 1999).

2.4.1 Nkomazi Irrigation Expansion Programme (NIEP)

Sugar-cane development started for the Nkomazi community with the fifth phase of the farmer support programme (FSP) (Kirsten, 1994:186), but the NIEP was eventually the programme that continued the development evolving from the Komati Basin Development Programme. The KaNgwane administration initiated the NIEP for promoting sugar-cane farming of black farmers in 1993. Responsibilities were transferred to the Department of Agriculture in Mpumalanga in 1994 due to the incorporation of the homelands to South Africa. The aim of the NIEP was ‘to promote the economic development of the Nkomazi Region of KaNgwane using agricultural development as catalyst, vehicle and driving force’ (Brown & Woodhouse 2004:17).

Objectives to address in the NIEP were the following:

1. The creation of opportunities through identifying and implementing economic activities and to increase options for economic activity.
2. Strengthening of regional and local institutional structures.
3. Improvement of the quality of living of the inhabitants of the region where backlogs are severe and poverty has been manifested.

4. Optimal use of the natural resources of the Nkomazi region.

5. Support of farmers of the Nkomazi region to start sugar-cane production as a primary crop, then to convert as the demand is required to other crops such as sub-tropical fruits to improve and stabilise individual farm incomes (MDC, n.d.).

As the Tsb Sugar mills were already available for sugar-cane crushing, a platform was set and a local market was available to distribute the sugar. It therefore guaranteed a stable income to the farmers as well (Brown & Woodhouse 2004:17). Preparations for 7 200 ha for about 960 emerging small farmers and 19 irrigation projects were made in addition to the 600 ha sugar-cane already being cultivated by SSGs. There were two phases of development. Phase 1A aimed to allocate about 700 farmers to cultivate 5 300 ha. It was also known as the 'pre-Driekoppies Dam' phase. The first phase, 1A, of the NIEP took place from 1993 to 1998 with 7 094 ha planted (NOWAC in Brown & Woodhouse, 2004:17). The water supply was from the river pumping station, an off-channel storage dam and four river weirs. Phase 1B was planned for about 250 farmers to plant cane on 1 900 ha of irrigated land. Their water supply was from the Driekoppies Dam and the downstream pumping stations (DBSA, 1999). The Mbunu B irrigation development project, which is given further attention later in the study, was part of Phase 1A. During 1998 and 2000 there were financial problems that restricted the continuation of the programme at that stage. In 2000 funding was provided by the Land Distribution and Agricultural Development (LRAD) programme, which is part of a sub-programme of the Department of Land Affairs that was used to facilitate the buying of farms and re-selling the farms to previously disadvantaged communities. These farms were acquired on the principle of the willing buyer, willing seller concept. In the Nkomazi area, the LRAD programme was called the 'seven project' and consisted of the following areas: Phiva, Mzinti, Magudu, Sikhwahlane, Ntunda, Langeloop[3] and Vlakbult. This project introduced a situation where tribal land, also known as state owned land, was developed rather than buying so-called 'white-owned' farms. One of the functions of LRAD was to provide an initial R20 000 grant to farmers to start their farming operations (Brown & Woodhouse, 2004:17). The Department of Agriculture provided the bulk water infrastructure. Agriwane provided funding for the

[3] Langeloop is one of the projects that is been developing in a cooperative where the individual projects combined land and is beneficiaries of their land that have the potential to be much more successful than only the farmers that had only the 7 ha cane fields (Cronje, 2011, Murray, 2011).

requirements for irrigation systems farming. All this institutional support contributed to the establishment of the SSG development in Mpumalanga.

2.4.2 Building of the Driekoppies Dam

Because sugar-cane expansion was started before the Driekoppies Dam was built, additional water supply for the new development became a huge requirement. Until the 1990s, the only storage dams in Mpumalanga were the Nooitgedacht, Vygeboom, Barberton, Shiyalongubo Dams and in Swaziland the Sand River Dam. With higher water demands from irrigation activities and domestic use in the Nkomazi area, the need for the dam became critical. The existing storage dams could not keep up with water supply. The building of the Driekoppies Dam in the Lomati River was to provide additional water storage for domestic water use and irrigation activities before ultimately flowing into the Indian Ocean. The construction of the dam commenced under KOBWA with Phase 1A of Phase 1, which was part of a long-term plan for the joint development of the water resources in the Komati River Basin. The basin is an international drainage area used by South Africa, the Kingdom of Swaziland and Mozambique. Phase 1B included the building of the Maguga Dam in Swaziland (InWEnt, KOBWA & ACWR, 1994:2-3). Construction of the Driekoppies Dam started in 1993 and it was completed in 1997. It spilled over for the first time in 2000. A photo of the Driekoppies Dam in flood together with its characteristics is included in Figure 2.5 below.

Characteristic	Value
Catchment Area	900 km^2
Mean Annual Runoff	2.16 x $10^6 m^3$
Reservoir Capacity	2.51 x $10^6 m^3$
Reservoir Surface Area	1 870 ha
Full Supply Elevation	328.5 m.a.m.s.l.
Dam Wall Length	2 400 m
Spillway Design Capacity	3 900 $m^3 s^{-1}$

Figure 2.5: The Driekoppies Dam and its characteristics

Source: InWEnt, KOBWA & ACWR, 2009:20

The Driekoppies Dam is a magnificent spectacle to behold and assists in capturing water flow to assure more water to be continuously available in the Lomati River irrigation activities. However, it was necessary to relocate local communities that lived where the dam was built. A Driekoppies Relocation Action Plan (RAP) Phase 2 was introduced that assisted in the short-term objectives where hectares that were used for planting or grazing agricultural activities might have been lost. Sugar-cane projects were also developed from the RAP to promote sustainability for the communities with an allocation of 155 ha (InWEnt, KOBWA & ACWR 2009:23, 27-28).

Although the building of the Driekoppies Dam provided greater water assurance for the community in the Nkomazi, more water security is required. Studies have been conducted and others, investigating possible additional water resources in Mpumalanga for sugar-cane and other agricultural crops, are under way.

2.4.3 Institutional support for the SSGs

Continued support for the growers was and still is critical for sustaining their cane fields. Assistance in different facets was provided by institutions such as Mpumalanga Economic Growth Agency (MEGA), the Land Bank and Akwandze Agricultural Finance (Akwandze).

MEGA, previously known as Mpumalanga Development Corporation or Agriwane, aims to develop people. They aim to assist in services such as funding as well as in being involved in capacity building by facilitating training and giving business advice. They specialise in the supporting services of finance, production, enterprise development and management. The growers can acquire funding for seasonal shortages and for initial business loans. MEGA also assists in loans for equipment required by the growers. They provide a flexible credit facility and they also have an agricultural enterprise and acquisition scheme (MEGA, 2012).

Growers can also get funding through the Land Bank, which provides services to developing farmers and also to businesses involved in the agricultural sector. The role of the Land Bank is to act as an intermediary agent to provide funding and to develop supporting products. In addition, they provide financial management assistance; monitor financial soundness and administer financial support schemes as well (DoA, 2004).

Akwandze is an institution that since 2005 has provided loans for small-scale sugar-cane growers. Previously the Financial Aid Fund, later renamed Umthombo Agricultural Finance, it was established in the 1970s by the South African Sugar Association (SASA), providing loans for the SSGs on tribal land. In 2005 SASA decided not to pursue the lending function any longer, to write off their bad debt and to transfer this function to the local sugar associations to take over the loan books and continue the funding for the SSGs.

Despite the risks regarding the SSGs who could not pay back their loans, the Mpumalanga region was the only area that took up the challenge and continued with funding (Armitage in Tsb Sugar, 2010:25). As there was about 10 000 ha under cane by the SSGs and the produce about 20% of the output of the mills, the need for the continuation to offer credit was essential. Funding provided to the SSGs to produce sugar-cane is essential as it has a direct relation to the future outlook of the local economy. As the small-scale growers are the 'backbone' of the local community, Akwandze was the start of the credit association to the small-scale growers only in the Mpumalanga region.

Akwandze is the siSwati word for 'we are growing', Tsb Sugar and the cane growers have an equal partnership share in the company. SASA made funds of R10 million available to the Mpumalanga Sugar Financing Association which in turn distributed it to Akwandze. The growers raised another R5 million through a contribution by means of a levy on their sugar-cane proceeds. That accounted for R15 million from these two organisations. The growers living in the tribal areas of the Nkomazi district are part of the Liguguletfu Cooperative which has about 900 SSGs. Tsb Sugar also provided a further R5 million which equals the amount generated by the cane growers. Therefore, the total amount available for funding the SSG's production operations and contributed by SASA, Tsb Sugar and the cane growers was R20 million. A further amount of R5 million was contributed by other sources, which brought the initial funding available to Akwandze to facilitate credit to R25 million.

It was soon realised that R25 million was not sufficient to provide credit to the farmers. To overcome this obstacle a new funding partner was found in Khula Enterprise Finance Ltd., a guarantee instrument from Nedbank. They are part of the Department of Trade and Industry's Development Finance Institution that assists SMMEs in all sectors of the economy. In October 2009 Khula contributed R75 million, which raised the fund to R100 million. This newly established Khula Akwandze fund extended their scope to assist the SSGs contracted to Tsb Sugar (Armitage in Tsb Sugar, 2010:25). The financial assistance by the Khula Akwandze fund gave the emerging farmers in Mpumalanga a sound opportunity to be sustainable with credit facilities available. Despite funding being available, not all requests for loans are accepted. Reasons for loans to be rejected, as stated in Thomson (2010:125) are:

1. Yields of a declining nature.
2. The time that passes until the funds are approved.
3. Items not budgeted for, such as breakdowns of implements and other situations that occur unexpectedly.
4. Instances of cable and pipe theft on farming properties damaged the owner's good record to apply for a loan.

5. Sugar-cane growers are not always willing to sign cessions.

2.4.4 Other support systems

The Cane Growers' Association aims to provide services to the growers to successfully produce their own sugar-cane. They provide specific functions, which include technical and economic research services. Through skills development they support and act as mentors to the farmers to seize the opportunity to develop the agricultural, economic and the institutional capacity. The Cane Growers' Association represents the farmers in the necessary forums and is responsible for liaison with the stakeholders. They have various regional branches of which the Malelane and Komatipoort branches are in Mpumalanga (SACGA, 2011). Most of the sugar-cane data used in the study was from the SACGA.

Tsb Sugar is primarily responsible for accepting sugar-cane that farmers deliver to the mill and to process it until the cane is transformed to sugar and other related products. The two sugar mills, Komatipoort and Malelane, support farming practices in the Mpumalanga Province. The province has produced about 470 000 tonnes of sugar that is supplied by about 1 500 small and large-scale farmers in Mpumalanga in 2011 (SACGA, 2011). Tsb Sugar is the third largest private company in the Lowveld and has contributed to the economic growth of the Mpumalanga Province in the last three decades. The company is specifically involved in assisting with measures promoting the sustainability of cane growers in the area (Tsb Sugar, 2012b). As a company they realised the importance to support those growers who have small farms and are continuously looking for ways to improve their profitability to benefit themselves and the local community.

Tsb Sugar, therefore, provides extension services for the sugar-cane growers to stay competitive in the long-term, to produce more sugar-cane and to increase their yields. This in turn assists Tsb Sugar to be a more dominant market player domestically and even internationally. The services for those objectives include agronomic advice and engineering support for the irrigation systems. They provide maintenance of pump and irrigation infrastructure on a voluntary basis where the growers will pay the cost of material and consumables for repairs. The extension services also provide irrigation system design evaluation and monitoring the process for the grower and the financier. With this service they prevent any exploitation of the growers. As the irrigation systems are expensive and to ensure that they get the quality they paid for, they protect the farmer in budgeting to ensure that they can meet the loan requirements. They provide advice in assisting the farmers with the technical aspects so they can make sound choices before investing in a new irrigation system. The extension officers also facilitate training by government or private institutions. Tsb Sugar was also part of the initiative to contract Lima Rural Development Foundation (Lima) in assisting with a long-term sustainability plan for the small-scale growers (Tsb Sugar, 2012b). Despite all the assistance the growers are provided with, the political, social and education profiles of the growers dictate the SSGs choice to accept advice.

The Lima Rural Development Foundation was established in 1989 and is a non-government and non-profit organisation registered as a company in terms of section 21 of the Companies Act. Lima is responsible for the implementation of projects in KwaZulu-Natal, Eastern Cape, Limpopo as well as Mpumalanga (Lima, n.d.). In Mpumalanga Province they became involved in the Nkomazi Small-scale Grower Sustainability Programme with the founders, Tsb Sugar in conjunction with the Business Trust, the Shared Growth Challenge Fund as well as the Sugar Association Small Development Grower Fund. Lima encourages communication and liaison between stakeholders in projects. Although there are many problems in the SSG sector, Lima focuses on identifying individual problem areas in their projects and assists in pro-active measures for each project needed to promote long term sustainability. For the time they have been involved with the SSGs in Mpumalanga, they have identified the following (Lima, 2009):

1. Rehabilitation of infrastructure has to take place
2. Lack of leadership in certain projects
3. Farmers have to take their own decisions rather than expect the facilitators to make the decisions for them
4. Lack of resources for the governmental extension officer
5. Low literary levels of farmers and committee members, which have an impact on the creation and execution of planning committees' operations.

There have also been initiatives planned at the project level:

1. New management structure by which to consolidate farming operations.
2. Promoting of a rental market for growers that have lost interest to provide opportunities for additional land to be used by those that require more land and are enthusiastic about farming.

Due to the availability of these support structures such as Canegrowers and Akwandze, and also by identifying the challenges and initiatives planned by Lima in 2009, there is a continued drive to let NIEP's initial projections realised to be financial sustainable.

2.5 SUMMARY

Much has happened since Edmund Morewood first started planting sugar-cane in South Africa in 1847. The sugar-cane industry has expanded in many areas of the country where the climate and soils are suitable for cane production. Although sugar-cane cultivation started in the Nkomazi region of Mpumalanga in the 1960's, small-scale sugar-cane development evolved significantly through the Nkomazi Irrigation Expansion Programme (NIEP). It added to the Mpumalanga sugar-cane production which contributed to South Africa becoming a major exporter of sugar-cane and being amongst the top ten countries exporting raw sugar-cane. The Mpumalanga region is the largest contributor to the sugar industry in South Africa although it had the least number of growers in 2010 and has only two sugar mills, at Komatipoort and Malelane, to which the SSGs deliver sugar-cane.

The building of the Driekoppies Dam in the Lomati River provided more water security for the sugar-cane growers. The people who became SSGs are generally poor, live on tribal land and received a Right to Occupy (RTO) to be able to cultivate sugar-cane. These SSGs have to face issues such as irrigation system management and the choice of irrigation systems available to enhance production. Support organisations and structures that play an active role in support of the SSGs' daily operations, are the various Cane Growers' Associations, Tsb Sugar, and since 2006, Akwandze Agricultural Finance, which was formed to assist SSGs by providing loans. But, in spite of all the support systems and projects, the SSGs in

Mpumalanga still have an uphill struggle to stay in sugar-cane farming due to their limitations such as a low literacy rate and lack of knowledge regarding farming practices. Internal politics and unreliable support from some project committees are additional contributing factors that hamper the sustainability of the SSGs.

CHAPTER 3

PRODUCTIVITY AND EFFICIENCY OF SMALL-SCALE SUGAR-CANE GROWERS IN MPUMALANGA

3.1 INTRODUCTION

Small-scale sugar-cane growers have on average seven hectares of land. The initial establishment of the emerging growers was successful, but they experienced a decline in their average yields since the start of the millennium. The LSGs' with farms on average 190 ha, seemed to have a slight decline (Figure 1.1). To establish the outcome, objectives of comparative land use of SSGs and LSGs will be analysed. Partial productivity measurements will be used.

Productivity, in general, is expressed as the ratio which measures the amount of output that is produced with given amounts of input (Mohr, 2000:162). Productivity can be measured on the basis of partial or total factor productivity. Partial productivity is defined as the amount of output per unit of a specific input that only considers one input in the ratio (Ramaila, Mahlangu & Du Toit, 2011:12). It is a simple method to apply as it requires a limited amount of data, although the difficulty lies in the identification of the factors that cause the changes in productivity. Also, Hannula (2002:59) argues that in partial productivity no trade-offs are reflected. The ratios determined by the partial method are less complex than when total productivity factors are used. Efficiency is the production level which is to be compared with resources and cost (Berchtold, 2002:1). It is also defined, in a relative sense, as the distance between observed input-output combinations and a best production frontier (Helfand & Levine 2004:242). This study focuses on the measurement of land productivity. Additionally, in order to establish efficiency, minor tests of efficiency for factors such as irrigation and fertilizer were performed.

The future of small farms will be debated in this chapter, and this will mainly revolve around their land productivity in relation to farm size. Much has been argued for and against the conservation of small-scale farms. Mpumalanga Province has 1 300 sugar-cane growers with about seven hectares each on which to produce sugar-cane. The question is whether this farm size is large enough and whether it produces a higher average yield than that of the large-scale farmers, as it is considered by certain researchers that farm size has an inverse relationship to productivity. Due to data limitation, only partial productivity measures will be used to determine whether this is also true for the 2009 survey data from large and small-scale growers. Regression analysis will be used to determine the significance of data used. Viewpoints in the sugar-cane industry will provide supporting reasons for the outcome of the average yield of the small-scale growers. To a lesser extent, partial productivity analyses will be performed on labour and fertiliser use by SSGs, which will help to assess their efficiency as well.

3.2 THE RELATIONSHIP BETWEEN FARM SIZE, PRODUCTIVITY AND EFFICIENCY

A number of studies have been conducted for many decades testing the relationship of farm size and productivity. A.V. Chaynov recognised it in Russia in a study completed as early as 1926. A.K. Sen (1962) identified an inverse relationship and is identified as one of the first modern references to it (cited in Matchaya 2007:3, cited in Barbier, 1984:A189). In Berry and Cline (1979), the agrarian structure and productivity in developing countries were discussed and the results showed that an inverse relationship does exist between farm size and land productivity analysing sample sizes of mostly small farms. Barbier (1984), Cornia (1985), Townsend, Kirsten and Vink (1998), Eastwood, Lipton and Newell (2010) also studied the inverse relationship of farm size and land productivity.

Barbier (1984:A189) identified that there was no general consensus among economists investigating farm size and productivity and that there are always additional variables at work. Although the statistical evidence proved their theory favouring land reform, it always includes conditions such as policies intervention, assistance from the private sector and technical improvements. Fifteen years later, Collier and Dercon (2009:4) established, after reviewing the literature, that most studies favouring the inverse relationship had flawed methodologies, amongst other things extrapolating the data from large scale farmers. There were, however, some African studies presenting a positive relationship, which included a study for Sudan in 1996 by Kevane, as well as a study for Tunisia by Zaibet and Dunn in 1998 (Collier & Dercon

2009:3). Kevane identified that as farmers expand their land, obtain higher average yields and became wealthier it assisted them in bearing the foregoing risk and to be able to finance the farm operations before harvesting (Kevane 1996:237). According to the findings of Zaibet and Dunn (1998:846), those participating in large scale farming favour mechanisation more and also use inputs such as labour and fertiliser to a lesser extent. From these findings it appears that the debate still continues regarding land size and land quality, labour productivity, technology and market opportunities.

Cornia (1985:514,531) addresses economies of scale as a key aspect in the decision of what an optimal farm size should be. In his study of fifteen countries he established that in small-scale farming the intensity of the use of land and resources is higher than for large-scale farming. He shows that this actually resulted in higher average yields per hectare than large-scale farming. However, it was found that intensity of production declined where land holding fragmentation occurred. The variation of land use patterns, though, is not noteworthy where land sizes differed. Where small-scale farms were associated with a proportionally large number of farm workers, the numbers declined when other job opportunities were created. These findings were observed in Asian, Latin American, Tropical African and the Middle East countries. Berry and Cline (1979:134) identified that higher input of labour per output on land occurred on small farms, in their study of various countries investigated. Their study found that when more rewarding job opportunities became available elsewhere, the labour supply decreased which caused inefficiency such as experienced in Japan.

When producing on a small land area, the motivation of the farmer, and normally also of his family members, is high. Another positive aspect is that the farmer personally supervises the processes from planting until harvesting and can adjust should the schedule or other factors change during operations. The difficulty for the large-scale farmer on labour issues is that labour needs to be hired and supervised. Subsequently, it increases the transaction costs and/or the variable costs in the large-scale farmers’ production budget.

The literature suggests that small land size will result in efficiently used family labour. Yields are higher than for large-scale farms as small-scale farmers are able to have more labourers per hectare (Wiggins *et al.*, 2010:1343). Family members tend to be both producers and consumers. If the objective would be to produce more than necessary for the basic needs of the family, additional labour will have to be employed.

The small-scale farmer is often hesitant to progress towards large-scale farming due to the added transaction costs, such as for supervision of additional labour (Eastwood *et al*., 2010:3337). Their resistance flows from the theory that they can only discontinue family labour if capital transaction costs are higher than the cost of hired labour supervision. They tend to focus so much on this factor that they underrate the economies of scale that result from capital inputs.

A study by Van Zyl, Binswanger and Thirtle (1995:39), considered the situation of policy distortions to the large-scale growers in South Africa, and concludes that the inverse relationship is even stronger once the distortions are removed. In a study conducted by Townsend, Kirsten and Vink (1998:175) in the South African wine industry, they argued that the inverse relationship between farm size and land productivity, which has become a 'stylised' fact, does not hold when total productivity measures are used.

Despite the overwhelming findings of many studies favouring the inverse relationship between farm size and productivity, there are researchers that argue that large-scale farming has to be the preferred option for agricultural development. Lewis argued that the subsistence sector can do little more than supplying resources such as labour until the large-scale agriculture sector is able to take over the traditional farmers' activities (Lewis (1954), cited in Ellis & Biggs, 2001:440). Those in favour of large-scale farming believe that with economies of scale, large-scale farmers are more efficient in using their resources as well as applying the technologies available (Ellis & Biggs, 2001:440). Simon Maxwell suggests that peasantry must be accepted as an inefficient business and those large-scale farmers are the drivers in agriculture. He goes on to argue that large-scale agriculturists will create employment opportunities and wealth for those farmers coming from farming enterprises which were not viable (DFID & Thomson, 2004:19). Sir Arthur Lewis argued many years ago that, if there is an occurrence of low marginal productivity in agriculture, it would be better for those farmers to turn to the industrial sector for survival. Although that might seem to be the easier option, industrialisation has not always provided employment opportunities for peasants (Ellis & Biggs, 2001:440, Wiggins *et al.,* 2010:1341).

Contrary to these arguments, Schultz (1964) believes that efficiency of smallholders can be achieved with technical improvements that result in higher productivity (cited in Ellis & Biggs, 2001:440, cited in Wiggins *et al.*, 2010:1341). According to Thomson *et al*. (2004:4) the small farm set-up provided farms with the best potential for growth in productivity to alleviate poverty, especially prominent in Asia. Just as improved technology played a large role in the development of small farms in the sixties, Schultz suggests that technical improvements will benefit future developments in small-scale farming (Wiggins *et.al*. 2010:1342). Lipton in DFID and Thomson (2004:20) agree that this is still valid in the 21st century. The development of applicable policies and support for sustainability of innovation has the potential to increase productivity. Assisting the farmers will have a direct impact on alleviation of poverty. Higher productivity levels can lead to more income generated from the small farms. With the increased income the local economy will be stimulated in respect of production and consumption (DFID & Thomson, 2004:20; Wiggins *et al*., 2010:1343).

In this regard technical improvements coming with the 'green revolution' should also be considered as they can benefit all farmers, regardless of size. The green revolution can be defined as new agricultural techniques which at the beginning of the 1960s brought multiple increases in production and greatly decreased the incidence of hunger worldwide. Green revolution techniques include double cropping, the application of pesticides and synthetic fertilisers, irrigation, and crop breeding (CSA, 2010). The sharp increase in maize prices in 1973–1974 emphasised the need for the continuation of the green revolution. Unfortunately, there is however a need for caution. Sayer (2006:3) reports that, under principles of sustainability identified as ecological, economic and social, the Green Revolution has failed and led small farmers into poverty and bad debt.

The debate regarding the small against large scale farming also impacts on the approach towards poverty alleviation. For poverty to be alleviated, support systems will have to be in place for both smaller and bigger farms. It is important that the necessary policies lead to the provision of health and education facilities in order to improve the development of human capital in such a way that even the poorest farm-dwellers are able to work in their own or other areas, as off-farm job opportunities open up (DFID & Thomson, 2004:22). The developmental approaches have therefore split into two ways of assisting the small farms. Those pro-poor advise policy support for them to continue farming on their own, while those that favour the large-scale viewpoint suggest that land needs to be given to the large-scale farmers and to rather support the small-scale farmers' off-farm with the required policies. The sections below will conduct tests of the situation of the small-scale sugar-cane irrigation farm in Mpumalanga. Hence the hypothesis regarding existence of an inverse relationship between farm size and land productivity; and that compared to large-scale growers (LSGs), small-scale sugar-cane growers' yields have declined measurably over the last few years, will be discussed in the section below.

