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A farm survey of small-scale sugarcane growers in Nkomazi, Mpumalanga province, South Africa

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Abstract

Against a context of declining sugar output in South Africa as a whole, the sugar industry in the Nkomazi Municipality of Mpumalanga Province has increased its share of the South African market. It has achieved this despite the transfer of at least 25 per cent of land growing sugarcane into black community ownership through South Africa's land reform programme. The industry now claims that the majority of land used for sugar cane in Nkomazi is owned by the beneficiaries of land reform. This paper describes a survey of small-scale sugar-cane growers. It presents quantitative data that shows, on the one hand, a process of land concentration and 'accumulation from below', visible in the emergence of medium-scale growers, and, on the other hand, a move by the sugar milling company to take more direct control of sugarcane growing through rental agreements with small-scale land-owners. The paper examines the causes and implications of these processes. It concludes that the pattern of small-scale sugar-cane production designed two decades ago has arguably benefitted and transformed the prospects of the small-scale growers and their children, but whether it can now evolve to provide a platform for agricultural livelihoods for a new generation remains to be tested.

Keywords

South Africa, Sugar industry, small-scale farmers, land reform, contract farming.

Acknowledgement

The authors wish to acknowledge the contribution to this research of many people in Nkomazi. In particular we wish to thank the staff at Transvaal Suiker Bpk, Akwandze, LIMA, Agriwiz and Mpumalanga Canegrowers for their generosity and professionalism in making time available for discussion, in providing data and in other assistance to help us achieve our research objectives. We wish also to acknowledge the contribution of the Mill Cane Committees at Malalane and Komati, SSG project secretaries and the more than one hundred and twenty small-scale growers who took part in farm surveys or interviews. Finally we thank Zinhle Mhlanga, Phindile Ndlala and Sertorio Mshothola for their invaluable contribution to the fieldwork we report here.

1. Background

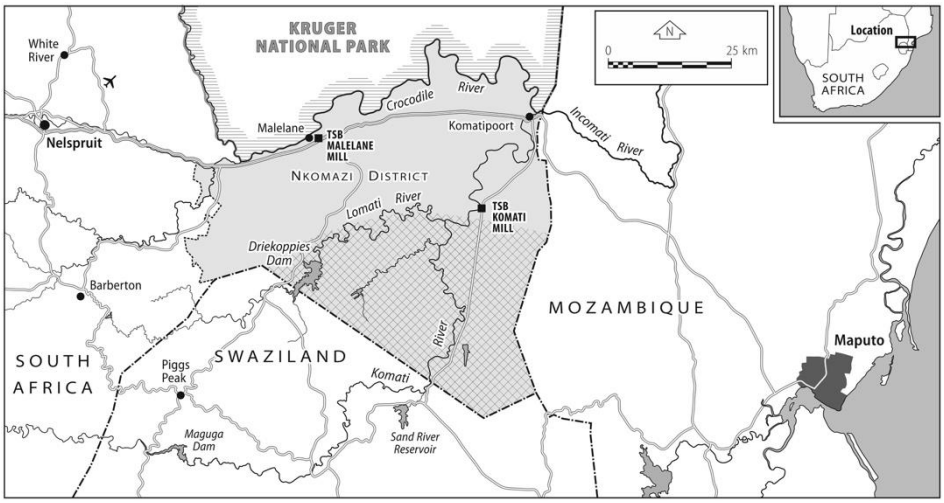
1.1. The Nkomazi Sugar Industry

The sugar industry was established in the lowveld 'Onderberg' area of the then Eastern Transvaal in the 1960s, with the construction of a sugar mill by Transvaal Suiker Bpk (TSB) at Malalane, some 60km east of Nelspruit, and 1km south of the Crocodile River that forms the southern boundary of the Kruger Park. It is distinctive in the South African context because it is entirely based on irrigated production, whereas the longer-established industry in KwaZulu-Natal is predominantly reliant on rainfall. Expansion of commercial sugarcane growing in the 1970s was associated with the establishment of the KaNgwane 'homeland' to which much of the black population was removed and resettled.

Small-scale sugarcane growing by black producers to supply the Malalane Mill was begun in 1983 in the Nkomazi area of KaNgwane (roughly 2500ha between the Swazi frontier and the Lomati river), and then expanded (a further 7000ha was planned) through the Nkomazi Irrigation Expansion Scheme (NIEP) associated with the construction of the Driekoppies Dam in the mid-1990s with funding from the Development Bank of Southern Africa (DBSA), and construction of a second sugar mill south of Komatipoort. A final expansion (1300ha) of irrigated sugarcane production by small-scale growers was funded by the Land Bank in 2003-2005. Small-scale sugarcane production was organised in the form of 'projects' of between 150 and 250ha in which individually-farmed plots of between two and ten hectares were irrigated using shared infrastructure (pipes, pumps and weirs) to deliver water from the Lomati or Komati rivers. By 2010, small-scale growers were farming about 10,000ha, or a quarter of the total area of sugarcane, and contributed 13% of the total sugarcane harvested and delivered to the mills at Malalane and Komati. Table 1 summarises the phases of expansion of small-scale sugarcane production.

Nkomazi District

(shaded area: hatched portion was previously administered as KaNgwane homeland)



The expansion of small-scale production has taken place against a backdrop of profound political change. The end of apartheid government and constitutional reform in 1994 was followed by a re-structuring of local government. The 'homeland' administration of KaNgwane was dismantled and transferred to the new Provincial government of Mpumalanga in Nelspruit. The 'communal areas' were incorporated together with the commercial farming of the 'Onderberg' into Nkomazi Local Municipality, with a population of 393,000 (2011 census[1]). Since 1998, the South African government embarked on a programme of land reform intended to redress historical disadvantage. The programme consisted of three elements: restitution, redistribution, and land tenure reform.

Restitution was intended to restore land to people who had been evicted from land since 1913 as a result of government policy. If upheld by the Land Claims Court, restitution claims would be settled either by cash compensation from the state, or transfer of land ownership following state purchase from the existing land owners. The commercial farming areas of Nkomazi District have been the location of some of the largest of such restitution transfers, with over 61,000ha of land claims settled in 2008. The progress of production on farms claimed under restitution is the focus of Working Paper 2 of this study. Redistribution involved government-assisted purchase of white-owned farmland by black farmers on a 'willing buyer – willing seller' basis. When first started in the early 1990s Settlement and Land Acquisition Grants (SLAG) were issued to individuals who generally had to pool their grants in order to purchase a medium-scale commercial farm. In 2001 the SLAG was replaced by the Land Reform for Agricultural Development (LRAD) scheme which provided larger grants to enable existing commercial farms to be acquired by individuals. Since the Land Summit in 2005, two further schemes were launched that enable government to be more proactive in acquiring land for subsequent lease to black farmers.

While the processes of land restitution and land redistribution have taken place largely in parallel with the continuing development of small-scale sugarcane projects, there have been effects and interactions, notably in the move of a small number of small-scale growers into medium-scale production, and in the application of the industry's experience in restitution projects to the evolution of support to small-scale growers. We return to these particular issues in the final section of this report.