3.3 LAND PRODUCTIVITY

DFID and Thomson (2004:7) define land productivity as the volume of output per land unit. This ratio can be expressed as tonnes of sugar-cane harvested per hectare (t/ha), which represents the average yield. As one input factor will be used for an output factor, it resembles partial productivity. As identified in the previous section, researchers have studied the relationship between land and land yields for decades. Productivity of land is discussed below to determine whether there is an inverse relationship between farm size and land productivity amongst sugar-cane growers in Mpumalanga.

For the purpose of the analysis below, the number of hectares of sugar-cane area planted will be used, expressed as area under cane (AUC). The land productivity analysis will be the core analysis in the study while the other analyses will identify the financial situation and macro-economic contribution of the sugar-cane growers in chapters four and five. In this section, a farm size productivity analysis will be performed, providing descriptive statistic of the sample. It will continue with a regression analysis to test the significance of the data. The availability of data was very limited and only in the 2008/09 season a sample size of SSGs was made available by SACGA, as well as a set of LSG data. Due to the lack of data, the importance of the significance of data to address hypothesis 1 was tested in three different forms of regression analysis. A linear, log-linear and a dummy variable approach were used to test the relationship of farm size and land productivity amongst the sugar-cane farmers in Mpumalanga. In certain instances the whole sample size was used, while in other instances different farm groups were individually observed.

3.3.1 Farm size productivity relationship

Yield data from the 2009 production season was obtained from 211 registered farmers at Tsb Sugar who delivered cane to the Malelane and Komati mills. They consisted of 82 SSGs and 129 LSGs and the data was collected by SACGA. Table 3.1 represents descriptive statistics of the total sample and of SSGs and LSGs separately.

Table 3.1: Descriptive statistics of the sample for AUC (2009 season)

Statistics	SSGs	LSGs	Total
Number of growers	82.0	129.0	211.0
Average farm size area (ha)	7.3	251.5	156.6
Median (ha)	7.2	104.6	51.8
Minimum (ha)	1.9	30.1	1.9
Maximum (ha)	23.4	3 888.1	3 888.1
Standard deviation (ha)	3.6	510.4	415.9
Range (ha)	21.5	3 858.0	3 886.2

Source: Adapted from SACGA, 2010a; SACGA, 2012b

The total average farm size is 156.6 ha. For the 82 SSGs the average farm size is 7.3 ha and for the 129 LSGs the average is 251.5 ha. The SSGs' minimum farm size is 1.9 ha and their maximum is 23.4 ha, where the LSGs' ranges between 30.1 ha and 3888.1 ha respectively.

A semi-log model and more specifically the lin-log model will be applied for the total sample size and is defined as follows:

$$Y_i = \beta_1 + \beta_2 \ln (X_i) + \mu_i \qquad (3.1)$$

where Y_i = average yield of sugar-cane grower i

X_i = farm size (ha) of sugar-cane grower i

The parameters to be estimated is β_1, the constant intercept, and β_2 represents the slope coefficient with μ_i indicates the error term and i = number of observations of sugar-cane grower.

The total observations of the dataset are represented in Figure 3.1 below.

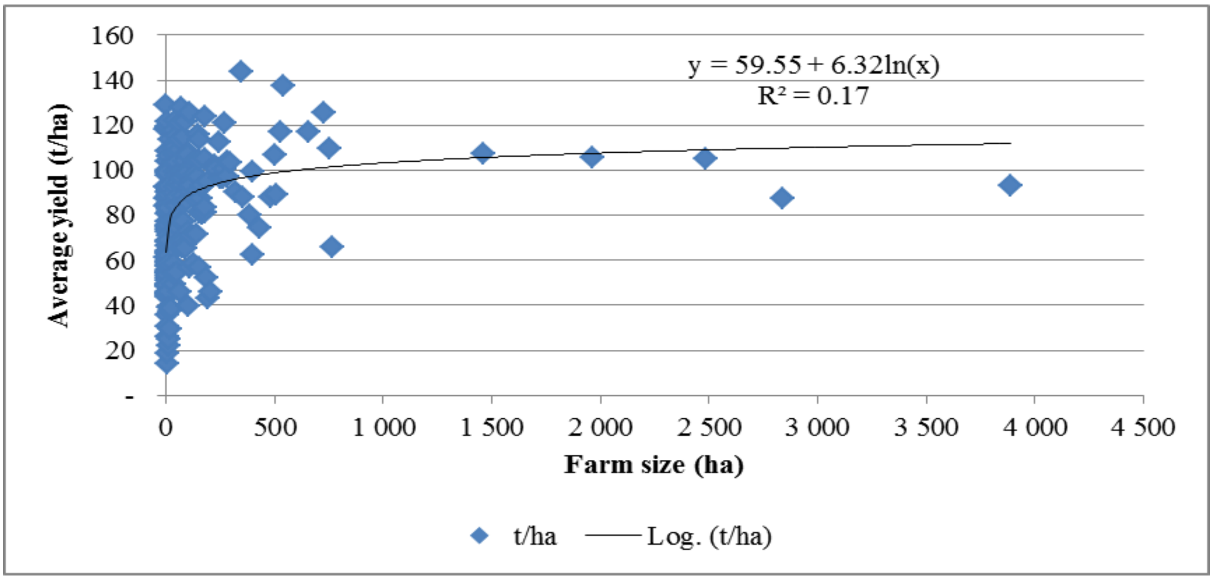

Figure 3.1: Partial productivity analysis of total sample in the 2009 season

Source: Adapted from SACGA, 2010a; SACGA, 2012b

In Figure 3.1 traces of a positive relationship were found as β_2 indicated a positive slope. The regression results of the total sample are as follows:

$$y = 59.02 + 6.46 \ln(x) \quad (3.2)$$

(0.000) (0.000)

In Equation 3.2 the β_2 is highly significant at a 1% level with a p-value of 0.000 to explain that a relationship does exist between farm size and average yield of the total sample size. The β_2 has a positive sign, which signifies a positive relationship between land and average yield. The evidence of the empirical results indicates that the dataset is significant and rejects the accepted fact that farm size and land productivity have an inverse relationship to each other for the total sample of sugar-cane growers during the 2009 season in Mpumalanga.

These indications are supported by another regression analysis which was conducted on the dataset below 200 ha with a sample size of n = 179, of which 82 farms were below 25 ha. It resulted with both p-values of β_1 and β_2 almost rounding to zero. Although the R-square explains 12% of the average yield by the explanatory variable, AUC, the sign of the β_2 was also positive in the sample of growers below 200 ha, as presented in the 4 000 ha sample of Figure 3.2.

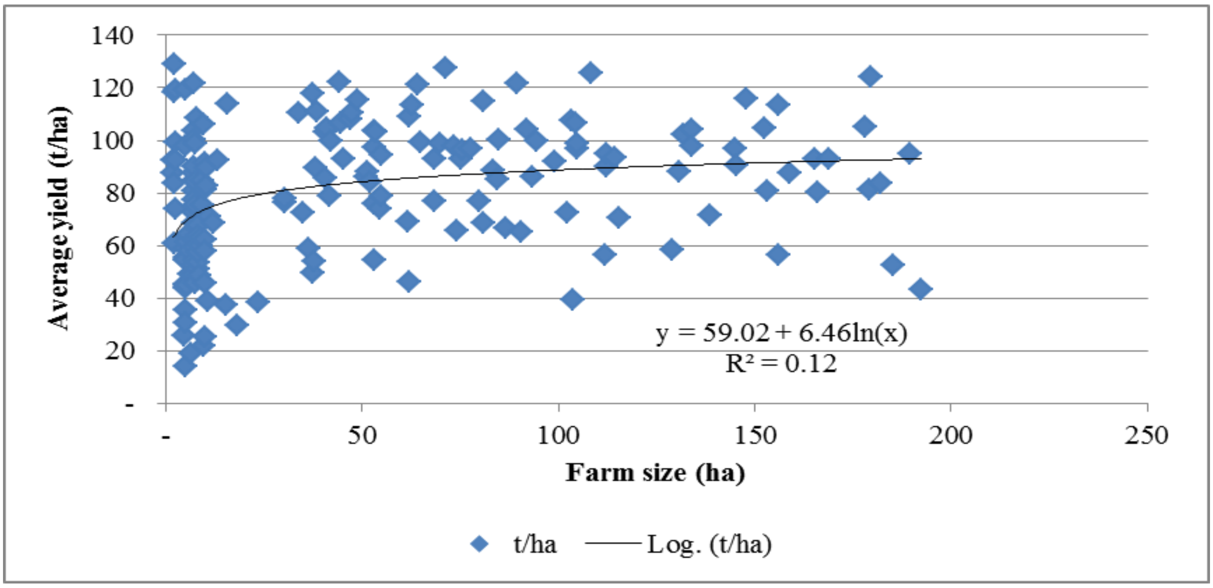

Figure 3.2: Partial productivity below 200 ha in the 2009 season

Source: Adapted from SACGA, 2010a; SACGA, 2012b

To determine whether an inverse relationship exists for more specific farm size groups, Table 3.2 below shows the behaviour of the different farm size group coefficients using linear, lin-log functional forms as well as a dummy variable approach in regression analysis. These tests are conducted in specific farm size groups to coordinate the intervals chosen by other researchers studied farm sizes that focussed mostly on farm sizes below 7 ha. As small-scale farms and large-scale farms form part of the sugar-cane farming community in Mpumalanga, the farm group sizes is grouped beyond 7 ha. The farm sizes are categorised into seven groups consisting of 0–7 ha, 7.1–25 ha, 25.1–50 ha, 50.1–100 ha, 100.1–200 ha, 200.1–400 ha and 400.1–4 000 ha. A category of 0–4 000 ha comprising of all the sugar-cane farms in the sample is also included in the discussion.

The limit of until seven hectares for the first group was chosen as it correlates with the range of farm sizes studied in the literature. The second group (7.1–25 ha) was also identified as SSGs and are therefore categorised as such. Groups ranging between 25 and 4 000 ha are identified as LSGs, but since the range of hectares is so large and number of observations much lower than SSGs, by using regression tests on different intervals, five groups of LSGs were identified for better categorisation. The number of observations of the farms, slope behaviour and significance between farm size and land productivity were part of the criteria to decide upon these intervals.

As farm size is the only clear cut explanatory variable, a dummy variable approach was also used to test the significance of the different intervals. The model is represented by the following equation:

$$Y_i = \beta_1 + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + \beta_5 D_{5i} + \beta_6 D_{6i} + \beta_7 D_{7i} + \mu_i \quad (3.3)$$

where:

Y_i = average yield of sugar-cane grower i

D_2 = 1 if farm size (ha) of sugar-cane grower is between 0–7 ha, D_2 = 0 otherwise

D_3 = 1 if farm size (ha) of sugar-cane grower is between 7.1–25 ha, D_3 = 0 otherwise

D_4 = 1 if farm size (ha) of sugar-cane grower is between 25.1–50 ha, D_4 = 0 otherwise

D_5 = 1 if farm size (ha) of sugar-cane grower is between 50.1–100 ha, D_5 = 0 otherwise

D_6 = 1 if farm size (ha) of sugar-cane grower is between 100.1–200 ha, D_6 = 0 otherwise

D_7 = 1 if farm size (ha) of sugar-cane grower is between 200.1–400 ha, D_7 = 0 otherwise

The parameters (β_1 - β_7) represent the slope coefficients with μ_i indicating the error term and i a specific sugar-cane grower. The three different regression functions are shown in Table 3.2 below.

Table 3.2: Farm size groups coefficients and significance analysis

Farm size group	(β_2 = Farm size)				($\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$ = Farm size)	
	Linear		Log-linear		Dummy	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
0-7 ha	-6.608	0.013**	-30.271	0.003***	-33.802	0.000***
7.1-25 ha	-1.734	0.126	-20.053	0.142	-33.776	0.000***
25.1-50 ha	2.082	0.020**	78.650	0.024**	-9.150	0.230
50.1-100 ha	0.139	0.505	10.526	0.472	-11.658	0.088*
100.1-200 ha	-0.052	0.677	-5.784	0.743	-13.646	0.049**
200.1-400 ha	-0.022	0.824	0.037	0.999	-4.994	0.532
400.1-4 000 ha	-0.002	0.599	-2.090	0.757	Not determined	
All farms	0.012	0.006***	6.323	0.000***	Not applicable	

** 10%,** 5%, ***1% significance levels*

Source: Author's calculations

The farm size groups' coefficients as well as their p-values were used to explain the relationship between the farm size and the average yield in a particular group. The 0–7 ha farm size tests significant at the 5% level of significance by applying the linear model that indicates a p-value of 0.013. The estimates from the log-linear and dummy variable regression test highly significant with p-values below the 1% level of significance. The sign of the coefficient also indicates a strong inverse relationship between AUC and average yield. This evidence due to a strong indirect relationship and high significance of the data, would suggest that the hypothesis 1 is true that there is an inverse relationship between farm size and land productivity.

The results for farms in the 0–7 ha category associate with studies of Berry and Cline (1979), Matchaya (2007), and Cornia (1985) who identified the inverse relationship. Collier and Dercon (2009:4) however argue that those studies in Africa didn't extend the sample to the behaviour of the yields of larger farms. The studies of the above mentioned authors were mainly based on estimations of 5 ha or even as low as 1 ha. In reference to Collier and Dercon (2009) the question should be asked whether the results for farms larger than 7 ha would still correlate.

Continuing the regression analysis on the sugar-cane growers in Mpumalanga, when assessing the dataset of the larger farm size groups, the results show a different trend (Fig 3.1 and Fig

3.2). The farm size group of 25.1–50 ha was significant on a 5% level in the linear and log-linear regression with p-values of 0.02 and 0.24 respectively. What is also important is that it has a positive correlation between the farms and average yield. This can be contributed to farmers who utilised their resources better as the farm sizes increased. When linear and log-linear regressions were used, the different groups between 50 and 4 000 ha didn't represent significant evidence of a relationship between farm size and their average yield. Although some of the larger farms were not significant, the trend suggests inverse reductions as the linear functions' coefficient is estimated for the 0–7 ha farm size group with a coefficient of –6.61 and for the 400–4 000 ha farm size group with a coefficient of –0.002. In the linear and log-linear functions the estimation for the 25–50 ha farm size group has positive coefficients with 2.082 and 78.650. In the dummy variable function the coefficient is estimated at –9.150 which is lower than the coefficients in the 7.1–25 ha and 50.1–100 ha farm size groups. It therefore suggests that there is evidence in this sample that there exists a direct relationship between farm size and land productivity that rejects hypothesis 1.

The data points are examined more closely in Table 3.3 and Figure 3.3 below. Seven farms' size groups were carefully selected to demonstrate the behaviour of the different farm sizes. The majority of growers' farm sizes in the sample range from 7.1 to 25 ha. Although that is the largest sugar-cane grower group observed, their total yield was the second lowest. The growers who has the highest total yield have those growers from 400.1 to 4 000 ha.

Table 3.3: Farm size groups of Mpumalanga sugar-cane growers sample, 2009

Farm size groups (ha)	Nr of growers per farm size group	Average yield (t/ha)	Total yield ('000 t)
Until 7 ha	38	63.78	12
7.1–25	44	66.16	28
25.1–50	21	94.00	79
50.1–100	39	90.54	249
100.1–200	36	87.83	448
200.1–400	17	96.55	467
400.1–4 000	16	99.59	1 884
All farms	**211**	**95.81**	**3 166**

Source: Adapted from SACGA, 2010a; SACGA, 2012b

Figure 3.3 presents the average yield and the total yield by the specific farm groups as shown in the Table 3.3 above. A polynomial function is the best fit to the average yield shown in Figure 3.3 below.

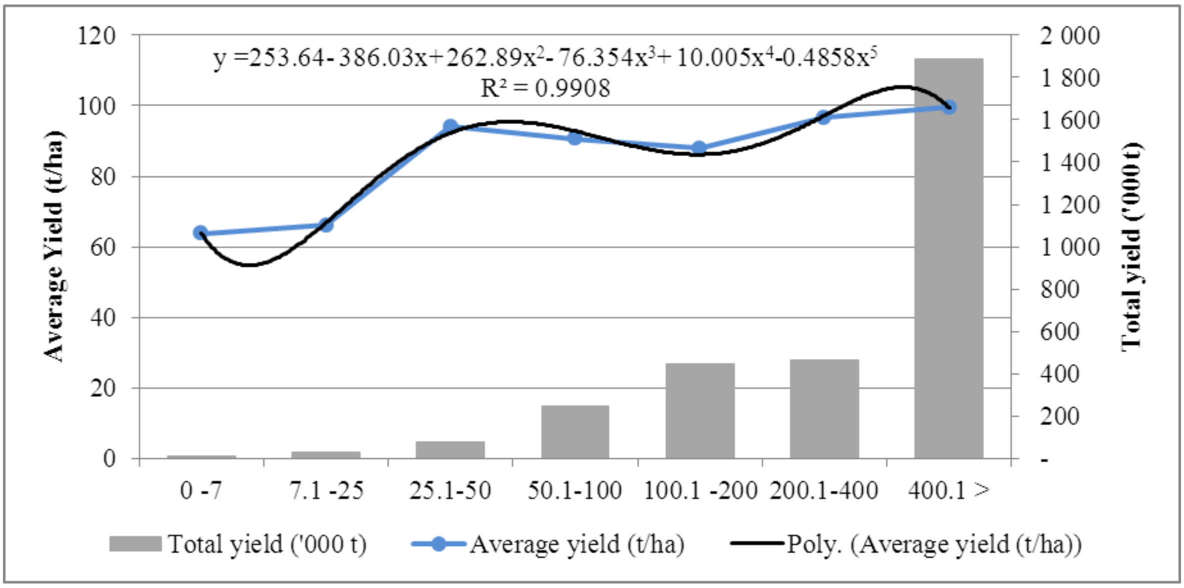

Figure 3.3: Yield versus farm size in farm size groups for the 2009 season

Source: Adapted from SACGA, 2010a; SACGA, 2012b

There are certain farm size groups that do not follow the upward trend. Farm size groups of 50.1–100 ha and 100.1–200 ha showed the average yield to decline slightly. These two groups which are SSGs have the lowest average yields, with 64 t/ha and 66 t/ha respectively. An average yield difference of 30 t/ha is observed between the SSGs and LSGs in 2009. The LSGs are divided into five groups starting from the 24.1–50 ha group. This is the group that has the highest average yield below 200 ha with 94 t/ha. These growers increase their land size which enables them to invest due to higher income potential. The groups of 50.1–100 ha and 100.1–200 ha are groups that have the lowest average yields. This can be contributed to the grower's capability of investing in the farm and as well as to balancing his/her cost of living expenses. In the 200.1–400 ha farm size group the average yield increases as well. The growers can invest in the farm requirements without compromising their preferred level of cost of living (J Cronje, 2012). These findings therefore suggest that a positive relationship exists between farm size and land productivity amongst sugar-cane growers in Mpumalanga. Traces of an inverse relationship can however be observed for the 50.1–100 ha and 100.1–200 ha farm size groups identified in Figure 3.3.

Although results up to this point largely indicate a positive relationship between farm size and land productivity as suggested in hypothesis 1, the results are not conclusive enough to accept or reject the hypothesis. Information gathered in the testing of hypothesis 2 will assist in reaching final assessment.

To test hypothesis 2 of whether land productivity has declined amongst small-scale sugar-cane growers' in Mpumalanga and not so amongst large-scale growers (LSGs), a partial productivity analysis was carried out showing the results of the LSGs and the SSGs for three different years with AUC, number of tonnes delivered, number of growers per group and different average yields (Table 3.4).

Table 3.4: LSGs and SSGs in Mpumalanga Province in 2002, 2007 and 2011 season

Grower Details	Grower numbers	Total yield (t)	AUC (ha)	Average yield (t/ha)	AUC (ha)/Grower
2002 Season					
LSG	189	3 037 122	34 676	87.59	183.47
SSG	1 209	631 127	8 588	73.49	7.10
Total	**1 398**	**3 668 249**	**43 264**	**Not applicable**	
2007 Season					
LSG	215	3 014 038	38 575	78.13	179.42
SSG	1 606	609 191	9 048	67.33	5.63
Total	**1 821**	**3 623 229**	**47 623**	**Not applicable**	
2011 Season					
LSG	172	3 417 757	37 080	92.17	215.58
SSG	1 164	430 800	7 958	54.13	6.84
Total	**1 338**	**3 848 557**	**45 038**	**Not applicable**	
Average 2002-2011 Seasons					
LSG	192	3 156 306	36 777	85.96	192.82
SSG	1 326	557 039	8 531	64.98	6.52
Total	**1 519**	**3 713 345**	**45 308**	**Not applicable**	
Growth Rate 2002-2011 Seasons					
LSG	-1.04%	1.32%	0.75%	0.57%	1.81%
SSG	-0.42%	-4.15%	-0.84%	-3.34%	-0.42%
Total Average	**-0.73**	**-1.42**	**-0.05%**	**Not applicable**	

Source: Adapted from SACGA, 2002; SACGA, 2011a

In the nine year period shown the LSG group had an average of 192 growers registered while 1 326 SSGs was registered on average during the 2002-2011 seasons. The AUC was 23.2% of the LSGs' with a farm size average of 192.82 ha. The average yields fluctuate between the LSGs and the SSGs by 20 t/ha, with the SSGs the lowest at the specific data points as well as on average between 2002-2011 seasons. These values indicate that, with all other elements kept constant, on average, LSGs land productivity is more than the SSGs.

The above values suggest acceptance of hypothesis 2 as SSGs had a negative growth rate of 3.34% compared to the growth rate of 0.57% for the LSGs. However, further research is presented for comparisons between the two groups in the following section.

3.3.2 Historic average yields of the Mpumalanga sugar-cane growers

The average yield (t/ha) relationship between the SSGs and the LSGs for the seasons 2001–2009 is shown below in Table 3.5. The growth rates of different periods are also indicated.

Table 3.5: Comparison of growth rates, 2001-2009 seasons

Season	Average yield	
	LSGs	**SSGs**
2001	93.1 t/ha	90.3 t/ha
2002	87.6 t/ha	73.5 t/ha
2003	91.0 t/ha	72.7 t/ha
2004	90.2 t/ha	64.0 t/ha
2005	74.8 t/ha	67.3 t/ha
2006	81.3 t/ha	67.4 t/ha
2007	78.1 t/ha	67.4 t/ha
2008	85.4 t/ha	56.6 t/ha
2009	95.6 t/ha	61.7 t/ha
Growth rate 2001 – 2005	**-4.3%**	**-5.7%**
Growth rate 2005 – 2009	**5.0%**	**-1.7%**
Growth rate 2001 – 2009	**0.3%**	**-4.6%**

Source: Adapted from SACGA, 2011a

According to this table there was a decline in average yield in SSGs' growth rates over the periods of 2001–2005, 2005–2009 as well as over the entire period. The LSGs had a negative growth rate during 2001–2005 but a positive from 2005–2009. The whole period (2001–2009) showed a marginal positive growth. The figure below illustrates the 2001–2009 period of the average yield between the SSGs and LSGs in Mpumalanga Province.

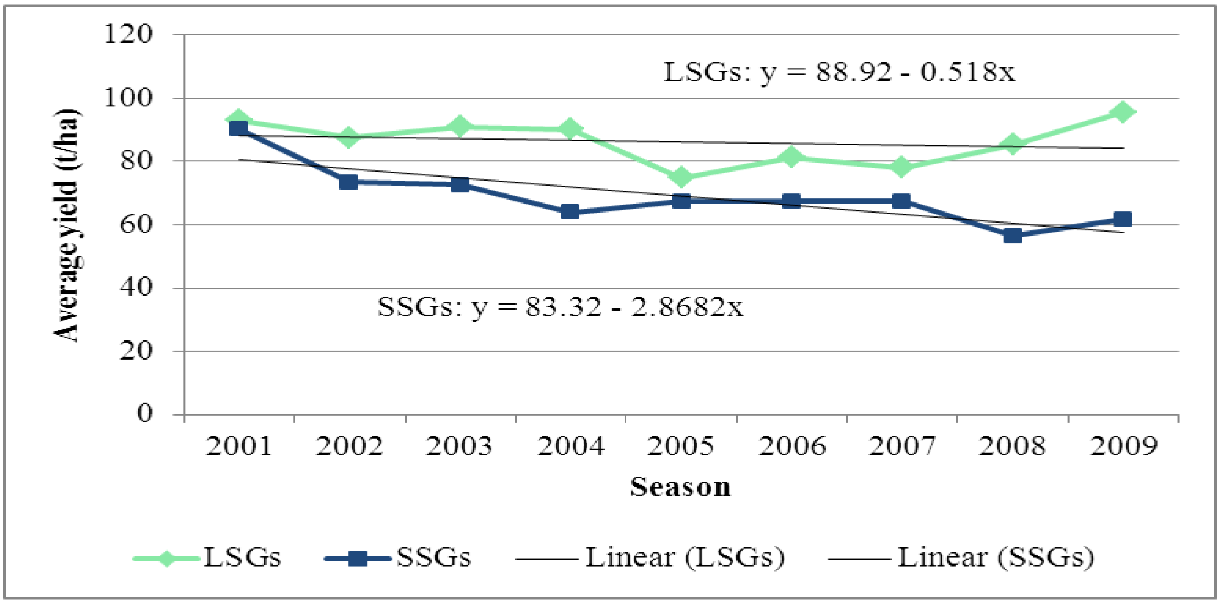

Figure 3.4: Trends in average yield (t/ha) between LSGs and SSGs, 2001-2009 seasons

Source: Adapted from SACGA, 2011a

Figure 3.4 above indicates the average yield trend of the LSGs and SSGs over an eight-year period. The slopes of both groups are negative, a marginally negative coefficient of –0.52 for the LSGs compare to –2.87 for SSGs. Table 3.5 suggests that land productivity has declined amongst SSGs (growth rate of –4.6%) while it stayed almost constant amongst LSGs (growth rate of 0.3%). The possible reasons for the decline will be discussed in the following section.