1.2. Evolution of support to small-scale sugarcane growers since 1994.

The first small-scale sugarcane schemes were established and managed in the 1980s by Agriwane, a parastatal organisation of the KaNgwane government department of agriculture. Although the NIEP was initiated during the period of KaNgwane administration, by the time of its completion Agriwane had been wound up and its functions had been transferred to the Department of Agriculture of the newly-formed Provincial Government of Mpumalanga, in Nelspruit. In practice, the capacity of Provincial agricultural department staff to provide technical support to small-scale

[1] http://beta2.statssa.gov.za/?page_id=993&id=nkomazi-municipality

sugarcane growers proved limited. By 2000, technical and business advisory services were increasingly being provided by TSB's own staff, including engineers and extension workers. Of particular significance is the provision of an advisory service on pump maintenance for which farmers do not pay. The collapse of the sugar industry credit scheme in KwaZulu Natal (FAF, later renamed Umthombo) in 2000 meant that the Mpumalanga industry had to set up its own credit system (section 5, below), but access to credit for small-scale growers in Nkomazi was maintained largely without interruption during this transition.

Table 1: Construction phases of projects, current registered area, and area harvested 2011-12

	Project	Construction phase and nominal area (ha)			Area harvested 2011-12*	Active growers 2011-12*	Average area per grower (ha)
		Agriwane 1980s	NIEP 1994-8	LandBank 2003-5			
Komati Mill	Figtree A (HOYI)	256.6			224.7	16	14.0
	Figtree B	241.3			211.4	20	10.6
	Figtree C	426.5			402.5	54	7.5
	Figtree D		407.4		399.5	79	5.1
	Lugedlane/Shinyokane	342.6	197.2		441.6	39	11.3
	Madadeni		422.6		311	42	7.4
	Mangweni	131.5			17.6		
	Mbunu B		392.1		365.5	63	5.8
	Mfunfane		333.9		288	43	6.7
	Sibange		381.2		305.6	42	7.3
	Spoons 7		240.9		222.4	28	7.9
	Spoons 8		628.7		483	63	7.7
	Walda		839.8		673.3	69	9.8
	Mbunu C		157.4		155.6	25	6.2
	Mangane		152.1		135.5	15	9.0
	Spoons 7B		93.8		78.3	10	7.8
	Phiva**			250.8	90.7		
	Mzinti**			285.8	14.9		
	Ntunda**			313.9	33.4		
	Sikwahlane**			400.1	60		
	Magudu**			427	0		
	Ntunda B **			45	0		
Komati Mill Total	7368.2	1398.5	4247.1	1722.6	4914.5	608	
Malalane Mill	Boschfontein 1		249.1		0		
	Boschfontein 2		128		0		
	Buffelspruit	232.4			171.6	27	6.4
	Langeloop I		426.5		356.5	50	7.1
	Langeloop II			299.3	0	reorganising as coop***	
	Mbongozi		178.9		111.8	22	5.1
	Middelplaas	68.4			46.2	9	5.1
	Ngogolo	591.4			510.1	70	7.3
	Nhlangu East		136.6		71.7	34	2.1
	Nhlangu West		122		89.5	39	2.3
	Schoemansdal		92.9		52.8	9	5.9
	Tikhontele		314.1				
	Vlakbult		43.2		43.3	2	21.7
	Zelpy				87.1	18	4.8
Malalane Mill Total	2882.8	892.2	1691.3	299.3	1540.6	280	
Total	10251	2290.7	5938.4	2021.9	6455.1	888	

** data from Mpumalanga Canegrowers*

*** data for areas harvested in 2011-12 from TSB*

**** Partial write-off (interest due) on Land Bank loans followed by rehabilitation as cooperative and imposition of R10 per ton levy to repay loan capital.*

Despite the increase in resources being made available by TSB, by 2011 it was apparent that small-scale growers were experiencing difficulties in maintaining levels of cane production and covering their costs, and only about 60% of the 10,000ha notionally available was harvesting cane annually (Table 1). As part of a broader investigation into the contribution of sugarcane to the livelihoods of people in Nkomazi, a sample survey was designed to obtain data on the current status and trends in sugarcane production by small-scale growers.

2. Survey Design

The purpose of the survey was to provide an analysis of the small-scale grower production system and to identify factors that distinguish those growers that were more successful from those that appeared to be failing. The sample was generated from a list of growers supplied by TSB extension services. Although this list was found to be not entirely up to date - some growers interviewed appeared not to be on it - such cases were rare, and we believe the list included the great majority of 'active' small-scale growers with contracts to deliver cane. There are 1,243 registered small-scale sugarcane growers in Mpumalanga. In 2011-12 there were 888 growers who Mpumalanga Canegrowers recorded to have delivered cane (Table 1). Of the 355 not registered as delivering cane, the majority were farmers who carried over their cane to the following season (did not harvest in time before the mill closed or replanted their field and therefore skipped a harvest season). Others had abandoned their fields, although a small number continued deliveries TSB of cane harvested from projects that had effectively ceased operation, as in a number of 'Land Bank' projects (Table 1).

The TSB list contained 920 growers, from which a sample of 120 was selected. In total 112 questionnaires were completed, of which two were duplicates (different plots of the same grower) and another was excluded as insufficiently complete. This provided sample data for 109 growers, or a sample of 11%.

The sample was constructed according to the following criteria:

a. Distribution of growers between cane mills:
   1/3 Malalane (40 questionnaires);
   2/3 Komati (80 questionnaires).

b. Projects:
   The selection of projects was made using criteria of: average area per grower; and average cane yield (tons per ha). These data were obtained from CANEGROWERS for each project. The selection of projects, and the number of growers sampled in each project, reflects approximately the proportions in the total population of growers, as defined by these project-level characteristics.

c. Productivity level of each grower:
The grower lists supplied by TSB classified each grower into 'top', 'medium' or 'bottom' third in terms of cane productivity. The sampling within each project sought to generate a random sample within each of these productivity categories. In practice, there was an over-representation of about 4% in the higher productivity category and an under-representation of 12% in the lowest productivity category. In part, this reflected difficulties in contacting the specific individuals identified for the sample, and their substitution by others. Such substitutions were made, as far as possible, within the same productivity class. This did not always prove possible, and a tendency emerged for more 'available' growers to be in medium or high productivity categories. It also needs to be observed, however, that the productivity categories used in sampling needed further adjustment during data analysis to more accurately reflect sugarcane yields actually attained by the growers in the sample. This adjustment placed 47% of the sample in the 'low' productivity class (see section 5, below).

Table 2: Distribution of sample between projects

Mill and project name	Number of growers*	Percent of total	Number of growers in sample	% of sample
Komati - Figtree C	48	8.3	8	7.3
Komati - Figtree D	58	10.1	10	9.2
Komati - FigtreeB	19	3.3	5	4.6
Komati - Madadeni	45	7.8	9	8.3
Komati - Mbunu B	63	11.0	12	11.0
Komati - Sibange	45	7.8	10	9.2
Komati - Spoons 8	65	11.3	12	11.0
Komati - Walda	69	12.0	12	11.0
Malalane - Buffelspruit	27	4.7	7	6.4
Malalane - Mbongozi	26	4.5	6	5.5
Malalane - Nhlangu W	39	6.8	7	6.4
Malalane - Ngogolo	69	12.0	11	10.1
Total	573		109	100.0