The result of a questionnaire on items that could possibly influence the average yield that was completed by Slabbert (2011a) is shown below. The questionnaire was used to determine which factors caused the average yield growth differences between the LSGs and SSGs. It consisted of land size, weather patterns (external influence), fertiliser price (external influence), application of fertiliser, finance, soil quality (external influence), general management, management of irrigation systems, labour scarcity, transport of cane to mill, pests and diseases (external influence) and education level.

The coding used for identifying levels was 1 – good, 2 – average and 3 – bad, reflecting how the growers responded to the items.

Table 3.6: Possible factors affecting average yield trends for Mpumalanga growers

Factor	Large-scale growers		Small-scale growers	
	Phase 1: 2001–2005	**Phase 2: 2005–2009**	**Phase 1: 2001–2005**	**Phase 2: 2005–2009**
% Change in average yield (t/ha)	**−4.3 %**	**5.0 %**	**−5.7 %**	**−1.7 %**
Land size	1	1	3	3
Weather patterns (External)	3	1	3	1
Fertiliser price (External)	1	3	1	3
Application of fertiliser	1	2	3	3
Finance	1	1	1	1
Soil quality (External)	1	1	1	1
General management	1	1	3	3
Management of irrigation systems	1	1	3	3
Labour scarcity	1	1	1	1
Transport of cane to mill	1	1	1	1
Pests and diseases (External)	1	1	1	1
Education	2	2	3	3
Total rating	**15**	**16**	**24**	**24**

Note: Soil quality – mostly 1 = good although there are some growers of 3 = bad

Source: Questionnaire completed by Slabbert, 2011a

Table 3.6 represents the difference in phases 2001–2005 (Phase 1) and 2005–2009 (Phase 2). The changes in average yield for the SSGs were negative in both phases with –5.7% and –1.7% respectively. The LSGs had a declining average yield in Phase 1 with –4.3%, while an increase occurred in Phase 2 to 5.0%. Average yield comparison does suggest that the LSG performs better than the SSG. The effects of the factors are shown below:

1. When comparing land size, the LSGs were ‘good’ in both Phases 1 and 2, while the SSGs had ‘bad’ land sizes.
2. The weather patterns for both groups had a negative effect in the first phase while the groups had good weather in Phase 2.
3. The fertiliser price was good in the first phase while bad in the second. The manner in which fertiliser was applied by the SSGs in both phases was bad compared to the LSGs, who had better application of fertiliser through both phases.
4. The provision of finance for the sugar-cane grower groups was good for both groups and phases.
5. The soil quality was good almost at all times for all groups, except for some of the SSGs.

6. The ranking of general management and the management of the irrigation system were in both phases identified as 'good' for the LSGs and 'bad' for the SSGs.
7. Items such as labour scarcity and transport of cane to mill, pest and disease care were not problematic as there was enough labourers available and the prevention of pest and diseases was generally under control.
8. However, the level of education of the SSGs was bad, while an average education level of the LSGs was identified.

To summarise, factors such as fertiliser prices and weather patterns were occurrences that affected the SSGs more than the LSGs. Also the general maintenance and the irrigation maintenance were below par for the SSGs. Land size, or the lack of it, also caused problems for the SSGs as the LSGs have much larger areas to produce sugar-cane on as economies of scale becomes an advantage.

An additional problem for the growers is that they are required to apply for a water licence at the Department of Water Affairs (previously Department of Water Affairs and Forestry). A water right certificate is then issued. The department has started installing more water meters for better regulation of water use in the future. During interviews with farmers regarding the process of compulsory licensing to be introduced through the Water Allocation Reform Programme and the possibility that it can end in a situation where water will be restricted with a resulting decrease in profit, concerned emotions were observed by growers. It is a programme that evolved from the National Water Act (Act 36 of 1998) that would lead to additional pressure on the South African Sugar industry to use their irrigation water more economically (Olivier & Singels, n.d.). However, improvement of technology can assist in using water more effectively and efficiently.

For the sugar-cane grower, improvement of technology means installing and maintaining a mechanised irrigation system. There are, however factors that hamper the effective use of irrigation systems. Such a factor is the level of maintenance of irrigation systems as shown in Figure 3.5 below.

Figure 3.5: Dragline irrigation technology used by SSGs

Source: Photo taken by author, 2011

In this instance the rubber pipes of the sprinkler in the front were not removed before the burning of the cane was done. With better management to firstly arrange for removal of the pipes, this situation could have been prevented.

A second factor is the major problem of theft of electricity cables and malicious damage to pumps. When theft occurs, the SSGs have an immediate loss of water and if there is no rain, the yield is at risk. Furthermore, the period from submitting the application for loans until receipt of the money to replace the stolen parts can be up to a month. As not all are full-time farmers in an irrigation project, they often are not present and available to give their cooperation when decisions have to be taken in the projects. Some growers share a communal irrigation pump which can be positive as they can share the payment of electricity costs – but it becomes a problem when some of the farmers fail and cannot pay their share. This may result in forcing the other growers to stop farming as well, as the respective contributions become too large a financial burden. The LSGs have the advantage that they have capital available to immediately replace the irrigation system should these be stolen or damaged. They are usually readily able to rectify problems as they occur and as they are not part of a communal pump system, the problem doesn't affect other neighbouring farmers should they not pay their portion for electricity anymore.

The most likely item to cause the decline of yields in 2003 and 2004 was discussed with Mr M. Slabbert and Mr J. Murray and Mrs F. Mavimbela (both working with the Mpumalanga growers for many years). Mr Slabbert responded in writing and Mr J. Murray and Mrs F. Mavimbela replied orally to a questionnaire. They reasoned that the most likely item to cause the decline in yields was the weather patterns experienced in 2003 and 2004 which occurred in Phase 1. The droughts affected farmers in a very serious way during the 2003 season. Water restrictions that were implemented after the low rainfall period also had a further effect on the decline in the yield during the 2004 season (Brown & Woodhouse 2004:18). Although all of them are irrigation farmers and are not dependant on rainfall alone, it could be argued that it was not supposed to influence them. This was not the case as there were general water restrictions that forced them to reduce their water quotas. After the drought, floods also affected yield performances. The floods made it very difficult for the farmers to prepare their fields. After the rains the lands were wet and muddy and that also caused damage to the irrigation equipment. It took the SSGs about a year to recover, which in reality caused an ‘artificial drought’ as they could not irrigate their lands. The LSGs, however, were more capable of addressing the problems and recovered more easily due to their greater experience and having easier access to funding or having more reserves than the SSGs.

All these problems caused the growers to produce less cane on their farms over time as they struggled to bear the risks while LSGs were more able to continue and increase their output again. This contributed to a larger declining average yield than the LSGs as shown in Figure 3.4.

The section below discusses problems and challenges that occurred in the NIEP development. It also provides an example of one of the projects that was able to rise above the declining average yield of the average trend of the SSGs.

3.3.3 Challenges faced by Mpumalanga SSGs

The SSGs have come a long way since the 1990s. They had to face, and are still facing, certain challenges in various irrigation projects. It was found that lack of skills and training in farm management, agronomy and irrigation scheduling contributed to the decline in production (MCGA 2008:2–3). Improved management can have a positive effect as shown in

Table 3.7 where the average yield trend of project Mbunu B was compared against the Mpumalanga SSGs.

Table 3.7: Average yield (t/ha) growth rate of Mpumalanga SSGs and Mbunu B

Yield growth rate period	Mpumalanga SSGs	Mbunu B irrigation project
Phase 1: 2001–2005	−5.7%	−3.1%
Phase 2: 2005–2009	−1.7%	2.3%
Total Period: 2001–2009	**−4.6%**	**−0.5%**

Source: SACGA, 2011a; Tsb Sugar Extension Services Department, 2009c

The table indicates the differences in average yield growth between the combined projects in Mpumalanga and the specific project that delivers sugar-cane to the Komati mill. However, not all the projects were so fortunate as to show an upward trend, as in the case of Mbunu B in the second time period. The average yield of the SSGs in total in Mpumalanga declined throughout the entire period as shown. A negative trend in growth was experienced in all phases in the Mpumalanga SSGs as well as in the first phase of Mbunu B. However, in the second phase a positive average yield change was observed of 2.3%. According to Mavimbela (2011a) the reasons were improvements in Mbunu B due to better management of fields, more reliable irrigation systems and a capable project committee interacting with the various stakeholders.

Although Mbunu B is one of the projects in Mpumalanga that is generally better off, they still have their problems. During interviews conducted in 2012 with some of the growers in the project, they mentioned that they struggled as they felt their farm sizes are too small and they need to expand. There were also drainage problems and fertiliser costs that were too high. Other farmers, not part of Mbunu B, mentioned the problem of cable theft, which leads to no irrigation until loans can be approved and new cables can be installed again. Cable theft occurs more in dragline irrigation, where the cables have high aluminium quantities that can be sold. Gillespie (2012) explains that if 100 mm less water is given to the cane, the average yield is reduced by 9 t/ha. With no irrigation, the growers can achieve 50 t/ha, but as the breakeven average yield increased over time, especially with a very small farm size, this became insufficient to produce a reasonable profit to support their living expenses. The growers with dragline irrigation want to convert to drip irrigation, especially for the benefit of less cable theft since drip irrigation systems are characterised by more plastic and rubber piping than aluminium components that is part of the system (Figure 3.5). It is however a more expensive irrigation system to buy and install, and needs technical training to manage it properly. Agriwiz started in 2006 to assist growers in Mpumalanga convert to drip irrigation, and provided a mentorship programme of three years from the date of installing the system (Schoeman, 2012b).

The findings in the average yield analysis show that the Mpumalanga SSGs' average yields have declined due to reasons such as not being able to deal with risks such as droughts, floods and price hikes of fertiliser and rising electricity costs between 2001 and 2005. However, the example of Mbunu B indicates that with improved management the average yield and therefore the sustainability of small-scale sugar-cane farming is achievable.

3.4 LABOUR PRODUCTIVITY

Labour productivity can be defined as the ratio between output and the labour input used to produce that output (Mohr 2000:162). It can be measured as output per worker or as output per hour. The equation can be expressed as follows:

$$\text{Labour Productivity} = Q/N, \qquad (3.3)$$

where

Q = Output and N = number of workers or input per hour.

In Equation 3.3, output (Q) will be total yield and N the number of hours of on-farm activities to produce sugar-cane. Only SSGs are examined in this equation.

The sugar-cane labour force consists of family labour, hired labour and contractors. Allocating accurate labour hour numbers to the different farmers was a task which couldn't be executed with high confidence and has therefore not been conducted. However, the average labour units (number of hours to perform an activity) that have been established will be used as a norm by which to determine labour productivity. The labour units were compiled from Akwandze (2012) and DoA (cited in Conningarth, 2011b). One form of labour activity that can be differentiated from others is irrigation labour use per farm. The labour items are divided between land preparation, planting which includes fertilising, weed control and top dressing, hand spraying, irrigation and harvesting. This combination of activities took the planting stage as well as a ratoon of seven years into account. Figure 3.6 shows the labour productivity of the 82 growers of the survey data of the SSGs, which was used in the land productivity analysis. This analysis was performed with 54 SSGs of which farm sizes were below eight hectares.

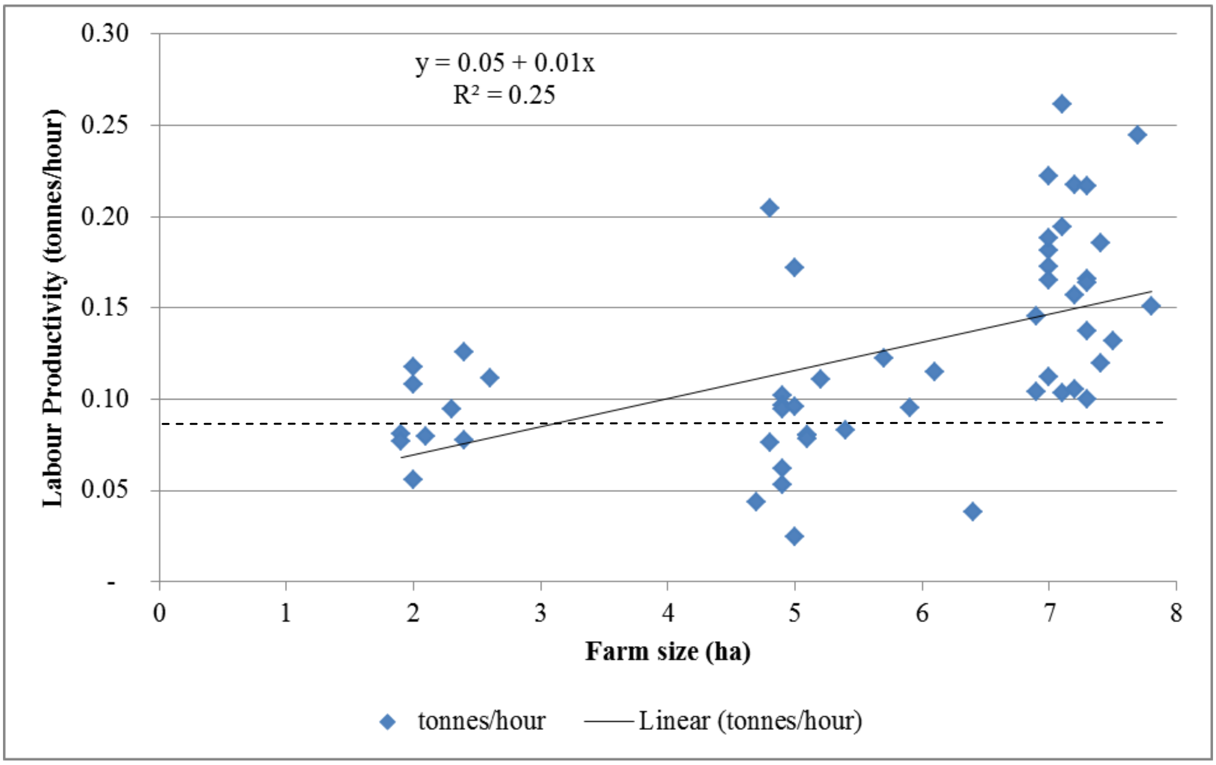

Figure 3.6: Labour productivity of MP SSGs below 8 ha in the 2009 season

Source: Adapted from SACGA, 2010a

In Figure 3.6 above, there is a positive relationship between labour productivity and farm size using a linear function. The hours of all the activities were kept constant per hectare for all the growers, except the permanent irrigator hours determined by calculating its total hours by the individual farm size. The highest labour productivity was observed at levels between six and eight hectares. There were 54% of the growers who averaged below the labour productivity of 0.12 tonnes/hour indicated by the dotted line. The growers that had an above average labour productivity were mainly on seven to eight hectares farm sizes. This analysis indicates that irrigation labour was used more efficiently on the larger farm sizes of the SSGs.

Reliable LSGs data was also difficult to obtain. Due to a methodology change to improve the data collection process between years caused irregularities in the labour units surveyed (Ferrer, 2012) and therefore additional detailed analysis wasn't pursued. To overcome the problem regarding the surveys' estimated labour units, proxies of ha/labour full-time equivalent job opportunities of small and large sugar-cane growers will be used to estimate the labour units in the macro-economic impact of Chapter 5.

3.5 FERTILISER PRODUCTIVITY

Nitrogen (N), Phosphorus (P) and Potassium (K) are the main fertiliser components. The aim of this section is to determine if the farmers applied the recommended quantities of fertiliser in the 2009 season. It was a season that had a 100% increase in fertiliser costs over the previous year (The Cane Grower, June 2008). The Mbunu B irrigation project information was compiled by Tsb Sugar extension services department to distinguish how many growers did apply the recommended amount of fertiliser and what average yields they realised. There were 51 SSGs registered as growers of Mbunu B irrigation project of which 40 growers' fertiliser data were used after data mining. The average yield (t/ha) and fertiliser volumes applied per hectare (kg/ha) are shown in Figure 3.7 below.

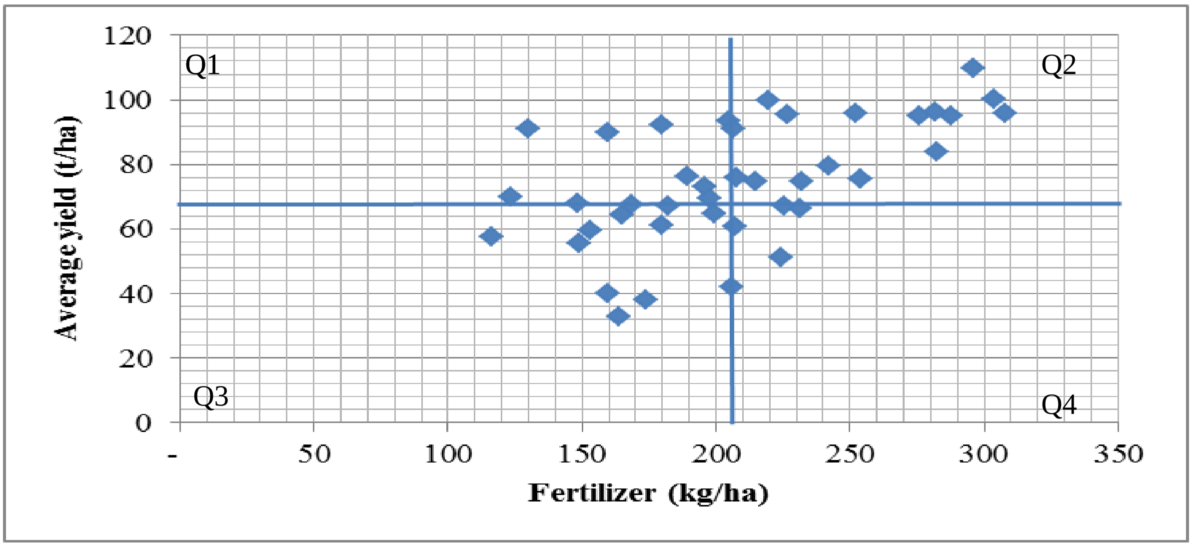

Figure 3.7: Fertiliser partial productivity of Mbunu B in the 2009 season

Source: Adapted from data from Tsb Sugar Extension Services Department, 2009b

Figure 3.7 is divided into four quadrants (Q1–Q4). The horizontal line represents the average of the farmer's average yields of 75 t/ha. The vertical line shows the average fertiliser combination of 208 kg. Table 3.8 below classifies the number of observations plotted in the specific quadrants as well. There were 13 growers (32.5%) that had above average fertiliser use and above average yield (t/ha) (Q2). Forty percent of all growers had below average fertiliser usage and also below average yields (t/ha) (Q3).

Table 3.8: Fertiliser use of Mbunu B irrigation project in the 2009 season

Fertiliser productivity	Average yield (t/ha) (below 74 t/ha)	Average yield (t/ha) (74 t/ha and higher)	Total
Fertiliser (200 kg and higher)	8 (20.0%) [Q1]	13 (32.5%) [Q2]	**21 (52.5%)**
Fertiliser (200 kg and below)	16 (40.0%) [Q3]	3 (7.5%) [Q4]	**19 (47.5%)**
Total	**24 (60.0%)**	**16 (40.0%)**	**40 (100.0%)**

Source: Adapted from data from Tsb Sugar Extension Services Department, 2009b

With this representation of the fertiliser application to the yield in Table 3.8, more than half of the growers applied more than 200 kg of fertiliser in the 2009 season (52.5%). A fertiliser table used by the extension officers as a guide for growers to buy the correct amount of fertiliser for the yield they want to achieve was used to test whether those 13 growers in quadrant 2 applied fertiliser as suggested. Also, the growers in quadrant 3 will also be tested to determine partially whether their below average yield of the sample is a result of inefficient fertiliser use. The fertiliser table is shown below in Table 3.9.

Table 3.9: Fertiliser recommendations for sugar-cane per seasonal application

Average yield (t/ha)	N (kg)	P (kg)	K (kg)	Total fertiliser (kg)
50	70	10	70	150
60	80	10	80	170
70	90	10	80	180
80	90	10	90	190
90	100	10	100	210
100	110	10	110	230
110	130	15	110	255
120	160	20	160	340

Source: Tsb Sugar Extension Services Department, 2009a

Most of the growers that produced the highest average yields (Q2) managed to comply with the applicable guidance. Their N, P and K inputs were within the range provided. However, a grower that had an average yield in the nineties and had a high input of fertiliser was classified as average. The reason was that only Nitrogen had been applied and all three fertilisers need to be applied for optimum yield performance (Johnston & Bruulsema, January 2006:1). This indicates that the efficiency of the fertiliser input was not optimised by not complying with the fertiliser table used as recommendations by the extension services.

Only six of the growers that applied less than the recommended 200 kg/ha (Q3) equalled the inputs allocation recommended for their projected yield potential. Three of the growers under-fertilized and it clearly influenced their yields keeping all other variables constant. The seven others followed the guidelines, but did not comply with the nitrogen and another input, either nitrogen or potassium. This lack of efficient use of fertiliser resulted in the lower yields with the type and amount of fertiliser inputs.

The application of fertiliser is particularly important when farms have sandy soils, such as at the Mbunu B project (Mavimbela, 2010), and most of growers that applied fertiliser as recommended received good average yields. Therefore, it is essential to apply fertiliser to achieve a favourable yield. However, the way in which the fertiliser is divided between applications of N, P and K affects the efficiency of the chemicals. As most of the SSGs are inexperienced in sugar-cane farming, the fertiliser table is a good reference in which advice is given by the extension officers to use the required fertiliser quantities to achieve a certain yield potential if all other factors stay constant.

3.6 IRRIGATION TECHNOLOGY

It is not only farm size, fertiliser and labour that affect the yield, but also the type of irrigation system used. A very limited illustration of testing dragline irrigation and drip irrigation systems will be given below where Block E in Mbunu B irrigation project was converted from dragline to drip irrigation. There are 13 registered growers in Mbunu B. Two growers were omitted due to the absence of data. The studies were only partially conducted by testing the different grower's yields from the year before the irrigation system changed until two years after the installation of drip irrigation. The growers replanted in 2007. In 2008 the first harvest with the new sugar stalks produced a yield for the average block of 87 t/ha. The 2009 season was therefore the second year in which the first ratoon phase started and the yield was 75 t/ha with dragline irrigation still being used. Figure 3.8 below shows the eleven growers' yields plotted for the specific years.