**data from Mpumalanga Canegrowers*

Table 3: Questionnaire sample for different grower productivity ratings

Project name	Grower productivity class			Total
	High	Middle	Low	
Komati - Figtree C	1	1	6	8
Komati - Figtree D	2	6	2	10
Komati - FigtreeB	2	3	0	5
Komati - Madadeni	8	1	0	9
Komati - Mbunu B	6	3	3	12
Komati - Sibange	3	5	2	10
Komati - Spoons 8	2	3	7	12
Komati - Walda	1	3	8	12
Malalane - Buffelspruit	5	1	1	7
Malalane - Mbongozi	0	6	0	6
Malalane - Nhlangu W	3	4	0	7
Malalane - Ngogolo	4	5	2	11
TOTAL	37 (34%)	41 (38%)	31 (28%)	109
Percent distribution in grower population (TSB data)	29.5%	29.9%	40.6%	904

Growers were contacted for interview via the project offices. Generally a project secretary had lists of growers' cell-phone numbers. Interviewing teams also used meetings of project members as opportunities to contact individual growers. Growers were asked to make available cane delivery statements to enable interviewers to verify data on cane delivery, RRV (the 'recoverable value': an index based on sucrose content measured by the mill for each cane delivery and that determines payments made to growers), and the deductions made from payments. Deductions include levies, payments for electricity and water, payments to contractors for cane-cutting, loading and transport, loan repayments and 'retention savings' deducted to provide finance for field costs (fertiliser, labour and herbicide) to grow the following year's crop.

All data were entered directly into questionnaire forms constructed using *SPSS data entry builder* software on a laptop computer. The resulting database was scrutinised for consistency and errors and analysed using SPSS. All participants were asked for written consent to allow the project to seek records of their production in past years from cane delivery records held by the milling company, and records of loans from Akwandze. In all cases this consent was provided, and further data on production (tons per hectare and RRV) for 2008-2013 were obtained from TSB. Data on loans were also obtained for the period 2002-2013. Variables derived from these data were added to the database. Early in the survey process it was recognised that a number of growers had more than one sugar cane plot, registered in different codes with the milling company (eg 123456a, 123456b, 123456c etc). Where the survey identified such cases, production data was requested for all plots held by a single grower. The loan data did not discriminate between different plots, all loans being identified only with a particular grower.

3. Grower profiles

Descriptive statistics show that, of the growers interviewed, three quarters were aged more than 50, and almost equal numbers of men (60%) and women (40%), though the disparity was greater among growers less than 40 years old, where men outnumbered women by 10 to 4.

Table 4: Age and sex of growers interviewed

	Age				Total
	20-30 years	30-40 years	40-50 years	more than 50 years	
Male	3	7	9	43	62
Female	1	3	7	33	44
Total	4	10	16	76	106

Most of those interviewed were the registered grower. However, a number were relatives who worked on the grower's plot, usually relatives who were in the process of taking over the plot from ageing spouses or parents. Nonetheless, the predominance of growers aged 50 or older is worth noting: 69% of male respondents and 75% of female respondents were over 50 years old. Among those respondents (90% of the sample) who were the registered grower, the proportions aged over 50 years old were even higher (80% of women and 75% of men). In contrast, among respondents who were not the registered grower, the proportion who were older than 50 was less than half (47%), with a higher proportion among women (55%) than among men (40%).

Table 5: Relationship of those interviewed to registered grower

Respondent	Number in sample	%
Registered grower	90	82.6
Son/daughter/grandchild	12	11
Wife/husband	3	2.8
Brother/sister	3	2.8
Other	1	0.9

Table 6: Educational level of interviewees

Highest level of school or college education completed		Interviewee		Total
		Male	Female	
	Primary	25 (40%)	20 (45%)	45 (42%)
	Secondary	25 (40%)	16 (36%)	41 (39%)
	Tertiary	3 (4.8%)	2 (4.5%)	5 (4.7%)
	(Missing)	(9)	(6)	(15)
Total		62 (100%)	44 (100%)	106 (100%)

Table 7: Further training experienced by interviewees

Further training	Male	Female	Total
Agriculture	39 (64%)	35 (79%)	74
Business/accountancy	5 (8%)	3 (7%)	8
Total	61	44	105

Educational levels tended to be higher for men (45.2% completing secondary or tertiary) than for women (40.9%), but the difference was not large. More women than men claimed to have received training in agriculture, but for both sexes business training had been experienced by less than 10%. Similarly, sources of income from outside farming did not differ significantly between men and women. As would be expected from the age profile, 54% of women and 42% of men are receiving social grants (pensions).

Table 8: Frequency of non-farm income, receipt of social grants (pensions), and official role in projects among male and female sugarcane growers

Non-farm income	Men		Women	
	N	%	N	%
Income from public or private sector job or own business	9	14.5	8	18.2
Social grants (pensions etc)	26	41.9	24	54.5
Official position in project	21	33.9	23	52.3

4. Changes in land occupation.

A major factor differentiating farmers is the acquisition of additional areas of cane. Areas of sugarcane farmed by individual growers vary greatly from one project to another, averaging from around 2ha per grower in Nhlangu West and East, to 14 ha per grower at Figtree A (Table 1). The average at Vlakbult (21.7ha per grower) is discounted here, since there are only two growers on this 'project'. The survey indicates that a minority of farmers have been adding to their original allocations of irrigated canefields, so that disparities in landholdings are becoming more pronounced. Because the number of growers on each project is diminishing, the average area per grower is increasing, but the increasing areas are concentrated among a minority of growers. These observations are quantified in more detail below.

Overall, the average area farmed by individual farmers has increased by 41% from 6.99ha when growers started their sugarcane production, to 9.89ha in 2012 (note: one of the largest single land acquisitions, of 36ha, recorded in the survey was outside the SSG area, at Kaapmuiden. This is excluded from the figures in Table 9 and Figure 1, which thus refer only to sugarcane land within the Nkomazi SSG projects.

The uneven pattern of land acquisition among small-scale growers may be summarised as follows:

- Thirty-four growers (31.2%) in our sample reported increasing their land area, but these were highly concentrated in particular projects. Some projects (Spoons 8, Madadeni, Mbunu B, Buffelspruit and Mbongozi) showed little or no shifts in average cultivation area per grower (Table 9 and Figure 1).

- While growers reporting further land acquisitions had marginally (9.7%) larger original holdings than those who did not, current average holdings of those who had acquired more land were now more than double (137% larger) the average holdings of those that did not (Table 10)
- The process of land accumulation has accelerated over the past decade: 6/41, or 15% (total 29.4ha) of reported land transactions took place before 2002, 9/41 transactions (22%, totalling 125 ha) took place between 2002 and 2007, and a further 26/41 (63%, totalling 136ha) in the years since 2008 (Table 12).
- Whereas both men and women originally acquired their sugarcane farms overwhelmingly via allocation by traditional authorities, there is some evidence that inheritance is more important to women growers, accounting for 30% of initial acquisitions of farms by women and 20% of acquisitions of additional land . More men than women are acquiring additional land (35% of male growers, compared to 25% of female growers). However, for both men and women, more than half of all land acquisition is via purchases, with loan finance being more important for such purchases by women than by men (Table 13 and Figure 3b).
- The overall proportion of land transactions involving purchase has increased over time (Table 12 and Figure 2.), with an increasing use of loans to make purchases. The average price per hectare of land has also increased, from about R20,000 per ha in 2005, to about R40,000 in 2010 (Table 14 and Figure 4).