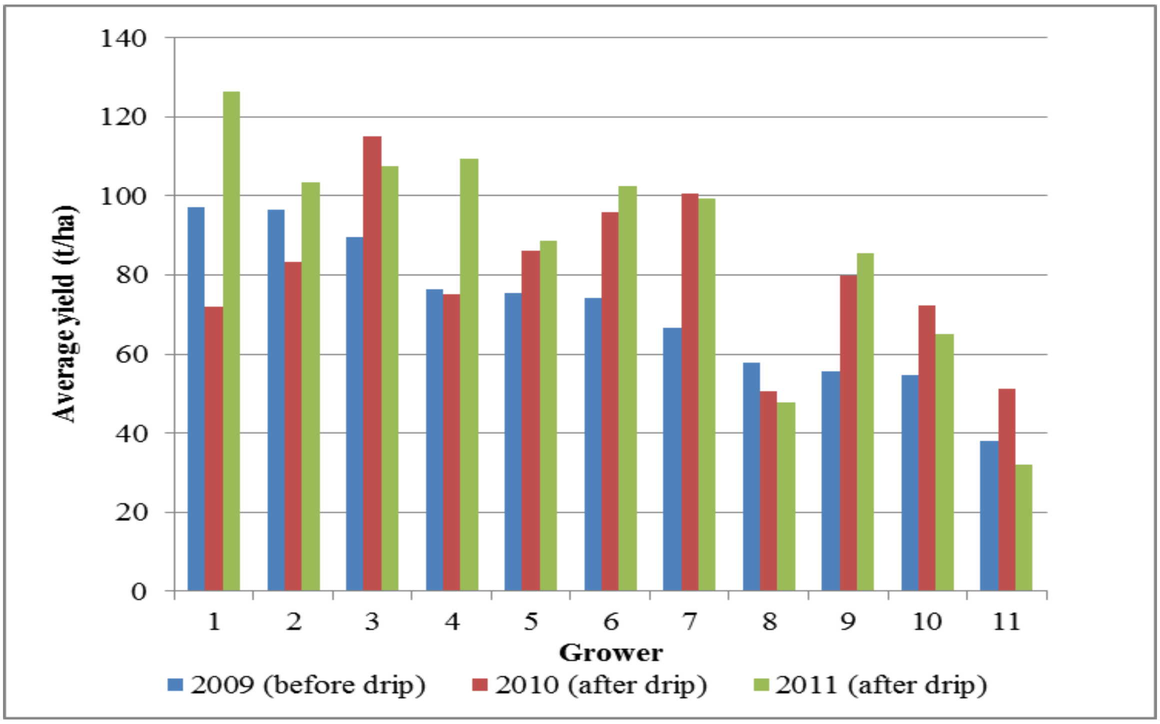

Figure 3.8: Irrigation efficiency of Mbunu B, block E (2009-2011 seasons)

Source: Adapted by Tsb Sugar Extension Services Department 2012

Figure 3.8 shows that most of the growers' yields increased dramatically when drip irrigation was installed. There were growers that didn't get this benefit, such as grower 8 who reflected no improvement in yield. This can possibly be attributed to below recommended fertiliser application. The average yield of all the growers in the 2010 and 2011 seasons was 93.52 t/ha and 94.32 t/ha respectively. As yields per annum are expected to decrease after planting, the effect of the change of technology increased their yield potential and therefore their financial sustainability as well.

3.7 SUMMARY

The average yields of LSGs for the first decade of the 21^{st} century showed a marginal growth while the SSGs experienced a decline in their average yields. Partial productivity measurements were used evaluate the difference and stakeholders' input was provided to determine the reasons.

Analyses of land, labour and fertiliser as well as tests for irrigation technology efficiency were performed. Despite a number of studies that found an inverse relationship between farm size and land productivity, a couple of African studies by Kevane (1996) and Zaibet and Dunn (1998) identified the opposite. This study examined the 2009 survey of LSGs and SSGs finding an inverse relationship for farms below seven hectares, as well as for those between 50 ha and 200 ha. However, for the overall 4 000 ha, the relationship between farm size and land productivity was positive and highly significant which does lead towards rejecting the first hypothesis.

The second hypothesis, namely that land productivity has declined amongst SSGs and not so amongst LSGs, was tested by observing partial productivity over different time periods. The LSGs had a negative growth rate during 2001–2005 but a positive from 2005–2009. The whole period to 2001–2009 showed a marginal positive growth. For the SSGs the land productivity declined both for specific data points 2002, 2007 and 2011, as well as for the whole decade. This confirms the second hypothesis.

The reasons for poorer performance of the SSGs compared to the LSGs were examined. It was found that aspects such as usage of labourers, inefficient use of fertiliser and less competitive irrigation technology were contributing factors. The potential for a better performance was illustrated by comparing the average yield results of the SSGs to the average yield results of the Mbunu B irrigation project. This project demonstrated that despite a relative small farm size, with better management and involvement with external services it remains possible for the small-scale farmer to have a future producing sugar-cane.

CHAPTER 4

FINANCIAL SUSTAINABILITY

4.1 INTRODUCTION

The aim of this chapter is to determine whether the SSGs are in a position to be financially sustainable in future. When they started farming sugar-cane in the beginning of the 1990s, there were high expectations from the growers themselves and also from government that they would be successful. With small land sizes relative to the large-scale farmers and a community with a limited education level, and subsequently little knowledge of how to manage a farm, the probability of successful farming in the long-term was and still is an on-going question to be answered. The research question to be answered is whether they generate enough income from the sugar-cane produced to support their livelihoods. There are a number of SSGs that have other full-time jobs, so the focus must fall on those that rely solely on their farm income. This is the group that eventually, if they are not successful enough, might have to consider letting or selling their farms and starting work in another sector or becoming farm labourers with a monthly income.

A survey of the Mpumalanga growers' income statements was obtained from SACGA and the growers were allocated in farm size groups. The Mbunu B project was compared against the Mpumalanga SSGs' performance in the 2009 season. Production budgets of a sample of the 2009 season of the Mpumalanga SSGs were used to identify the existence of the inverse relationship between farm size and productivity. Analysis of cost of living compared to NFI from sugar-cane that growers receive after their harvest was performed to determine their level of financial sustainability compared to other job opportunities in minimum wage categories. In this chapter the background of the sugar-cane cycle as well as the determination of the recoverable value (RV) price will also be provided. This chapter will therefore address hypothesis three by determining whether the SSGs were financial sustainable during the 2008/09 season.

4.2 SUGAR-CANE CYCLE

Although sugar-cane is known as a plant that is harvested annually, there are two main phases in its production, namely the planting phase and the ratoon phase.

4.2.1 Planting stage

Before being able to have a ratoon cycle, a matured stalk, also referred to as a seed cane stick has to be planted. Such a stalk is cut into sets of a maximum length of 40cm and after treatment these are laid down in a furrow made in the soil, enriched with fertiliser and covered with soil. Germination occurs over the next 10 to 21 days, depending on the soil moisture and temperature. The cane plant then develops further until about 12 stalks are formed on a set, which is then called a stool of sugar-cane (Sezela Cane Growers' Association, 2011:1).

The cane takes 12 to 14 months to mature inland (Sezela Cane Growers' Association, 2011:1). When the cane is ready to be harvested, it is cut. The cane can be burnt to ease the cutting process. The sugar-cane stems left in the ground, will then start growing again and the process is repeated. This cycle is known as a 'ratoon' and when it is properly maintained will have a fruitful lifespan of about 5 to 8 years, but with good management it can even be extended to 15 years. When a ratoon ends its life cycle, it needs to be replanted. For the small-scale growers in Mpumalanga, the average planting cost in 2009 was R16 799 per hectare for a farm of seven hectares (Akwandze, 2010).

4.2.2 Ratoon stage

After harvesting the first year of sugar-cane, the fields need to be inspected to determine whether there are barren areas in the field. These can be caused by theft of cane or where the stalks didn't respond to the treatment of the fertiliser or simply didn't grow following the planting stage. The farmers generally replant these areas with cane, which is known as gap filling. This ensures that the initial area set aside for cane is utilised to its optimum level. This takes about two weeks to complete in cases where a contractor is hired to assist in applying the fertiliser and chemicals for weed control. The next phase is the management of the cane until harvesting. When chemicals are applied correctly, weeding of the cane fields can be minimised. Irrigation is a permanent activity. It is the farmer's responsibility to manage the irrigation schedule and to ensure that the irrigation system is functioning continuously. The following phase will then be the harvesting and transporting of the cane to the mill. A contractor is used to perform these tasks. Before harvesting can take place, the irrigation system needs to be removed so the 'dry' cane leaves can be removed by burning. Cane is then cut and a contractor will then load the sugar-cane and transport it to the mill. The average planting cost for small-scale growers in Mpumalanga for the ratoons in 2009 was R7 524/ha (Akwandze, 2010). The duration of the ratoon stage is subject to the maintenance of the field.

LSGs and SSGs apply re-planting differently. Farmers are allowed by their contracts at Tsb Sugar to replant up to 10% of the sugar fields per year. Where the LSGs are thus able to keep 10 ha of a 100 ha field aside for re-planting, a SSG can only with difficulty spare one hectare per year. If the SSG has a farm of 10 ha and replants 10% of the field per annum, the area harvested will consist of only 9 ha. Therefore, although the SSGs do apply gap filling, they don't replant as recommended. This leads to lower yields as the maturing plant yield declines. It often happens that a SSG will carry on planting up to a point where he has to replant almost half of his cane fields. Regular replanting of a portion ensures that the average cane on the field stays 'young' and ensures a higher yield in the long-term.

4.2.3 Production budget

The production budget reflects the components of inflow and outflow during a harvesting season.[4]

Figure 4.1 shows the different components of a sugar-cane budget for a small-scale grower. The main components consist of:

1. Gross sugar-cane production value (Gross farm income)
2. Production costs (Directly allocatable variable costs and overhead costs), and
3. Net farm income (NFI) = Net profit/loss.

[4] Officially the harvest season is from March to February, ranging over a calendar year.

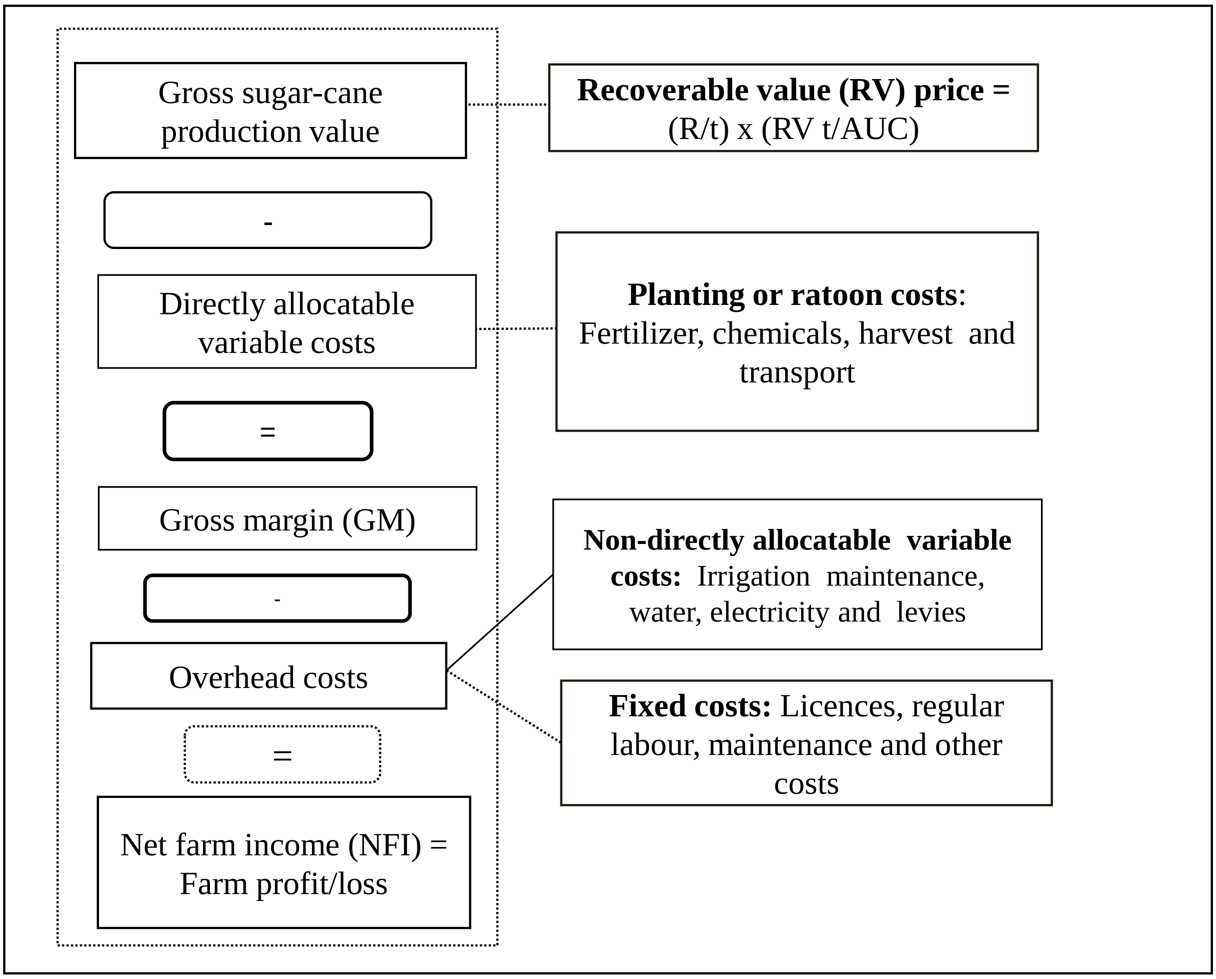

Figure 4.1: Components of the small-scale sugar-cane growers' production budget

Source: Adapted by SACGA, 2010a; The Standard Bank of South Africa Limited, 2005

The SSG budget items are quite limited in relation to the LSG budget. For this analysis it is assumed that the farmers only cultivate sugar-cane and no additional income or subsidies have been received. It is therefore their gross sugar-cane production value or defined as their gross farm income (GFI). Therefore, only the income received from the mill, of which the recoverable value (RV) tonnes is measured will be included. The directly allocatable variable items consist of planting and ratoon cost. These two stages in the sugar-cane life cycle will be simultaneously observed in the different production budget sections to be discussed. By subtracting the direct allocatable variable costs from the gross production income (gross income), the gross margin is determined. The overhead costs consist of non-directly allocatable costs as well as fixed costs. The SSGs not only has limited farm implements, but also does not have the budget for a management staff as the LSGs do. Therefore no payment of borrowed capital, hired land and rental management were added to the production structure. Due to the lack of these items, the net farm income (NFI) is treated as equal to the net income (NI) which indicates the profit or loss for the SSGs.

4.2.4 Determination of the Recoverable Value (RV) price

The sugar mills and refineries are dependent on the local and export market to sell the sugar and molasses. As sugar-cane needs to be transformed into another substance, more than just the grower will receive a portion of the proceeds. Industrial charges are deducted and the net divisible proceeds are divided between growers, millers and refiners. The grower to miller ratio was 0.64/0.34 in 2008/09 for the South African sugar industry. A preliminary RV price is estimated monthly and is used for the cane that is brought to the mill at that specific stage. In March, on an annual basis, a final recoverable value price is acknowledged (SACGA, 2008). Figure 4.2 shows the whole process of the divisions of proceeds.

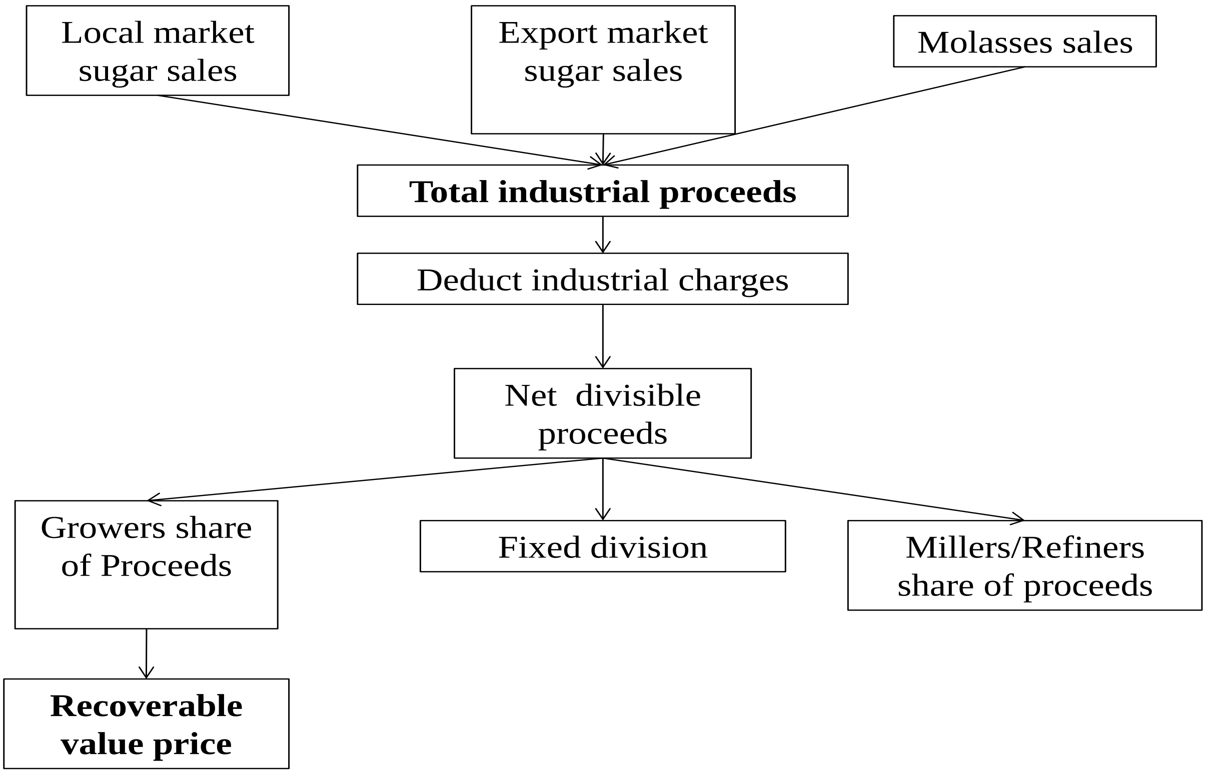

Figure 4.2: Division of proceeds

Source: Adapted from SACGA, 2011b

Figure 4.3 below shows in more detail the processes for the cane until the RV is determined. It reflects the process to calculate the quality of the sugar-cane brought to the mill. The RV percentage is the tonnes sucrose and molasses gain from the sugar-cane harvest. It can also be expressed as 'RV Tonnes/Area Harvested'. In the production analysis below 'RV Tonnes/Area Under Cane' were used as part of the income formula as shown below.

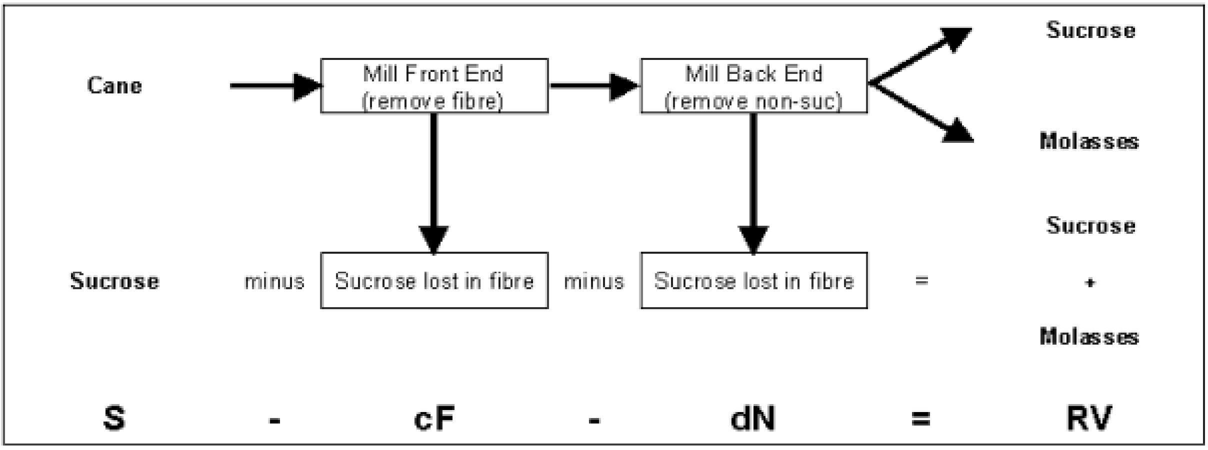

Figure 4.3: Flow diagram for determining the RV%

Source: SACGA, 2011b

The RV percentage equation is explained below:

RV% = S – dN – cF

S = Sucrose,

N = Non-sucrose and

F = Fibre is expressed in a percentage cane delivered.

D = The relative value of sucrose lost from sugar production per unit of non-sucrose taking into account the value of molasses recovered per unit of non-sucrose and

c= The loss of sucrose from sugar production per unit of fibre.

The RV percentage that determines the quality of the cane can be influenced by a number of factors. The main factors whereby the quality of the cane can be increased by the grower before delivery (SACGA, 2008) are:

1. Maturity of the cane

2. Freshness of the cane, and
3. Cleanliness of the cane.

To improve the maturity of the cane it is advised by the SACGA that general husbandry practices have to be efficient as reflected in the previous chapters as well. Furthermore the cutting cycle and the age of the cane need good management. The different varieties of sugar-cane, the soils and the manner in which it is looked after also play a role. The ripeners as well as the manner in which irrigation scheduling is applied also affect the maturity of the cane. The freshness of the cane is influenced by the frequency of burning the cane, by road systems, the zones applied, the type of haulier and the mill yard. Deterioration due to time delays also plays a role in the freshness of the cane. It is also to the benefit of the farmer if the cane is clean when the RV is determined at the mill. It is also to the benefit of the farmer if the cane is clean when the RV is determined at the mill. Topping height, base cutting, reducing the soil as well as the trash are all items that influence the cleanliness of the cane. An interesting fact of the RV% is that if the cane gets less water than recommended, the RV% is higher than for a grower that uses the recommended water allocation and scheduling. Not to penalise the grower with good irrigation practices, a ripener will be applied before harvesting began to artificially increase the sucrose in the cane. Although the RV% assists with the gross income price of the cane, the tonnes delivered are even more important (P Cronje, 2012). It is found that a higher RV% is observed at the SSGs as their irrigation practices as a group aren't that good compared to the LSGs. The Table 4.1 below shows different years RV% of the SSGs compared to the LSGs.

Table 4.1: RV% comparison of the grower groups in Mpumalanga

Growers	2002	2007	2011
LSG	12.2%	12.5%	12.9%
SSG	12.5%	13.0%	13.2%

Source: Adapted by SACGA, 2011a

The RV% ranged between 12% and 14%. Depending on climatic circumstances and other factors as discussed above, the SSGs had higher RV% in 2002, 2007 and 2011. However, the land productivity is the primary importance, followed by the RV% when determining their income.

4.2.5 Cane Payment System to the SSGs

As the SSGs often don't have money available for the operational expenses during the season, Tsb Sugar has formed an agreement with the SSGs to provide collateral for the grower until payment for the sugar-cane has been made. The mechanism of the cane system payment, namely how the farmer receives annual funds for their operations, was applied from 2006. Once a SSG receives a contract from Tsb Sugar, they have access to financial assistance. This lending account is administered by Akwandze Agricultural Finance for the South African Sugar Association (SASA). Akwandze allocates different lending accounts for the different activities during the season. They are very strict in honouring the agreements by only providing funding for the funds agreed upon.

The following loan products are provided to the SSGs:

1. Loans for the establishing of sugar-cane for a six-year period.
2. Loans for irrigation infrastructure for a six-year period.
3. Loans for ratoon management that include activities such as fertiliser, weed control, irrigation labour and gap filling. The loan product is provided for a year.
4. Electricity loans for one year.
5. Loans for irrigation equipment that include irrigation systems such as draglines, sprinklers, drippers, etc.
6. Right to Occupy (RTO) rental loans when renting another grower's RTO or for hiring a manager to supervise fields.

Furthermore, Akwandze acts as an agent that administers the Retention Savings scheme on behalf of SASA's Umthombo Agricultural Finance Department. This is a voluntary savings scheme in which R85/t of cane is deducted from the grower's cane proceeds and is held in an interest-bearing savings account for the grower. These funds will be drawn down for fertiliser, weedicides, hand weed control, irrigation labour and gap filling (seed cane and labour).

It is a loan agreement condition of Akwandze that a client must participate in the Retention Scheme if they wish to borrow from them. They also impose a restriction on their clients that their first draw-downs from the Retention Savings scheme must be fertiliser and weedicides. The SSG can afterwards withdraw money for labour.

The draw-down process is the same for loans and retention savings. The SSG will complete a works order for goods and services. The works order is signed by the grower (using a unique pin card which is embossed), the contractor and the project clerk. It is then delivered to the Akwandze office along with the service provider's quotation. Akwandze will then 'lock' the required funds from the loan account or retention savings account. The service provider will then be notified to deliver the goods or services. After the delivery is completed, the service provider will produce an invoice that needs to be signed by the grower acknowledging receipt of the goods/services. The invoice is delivered to the Akwandze office and they will pay the service provider directly. The only money that is paid to the grower is for labour (weeding labour, gap filling labour and irrigation labour). It is the SSGs' responsibility to pay their staff (Armitage, 2011).

All the elements of sugar-cane cycle such as planting, ratooning, RV price, cane payment system influence decisions on the production budget. A production costs analysis of the Mpumalanga SSGs as well as on the Mbunu B project is discussed below. Tests for the breakeven level to be financially sustainable are also presented in the following sections.

4.3 PRODUCTION COSTS ANALYSIS: MPUMALANGA

A presentation of the financial situation for 82 SSGs in the 2009 season was compiled by SACGA. This analysis consisted of:

1. Descriptive analysis of the main production items.
2. Budget Analysis for the growers representing five groups of farm sizes.

4.3.1 Descriptive Analysis

Table 4.2 describes the farm statistics of the total farm, which includes gross farm income (GFI), total costs, net farm income (NFI) per year and farm size.