Table 9: Cane areas farmed by sampled growers in each project

Project	Growers in sample	Original farm size (ha)	Current area (ha)		
		Mean	Mean	Min	Max
Figtree C	8	7.3	11.9	5.2	23
Figtree D	10	4.6	6.8	3.7	16.5
FigtreeB	5	11	17.7	10.1	23.8
Madadeni	9	7.4	7.5	6.5	11
Mbunu B	12	6.4	7.3	4.5	18.3
Sibange	10	7.1	8.7	6.2	16.3
Spoons 8	12	6.7	6.7	4.5	10.4
Walda	12	9.9	11.9	9.7	19.2
Buffelspruit	7	7.1	7.2	7	8
Mbongozi	5	5.1	5.8	5	7.1
Nhlangu W	7	2.8	3.2	2	5.3
Ngogolo	11	7.9	19.4	4.8	90
Total	108	7.0	9.6		

Figure 1: Change in mean area farmed by growers in the sample projects.

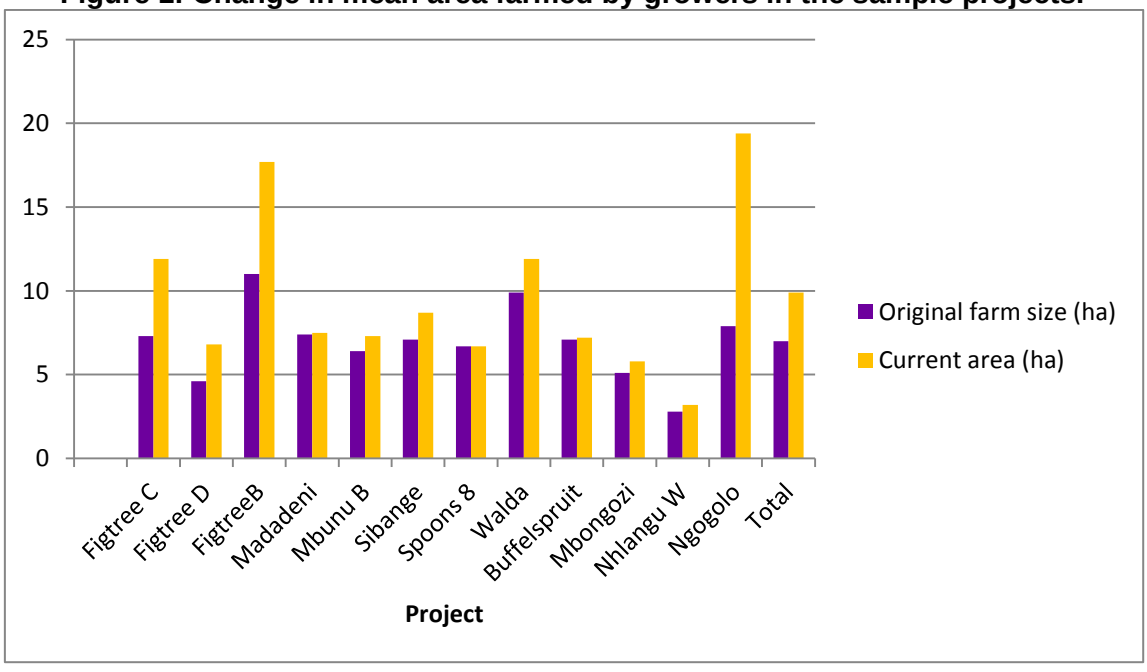


Table 10: Distribution of land between growers who acquire and do not acquire additional land

Growers acquiring land	Number	Original area farmed by growers in sample			Area acquired	Current area farmed by growers in sample		
		Ha	%	Average (ha) per grower	Ha	Ha	%	Average (ha) per grower
No	74	502	66.5	6.78	0	499	47.8	6.74
Yes	34	253	33.5	7.44	291	544	52.2	16
Total	108	755	100	6.99	291	1043	100	9.66

Table 11: Means of acquisition of additional land

	Frequency	%
Allocated (by chief)	15	34.9
Inherited	4	9.3
Purchased	6	14.0
Purchased with loan	16	37.2
Total	41	95.3

Table 12: Year and method of land transactions

		Means of land acquisition				Total
		Allocated (by chief)	Inherited	Purchased	Purchased with loan	
Year of land acquisition	1992	1	0	0	0	1
	1993	1	0	0	0	1
	1995	1	0	0	0	1
	1999	1	0	0	0	1
	2000	1	0	1	0	2
	2004	1	0	0	0	1
	2005	0	0	2	1	3
	2006	2	1	0	0	3
	2007	0	1	0	1	2
	2008	2	1	1	0	4
	2009	0	1	1	2	4
	2010	3	0	1	3	7
	2011	0	0	0	3	3
	2012	1	0	0	4	5
	2013	1	0	0	2	3
Total		15	4	6	16	41

Figure 2: Frequency of different methods of land acquisition on SSG projects 1992-2013

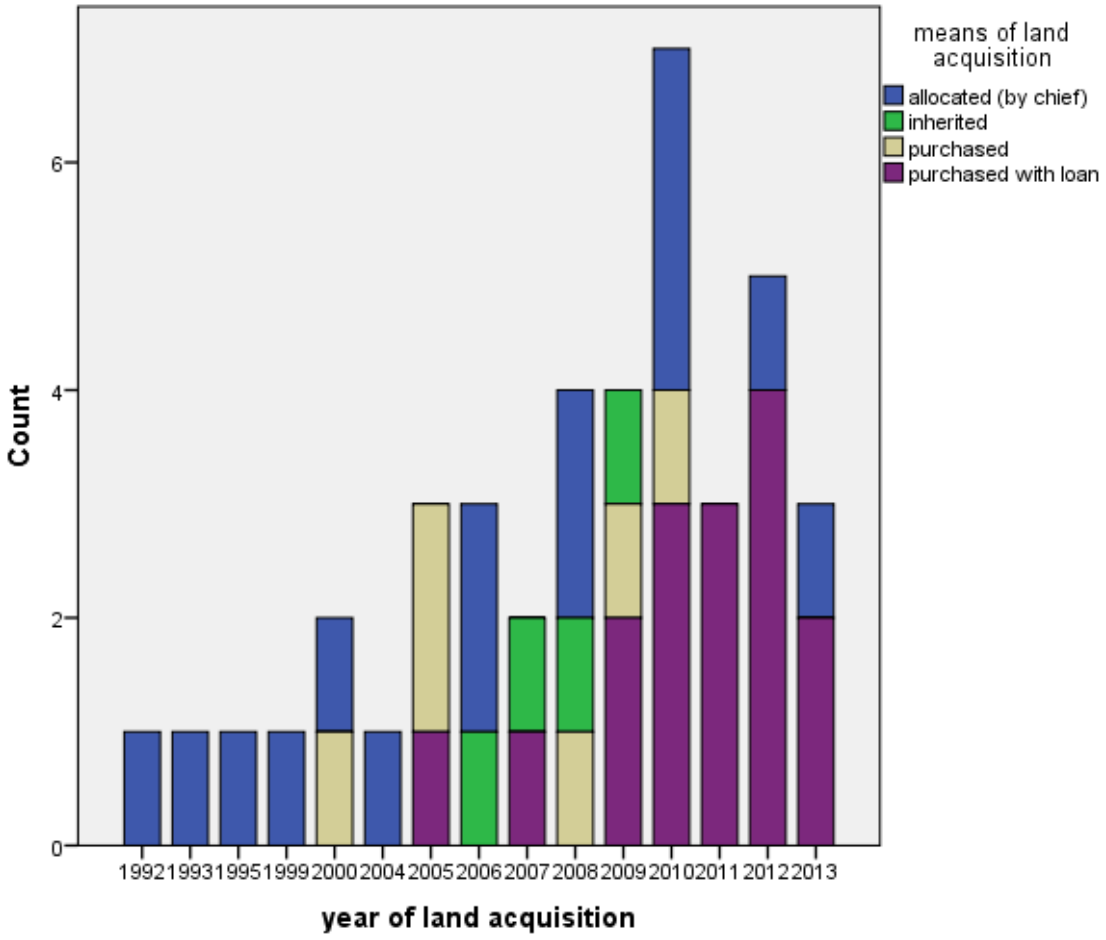


Table 13: Frequency of different modes of land acquisition differentiated by gender of grower