Table 4.2: Descriptive statistics of the main budget items in the 2009 season

Statistics	GFI per year (Rand '000)	Total costs per year (Rand '000)	NFI per year (Rand '000)	AUC (ha)
Mean	128.65	103.58	25.07	7.34
Median	118.39	95.34	18.25	7.15
Maximum	486.01	477.22	160.6	23.40
Minimum	17.13	12.02	-110.60	1.90
Range	468.88	465.20	271.2	21.50
Standard Deviation	76.52	71.79	43.58	3.57

Source: Author's Calculations

A SSG farm averaged almost R25 000 net farm income per year for 2009. For some the NFI were as low as −R111 000 and for others as high as R161 000. The farm sizes range between 1.9 and 23.40 ha. It does therefore indicate, when observing the range as well as the standard deviation, that there is a wide spectrum of growers farming in Mpumalanga. For a more graphical representation of the performance of the growers, the Figure 4.4 below indicates the relationship between the farm size and the NFI per farm generated from sugar-cane.

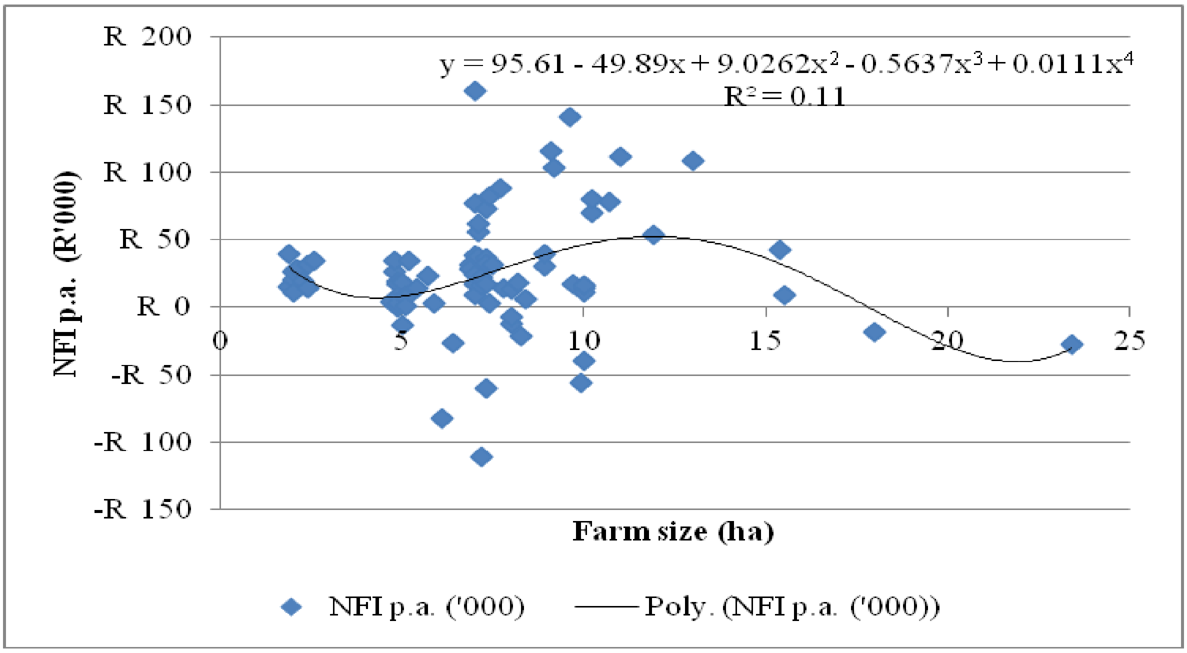

Figure 4.4: Farm size and NFI per year relationship of the SSGs (2009)

Source: Data adapted from SACGA, 2010a

Figure 4.4 shows that most of the growers' farm sizes are between two and ten hectares. The range of NFI from sugar-cane during 2009 differed from a negative NFI of about R15 000 to about R23 000. The best fit to the sample was a polynomial function. This indicates a trend that smallest farms had an inverse relationship between NFI and farm size. From about five hectares a positive relationship was shown but it peaked at about ten hectares. From ten hectares and above the NFI became inversely related again. However, no production budgets were available for farms over 25 ha to determine whether the NFI and farm size will increase and have a positive relationship again. Below ten hectares a farmer is able to handle farm operation on his or her own. From ten hectares and above the management became difficult as size increases (J Cronje, 2012).

4.3.2 Detailed analysis

A total of 82 budgets compiled by SACGA were translated to per hectare value. The farms were classified into five groups (0–3 ha, 3.1–6 ha, 6.1–9 ha, 9.1–12 ha and 12.1–24 ha). Of the 82 growers in the sample, 42% fell into the 6.1–9 ha group while only 5 growers assembled into the 12 to 24 ha group.

The arithmetic mean was used when grouping the different production budgets into the five farm size groups. Items such as income, fertiliser, irrigation and labour costs, cutting and transport of cane to mill costs were almost available for all the growers. Data relating to different farming activities were not always available in individual grower production budgets. Such items were planting costs, fertiliser application, chemical application as well as chemical prices. To illustrate the most realistic picture with the data available, minor instances occurred where data were removed or adjusted to prevent double counting, for which fertiliser and chemical information were allocated as farmer and contractor entries were listed together in the average budget. The age of the cane also differed (initial planting and ratoon). The representation of the growers in the groups was represented in Table 4.3.

Table 4.3: Production budget analysis of five farm size groups of Mpumalanga SSGs

Items	Farm size groups				
Farm size groups	**0-3 ha**	**3.1-6 ha**	**6.1-9 ha**	**9.1-12 ha**	**12.1-24 ha**
Number of growers	**10**	**9**	**34**	**15**	**5**
Average yield (t/ha)	95.82	52.47	69.20	66.70	58.29
GFI (R/ha)	**R 26 744**	**R 13 872**	**R 18 633**	**R 15 946**	**R 16 217**
Direct allocatable variable costs (R/ha)	R 11 680	R 7 826	R 9 566	R 6 869	R 8 301
Gross margin (R/ha)	**R 15 064**	**R 6 046**	**R 9 067**	**R 9 077**	**R 7 916**
Non-direct allocatable variable costs (R/ha)	R 1 692	R 2 942	R 4 060	R 3 496	R 5 213
Fixed costs (R/ha)	R 2 244	R 671	R 2 057	R 1 116	R 1 359
NFI (R/ha)	**R 11 128**	**R 2 433**	**R 2 950**	**R 4 465**	**R 1 344**
NFI (Rands) per year	**R 24 037**	**R 12 339**	**R 21 878**	**R 45 096**	**R 22 930**

Source: Author's calculations

During the 2009 season the growers in the respective farm size groups had variable performances with regards to partial productivity indicators such as average yield. The SSGs farming on land of less than 3 ha had the best average yield and NFI/ha of R11 128 in relation to the other farm size grower groups. These growers were in a mature age group, but were still healthy and are enthusiastic about their cane farming (Le Roux, 2012c). The 3.1–6 ha group had the lowest average yield and NFI/ha of 52.47t/ha and R2 433/ha respectively. The group of 34 growers between 6.1 ha and 9 ha had an NFI/ha of R2 950/ha. The group of 9.1–12 ha had the second highest NFI/ha of R4 465. The farm size group of 12.1–24 ha averaged the lowest NFI/ha of R1 344 and second lowest NFI per year of R22 930.

A comparison of the NFI/ha and NFI per year indicated that it did not necessarily follow that the group with the highest NFI/ha also had the highest NFI per year. Despite a high average yield and NFI on a small farm size of 3 ha and less, this group ranked second but with a much lower total NFI per annum compared to the 9.1–12 ha SSG groups' with R24 037 and R45 096 NFI per annum respectively. Growers on a very small farm size can produce higher average yields due to better husbandry of their cane. However, if good ratoon management doesn't take place and the average yield is reduced as shown in the 3.1–6 ha or even in the 12.1–24 ha SSG group, a larger farm size won't necessarily assist in the financial sustainability of the farmer. A balance of efficiency and farm size has to be met, as shown by the growers in the 9.1–12 ha SSG group that had an R45 096 NFI from the sugar-cane harvested from the 2009 season.

4.4 PRODUCTION COSTS ANALYSIS: MBUNU B IRRIGATION PROJECT

The farmers of the Mbunu B irrigation project originally cultivated maize. Since 1994 they started cultivating sugar-cane, funded by Agriwane. At that stage the project had 385 ha and 60 farmers and was divided into five irrigation blocks in which farms were allocated to the growers (Lima, 2010; MDC, n.d.). They share a pump station where five different pumps are allocated to each block. All farmers have been using dragline irrigation until the 2008/09 season. The farmers generally are pensioners although their children or grandchildren are starting to replace their right to occupy the land. Problems they have to bear are that they have poor soils with limited draining systems. There are also problems of salt that let field lay fallow as well as shortage of water is experienced and theft (Lima, 2010). There are mining activities nearby with a dam that causes leakage, making the fields overflow (Mbunu B growers, 2012). Agriwiz started with irrigation assistance and replaced two of the blocks irrigations systems since 2009.

The following analysis highlights the costs the SSGs spend on an annual basis. Comparisons will be made regarding:

1. Fertiliser
2. Chemicals
3. Irrigation
4. Labour, and
5. Other costs such as harvesting, transport and levies.

A sample survey undertaken by SACGA during 2009 was used for the income statements analysis. Four income statements of the Mbunu B project were used and compared to the income statement representing the average of the Mpumalanga SSGs[5]. The growers are labelled as farmers A, B, C and D in the analysis below. Growers A and B have been replanting while growers C and D have been ratooning.

[5]This will be referred to as MP Ave in the tables

The average yield (t/ha), NFI/ha and AUC or farm size (ha) shown below in Table 4.4 will be used as reference to compare the performances. They will also be ranked as 1 = Highest up to 5 = Lowest by reference to their NFI.

Table 4.4: Performance indicators of SSGs A–D and average of MP SSGs in 2009

SSG	AUC (ha)	Average yield (t/ha)	NFI/ha (Rands)	NFI per year (Rands)	Rank by NFI
A	13.0	92	8 363	108 716	1
B	10.2	89	6 895	70 326	2
C	7.5	59	4 127	30 951	3
D	8.2	54	2 223	18 231	5
MP Ave	**6.3**	**62**	**2 936**	**18 377**	**4**

Source: Adapted from SACGA, 2010a

Table 4.4 indicates that SSG A had the highest NFI per year (R108 716) and per hectare (R8 363). Except for SSG D all the farmers performed better than the Mpumalanga average.

4.4.1 Fertiliser

Data of the four growers of Mbunu B were used to compare the relationship between fertiliser prices and average yield in Figure 4.5 below.

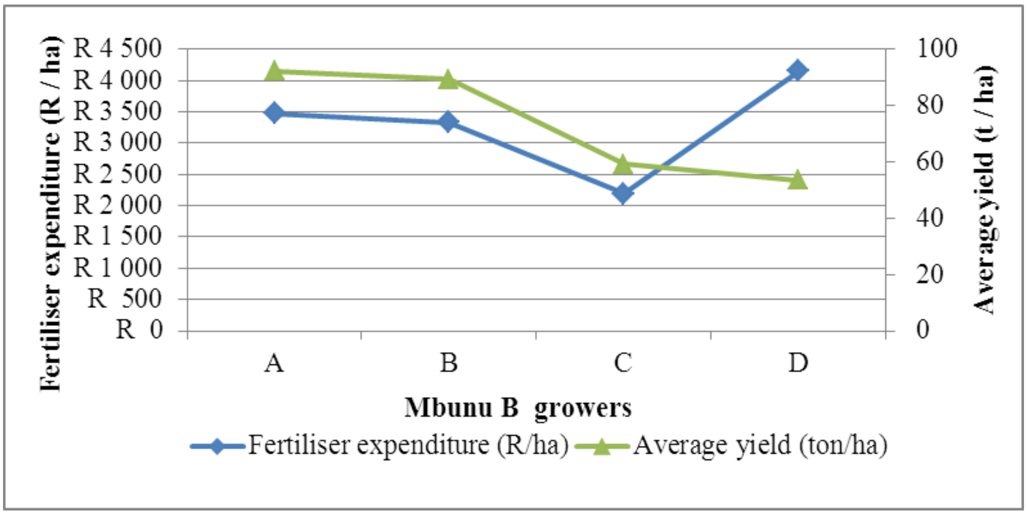

Figure 4.5: Land productivity and fertiliser spending of Mbunu B growers

Source: Adapted from SACGA, 2010; Tsb Sugar Extension Services Department, 2010b

Two of the four growers of Mbunu B had an average yield above 60 t/ha. The average yield of SSGs A, B and C follows the fertiliser expenditure trend. SSG D shows an inverse relationship between fertiliser price and average yield.

Table 4.5 below indicates the recommended amount of fertiliser to achieve a specific average yield. For purposes of this example it has been adjusted to the fertiliser recommended to match the average yield. The fertiliser consists of the chemicals nitrogen (N), phosphorus (P) and potassium (K), quantities in kilograms. The fertiliser used by the specific SSGs is also shown.

Table 4.5: Fertiliser application comparison with recommended application in 2009

SSG	Average yield (t/ha)	N (kg)	P (kg)	K (kg)	Total (kg)	% difference between SSG and recommended
A	92	104 (102)	0 (10)	92 (102)	**196 (214)**	−8.4%
B	89	128 (99)	0 (10)	91 (99)	**220 (208)**	5.6%
C	59	153 (79)	0 (10)	0 (79)	**153 (168)**	−8.7%
D	54	136 (89)	10 (10)	51 (79)	**198 (178)**	11%

Note: Value in brackets indicates the recommended fertiliser adjusted for the specific average yields

Source: Adapted from Tsb Sugar Extension Services Department, 2009b

SSGs A and B generally followed the fertiliser guidelines and achieved their specific average yields, with a difference in relation to the recommended fertiliser quantity for the season with a fluctuation of −8.4% and 5.6% respectively. However, SSG C and SSG D deviated from the recommended application with −8.7% and 11% more than the recommended amounts. As the deviation was further from the recommended amount, the average yields dropped when observing SSGs C and D only. Further information from the table is that nitrogen (N) was the fertiliser used by all the SSGs. Although the recommended phosphorus (P) application was used by SSG D, it was not sufficient to achieve the recommended average yield. There was an over application of fertiliser with too much spent by SSG C and SSG D. With a less efficient manner of applying the fertiliser, as SSG C and SSG D overspent or under spent on fertiliser, it can be concluded that inefficient fertiliser use was responsible for lower yields and unnecessary costs if all other variables stayed constant. In Table 4.6 below SSGs A–D and Mpumalanga SSGs fertiliser expenditure in relation to the other indicators is shown.

Table 4.6: Fertiliser analysis (2009 season)

SSG	Rank by NFI	Average yield (t/ha)	Fertiliser (incl. application) (R/ha)	Total Costs (R/ha)	Fertiliser Costs %
A	1	92	3 478	17 639	20
B	2	89	3 328	17 098	19
C	3	59	2 192	12 124	18
D	5	54	4 152	12 587	33
MP Ave	**4**	**62**	**2 972**	**13 705**	**22**

Source: Adapted from SACGA, 2010a

Table 4.6 demonstrates that the growers reflected in the sample have a higher net farm income level on average per hectare than the Mpumalanga (MP) average in the 2009 season. SSG C is an exception. As indicated in Table 4.6, SSG D has on average a much higher fertiliser/financial input than the average Mpumalanga grower and therefore shows overspending. Although SSGs A and B have on average higher costs, their outputs are much higher than those of the other growers. SSG D on the other hand, applied more fertiliser than recommended and also had the highest expenses on fertiliser.

4.4.2 Chemicals

Chemicals such as pesticides and herbicides are also items that growers require to reduce the weeds in the sugar-cane fields. However, not all the growers allocate money for these chemicals. Although weeds could be prevented by chemicals, additional weeding is also performed by hired labour. In the Table 4.7 below, the Mbunu B growers' information regarding their use of chemicals is shown.

Table 4.7: Chemical costs analysis (2009 season)

SSG	NFI (R/ha)	Average yield (t/ha)	Chemical application and chemicals (R/ha)	Chemical/ Total costs (%)
A	8 363	92	600	3.52
B	6 895	89	1 420	8.31
C	4 127	59	33	0.27
D	2 223	54	587	4.66
MP Ave	**2 936**	**62**	**331**	**2.42**

Source: Adapted from SACGA, 2010a

In the 2009 season grower B had the highest chemical costs with R1 420/ha. The chemical costs in relation to the total costs were also the highest of the growers analysed. The other growers' chemical costs were closer to the average of the Mpumalanga average of R331/ha.

4.4.3 Irrigation

According to Singels and Smith (2008:1) the amount of irrigation water to apply and also when to apply it, are important decisions for a grower to make, as this has a direct effect on profitability and sustainability of the sugar-cane enterprise. Drip irrigation is the more preferred irrigation system and farmers convert to this system where they can afford it. The small-scale growers mainly use draglines, though. In the months of March to December SSGs tend to over irrigate by about twenty percent which leads to higher costs for water and electricity (Brown & Woodhouse, 2004:21). This impacts negatively on profit and can therefore be regarded as a counterproductive activity. If no irrigation is done, a farmer can still achieve an average yield of around 50 t/ha. The danger lies in bearing the risk of droughts, which will result in little or no harvest in the year it occurs (Gillespie, 2012).

One of the main problems in the small-scale grower set-up is the communal pumps that are shared between numbers of growers (Thomson, 2012). The small-scale growers often make use of pumping stations that provide water transmission to the irrigation systems on each farmer's land. Although small-scale growers generally share a pump, some do have individual pumps. According to a communication by Mr C. Matyukira, former water engineer for the Tsb Sugar Extension Services (2010), a pump is usually shared for 200 ha of irrigated land. The Mbunu B project consists of five blocks, each having their own pump but they share the same pump station.

Table 4.8 below shows the irrigation costs analysed, including the water rates and electricity for the irrigation pumps together with the maintenance of equipment in the 2009 season in Mpumalanga. These growers all use dragline irrigation technology.

Table 4.8: Irrigation costs analysis (2009 season)

SSG	Rank by NFI	Water rates (R/ha)	Electricity (R/ha)	Irrigation maintenance costs (R/ha)	Total irrigation costs (R/ha)	Irrigation costs/ Total costs (%)
A	1	487	1 500	231	2 218	13
B	2	375	1 300	294	1 969	12
C	3	631	1 300	400	2 331	19
D	5	0	1 200	366	1 566	12
MP Ave	**4**	**N/A**	**N/A**	**N/A**	**1 709**	**12**

Source: Adapted from SACGA, 2010a

The irrigation costs of SSGs A–D were more or less the same per hectare as the average costs in Mpumalanga (MP). The contribution to irrigation costs, out of the total cost, also was in the same order. The electricity cost per hectare of all the SSGs was in the same range. The table indicates that SSG A had the highest net farm income per hectare with the lowest irrigation costs. This implies that the management of these irrigation systems is effective and efficient whereas SSG C had higher costs to deal with during the 2009 season. The correct and consistent irrigation measures do therefore attribute to the financial sustainability of a farm.

4.4.4 Labour

Small-scale farmers use different labour options. It may consist of family labour or the farmer may hire labourers. The farmer can either hire individuals or hire a contractor with own employees. Murray (2008:3–5) described the different reasons for choosing the concept of hiring a contractor to perform the farm duties on a sugar-cane farm. A SSG farmer will hire a contractor due to a lack of capital infrastructure as he or she does not, for example, have the required planting, harvesting and cane transport equipment. The benefit of hiring a contractor is that it includes supervision of the labourers. It also reduces the administrative burden of the SSG as the labour legislation regarding labourers is quite extensive. In Table 4.9, the labour costs for the four farmers used and the average for Mpumalanga will be presented.

Table 4.9: Labour costs analysis (2009 season)

SSG	NFI (R/ha)	Average yield (t/ha)	Hired Labour for irrigation and other (excl cutters) (R/ha)	Weeding (R/ha)	Total labour (R/ha)	Total labour cost/Total costs (%)
A	8 363	92	1 108	1 500	2 608	15.30
B	6 895	89	2 576	N/A	2 576	15.07
C	4 127	59	2 920	133	3 053	25.18
D	2 223	54	2 671	N/A	2 671	21.22
MP Ave	**2 936**	62	**2 287**	**Incl. in hired labour**	**2 287**	**16.69**

Source: Adapted from SACGA, 2010a

SSG C averages the highest for labour hired by the farmer. SSG D as well as SSG C has the lowest average yields as well as the highest labour percentage in relation of the total costs. This analysis provides an indication of inefficient use of labour by SSGs C and D. Their farm sizes are the smallest compared to SSGs A and B.

4.4.5 Other

Despite cost items such as fertiliser, chemicals, irrigation and labour, the other cost items in the budgets of the SSGs will be discussed below. The Table 4.10 indicates other costs in the production season of 2009.

Table 4.10: Other cost analyses (2009 season)

SSG	Rank by NFI	Other costs (R/ha)				
		Harvesting and transport	Planting	Levies	Other (including mechanical, chemicals)	Other/ Total costs (%)
A	1	7 025	640	240	231	48%
B	2	7 587	–	217	–	46%
C	3	4 377	–	137	–	37%
D	5	3 481	–	130	–	29%
MP Ave	**4**	**3 950**	**424**	**251**	**1 780**	**47%**

Source: Adapted from SACGA, 2010a

Other costs of the SSGs include harvesting and transport costs, planting, levies as well as sundry items that cannot be broken down into specific items. The major costs, besides the planting costs, are the harvesting and transport costs as reflected in all the SSG's income statements. SSG B and SSG A have the highest cost for harvesting and transport as described in the previous analyses, due to the most volumes of tonnes harvested to transport to the Komati mill. SSG A also planted some cane stalks and had some mechanical costs reported. Grower D has the lowest other cost/total ratio but due to the lowest tonnes produced the harvesting and transport costs will also be proportionally the lowest. The levies include fees such as annual fees to the Mill Cane Committee, which is a representative organisation for the SSG. A fee is also paid to the Mill Group Board, which is a committee consisting of growers and millers with the task to manage the interface between the growers and millers in daily operations. The Cane Testing Services also receive some income from the growers. They independently test the cane entering the mill to determine the constituents of the cane and play an important role in the Recoverable Value (RV). All these expenses to be paid contribute to the tasks needed to be performed during a production season and influence financial sustainability.

4.4.6 Summary of costs

Four income statements of SSGs (SSGs A–D) were assessed against the average of the Mpumalanga SSGs in 2009. Net farm income (NFI) margins for all for SSGs A, B and C was above the average of the Mpumalanga SSGs, except for SSG D. Direct ratoon costs as well as other expenses were analysed. Farmers were mostly directly responsible for paying fertiliser, irrigation and general labour costs on the land. Other items include harvesting and transport costs as well as chemical costs paid to a contractor for services rendered. Various levies were paid to institutions related to the sugar industry. An analysis and recommendations regarding the different SSGs are summarised below.

Table 4.11: Summary of the expenses of the SSGs (2009 season)

SSG	NFI (R/ha)	Average yield (t/ha)	Fertiliser (R/ha)	Chemicals (R/ha)	Irrigation (R/ha)	Labour (R/ha)	Other costs (R/ha)	Total (R/ha)
A	8 363	92	3 478	600	2 218	2 608	8 136	**17 039**
B	6 895	89	3 328	1 420	1 969	2 576	7 805	**17 098**
C	4 127	59	2 192	33	2 331	3 053	4 515	**12 124**
D	2 223	54	4 152	587	1 566	2 671	3 611	**12 587**
MP Ave	**3 195**	**62**	**2 972**	**331**	**1 709**	**2 287**	**6 406**	**13 705**

Source: Adapted from SACGA, 2010a

The sample results can be divided into two categories, those that were above the benchmark of 60 t/ha and those below as assessed in Table 4.11 above. SSGs A and B have in total much higher expenses but also have the highest average yields and net farm income. Although SSG D has the highest fertiliser cost per hectare and SSG C the highest irrigation cost, their average yield was much lower. This indicates that those growers overspent on the specific cost items. It can be derived that the skills to maintain a sugar-cane plantation is the key to investing in fertiliser, irrigation, labour and the other costs required to reach a sustainable net farm income.

4.4.7 Analysis to Determine the Sustainability Level

By investigating the various cost items as they compare to the profit margins of the respective growers, the following section will discuss whether it was plausible for the grower to continue farming or if it would have been a better option to have been performing another job. The Table 4.12 below shows a summary of the different farmers' income and costs made by being a small-scale sugar-cane farmer in the 2009 season.

Table 4.12: Summary of production budgets in the 2009 season of the 4 SSGs

Description	SSG A	SSG B	SSG C	SSG D	MP Ave
RV prices (R/t) (2009)	**2 011**	**2 011**	**2 011**	**2 011**	**2 011**
RV tonnes delivered	164	122	61	60	52
Area under cane (ha)	13.0	10.2	7.5	8.2	6.26
RV tonnes delivered/AUC (ha)	12.63	11.93	8.08	7.36	8.27
GFI/ha (R/ha)	25 402	23 993	16 251	14 810	16 899
Total costs/hectare (R/ha)	17 039	17 098	12 124	12 587	13 705
NFI /hectare (R/ha)	**8 363**	**6 895**	**4 127**	**2 223**	**2 936**
Average yield (t/ha)	**92**	**89**	**59**	**54**	**62**
NFI (Rands per annum)	**R 108 716**	**R 70 326**	**R 30 951**	**R 18 231**	**R 18 377**

Source: Adapted from SACGA, 2010a

The highest gross income of the sample size is SSG A followed by SSG B. Their NFI/ha is subsequently also the highest. Their area under cane is also the highest with 13 ha and 10.2 ha respectively, which is proportionally higher than the rest and identifies characteristics of economies of scale in that regard.

To reach a figure for net income, costs related to the irrigation system and costs for daily living expenses have to be deducted from the NFI. Table 4.12 indicates that an average Mpumalanga SSG receives an income of R18 377 per annum in 2009 if they were full-time farmers. This leads to the crux of the financial sustainability assessment – is the net farm income earned by producing sugar-cane sufficient to support a small-scale sugar-cane grower and his/her family on tribal land in Mpumalanga? If the net farm income margin is too low or if the farmer makes a loss, wouldn't it be better for the SSG rather to be employed on a large-scale farm or employed in another sector, for example in the hospitality sector or in the mining sector? For the SSG the hospitality trade can be an alternative as Mpumalanga is renowned for its many tourist attractions and facilities such as the Kruger National Park. An option is also to work on the nearby mines and sell or rent the farm out to a farmer willing to expand his land (Lima, 2009).

4.4.8 Scenarios – Alternative options for SSGs

If a SSG cannot sustain himself and his family through farming, at some stage he will have to consider some alternatives. The most logical alternative would be to find employment either as a farm labourer or in some other sector. There is however the question whether such employment would really put him in a better position.

The Labour Research Service (LRS) in the *Bargaining Monitor* (2011) provided an economic sector comparison of annual income. The following list of hectare groups in Section 4.3 is used as a comparison.

- Less than 3 ha: R23 221 per year – Below minimum wage of main economic sectors
- 3.1–6 ha: R12 234 per year – Below minimum wage of main economic sectors
- 6.1–9 ha: R21 857 per year – Below minimum wage of main economic sectors
- 9.1–12 ha: R50 053 per year – Above all sectors and exceeds living costs demands
- 12.1–24 ha: R29 701 per year – Above Agriculture, below the construction sector

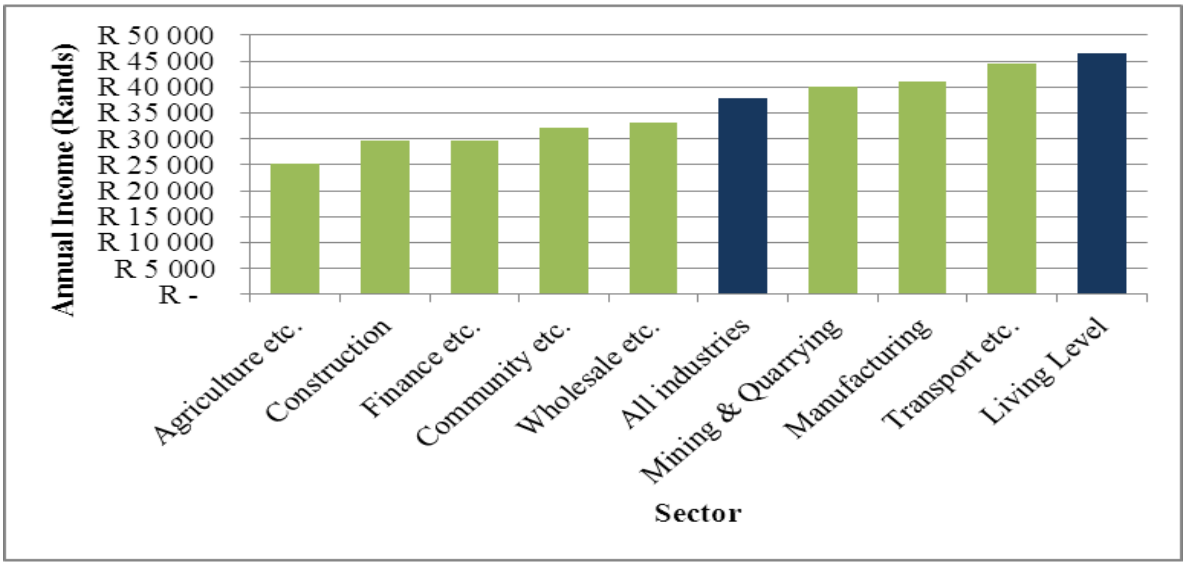

Figure 4.6: Minimum annual wage in the main economic sectors (Rands, 2009 Prices)

Source: Adapted from LRS, 2011

Figure 4.6 can be of guidance if the SSG should decide to stop farming and pursue employment in another sector where limited skills and education can provide the same income, if such a position is available. The agricultural, forestry, hunting and fishing sectors have the lowest minimum earnings compared to all the other sectors. It is about R12 000 per annum lower than a combined amount reflected for all the main economic sectors of about R38 000 per annum. In addition, an estimated living cost per annum identified by the Labour Research Service found that the minimum wage of all industries is not enough to maintain living costs. It is therefore not surprising that certain growers rather consider 'greener' pastures than bear the risk of producing a low net income or even a deficit. If the examples of an unskilled farm worker, a person in the hospitality sector and a person in the mining and quarrying sector are used, the current farmers' income, if assumed that the area under cane were also equalled to the area harvested, can be compared to their annual income in the 2009 season.

A full-time farm worker earned R13 317 per annum in the 2009 season (adapted from DoL, 2009).

1. A full-time hospitality worker earned R19 496 per annum in the 2009 season (adapted from Mywage, 2011).

2. A full-time worker in the mining and quarrying sector earned R40 053 per annum in the 2009 season (adapted from LRS, 2011).

The RV price and the AUC will be used to predict the benchmark for a farmer to decide whether to continue farming or opt for another job. The RV price for 2009 was R2 011/t which was part of the items that have an effect on the net farm income (NFI) of R18 377 per annum for the average Mpumalanga small-scale sugar-cane grower. The analysis below will demonstrate different scenarios by what more or less the change of the RV price will have to be for equalling minimum wage per annum of a farm worker, hospitality worker as well as the mining and quarrying sector. The results of the RV price scenarios when keeping the AUC and all the other factors constant are as shown in Table 4.13 below.

Table 4.13: RV price comparison between minimum wages for the 2009 season

Items	Average Mpumalanga SSG	Farm worker	Hospitality sector	Mining and quarrying sector
RV prices (R/t) (2009)	2 011	1 913	2 033	2 430
Area Under Cane (ha)	**6.26**	**6.26**	**6.26**	**6.26**
NFI (Rands per annum)	18 377	13 317	19 496	40 053
RV price change required to equal sector earnings (%)		–5.11	1.06	17.23

Source: Author's calculations

This Table 4.13 above shows that if a farmer has 6.26 ha there is a possibility that the profit can be R18 377 per annum with an RV price of R2 011/t. That was more than the minimum wages for the full-time farm worker. However it was in the same salary range of the hospitality sector for the minimum wage worker. The sector that the average SSG couldn't exceed was that of the mining and quarrying sector. It would imply that the RV price have to be R419/t more than it were in 2009. A grower that earned on average R18 377 in 2009 would at least not consider being a farm worker. However, a grower might consider changing to the mining and quarrying sector as it is almost double the profit that the SSGs on average would earn.

Expansion of area under cane may improve the SSG's income to a level where it can compare with the salaries of other categories. In Table 4.14 below, the variability of expansion needed is shown. The RV price and all the other factors are considered to remain constant.

Table 4.14: AUC[6] comparison between minimum wages

Items	Average Mpumalanga SSG	Farm worker	Hospitality sector	Mining and quarrying sector
RV price (R/t) (2009)	**2 011**	**2 011**	**2 011**	**2 011**
Area Under Cane (ha)	6.26	4.54	6.64	13.64
NFI or Salary (Rands per annum)	18 377	13 317	19 496	40 053
AUC change required to equal sector earnings (%)		–38.0	5.7	54.1

Source: Author's calculations

The average SSG in Mpumalanga would earn more than the full-time minimum wage farm worker with a farm size of 6.26 ha. However, the average Mpumalanga grower had to extend its farm size with an increase of 5.7% or 54.1% ha to equal earnings of the minimum wage in the hospitality sector or in the mining and quarrying sector.

If the average Mpumalanga grower's earnings of R18 377 is compared to the economic sector of Figure 4.6, it is not only below the mining and quarrying sector, but also below all the other economic sectors minimum wages. When only the minimum wage is taken into account for a farm worker, an average sugar-cane grower did exceed the wage. The advantage for a salary worker is that the income security is higher or that a monthly or weekly wage is received instead of an annual income. However, a grower such as SSG A and B of Mbunu B was able to have earnings above the living costs levels of almost R47 000 with annual income of R108 716 and R70 326 respectively. Although those growers were applying fertilising to the recommended amounts, there farm sizes were 13.0 ha and 10.2 ha respectively providing them opportunities for higher output tonnes and reduce their production costs. Therefore the choice for being a full-time farmer instead of being a salary earner is whether the grower is committed and obliged himself/herself to the guidelines of the extension services and also having farm size to cultivate taking into account changing economies of scale. This all

[6] In the analysis of the comparison of AUC that it was assumed to be equal to the area harvested.

contributes to whether the Mpumalanga SSGs will be sustainable and a having a future in sugar-cane farming.

4.4.9 Analysis of the breakeven point

The breakeven point represents the number of hectares harvested required for covering production costs and servicing any production loans (MCGA, 2008). In 2009 the breakeven average yield was 60 t/ha. However, to make a living out of sugar-cane, 75 t/ha was the borderline projection for a grower if he/she had a ten hectare farm in 2011 (Mavimbela, 2011b). In determining this figure, the cost of living for the farmer, depreciation and interest of a dragline irrigation system were added.

Interviewing full-time farmers of Mbunu B provided representative values of their cost of living for the 2009 season. In 2012 the value provided was between R2 000 and R4 000 per month for daily living expenses. If that value is deflated to the 2009 season with the CPI indicator for R3 000, it is about a R2 700 monthly requirement, which extrapolates to R32 730 per annum. This was sourced from the SSGs in Mbunu B that have only sugar-cane as a main source of income. The growers of Mbunu B have on average 6.24 ha, which is almost the same figure as the average of 6.26 ha for Mpumalanga SSGs in 2009. Their profit was R18 377 for the year. This indicates that most of the farmers were about R14 000 (R18 377- R32 730) in debt after the 2009 season.

A component that wasn't included in the income statement of the growers was that of their irrigation system costs. When the irrigation system payments and seed cane costs are included as part as the expenses to be paid, an additional R4 500 deduction occurs that leaves them in debt of around R20 000 if they don't benefit from government subsidies. However, they have on average five children to support for which they often receive a child grant that amounts to R2 760 per annum per child in the 2009 season (DSD, 2012). With such an 'income' for five children in 2009, it adds an additional R14 000 as 'income' that brings their balance back to – R6 000. In addition, a farmer needs capital to prepare for the next season's production, which implies that the growers will again have to borrow from Akwandze Agricultural Finance and even from the Land Bank or MEGA for additional financial support. This signifies the importance for a full-time sugar-cane grower to optimise all its farm income opportunities as well as limit its expenditure to be profitable and furthermore to be sustainable.

Although not every farmer is in such a situation, on average the Mpumalanga SSG faced a situation of continuing under the breakeven level and should consider renting the land to farmers who want to expand their farm size or to consider alternative employment. If these growers decide to seek alternative employment, consideration of being farm workers earning a minimum wage is not a suitable option. The average income of a farm worker is R5 060 per annum less than that of the average SSG. However, if the SSGs compare their NFI per annum to wages in the hospitality sector or the mining and quarrying sector, their NFI per annum is lower than those sectors' minimum wages (Table 4.14). If R32 370 for 2009 suggests being the breakeven point able to afford their costs of living, the option of considering the hospitality sector would be suitable as they have earned R19 496 in 2009. It is only the mining and quarrying sector that would enable them to have more disposable income available as required to pay for living costs, with earnings of R40 053 per annum. A SSG will have to expand its land size with 54% to compare with a miner's income. The conclusion therefore is that, to be financially sustainable, growers have either to expand their farms or if that is not possible, seek employment that will cover their costs of living.

To conclude, the third hypothesis, namely that the SSGs performed financially feasibly in the 2009 season, can be accepted if it is based on the breakeven point of the average yield estimated on 60 t/ha. However, when the net farm income per annum is included in the analysis, the number of hectares available for the farmer to produce sugar-cane determines its financial sustainability. Their NFI per annum was compared to alternative sectors' salaries as well. The net farm income was also compared to a reasonable amount necessary to cover living costs for the SSGs. If these last analyses are taken into account, the hypothesis is rejected if all other things stay constant.

4.5 SUMMARY

This chapter focused on the profitability of the SSGs. Production budgets of a grower survey conducted by SACGA of the SSGs were used to determine their income, costs and net farm income levels. When adding the breakeven point and cost of living to the debate, growers couldn’t make a living on a three hectare farm compared to the higher farm sizes groups that have the potential to generate a higher income due to scale economies. Factors such as land size, fertiliser application, irrigation scheduling, labour utilization and all the items consisting of a production budget as well as off-farm factors such as the RV price and weather conditions, have an influence on profitability and competitiveness. Analysis of individual growers in Mbunu B irrigation project indicates that the grower that had the largest farm size (13 ha) produced the highest average yield, applied the recommended fertiliser quantities and even had a labour cost of below that of the SSG of 7.5 ha. Although this detailed sample was very limited it adds to the dismissal of the existence of an inverse relationship between farm size and land productivity.

The existence of the inverse relationship of farm size and land productivity did occur in the less than three hectare grower group in the sample of the Mpumalanga grower survey. Their net farm income per hectare was the highest. However, growers that had larger farm sizes but not necessarily the same land productivity, had a higher NFI per annum than the growers of the less than three hectare group. With these findings, as well as those in Chapter 3, the first hypothesis can rather be rejected than accepted as a larger farm has higher income potential.

This also led to the rejection of hypothesis three of which the performance of SSGs in the 2009 season indicates financial sustainability. If financial sustainability were only analysed on land productivity, it could have been accepted as the average Mpumalanga SSGs average yield were higher than the breakeven point determined in the 2009 season with 62 t/ha compared to 60 t/ha. The evidence of the SSGs’ NFI per annum compared to alternative employment and as well as their breakeven point for a reasonable cost of living required, tilt the hypothesis three to rejection. To earn as much from sugar-cane farming to equal a minimum wage miner, the average SSG would have to expand its farm with 54% if all other factors stay the same.

CHAPTER 5

ECONOMIC CONTRIBUTION OF THE SMALL-SCALE SUGAR-CANE GROWERS IN MPUMALANGA

5.1 INTRODUCTION

This chapter assesses the performance of the SSGs in the Nkomati area as a macro-economic unit. Their farm income, their costs and their use of inputs such as land, labour and fertiliser has an effect on the economy of not only on the Nkomati area but also on of the whole of Mpumalanga and even further. The SSGs' economic contribution will be illustrated by means of econometric modelling. A Social Accounting Matrix (SAM) will be used for the calculations of the direct, indirect and induced effects on the economy that were the result of the NIEP, which was started two decades ago. The results of the economic contribution will be expressed in job creation opportunities, gross domestic product (GDP) and also on how the income distribution impacts on the low, medium and high income groups of Mpumalanga.

The SAM of Mpumalanga will form the base, with the sector 'sugar-cane farming' as the driver for this study's analysis. The SAM, in 2006 prices as prepared by Conningarth Economists with the assistance of the Development Bank of Southern Africa, the South African Reserve Bank, Statistics South Africa and the Treasury of Mpumalanga will be used as the base in this analysis. As the study required a more in depth investigation of the SSGs and the LSGs, the sugar-cane farming sector was split in SSG and LSG sectors. The reference to the information of the SAM application was applied with courtesy of Conningarth Economists. The information of the sugar-cane budgets was collected from SACGA and interviews conducted with stakeholders in the Mpumalanga sugar-cane area. Where applicable, indices were used to determine values as certain macro-economic impacts will be shown from 2007 to 2010.

5.2 APPROACH TO SPLIT THE SUGAR-CANE SECTOR IN THE SAM

5.2.1 Main groups

The Mpumalanga SAM consists of the following main groups:

1. Activities
2. Commodities
3. Current Account (Factor Payments – Labour and Capital, Institutions)
4. Capital Account (Government and all other sectors)
5. Trade Account (Rest of the RSA; Rest of the World)

Table 5.1 shows in broad the different interrelationships of the groups in the economy in the National Accounting Framework (NAM). The NAM shows the groups in the economy in a more summarised version than the SAM. The Rest of the World (RoW) group includes the Rest of South Africa as well as the Rest of the World.

Table 5.1: National Accounting Framework

Expenditures / Receipts		Activities	Commodities	Factors payments		Enterprises	Households	Government	Capital Account	RoW	Total
				Labour	Capital						
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Activities	**1**	–	P	–	–	–	–	–	–	–	G
Commodities	**2**	X	–	–	–	–	C	G	I	E	Q
Factor Payments – Labour	**3**	Wa	–	–	–	–	–	Wg	–	We	e_L
Factor Payments – Capital	**4**	Fa	–	–	–	–	–	Fg	–	Fe	e_c
Enterprises	**5**	–	–	–	Q_e	–	–	Trg_E	–	–	Z_u
Households	**6**	–	–	L	–	Qv	Trh_H^1	Trg_H^1	–	Trr_H	Z_H
Government	**7**	Ti	Ta	–	Tf	Tu	Td	Trg_G	–	Trr_G	Z_G
Capital Account	**8**	–	–	–	–	Quv	Sh	Sg	–	–	Z_C
Rest of the World	**9**	–	M	W_l	Q_r	–	Trh_H^2	Trg_H^2	Sa	–	Z_A
Total		g	q	e_L	e_c	Z_U	Z_H	Z_G	Z_C	Z_A	

Source: Conningarth, 2009:9

The National Accounting Framework is the total accounts matrix and combines the main groups in the SAM for a holistic picture (Conningarth, 2009:8). The sugar-cane sectors were divided where the production of the sugar-cane affects the items in the economy. Table 5.2 describes the symbols of the different matrices or vector items.

Table 5.2: Glossary of National Accounting Matrix framework terminology

Columns	Description of each matrix/vector
Column 1: Activities Account (Production)	X: Intermediate consumption; commodities required by activities as inputs. Wa: Remuneration of Labour. Fa: Remuneration of Capital. Ti: Indirect Taxes raised on Activities
Column 2: Commodities Account (Goods and Services)	P: Production of commodities by each activity. Ta: Indirect taxes on products (VAT). M: Imports from the a) Rest of RSA b) Rest of the World
Columns 3 & 4: Factor Account – Labour and Capital (GOS)	Q: Dividends and interests to enterprise in National. L: Salaries and wages to Households in National. Tf Indirect taxes (tax on Capital and Labour) to Government. Wl: Salaries and wages to Households in the a) Rest of RSA b) Rest of the World Qr: Dividends and interest to enterprises from the a) Rest of RSA b) Rest of the World
Column 5: Enterprises (Institutional Account)	Qv: Profits distributed to Households. Tu: Enterprise taxes Quv: Undistributed Profits
Column 6: Households (Institutional Account)	C: Private consumption expenditure by Households. $TrhH^1$: Transfers between Households. Td: Direct taxes and transfers paid to the Government. Sh: Household savings. $TrhH^2$: Transfers from Households to Households in the a) Rest of RSA b) Rest of the World
Column 7: Government (Institutional Account)	G: Government consumption expenditure Wg: Remuneration of government employees. Fg: Remuneration of government capital. TRgE: Transfers to Enterprises. $TRgH^1$: Transfers to Households in National. TRgG: Transfers to Government. Sg: Government savings $TRgH^2$: Transfers to households in the a) Rest of RSA b) Rest of the World
Column 8: Capital Account	I: Gross investment Sa: Capital flow from/to a) Rest of RSA b) Rest of the World
Column 9: Rest of the World (Trade) Account)	E: Exports from National to a) Rest of RSA b) Rest of the World W_e & F_e: Factor payments from National to the a) Rest of RSA b) Rest of the World Trr_H: Transfers from households in National to households in the a) Rest of RSA b) Rest of the World Trr_G: Transfers from the government in National to the a) Rest of RSA b) Rest of the World

Source: Conningarth, 2009:10

The Activity and Commodity sectors consist of 47 sectors. Although the Mpumalanga SAM diversifies the economy into 47 sectors, it doesn’t specify the difference between small and large-scale sugar-cane grower sectors. The importance for expanding the sugar-cane sector is an important requirement to determine the economic contribution of the SSGs in Mpumalanga. In order to conduct such an investigation, the Mpumalanga SAM, as developed in 2006 prices, was uniquely adjusted to provide economic impacts for the SSGs as well as LSGs. Table 5.3 illustrates the incorporation of the sugar-cane sectors to the adjusted SAM.

Table 5.3: Activity and Commodity sectors in the Mpumalanga SAM

Nr	Mpumalanga SAM	Adjusted SAM for sugar-cane LSGs and SSGs
1	Cereal and crop farming	Large-scale sugar-cane farming
2	Sugar-cane farming	Small-scale sugar-cane farming
3	Citrus farming	Citrus farming
4	Sub-tropical farming	Sub-tropical farming
5	Vegetable farming	Vegetable farming
6	Livestock farming	Livestock farming
7	Forestry	Forestry
8	Other agriculture	Other agriculture including cereal and crop farming
9	Coal & lignite mining	Coal & lignite mining
10	Platinum mining	Platinum mining
11	Ferrous mineral mining	Ferrous mineral mining
12	Non-ferrous mineral mining	Non-ferrous mineral mining
13	Other mining and quarrying products	Other mining and quarrying products
14	Meat, fish, fruit, vegetables, oils and fat products	Meat, fish, fruit, vegetables, oils and fat products
15	Dairy products	Dairy products
16	Grain mill, bakery and animal feed products	Grain mill, bakery and animal feed products
17	Other food products	Other food products
18	Beverages and tobacco products	Beverages and tobacco products
19	Textiles, clothing, leather products and footwear	Textiles, clothing, leather products and footwear
20	Wood and wood products	Wood and wood products
21	Furniture	Furniture
22	Paper and paper products	Paper and paper products
23	Publishing and printing	Publishing and printing
24	Petroleum	Petroleum
25	Chemicals & chemical products (including plastic products)	Chemicals & chemical products (including plastic products)
26	Rubber products	Rubber products
27	Non-metallic mineral products	Non-metallic mineral products
28	Basic metal products	Basic metal products
29	Structural metal products	Structural metal products
30	Other fabricated metal products	Other fabricated metal products
31	Machinery & equipment	Machinery & equipment
32	Electrical machinery & apparatus	Electrical machinery & apparatus
33	Communication, medical and other electronic equipment	Communication, medical and other electronic equipment
34	Manufacturing of transport equipment	Manufacturing of transport equipment
35	Other manufacturing & recycling	Other manufacturing & recycling
36	Electricity	Electricity
37	Water	Water
38	Building and construction	Building and construction
39	Trade	Trade
40	Accommodation	Accommodation
41	Transport	Transport
42	Communication	Communication
43	Insurance	Insurance
44	Real estate	Real estate
45	Business services	Business services
46	General government services	General government services
47	Community, social and personal services	Community, social and personal services

Source: Adapted from Conningarth, 2009:23

The values of the 'Cereal and crop farming' sectors were added together in the 'Other agriculture' sector. The values in the 'Sugar-cane farming' sector were removed or deleted from the SAM to make rows and columns available for the large-scale and small-scale farming sugar-cane sectors. In populating the different components of the SAM where the empty rows and columns became available, the budgets of the SSGs and LSGs were inserted. The 2006/07 production year's sugar-cane budgets were used to add the values in the 2006 SAM.

5.2.2 Adjusting the Activity Account column

To accommodate the split of the sugar-cane sectors, it was necessary to make some adjustments to the activity account to indicate the different production budget structures of LSGs and SSGs.

Commodities in Activity column

With the preparation of the new values to be included in the SAM, a number of different components had to be populated.

The Large-scale Grower Cost surveys were used for the 2007–2010 period. Although the GDP multiplier and the labour multiplier were developed for the 2007–2010 period, the complete SAM was adjusted for the 2006 Mpumalanga SAM. The 2006/07 production year's sugar-cane budgets were used to add the values in the 2006 SAM.