Mode of land acquisition	Original farm		Additional areas	
	Male	Female	Male	Female
Allocation by chief	46	31	11	3
Inherited	13	13	1	3
Purchased	1	0	5	1
Loan purchase	2	0	9	7
Total	62	44	26	14
% of transactions	58.5	41.5	65	35

Figure 3a: Mode of acquisition of original farm according to gender of grower (%)

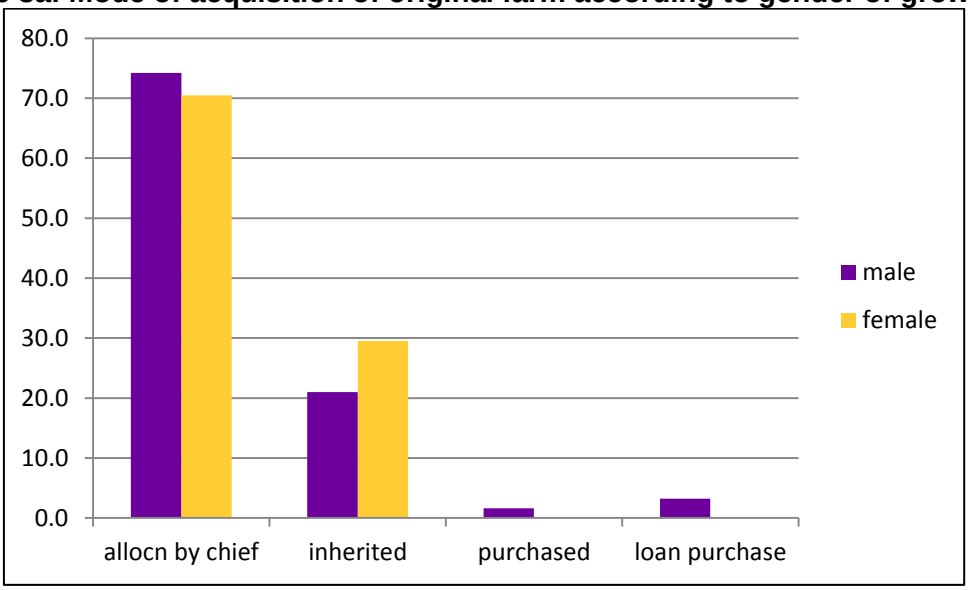


Figure 3b: Mode of acquisition of additional sugarcane areas according to gender of grower (%)

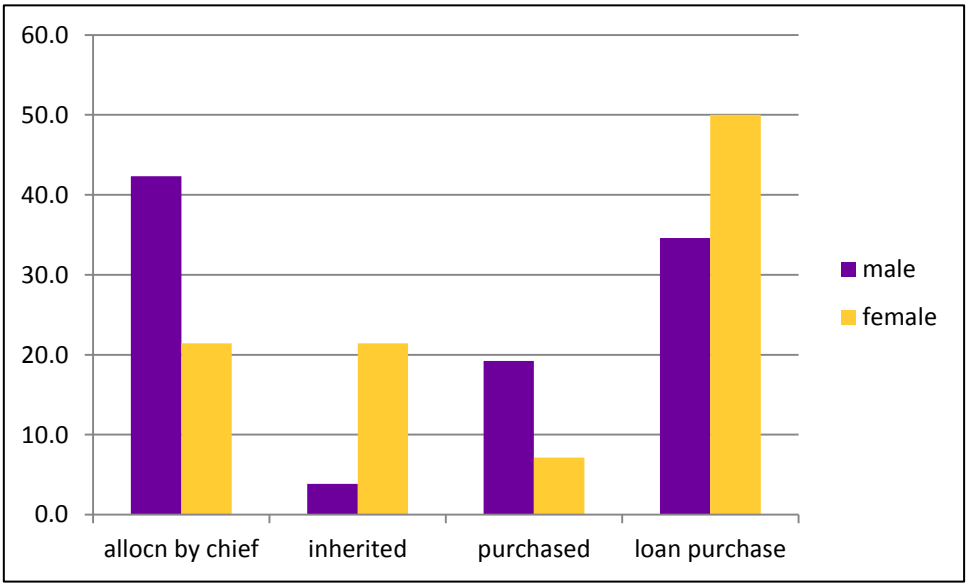
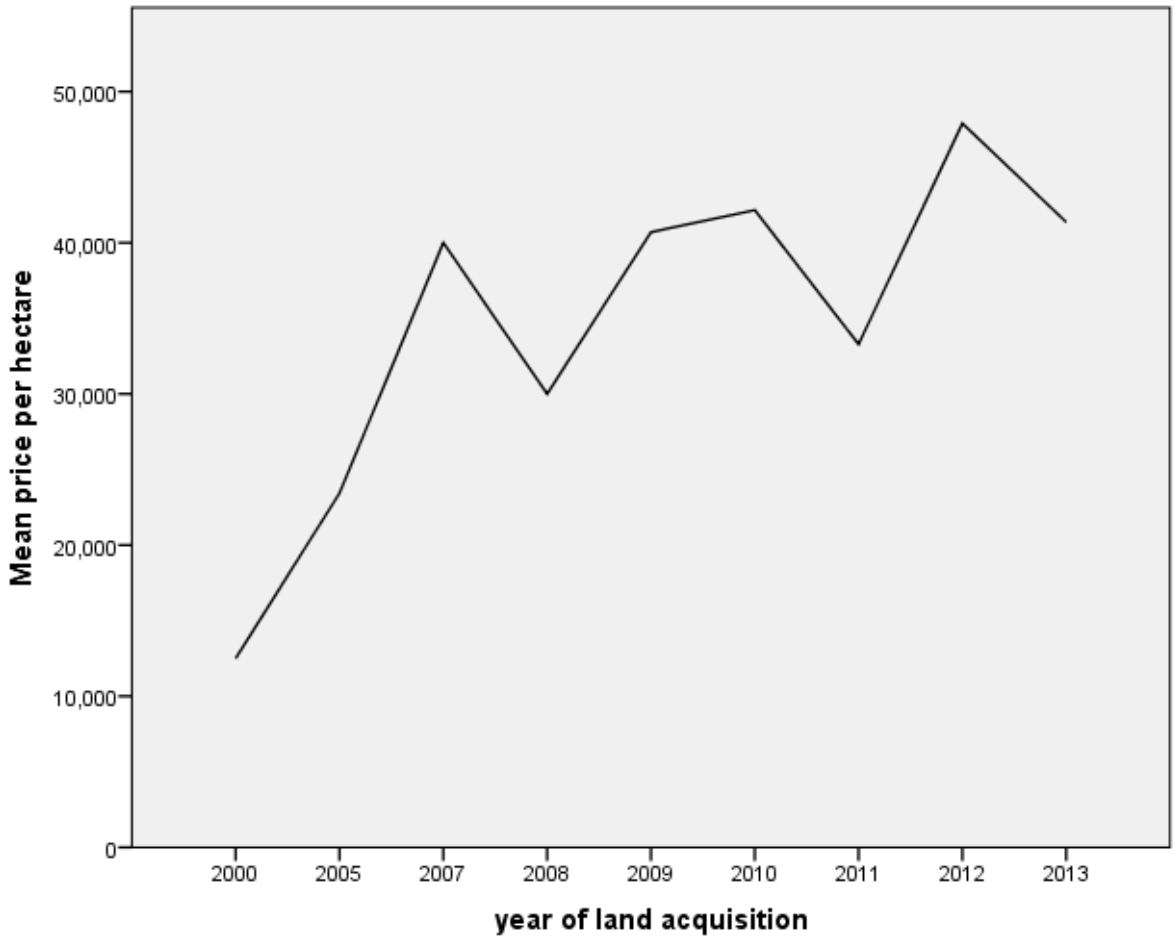