The SSG production budgets were compiled from different sources such as Akwandze Agricultural Finance, and indices from Statistics South Africa. It was broken down into the applicable components of the SAM. A representative budget structure was built using data from documents such as financial statements as well as interviews with different stakeholders in the Mpumalanga sugar-cane set-up. However, the planting and ratoon stages were combined as the different farmers in the different projects do not necessarily all plant and harvest at a specific time.

The two main differences in their budgets (a constant factor regardless whether the budget was compiled in 2007 or 2010) was their use of labour and of capital infrastructure. For SSGs labour is provided mainly by contractors that take care of activities in the pre-harvest phase such as land preparation and application of ripener, fertiliser and chemicals. Irrigation is performed by employees hired by the SSGs themselves. These employees also do weeding when the herbicides don't eliminate all the weeds. In the harvesting phase, except for the lighting of a match to burn the cane, the rest of the work such as cutting, infield loading and transporting the cane to the allocated mill, is done by contractors. Tasks, such as picking up the additional cane that wasn't picked up by the contractors services are done by the growers themselves or their children to boost the tonnes produced. The irrigation systems to prevent burning are also removed by the farmers themselves. In contrast, the LSG mostly has own farm staff to perform the various activities. Some of the LSGs do make use of contractors for the harvesting activities. The LSGs have more capital resources than the SSGs as they have their own tractors, rippers, disc, wagons and 'bakkies'.

The specific areas in the SAM relating to budget items are shown in the activity column.

Table 5.4: Activities (Column 1): Activities Account (Production)

Expenditures / **Receipts**		**Activities**
		1
Activities	**1**	–
Commodities	**2**	X
Factor Payments – Labour	**3**	Wa
Factor Payments – Capital	**4**	Fa
Enterprises	**5**	–
Households	**6**	–
Government	**7**	Ti
Capital Account	**8**	–
Rest of the RSA and World	**9**	–
Total		g

Source: Conningarth, 2009:9

The SSGs' as well as the LSGs' income statements were used for populating the matrix of X, namely the intermediate consumption of where commodities are required by activities such as inputs. The budget items were allocated to the commodities as follows:

Table 5.5: Commodity division to the Activity column for the SSGs

Budget Item	Commodity division to the Activity column for the SSGs
Seed cane	1. Large-scale sugar-cane farming 2. Small-scale sugar-cane farming 8. Other agriculture
Fertiliser, chemicals	25. Chemicals and chemical products
Mechanical costs	31. Machinery and equipment
Electricity	36. Electricity
Water	27. Water
Fertiliser application, chemical application, ripener, harvest costs, levies to the sugar-cane industry	45. Business services
Sundry items	Allocated as structure used from original SAM: 13. Other mining and quarrying products 19. Textiles, clothing, leather products and footwear 20. Wood and wood products 22. Paper and paper products 23. Publishing and printing 24. Petroleum 26. Rubber products, 30. Other fabricated metal products 34. Manufacturing of transports equipment 38. Building and construction 39. Trade 41. Transport 42. Communication 43. Insurance 44. Real estate 47. Community, social and personal services

Source: Adapted from the production budget structure to MP SAM (SACGA 2010a; Conningarth, 2009:9)

Table 5.6 below indicates the budget items allocated to the large-scale sugar-cane farming sector.

Table 5.6: Commodity division to the Activity column for the LSGs

Budget Item	Commodity
Seed cane	1. Large-scale sugar-cane farming 2. Small-scale sugar-cane farming 8. Other agriculture
Fuel and lubricants	24. Petroleum
Fertiliser, chemicals	25. Chemicals and chemical products
Mechanical maintenance	31. Machinery and equipment
83 % of services	36. Electricity
17 % of services	27. Water
Fixture maintenance	38. Building and construction
Administration, licenses, 30 % cane transport contractors (70 % farm labour)	45. Business Services
Sundry	Allocated as structure from original SAM: 13. Other mining and quarrying products 19. Textiles, clothing, leather products and footwear 20. Wood and wood products 22. Paper and paper products 23. Publishing and printing 26. Rubber products 30. Other fabricated metal products 34. Manufacturing of transports equipment 39. Trade 41. Transport 42. Communication 44. Real estate 47. Community, social and personal services

Source: Adapted from the production budget structure to Mpumalanga SAM (SACGA 2010c; Conningarth, 2009:9)

The budget items expressed in R/ha were firstly allocated to the applicable groups. After it was divided into the different components, it was transferred to production values for 2006/07. It was multiplied by the area harvested by the LSG and SSGs. The 2006 Mpumalanga (MP) SAM production value differed from the calculated LSGs and SSGs production. To bring the level of production in line with the level of the 2006 MP SAM, the values were adjusted by using the values of the original MP SAM. The production calculations for the agriculture sector of the 2006 MP SAM were sourced from the Census of Commercial Agriculture 2002, the Reserve Bank Bulletin, reports from Statistics South Africa (StatsSA) and a Survey of Non-VAT-Registered Businesses in South Africa by StatsSA in

2002. The Abstract of Agricultural Statistics in 2008 was used for production calculations (Conningarth, 2009:24).

Information from the different production budgets of the two sugar-cane groups was used. The LSG budgets were based on the secondary data received from the SACGA that included the income and cost data. The annual survey data were used as well as indices from official sources.

Labour Factor Payments in Activity column

The different approaches in how the labour structures differ are shown below. In Table 5.7 the work of contractors was handled as business services, part of the commodity structure while the staff hired or employed by the farmers themselves were divided into the labour remuneration section where applicable.

Table 5.7: Labour factor approaches (R mil, 2007 season)

Labour Factor Payments		Divided SAM		Original SAM
		Large-scale sugar-cane farming	Small-scale sugar-cane farming	Sugar-cane farming
1	Africans – Legislators, senior officials and managers	-	-	1.59
2	Africans – Professionals	-	-	1.06
3	Africans – Technical & associate professionals	-	-	1.18
4	Africans – Clerks	-	-	2.17
5	Africans – Service workers, shop & market sales workers	-	-	1.36
6	Africans – Skilled agric. and fishery workers	5.07	3.05	5.43
7	Africans – Craft and related traders workers	-	-	2.53
8	Africans – Plant and machine operators & assemblers	5.82	-	6.24
9	Africans – Elementary occupations	41.14	5.61	10.23
10	Africans – Domestic workers	-	-	3.11
11	Africans – Occupation unspecified	-	-	-
12	Coloureds – Legislators, senior officials and managers	-	-	0.06
13	Coloureds – Professionals	-	-	0.04
14	Coloureds – Technical & associate professionals	-	-	0.04
15	Coloureds – Clerks	-	-	0.06
16	Coloureds – Service workers, shop & market sales workers	-	-	0.02
17	Coloureds – Skilled agric. and fishery workers	-	-	0.01
18	Coloureds – Craft and related traders workers	-	-	0.07
19	Coloureds – Plant and machine operators & assemblers	-	-	0.04
20	Coloureds – Elementary occupations	-	-	0.05
21	Coloureds – Domestic workers	-	-	0.01
22	Coloureds – Occupation unspecified	-	-	-
23	Asians/Indians – Legislators, senior officials and managers	-	-	1.01
24	Asians/Indians – Professionals	-	-	0.66
25	Asians/Indians – Technical & associate professionals	-	-	0.74
26	Asians/Indians – Clerks	-	-	1.15
27	Asians/Indians – Service workers, shop & market sales workers	-	-	0.37
28	Asians/Indians – Skilled agric. and fishery workers	-	-	0.17
29	Asians/Indians – Craft and related traders workers	-	-	0.57
30	Asians/Indians – Plant and machine operators & assemblers	-	-	0.83
31	Asians/Indians – Elementary occupations	-	-	0.31
32	Asians/Indians – Domestic workers	-	-	0.06
33	Asians/Indians – Occupation unspecified	-	-	-
34	Whites – Legislators, senior officials and managers	-	-	4.85
35	Whites – Professionals	9.43	-	2.13
36	Whites – Technical & associate professionals	-	-	0.95
37	Whites – Clerks	-	-	0.94
38	Whites – Service workers, shop & market sales workers	-	-	0.21
39	Whites – Skilled agric. and fishery workers	-	-	6.75
40	Whites – Craft and related traders workers	-	-	0.52
41	Whites – Plant and machine operators & assemblers	1.76	-	0.25
42	Whites – Elementary occupations	-	-	0.36
43	Whites – Domestic workers	-	-	0.31
44	Whites – Occupation Unspecified	-	-	-
	Total	**63.22**	**8.66**	**58.44**

Source: Author's Calculations

The main difference between the two approaches was the labour position in the structure. The original SAM allocated the values to almost all the different sectors relating to labour, while in the adjusted SAM the labour remuneration paid to workers specifically were identified and allocated. The values of the original SAM were taken from the basis of official documents applying a percentage spread over all the agricultural sectors. Budget values populated in a more specific manner than a holistic approach to labour resulted in different labour structures. The services of the contractors were allocated to the commodities column into the business services sector.

<u>Capital Factor Payments in Activity column</u>

The following group in the activity column which was divided was the capital factor payments. The capital payments include Gross Operating Surplus (GOS) of Private Business Enterprises and consisted of Net Profits, Interest on Loans and Depreciation. The LSGs values of interest on Loans and Depreciation were itemised in their budget. Although SSGs have loans and depreciation to be paid, it doesn’t reflect as a specific item in the budgets used. A value was determined from the irrigation systems invested to provide the interest on Loans and Depreciation. The GOS-value reflected in the adjusted SAM was R98.5 million for the large-scale sugar-cane farming while for the small-scale farmers it was R21.7 million in the 2006/07 production year. It shows an 82 % contribution of GOS by the LSGs and 18 % by the SSGs.

<u>Indirect Taxes in the Activities column</u>

The indirect taxes consisted of seven components. However, in the Activity column the taxes were based on four components such as Indirect Tax and subsidies by the National Government, as well as contributions paid to the provincial and local government. This section was conducted in a hypothetical manner as a budget doesn’t provide this external information. To diversify the SSG from the LSG, a split by hectare distribution was used to provide the values for the four components. The values were firstly adjusted to fit the real allocation to the taxes, and then transformed back to the levels of the 2006 SAM. As the whole activity column was adjusted, the values reflect differences from the original SAM.

Table 5.8: Indirect Taxes (R mil, 2007 season)

Indirect Taxes	Large-scale sugar-cane farming	Small-scale sugar-cane farming	Total sugar-cane sector	Original SAM Total sugar-cane sector
National Government – Indirect tax	R0.56	R0.13	R0.69	R0.69
National Government – Subsidies	−R6.78	−R1.59	−R8.37	−R8.37
Provincial government	−R1.60	−R0.38	−R1.98	−R1.98
Local government	R0.82	R0.19	R1.01	R1.01
Net Indirect Taxes	**−R7.00**	**−R1.65**	**−R8.65**	**−R8.65**

Source: Adapted from 2006 MP SAM, Conningarth, 2009

5.2.3 Adjusting the Commodity column

The commodity account reflects the goods and services used in the economy. Table 5.9 identified the different components in the Commodity Account.

Table 5.9: Commodity column details

Expenditures / Receipts		Commodities
		2
Activities	1	P
Commodities	2	–
Factor Payments – Labour	3	–
Factor Payments – Capital	4	–
Enterprises	5	–
Households	6	–
Government	7	Ta
Capital Account	8	–
Rest of the World	9	M
Total		q

Source: Conningarth, 2009:9

The components affected when the commodities were divided into large-scale and small-scale sugar-cane farming are the production values of commodities for each activity, and indirect taxes on product imports from the rest of South Africa and the world. The split was initiated with the difference of production of the LSGs and SSGs. The associated values in the original SAM were split accordingly. The values of the two sugar-cane sectors were placed in separate rows and columns according to the nature of the matrix. The large-scale sugar-cane farming inputs flow over to the production of large-scale sugar-cane farming. The same is valid for small-scale sugar-cane farming.

Table 5.10: Split of Activities in the Commodity column (R mil, 2006/07 season)

		Commodities	
		Large-scale sugar-cane farming	**Small-scale sugar-cane farming**
Activities	**Large-scale sugar-cane farming**	R 273.72	–
	Small-scale sugar-cane farming	–	R 55.39

Source: Production value, adapted from SACGA, 2011

This division was also relevant with adjusting the sugar-cane sector split in the Activity row.

5.2.4 Adjusting the Commodity row

Table 5.11 identifies the different components to be divided in the Commodities Row.

Table 5.11: Commodity row

Expenditures / Receipts		Activities	Commodities	Factors payments		Enterprises	Households	Government	Capital Account	RoW	Total
				Labour	Capital						
		1	2	3	4	5	6	7	8	9	
Commodities	**2**	X	–	–	–	–	C	G	I	E	Q

Source: Conningarth, 2009:9

The vector where the split in the Commodity Row was applicable consisted of Activities, Households, Government, Capital Account and the Rest of the World. The two sugar-cane sectors were divided by the production output. The 'X', namely the intermediate consumption of where commodities are required by activities as inputs, was already divided in the distribution in the Activities Column.

5.2.5 Completion of the Adjusted Mpumalanga SAM

After the columns and rows were divided appropriately, it was linked to the SAM where the Cereal and Crop Farming as well as the Sugar-cane Farming sectors were removed or 'emptied'.

5.2.6 Labourers from Mozambique

Most of the labourers on the sugar-cane farms as well as the farmers themselves are South African citizens. However, the cane harvesters are mainly of Mozambican origin. The number of cane harvesters in 2011 was about 3 000 (interview with a Tsb Sugar cutting contractor). Cutting is hard work for little money. If a farm worker received the required minimum wage in 2011 he still got less than half the minimum wage of a mine worker. It is no surprise that for cutters from Mozambique a work permit is the passport for an opportunity to move on to the mining sector where the financial remuneration is much better than in their native country. This is one of the factors causing a common problem for Mpumalanga cane production, namely the unreliability of employees to be available when the cutting season starts. The high number of HIV/Aids casualties is another factor. The contractors therefore keep a number of potential workers on their payroll as a backup for absent employees. The contractor can make use of mechanical methods, but manual labour is still preferred as more cane is taken from the land in that way. The Mozambicans will take about half their earnings over the border. Although the money is taken out of the country, no input structure changes were performed. The farmer receives an income due to the expense paid to the contractor for the labour utilised. Subsequently, the contractor also receives an income from the services rendered to the farmer. The contractor pays taxes to the South African government regardless of the nationality of the particular employee. Therefore, in the calculations of the GDP and Labour multiplier no change occurs. However, it is an outflow of money which is acknowledged in the Rest of the World column in the SAM and connects with the Households row and Rest of the World column (Table 5.1). It is defined as the ‘Transfers from households in Mpumalanga to households outside the borders of the province’ (Conningarth, 2009:10). This money transfer doesn’t affect the multiplier effect. It falls outside the areas where the matrix is closed to derive the direct, indirect and induced multipliers.

5.2.7 Model Process

To determine the economic outcome, four main phases were implemented namely:

1. Setting up the SSG and LSG budgets for the particular years of use.
2. Include the structures in the technical coefficient structure of the SAM.

3. Determining the multipliers.
4. Bringing the structures and multipliers together in the model uniquely created for the purpose of this study.

To incorporate the production structures of the grower groups, they were allocated to the standard structure of the SAM. The next section will discuss the outlay and mechanics of the SAM implementation for determining the outcome.

Leontief Inverse

A Social Accounting Matrix (SAM) is defined as a comprehensive, economy-wide database, which contains information on the flow of resources that take place between the different economic sectors that exist within an economy and includes business enterprises, households and government in a specific timeframe that is normally per annum. (Conningarth, 2011a:16) When economic agents in an economy are involved in transactions, financial resources change hands. A SAM provides a database of all transactions that take place between these agents in a particular period, thereby presenting a 'snapshot' of the structure of the economy for that time period. A SAM has components of the Input-Output table, which reflect inter-sectoral linkages in terms of sales and purchases of goods and services, as well as the remuneration of production factors that form the essence of any economy's functioning. An Input-Output table consists of intermediate inputs, imports, remuneration of employees; gross operating surplus and indirect taxes (University of Pretoria, 2001:97). The SAM is an extension of the Input-Output analysis and also reflects the economic related activities of households. The households are the basic economic unit where decision making influences economic variable outcomes, such as consumption expenditure and personal savings. When households are combined to homogenous groups in the SAM, it assists to determine what the economic welfare of these groups might be in the economy. The closed inverse is the matrix used in the process to determine the total multiplier. The activities, commodities, labour factor payments and households groups are part of the closed inverse. The open inverse consists of activities and commodities and is used for production effects of the indirect multiplier.

After combining the two newly formed structures to the technical coefficient matrix, the Leontief inverse was implemented to create the indirect and induced production. This will furthermore be used to determine the ‘kick’ values or described alternatively, to activate the model. The direct multipliers will then be multiplied by this ‘kick’ to estimate the economic impacts of choice.

For an economic model to be applied from where the SAM serves as the basis, it was necessary to divide the SAM by an endogenous and exogenous portion. The model used for the division is known in Input-Output theory as the Leontief Inverse:

$$(I-A)^{-1} \tag{5.1}$$

This consists of (A) as a coefficient matrix by the endogenous portion and (I) that illustrates the unity matrix. The (I-A) is then inverted and form the Leontief inverse.

The coefficient matrix (A), of the production input structure of the various sectors represented in the Mpumalanga SAM as well as the expenditure structure of the different household groups. The total impact of the production is determined by the formula below:

$$(I-A)^{-1} \times \text{Exogenous stimulus} \tag{5.2}$$

The exogenous stimuli are expressed in monetary values of a project. It is also the part that is responsible for the ‘kick’ or the shock to the model.

The inputs required to be broken down in such an exogenous ‘kick’ are discussed in the next section.

The economic modelling continued and was applied to four main components:

1. Inputs required preparing the exogenous stimulus or ‘kick’.
2. Economic modelling that uses the SAM whereby the Leontief inverse is used to create the production impacts using matrix algebra.
3. Multipliers expressed in a GDP/Production ratio and a Labour/Production ratio.

4. Economic Impacts expressed in different levels of economic indicators such as GDP, employment creation and the distribution to different income households.

Inputs to the Sugar-cane Model

The main inputs for the exogenous stimulus consist of the following:

1. Total income of the specific groups, also defined as production

2. Direct employment numbers

The total income was determined by using the number of hectares multiplied by the gross income per hectare of the specific group. The direct employment consists of the cane planted per group and the employment per hectare used for sugar-cane farming. These inputs were individually inserted for each of the specific models. They were determined by calculations used for the other purposes for the models as well.

The other inputs that were used to populate the exogenous stimulus were derived from the SAM structure of the LSGs' and the SSGs' sugar-cane activities for the specific years in the adjusted structures of the Mpumalanga SAM stipulated below:

1. Total production split between the domestic and export portions
2. Production split between various economic activities (intermediate inputs, labour remuneration and Gross Operating Surplus)
3. An extension of the intermediate demand that consists of the split of the different sectors
4. The portion of imports identified in the different sectors
5. Disaggregation of the labour remuneration between various labourers, and
6. Direct and indirect taxes.

It must be noted that the values of the direct and indirect taxes were only deflated or inflated to the specific years and the structure. The 2006 SAM values were unchanged as originally built.

The primary and secondary inputs above form three components in the matrix:

1. The demand of the usage of commodities as the inputs for the production process.
2. The salaries and wages that are also part of the production costs of the beneficiation of every stage. This component is also divided in further sub-groups, the population and occupation groups are structured in accordance with Statistics South Africa publications.
3. The Gross Operating Surplus (GOS) is identified as a specific economic activity that is divided into depreciation, interest paid and net profit.

Multiplier Application

As discussed above, after the exogenous stimulus is formed the multipliers are implemented were used in determining of the economic impacts.

To calculate the GDP the value added portion in the SAM is utilised. It includes remuneration of employees, gross operating surplus (which includes profit and depreciation), and net indirect taxes of the different activities producing products i.e. commodities. The depreciation forms part of the capital items which for the SSGs mainly consist of irrigation systems.

On the expenditure side, effects of the fluctuations of factors such as fertiliser and electricity prices and hectares harvested in the analysis period, play an important role in the variability of the GOS, which furthermore affects the GDP/Production ratio. A ratio between the value added and production was determined. The GDP/Production multiplier for the two sugar groups is tabulated below:

Table 5.12: Direct GDP multipliers over the 2007 to 2010 period

Season	2006/07	2007/08	2008/09	2009/10
Large-scale sugar-cane farming	0.57	0.51	0.47	0.41
Small-scale sugar-cane farming	0.52	0.37	0.30	0.36
Original from 2006 SAM	0.60	N/A	N/A	N/A

Source: Author's calculations using MP SAM structure

Table 5.12 above reflects that the composition of the GDP to production changes year to year. The combination of GOS, labour payments and indirect taxes played a role in each of the different years and budgets leading towards the different ratios. In the 2006/07 season, the ratios of the SSGs and the LSGs differ from the original approach. As the budgets were uniquely compiled, a more sensitive GDP multiplier was determined by the original Mpumalanga (MP) SAM where the sugar-cane sector included both of the grower groups. The original MP SAM used a holistic approach by compiling all the different commodities to determine their production structure, which was converted to a GDP multiplier.

The multiplier for direct employment was calculated by the number of job opportunities divided by the production per annum. Direct employment derived from the ratio for the LSG was 0.18 and for the SSG 0.28 for full equivalent job opportunities/ha multiplied by the number of hectares for the specific year. Irrigation labour productivity is the only item of all the labour activities with a difference between LSGs and SSGs. The production which is equal to the gross production value of the growers was used as the denominator. Therefore the direct full equivalent job opportunities/production (R million) per year of the period 2001–2011 is shown below.

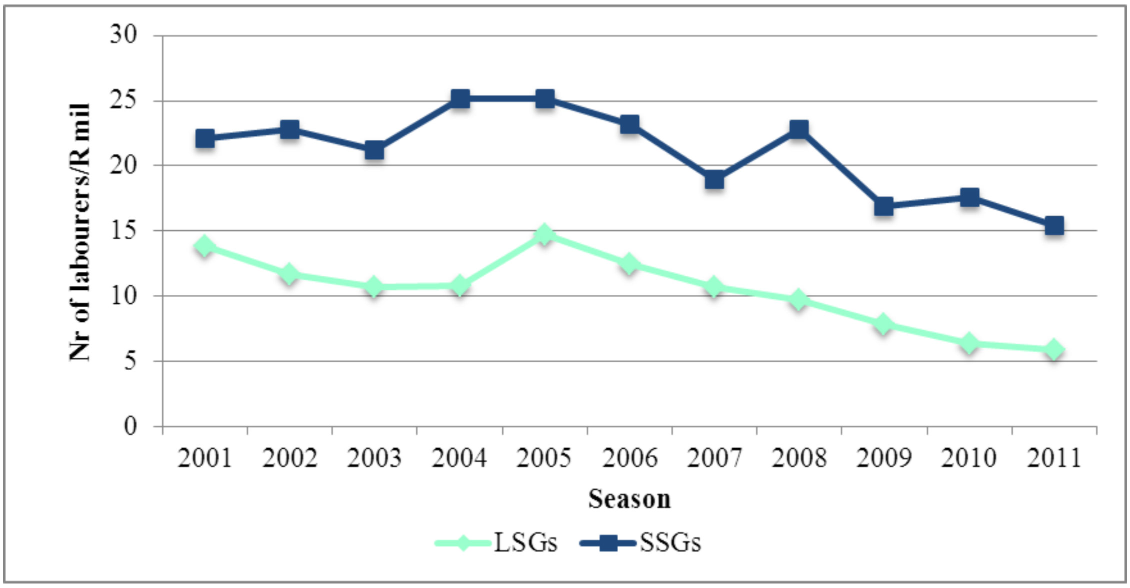

Figure 5.1: Direct labour multiplier from 2001-2011 (Number/R mil production)

Source: Author's calculations

Figure 5.1 indicates a downward trend of the labour opportunities over time for both the small and the large-scale cane growers. It reflected that when R1 million was produced as for instance during the 2006/07 season, eleven job opportunities were created by the LSGs and nineteen by the SSGs. The changes between the different years per group can be explained with the variation of the production values per annum. The direct multiplier for sugar-cane farming for representing the 2006/07 season was 12.8 job opportunities per R million production (Conningarth, 2008).

5.3 RESULTS

The economic impacts to be determined will be direct, indirect and induced economic effects. The total economic impact is the sum of direct, indirect and induced effects for the four groups to be analysed. The economic impacts will be expressed in the indicators GDP, impact on employment creation and income distribution to households.

1. Direct impacts refer to the effect of the activities that take place in the sugar-cane farming sector. It refers to the income and expenditure that is associated with the everyday operation of the farm that is taken up in its production budget.

2. Indirect impacts refer to economic activities that arise in the sectors that provide inputs to the sugar-cane industry components and other backward linked industries. For example, as the sugar-cane farming sector uses fertiliser, the indirect impacts refer to the activity (paying of salaries and wages; and profit generation) that occur in the fertiliser industry as well as the sectors that provide materials to the fertiliser industry. Fertiliser is allocated to the manufacturing sector.