Table 14: Land prices in Rands per hectare (purchase transactions only) for different years

Year of acquisition	Mean	N	Std. Deviation	Median	Minimum	Maximum
2000	12500	1		12500	12500	12500
2005	23440	2	3215	23440	21167	25714
2007	40000	1		40000	40000	40000
2008	30000	1		30000	30000	30000
2009	40701	3	3767	39130	37975	45000
2010	42162	4	20797	37500	22222	71429
2011	33284	3	12834	28750	23333	47771
2012	47894	3	8159	50000	38889	54795
2013	41364	2	20069	41364	27174	55556
Total	37320	20	14159	37737	12500	71429

Figure 4: Average prices of sugar cane fields transferred between growers in SSG projects



Two further observations may be made at this point. Firstly, the land being purchased in these transactions is nominally 'owned' under customary tenure and tribal authority, since all the SSG projects were established on land previously within the territory of the KaNgwane 'homeland'. Although the separate homeland administration has been dismantled, the land tenure system has not yet been formally changed and land users hold their land in the form of a document conferring a 'Right to Occupy" or "Permit to Occupy" (RTO/PTO) issued by a tribal authority. From discussions with survey participants and with others interviewed as part of this project it seems clear that these rights are being traded in the same way as title deeds, even though such transactions require, at least in principle, payment of fees to tribal authorities. The development of a *de facto* land market for irrigated sugarcane plots is doubtless underpinned by the ability of growers to use the plots as collateral for credit for sugarcane production (and, conversely, the sugarcane delivery contract provides collateral for loans used to buy land), but it suggests a potential ambiguity of land rights that may need to be addressed in future, should the land cease to be used for sugarcane farming.

Secondly, the growing importance of loan finance for land purchases evident from the survey data raises the question of risk and the ability of growers to service their loans. Although there are clear differences in land acquisition activity between projects (Table 15), there is also some evidence that growers with non-farm sources of income (public or private sector employment or own business, but excluding social grants) may be better equipped to engage in the land market, and have acquired more land than those without such income sources.

Of the 34 growers in this survey who had acquired additional land, seven (21%) also had sources of non-farm income, compared to ten (13%) among the 74 farmers who did not acquire additional land. However when mean area of *additional* land is compared among farmers who acquired land (N=34), those with non-farm income (N=7) averaged 14.9 ha compared to 6.5ha for those without non-farm income (N=27). The small sample size for this comparison and heterogeneity of variance does not allow us to draw a clear conclusion at this stage, but the role of non-farm income (salary or own business) will be revisited in section 7.

Table 15: Average size of additional areas (hectares per grower) acquired by growers in different projects

Project	Mean	N	Std. Deviation	Median
Komati - Figtree C	9.6	4	5.29	8.4
Komati - Figtree D	7.2	3	4.84	4.9
Komati - FigtreeB	11.2	3	6.37	14.0
Komati - Madadeni	1.0	1	.	1.0
Komati - Mbunu B	3.7	3	5.69	0.6
Komati - Sibange	8.9	2	.07	8.9
Komati - Walda	4.7	5	3.37	3.7
Malelane - Buffelspruit	1.0	1	.	1.0
Malelane - Mbongozi	1.8	2	.35	1.8
Malelane - Mhlangu W	3.0	1	.	3.0
Malelane - Ngogolo	14.0	9	26.37	2.0
Total	8.2	34	14.1	4.2

5. Production, productivity and finance

5.1. Physical productivity

Tables 16 and 17 summarise productivity indicators for the entire sample: physical productivity (tons of cane per hectare, and % recoverable value (RV, calculated from sugar content of cane). Indicators of financial return are summarised in Table 18, as follows

- Net earnings per ha: net payments to grower after all deductions by TSB for contract work (cutting, loading and transport), levies, irrigation-related deductions (electricity, water and maintenance), loan repayments and ‘retention savings’ (deductions to cover payments for labour and applications of fertiliser and pesticide in the following growing season).

- Deductions as a percentage of gross earnings.
- Gross margin per hectare: cane income less all production costs but excluding loan repayments. In this case 'production costs' were estimated from growers' recall of amounts paid for labour, fertiliser and herbicide application and equipment costs, together with deductions made for levies, water, electricity, and contractors' fees for harvesting loading and transport.

Table 16: Mean yield and RV% for small scale grower sample

	N	Minimum	Maximum	Mean	Std. Deviation
Average cane yield 2010-2012	108	23.8	119.7	65.0	22.4
Estimated RV% content of cane	108	9.50	16.17	12.9	1.07

Data from questionnaires and cane delivery statements

Table 17: Average yield (ton / ha) in 2012 for the sampled growers in each project

Project	Sample mean	N	Std. Deviation	Median	Overall project average*	
					2011-12	2012-13
Komati - Figtree C	58.7	8	14.25	61.2	67.4	54.0
Komati - Figtree D	71.7	10	19.27	67.7	76.7	66.5
Komati - FigtreeB	65.7	5	23.59	67.2	79.1	76.3
Komati - Madadeni	80.3	9	24.36	87.6	72.5	62.0
Komati - Mbunu B	68.6	12	19.61	63.2	83.5	67.6
Komati - Sibange	79.1	10	29.30	80.4	70.0	71.2
Komati - Spoons 8	67.3	12	30.66	71.8	65.6	60.9
Komati - Walda	50.4	12	13.74	47.2	65.7	54.7
Malalane - Buffelspruit	57.5	7	14.54	61.6	79.1	53.7
Malalane - Mbongozi	43.3	5	21.98	40.6	57.0	28.1
Malalane - Nhlangu W	82.4	7	22.67	74.4	67.2	60.5
Malalane - Ngogolo	59.7	11	21.084	52.3	71.6	51.3
Total	65.9	108	23.59	62.8		

**Data from Mpumalanga CANEGROWERS*

Table 18: Average values for questionnaire sample: Gross margin per ha*, total deductions as percentage of gross earnings, net payment to grower

	N	Minimum	Maximum	Mean	Std. Deviation
Gross margin (Rands/ha)*	105	-8142	27188	8581	8105
Deductions as % of gross earnings**	105	21	121	78.7	19.5
Net earnings after deductions (Rands/ha)	105	-3137	27511	6238	6193

**gross margin per ha: gross earnings less levies, contract costs (cutting, loading, transport) irrigation costs (water, electricity), agrochemicals, equipment maintenance and spare parts, and labour costs.*

***16 growers recorded zero net income, with deductions effectively exceeding gross earnings. While the majority of deductions are made as charge per ton of harvested cane (and thus cannot exceed gross earnings), others (water, electricity, maintenance) are not, thus creating a possible negative balance.*

The performance of individual growers showed wide variation, so a more disaggregated analysis was sought. Original (TSB) grower categories (see section 3) based on productivity classes showed overlaps (outliers from each category), so a re-classification was undertaken based on annual yield (tons cane/ha) for each grower over a three-year period (2010-12) estimated as an average across all plots registered to each individual grower. This re-classification provided the following three categories:

- 3-year average 2010-2012 cane yield <60 tons per hectare (51 growers)
- 3-year average 2010-2012 cane yield between 60 and 80 tons per hectare (28 growers)
- 3-year average 2010-2012 cane yield >80 tons per hectare (29 growers)

In much of the analysis that follows, the lowest productivity group was reduced to 48, in order to eliminate cases where parts of the data were incomplete. This provided a dataset of 105 SSGs.

Disaggregating the sample into these three groups indicates a dispersal of trajectories. The lower-yielding growers appear to be suffering a further loss of yield in the three years 2010-2012 compared to 2008-2010, whereas the higher-yielding groups appeared to be increasing their yield over the same period (Table 19).

Table 19. Yield trends for growers in different productivity categories

`Productivity group: average cane yield 2010-2012		**Average yield 2012 across all plots for each grower**	**Average yield 2008-2010**	**Average yield 2010-2012**	**Percent change in cane yield 2010-2012 compared to 2008-2010**
< 60 ton/ha (N=48)	Mean	53.6	54.1	46.1	-14.3%
	Std. Deviation	21.4	19.1	9.3	63.2
	Median	49.9	57.2	45.7	-15.1%
60-80 ton/ha (N=28)	Mean	66.5	65.1	68.9	+11.6%
	Std. Deviation	14.1	15.2	6.2	28.1
	Median	65.6	64.5	65.9	+8.3%
> 80 ton/ha (N=29)	Mean	88.2	93.0	94.7	+8.4%
	Std. Deviation	18.4	27.7	12.0	25.7
	Median	82.9	90.8	91.6	+7.0%

For each of these three yield categories, an analysis of productivity indices was undertaken using the data for the 2012 harvest obtained from the survey questionnaires and cane delivery statements (Table 20). Since these data refer only to the particular plots for which production costs were available (and not all the plots operated by each grower), average yield data for each productivity group in Table 20 was slightly different from that in Table 19. Moreover, since the productivity categories were based on average yields 2010-2012, in some cases 2012 yields were not consistent with the productivity category. A sequence of low yields was in some cases followed by a high yield in 2012 if a cane field had been replanted in 2011, for instance.

Thus the productivity categories represent only a loose disaggregation but we feel that, given year-to-year variability of sugarcane productivity on individual growers' fields, it represents a useful approach to comparing costs and earnings for different productivity levels since it takes some account of yield stability over time.

Estimates of gross margins used an estimate of gross earnings calculated from the tons RRV recorded on the growers' delivery statements multiplied by the 'final' price for 2012 (R3197.32/ton RV). This avoided interim valuations due to price fluctuations during the growing season, and retentions (usually 5%) used by TSB to buffer them, that modify the stated valuation of the growers' cane delivery according to the date of delivery. Gross margins were estimated from gross earnings by subtracting the production costs obtained from the questionnaires. These included costs for: labour, fertiliser, pesticides, irrigation (including equipment replacement), levies, and contract costs for cutting loading and transport).

Gross margins showed significant advantages of more productive growers (Table 20). Those producing over 80 tons per hectare averaged margins (R/ha) more than double those producing less than 60 tons per hectare. The breakdown of cost of production (Figure 7) provides estimates similar to indicative values provided by Akwandze (see Table 25), except that growers' costs for labour were on average 40-50% higher than those estimated by Akwandze for growers producing over 60tons per hectare. We return to consider this observation in section 5.3, below.

Table 20: Productivity indices for different levels of cane productivity.

Average cane yield 2010-2012		Average cane yield 2012 (t/ha)*	Gross margin Rands/ha:	Deductions as% of gross earnings	Net payments to grower (Rands/ha)
< 60 ton / ha (N=48)	Mean	55.1	7456	87.06	2854
	Std. Deviation	22.5	8518	16.9	3708
	Median	50.8	7535	92.8	1979
60-80 ton/ha (N=28)	Mean	69.9	10387	78.93	6201
	Std. Deviation	16.0	7109	17.18	5125
	Median	67.7	9583	83.89	4736
> 80 ton/ha (N=29)	Mean	84.2	14532	64.80	11875
	Std. Deviation	21.2	8387	18.07	6446
	Median	83.7	12476	62.98	12676
Total (N=105)	Mean	67.1	10192	78.74	6238
	Std. Deviation	23.9	8577	19.54	6193
	Median	66.7	9819	82.40	4676

**For plots for which production costs data were collected in the survey*

Otherwise, gross margins estimated from the survey questionnaire responses for each of the productivity classes were comparable with Akwandze's expectations (see table 25): growers producing more than 80 tons per hectare in 2010-2012 (average 84 tons per hectare in 2012) had gross margins averaging R14532 /ha (R14524/ha estimated by Akwandze for an equivalent cane yield); those producing between 60 and 80 tons per hectare (average 70 tons per hectare in 2012) had an average gross margin of

R10388/ha (R10480/ha) and those producing less than 60 tons per hectare (average 55 tons per hectare) had a GM of R7456/ha (R6332/ha).

Loan repayments further reduce the margin of earnings over costs, particularly for growers producing lower yields. Thus, the difference for different productivity levels is even more pronounced in final payments made to growers (after loan repayments as well as production costs), which (Table 20) averaged almost R12000/ha for growers in the highest productivity group (>80 tons per hectare), but less than a quarter of that (R2854/ha) for 48 growers in the lowest productivity group (< 60 tons per hectare). We consider this further in section 5.2, below.

Since the basis of payments to farmers is not the tons of cane delivered, but the 'recoverable value' (RRV) derived principally from sucrose content, the analysis considered the cane quality variation for growers in the survey sample. Although there is a suggestion (Table 21) that more productive growers, in terms of harvested cane per hectare, are also delivering cane with a slightly higher average RV percentage (13.1%) compared to those with lower cane harvests (12.7%), RV% is only weakly correlated[2] with cane yield per hectare. However, regression analysis shows gross margin to be significantly[3] related to both RV% and harvested cane (tons per ha), and indicates that an additional gross margin of R1000/ha may be gained by increasing RV by 0.78% or by raising harvested yield by 3.9 tons per hectare (GM= -26008+(1278*RV)+(255*yield))

Table 21: Estimated RV% of cane

Average yield across all plots for each grower	Mean	N	Std. Deviation	Median
<60t/ha	12.8	48	1.3	12.8
60-80t/ha	13.2	28	0.82	13.5
>80t/ha	12.8	29	0.75	12.8
Total	12.9	105	1.1	13.1

[2] Pearson, P=0.071
[3] P<0.002

5.2. Credit

The sugar industry's credit scheme (Umthombo) was hit by loan repayment defaults, particularly in Kwazulu-Natal, where a significant debt write-off was undertaken after 2000. The credit system in Mpumalanga was therefore re-organised as a joint venture (Akwandze) between the milling company and the growers. The Akwandze scheme was initially funded with 50% capital from the growers' Liguguletu levy fund, and 50% from the milling company. Since its establishment with R20 million, the Akwandze scheme has raised further funding of the order of R75 million from the Small Enterprise Financing Agency (SEFA) and R150 million from the Land Bank.