3. Induced impacts refer, *inter alia*, to the economic impacts that result from the payment of salaries and wages to people who are (directly) employed at the various consecutive stages of beneficiation of the sugar-cane farming sector. In addition the induced impact also includes the salaries and wages paid by businesses operating in the sectors indirectly linked to these industries through the supply of inputs. These additional salaries and wages lead to an increased demand for various consumable goods that need to be supplied by other sectors of the economy that then have to raise their production in tandem with the demand for their products and services. These induced impacts can then be expressed in terms of their contribution to GDP, and employment creation.

5.3.1 Gross Domestic Product

The direct GDP of both of the groups are shown in Table 5.13.

Table 5.13: Direct GDP impacts (R mil, 2007 season)

Season	SSGs	LSGs	Total
2006/07	R 70.7 (16%)	R 370.6 (84%)	R 441.3

Source: Author's calculations

Contributions to the direct GDP of Mpumalanga between the SSGs and the LSGs are respectively 16% and 84%. The amount in which the total SSG contributes to the Mpumalanga economy is shown in Table 5.14.

Table 5.14: GDP impacts of the SSGs' contribution (2007 season)

No.	Economic sector	Direct impact (R mil)	Indirect impact (R mil)	Induced impact (R mil)	Total impact (R mil)	Percentage (Total)
1a.	Large-scale sugar-cane farming	-	1.0	0.0	1.0	0.9
1b.	Small-scale sugar-cane farming	70.7	0.2	0.0	70.9	63.4
1c.	Other agriculture	-	0.2	0.8	1.0	0.9
2	Mining	-	2.2	0.6	2.8	2.5
3	Manufacturing	-	2.0	3.0	4.9	4.4
4	Electricity & water	-	6.1	1.3	7.4	6.6
5	Construction	-	0.3	0.4	0.7	0.7
6	Trade & accommodation	-	1.3	1.1	2.4	2.1
7	Transport & communication	-	1.7	2.4	4.0	3.6
8	Financial & business services	-	9.0	5.8	14.8	13.3
9	Community services	-	0.2	1.5	1.8	1.6
	Total	**70.7**	**24.2**	**16.9**	**111.8**	**100.0**

Source: Author's Calculations

Table 5.14 above shows how the contribution of the SSGs producing sugar-cane affects the other main sectors in the economy in Mpumalanga. The direct impact resulted directly from the income that the growers delivered to the mills, contribute 63.4% with a GDP of R70.7 million. As the input structure was used with the SAM input-output distribution to the various sectors and added to the inverse matrix process, which is part of the modelling process, the indirect and induced GDP distribution is allocated to the different sectors. It is shown in the GDP contribution that agriculture is the largest contributor due to the direct impact. The second highest is in the financial and business sector with almost 13.3%. That is due to the farm implements the contractors use and also the other inputs such as fuel, fertiliser and chemicals that are needed for the sugar-cane production, which are allocated to that sector. The third highest sector, where the sugar-cane farming sector has an effect on the economy, is on the electricity and water sector with 6.6% followed by the transport and communication sectors. However, as sugar-cane farming is a primary sector, all the costs paid to deliver sugar-cane contribute to the economy by analysing the backward linkages effect of the cane produced. It shows therefore that the production from the number of farms of the SSGs in Mpumalanga assists in other sectors of the economy as well. For example, as the sugar-cane farming sector uses fertiliser, the indirect impacts of R2 million refer to the activity (paying of salaries and wages; and profit generation) that occurs in the fertiliser industry as well as the sectors that provide materials to the fertiliser industry. Fertiliser is reflected in the manufacturing sector. The induced impacts such as additional salaries and wages lead to an increased demand for various consumable goods that needs to be supplied by other sectors of the economy that have to raise their production in tandem with the demand for their products and services. R4.9 million is reflected in the manufacturing sector of which the fertiliser industry forms part.

5.3.2 Employment

Table 5.15 below indicates the direct impact of the SSG and LSG growers groups using the labour/ha ratio of 0.28 for the SSGs and 0.18 for LSGs when they used dragline irrigation. Contributions to the direct employment of Mpumalanga between the SSGs and the LSGs are respectively 27% and 73%. That entails only the on-farm labour use per hectare regardless of the labour used, whether it was contract or labour hired by the farmer.

Table 5.15: Direct labour impacts 2007 season (Numbers, person days)

Season	SSGs	LSGs	Total
2006/07	2 551 (27%)	6 908 (73%)	9 459

Source: Author's calculations

Table 5.16 below indicates not only the direct contribution of the SSGs, but also the indirect and induced effects the sector creates. The sector creates 142 indirect as well as 130 induced job opportunities which brings the total of job opportunities by the SSG farming sector to 2 823.

Table 5.16: Labour impacts of the SSGs' contribution (2007 season)

No.	Economic sector	Direct impact (R mil)	Indirect impact (R mil)	Induced impact (R mil)	Total impact (R mil)	Percentage (Total)
1a.	Large-scale sugar-cane farming	–	18	0	18	0.6
1b.	Small-scale sugar-cane farming	2 551	7	0	2 559	90.6
1c.	Other agriculture	–	5	24	29	1.0
2	Mining	–	3	1	5	0.2
3	Manufacturing	–	11	25	36	1.3
4	Electricity & water	–	17	3	20	0.7
5	Construction	–	12	13	25	0.9
6	Trade & accommodation	–	23	19	42	1.5
7	Transport & communication	–	6	9	15	0.5
8	Financial & business services	–	39	24	63	2.2
9	Community services	–	1	10	12	0.4
	Total	**2 551**	**142**	**130**	**2 823**	**100.0**

Source: Author's calculations

5.3.3 Household income distribution

The impact on households represents the income the public received from the 'kick' or exogenous stimulus when blended into the economy. The income distribution for the different study groups is shown in Table 5.17 below.

Table 5.17: Income category per annum equal to specific percentile (2007 season)

Income groups	Percentile	Annual income category per household (2007)
Low	P1 – P8	No income – R 25 600
Medium	P9 – P10	R 25 601 – R 102 400
High	P11 – P12	R 102 401 – R 204 801 or more

Source: StatsSA, 2007

The income distribution reflects the percentiles. The income categories are divided into low income households in the P1 to P8 range; medium-income households at P9 and P10 and high-income households at P11 and P12. This distinction was decided upon by a panel of members of Conningarth Economists and the DBSA in 2009 as it was previously divided as follows: P1–P4 as low, P5–P8 as middle and P9–12 as the high income group, for representation purposes.

By applying the closed matrix as an iterative process, the portion of the production allocated to households is estimated. The closed matrix includes the activities, commodities, labour remuneration, capital payments and households. The open matrix is used to determine the induced and indirect effects in the economy while the closed matrix determines the household distribution. The figure below demonstrates the different income groups for 2007.

Table 5.18: LSGs and SSGs income distribution (R mil, 2007 season)

Year	LSGs	SSGs	Total
Low	R 125.0	R 25.6	R 150.5
Medium	R 44.3	R 8.1	R 52.3
High	R 93.1	R 16.3	R 109.4
Total	**R 262.3 (84 %)**	**R 50.0 (16 %)**	**R 312.3**

Source: Author's calculations

Table 5.18 shows that the disposable income created by the SSGs is 14% compared to the 84% of the LSGs.

Figure 5.2 below shows the distribution of income generated by the SSGs to the different income groups. Of the total number of farmers, 51% of the income was channelled to the low income group.

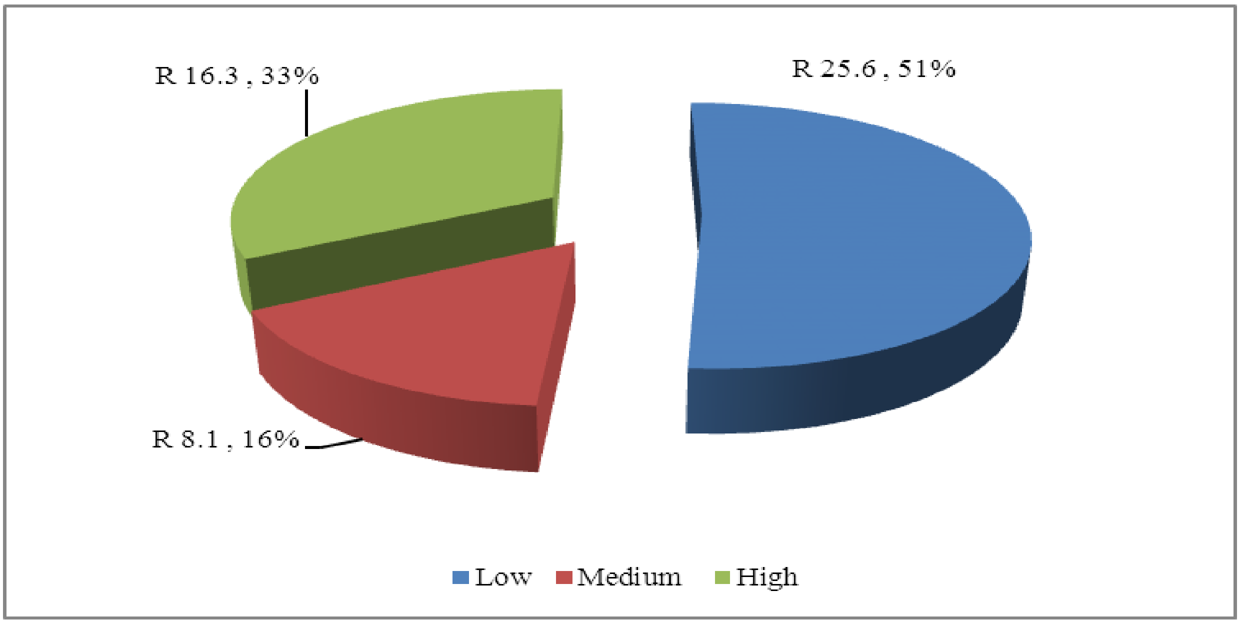

Figure 5.2: Distribution of disposable income of SSGs (2007 season, R mil, %)

Source: Author's calculations

The next section will identify whether the technique in splitting the sugar-cane farming in unique grower groups have resulted in different results comparing the combined results to the original structure of the SAM with only the sugar-cane farming sector compiled.

5.4 COMPARISON OF SAMS

The 2006 SAM showed the sugar-cane farming fraternity as one group only. For the purposes of this study the sector was divided into large-scale sugar-cane farming and small-scale sugar-cane farming sectors. Table 5.19 below shows the outcome for the two groups in the different economic sector structures.

Table 5.19: Comparison of original SAM and expanded SAM during the 2007 season

Indicator	SAM	Total sugar-cane farming impact	Direct sugar-cane farming impact	Indirect sugar-cane farming impact	Induced sugar-cane farming impact
GDP (R mil)	**Original**	**627.10**	**446.80**	**112.30**	**68.00**
	LSG and SSG sectors split	**659.63**	**441.34**	**112.98**	**105.31**
	LSG	547.85	370.64	88.79	88.42
	SSG	111.78	70.70	24.19	16.89
Labour (Numbers)	**Original**	**8 908**	**7 618**	**558**	**733**
	LSG and SSG sectors split	**10 987**	**9 457**	**718**	**809**
	LSG	8 164	6 908	576	679
	SSG	2 823	2 551	142	130
Income Households (R mil)	**Original**	**304.80**	Not Applicable		
	LSG and SSG sectors split	**312.30**			
	LSG	262.35			
	SSG	49.96			

Source: Author's calculations using the original 2006 MP SAM and the expanded MP SAM

The following reasons for differences in Table 5.19 are discussed below:

1. The original SAM used the agricultural census and additional structures for calculation as the specific structures used for the LSG and SSGs as the split of the sugar-cane sectors were built from LSG and SSG production budgets for the 2006/07 season.

2. The direct labour labour/hectare ratios were also interpreted differently as the dragline labour requirements of 0.28 labour/ha for the SSGs and 0.18 labour/ha for the LSGs. The value of 0.16 labour/ha for the centre pivot irrigation system was used to determine in the impacts of the total sugar-cane farming group.

A more detailed representation of the grower groups assists in better distinction. Splitting the two sugar-cane groups into LSGs and SSGs made it possible to differentiate the GDP and Labour effect. The lower GDP for the SSGs impact can be attributed to the Gross Operating Surplus (GOS) consisting of Net Profits, Interest on Loans and Depreciation. For example, their overuse of labour per hectare for irrigation caused higher fixed costs and thus reduced the profits of the SSGs.

Table 5.19 above, also indicates that the SSGs have estimated economic contributions to total GDP, total labour and distribution of household income of respectively 17%, 26% and 16% in the sugar-cane farming sector. It does therefore suggest that essential interventions to counter the declining trend of the SSGs have to be explored. Interventions to consider as shown in previous analyses were the increase of land size for growers to at least ten hectares, more emphasis to be placed on better soil management and therefore more efficient application of fertiliser. With an increase of land size the irrigation labour is also better utilised and as higher labour productivity became noticeable. It is also an option for growers to rent out land or seeking other job opportunities for growers if they are not enthusiastic about sugar-cane cultivation. The other interventions for the SSGs are to form a co-operation such as Langeloop II where the individual projects are combined and the beneficiaries have the potential to be much more successful than only the farming on seven hectare cane fields.

To analyse the portion of the production impact of the SSGs as well as the LSG in the Mpumalanga Province, the following table is compiled by using the SAM.

Table 5.20: Production impact distribution and direct labour multiplier 2007 season

No.	Economic sector	Production distribution (%)	Direct labour multiplier (Number/R mil)
1a.	Large-scale sugar-cane farming	0.12	10.7
1b.	Small-scale sugar-cane farming	0.03	19.0
1c.	Other agriculture	4.20	7.13
2	Mining	15.11	1.46
3	Manufacturing	38.06	1.39
4	Electricity & water	5.07	0.95
5	Construction	3.86	10.39
6	Trade & accommodation	9.22	12.24
7	Transport & communication	8.88	2.43
8	Financial & business services	10.73	3.43
9	Community services	4.74	5.12
	Total	**100**	**3.60**

Source: Author's calculations using the expanded 2006 SAM; Multipliers adapted from, Conningarth, 2008

The sugar mills' production is calculated as part of the manufacturing sector. The actual sugar-cane farming's production distribution is only 0.15% of the production distribution of the whole Mpumalanga Province. Although the SSGs have the lowest production distribution of all the sectors, its value to the community cannot be under-estimated. It is the backbone of the local community (Armitage cited in Tsb Sugar) with a multiplier of 19.0 in the 2006/07 season, the highest direct labour multiplier in the whole of Mpumalanga. Therefore, if only the production distribution is taken into account, the hypothesis that the SSGs is an important and essential part of the Mpumalanga economy and that there economic contribution is critical to the region, can be rejected. However, those traditional authorities who were transformed from subsistence farming to producing sugar-cane actively take part in the supply chain and offer a substantial contribution to the creation of employment opportunities. In this regard, the hypothesis can be confirmed.

5.5 SUMMARY

This chapter described the contribution of a major farming group, the LSGs, as well as that of the SSGs in Mpumalanga. Budgets were examined to determine the impacts from 2007 to 2010. This was expressed as different levels of impact, such as direct, indirect and induced, according to the economic indicators GDP and employment, as well as the way the production of sugar-cane influences the different income households. Splitting the two sugar-cane sectors provided more detail on the behaviour of the two different groups and their different characteristics.

When considering the production magnitude of the SSGs of only 0.03% of the total for Mpumalanga Province, the fourth hypothesis can be rejected. Other sectors contributed much more (Figure 5.19). However, to assess the real importance of the SSGs, other factors besides production magnitude should also be considered. A major contribution of the SSG sector is amount of labour opportunities they offer. The magnitude of contribution is small in terms of a financial or even a purely economic consideration. However, for the local community the opportunity given by the NIEP to plant sugar-cane did initiate the rural community into the sugar-cane supply chain of not only the local community, but support Mozambican households as well. It provided rural development opportunities, which contributed to the economy in Mpumalanga.

However, if the farmers would decide to use the land for other subsistence farming practices again, they would weaken the sugar supply chain and risk losing other economic activities, such as spaza shops and equipment stores, a development which could make them slip back into severe poverty. The conclusion therefore is that the SSGs are an important and essential part of the Mpumalanga economy and make a critical economic contribution to the region.

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 INTRODUCTION

Mpumalanga Province has two sugar-cane grower types of which one group can be identified as the large scale sugar-cane growers who were there since the origin of the Malelane mill in the 1960's. The other group can be identified as the small scale growers (SSGs). They were mainly from the SiSwati tribal authority which was given opportunities by Tsb Sugar from the early nineties to deliver sugar-cane to the Malelane and Komati mills. These growers had a lack of education and low literacy levels. The SSGs' opportunities were improved by the building of the Driekoppies Dam (completed in 1997) to add water assurance to their 7 200 ha of sugar-cane. They received considerable assistance from government as well as from the private sector in establishing their farms. The assistance was in the form of land, equipment and implements, financial assistance, training programmes and extension services. These programmes and services still continue, but despite these structures/efforts there has been a gradual downward trend in sugar-cane yields.

6.2 SUMMARY

Four hypotheses were identified to test the financial sustainability and socio-economic contribution of the small-scale growers in Mpumalanga Province, namely:

1. There exits an inverse relationship between farm size and land productivity amongst sugar-cane growers in Mpumalanga.
2. Land productivity has declined amongst small-scale sugar-cane growers in Mpumalanga and not so amongst large-scale growers (LSGs).
3. The performance of SSGs in the 2009 season indicates financial sustainability.

4. The small-scale growers (SSGs) are an important and essential part of the Mpumalanga economy and make a critical economic contribution to the region.

To address these hypotheses, a number of different analyses were executed. Partial productivity analyses using regression analysis to determine the signs of the coefficients as well as the significance of the sample for land productivity were specifically conducted to test the first hypothesis. Land productivity was discussed in partial productivity analyses using a sample of SSGs and LSGs in 2009. A comparison was made of LSGs and SSGs average yields in the first decade of the twenty first century with specific focus on 2002, 2007 and 2011 production seasons. As labour is part and parcel of any agricultural activity, labour productivity and especially the effect of irrigation labour was examined. A fertiliser productivity analysis was also performed to determine whether the allocated amount of fertiliser will increase the average yields. Irrigation system efficiency was evaluated to identify the advantages of irrigation technology such as drip irrigation technology versus dragline irrigation technology. In addition, profitability levels of different farm size groups of the Mpumalanga SSGs in 2009 were analysed, as well as those of individual growers compared to the Mpumalanga SSGs of the Mbunu B project. A production analysis of a sample of SSGs for the 2009 season was performed.

These analyses all contributed towards testing the possible existence of an inverse relationship between farm size and land productivity. Additionally the NFI/ha as well as per annum was evaluated. A breakeven analysis comparing profit of a sugar farmer against other employment opportunities was also conducted. This was conducted to identify whether the growers would be better off leaving their land and become minimum wage workers on a farm, an employee in the hospitality sector or even in the mining sector, or whether to continue farming. Analyses were executed to project how the RV-price would increase or decrease to equal the salary (earnings) of the minimum wage of the chosen sectors to the small-scale sugar-cane growers' annual net farm income in 2009.

The final method used was a macro-economic study to determine the impact of the SSGs on the economy of Mpumalanga Province. This was determined by using the SAM of which the closed and open inverses could be derived by using the Leontief Matrix to determine indirect and induced impacts. Direct impacts as well as the sugar-cane multipliers were derived from the production budgets as well as the use of the SAM-structure. To determine the different sugar-cane grower groups' unique contributions to the Mpumalanga economy, the original Mpumalanga SAM's sugar-cane sector was divided into a small-scale sugar-cane farming sector as well as the large-scale sugar-cane farming sector. The macro-economic impact indicators consisted of GDP, full-time equivalent labour opportunities and also how disposable income was distributed to the low, medium and high income groups of the Mpumalanga sugar-cane farmers.

Data was gathered from literature studies, internet searches and annual reports. Interviews with stakeholders in the sugar-cane industry in Mpumalanga were important sources of data and also a useful directive, especially when verifying the historic, present and future situation of the improvements or flaws of the SSGs.

6.3 CONCLUSIONS

The empirical testing of the first hypothesis established that there is mostly a positive relationship between farm size and land productivity. There have been instances where the grower groups between 50.1 and 200 ha have an inverse tendency, but the majority of the growers in the sample size of 211 signified a positive relationship. Therefore, this hypothesis was not conclusive, but lend towards rejection of the hypothesis. When analysing the production budgets of the SSGs in particular growers groups, the farm size group with less than three hectares had the highest average yield. However, it lost its ranking when the annual NFI was compared to the other groups although the latter had lower average yields. In addition, average yields are not the only factor to be compared in relation to farm size, but the NFI per farm is even more critical to consider when determining a financial sustainable overview. Therefore, the first hypotheses were rejected.

The second hypothesis can only be partially confirmed as both the SSGs and the LSGs showed a declining trend for the period from 2001 to 2009. The trend for the SSGs was however worse than for LSGs. Reasons for the difference was that the LSGs' general and irrigation management was more efficient. Other factors were a low literacy rate and lack of knowledge regarding farming practices and incorrect use of fertiliser. Contributing factors to farmer sustainability (or lack thereof) are politics on a family level but also the support from the project committees to the growers, which plays a large social role and which influence project decision making if agreement can't be reached for certain necessary actions.

The third hypothesis resulted in evidence that suggests that the SSGs on average in 2009 season was perhaps above the breakeven level of 60 t/ha when assessing land productivity, but under-performing when they were compared on an NFI per annum as well as on a scenario of living costs requirements. The hypothesis was therefore rejected on those grounds.

The findings confirmed the fourth hypothesis. The SSG sector is indeed an important and essential part of the Mpumalanga economy and makes a critical economic contribution to the region primarily because of their contribution towards labour creation. Although their contribution to the economy of the whole province is minor, their contribution to the Nkomati region is major. As part of the supply chain, the SSGs add value to the whole social structure of the region. If they would disappear, many job opportunities would disappear as well and poverty will increase.

6.4 RECOMMENDATIONS

The findings of this study broadly suggest that small-scale sugar-cane farming in Mpumalanga renders a positive contribution to the community but this contribution can be improved. The following recommendations suggest actions for such improvements.

1. Expansion of empirical testing should be considered. A total factor productivity analysis that include variables such as land quality, different ownership models (rental or ownership of land), labour (own or hired labour) and education levels can be carried out. These analyses can be extended to different crops and regions which have to include small and large-scale farming. As this study was performed for a specific time period, the macro-economic contribution with an updated base year for the Mpumalanga SAM is also recommended for future research.

2. As these SSGs are emerging growers that do not necessarily have the support structures that large-scale farmers are equipped with, policies or programmes that can lead to decrease in profit will have to be negotiated carefully. An example of such a

programme that can have a negative impact is one that evolved from the National Water Act (Act 36 of 1998) which could lead to additional pressure on the South African Sugar industry[7].

3. A recommendation to the sugar-cane community, specifically for unsuccessful growers, or growers who do not want or can afford to farm anymore, is to consider letting or selling their farms and find alternative employment. This would provide the option for growers that are financially sustainable to expand their farms to earn a higher annual income than can be made on only seven hectares or less.

4. For those growers that still have the enthusiasm to produce their own sugar-cane, the current support structures will have to continue and be improved where possible. The Farmer Support Programme as originally set out in the Nkomazi area, later continued with the NIEP that focused on sugar-cane production, has to be maintained. Other support structures that play an active role in the SSGs' daily operation still have to receive the necessary funding and other much needed assistance. These structures are the Cane Growers' Association, Tsb Sugar, Akwandze Agricultural Finance as well as the extension services. Capacity building of growers to improve literacy levels and knowledge of farm management is also recommended. The organisational structures in the projects themselves regarding the project committee and chairperson have to be monitored and intervention measures developed where inefficient management of a project occurs.

5. A further recommendation to the sugar-cane community is to consider a co-operative system. The ultimate goal will be a system where costs can be shared to take advantage of economies of scale as well as optimised levels of efficiency to increase productivity. Such a possibility has been initiated by Tsb Sugar and the grower project Langeloop II. It has been planned that the project will be run as a single economic unit where the farmers will receive dividends in proportion to their farm size, be able to have more bargaining power for purchases such as fertiliser. This is an intervention that reaped awards in the 2011 season which is an example which might contribute to

[7] Cf Chapter 3.3.2

the development of small-scale sugar-cane production on the one hand with commercial management practices of large-scale sugar-cane farmers on the other.

6. In general, it must be remembered that although small-scale growers aren't all financial sustainable, they do provide an economic contribution in Mpumalanga and especially in the Nkomazi area. Continued research regarding the financial sustainability of small farms in South Africa other parts of the world is therefore recommended in assessing whether a small-scale farming approach or large-scale farming approach will be best suitable for rural development.

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