Access to the scheme is conditional on a contract to deliver cane to the sugar mill. Under the scheme two forms of deductions are made from TSB payments to growers. Firstly, 'retention savings' are deducted from growers' cane income at source (R92/ton of cane in 2012) to provide funds to cover the following year's production costs. Secondly, deductions are made to repay loans advanced for a variety of purposes: for cane replanting (6-year loans) and ratoon costs (12-month loans) and, more recently, for land purchase ("RTO consolidation"). As expected, loan redemptions (interest and capital) are proportionately lower for growers with the highest productivity levels (Table 22). Where loans "look bad" Akwandze can intervene and hire contractors or place a manager to assure a harvest from the land. This is built into the loan agreement, but up to now "they have not had to force a farmer to accept management, and it has always been by agreement" (M. Slabbert, pers comm).

Table 22: Loan repayments as % of gross earnings.

Average cane yield 2010-2012	Mean	N	Std. Deviation
< 60 ton/ha	14.97%	48	12.6
60-80 ton/ha	15.13%	28	14.7
> 80 ton/ha	8.83%	29	8.9
Total	13.3%	105	12.5

The deduction of loan repayments from growers' payments for cane delivered follows a strict hierarchy of priority: retention savings (for next year's production costs) take highest priority; next are repayments to Akwandze loans; followed by repayments to Land Bank; and finally other commercial loans.

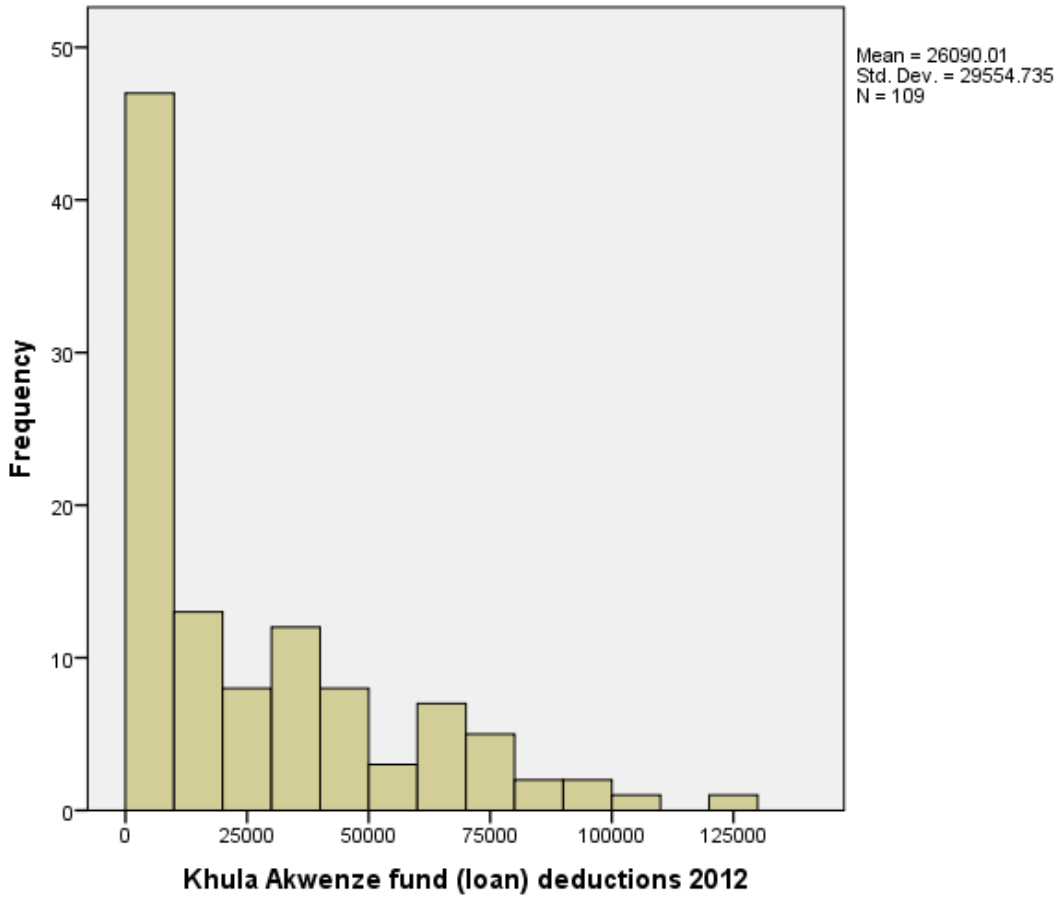
Akwandze loan records for the growers in this survey showed that both the proportion of growers taking loans and the total amount borrowed increased in the 5-year period 2008-13 compared with the earlier 5-year period 2002-7 (Table 23). The total amount borrowed per grower increased almost three-fold over the period 2008-13 compared to 2002-7. In the more recent period, 89 (82%) SSG took loans to cover ratoon (annual) costs, while 72 (66%) borrowed to replant fields. A small minority (13%) took out loans to finance land purchases. The highly skewed distribution of size of loans is indicated in Figure 5, which presents a frequency distribution of the size of loan repayments listed as deductions on growers' cane delivery statements.

Table 23: Number of growers using Akwandze loans, and total amount borrowed over 5 years

	N	Minimum	Maximum	Mean	Std. Deviation
Loan and interest total 2002-2007 (Rands)	77	3895	246943	64429	63427
Loan and interest total 2008-13 (Rands)	99	562	2636318	180444	293837
Ratoon (short-term) loans and interest 2008-13 (Rands)	89	562	252481	52569	51183
Replanting (6-yr) loans 2008-13 (Rands)	72	8378	645376	112564	93460
RTO consolidation (land) loans 2008-13 (Rands)	14	43083	1735723	348123	420516

Despite widespread recourse to loans to support production costs, most growers in the survey sample appeared to be repaying their loans, although at the expense of their new income, particularly in the case of growers in the lower productivity classes (<80t/ha), where, on average, loan repayments accounted for 15% of gross earnings (Table 22), but 53% and 44% of the gross margin (remaining after deduction of production costs) for growers in the lowest (<60 tons per hectare) and middle (60-80 tons per hectare) productivity categories, respectively. For growers in the highest productivity category (> 80 tons per hectare), the corresponding average proportion of gross margin consumed by loan repayments was estimated as 21% (Table 25).

Figure 5: Distribution of loan repayment deductions (Rands) within grower sample



5.3. Labour

A considerable part of labour costs are paid to labour contractors, notably for cutting the sugarcane at harvest. Average rates paid for cane cutting were R1288 per harvested hectare, compared to an average of about R3200 per hectare for all other labour paid by SSGs. In addition, eight growers in the survey purchased all their farm labour from contractors.

The remainder hired temporary workers at a day rate ranging between R16 and R108. The average daily rate of R34 paid to temporary workers is well below the statutory minimum (R105), which growers justified with the explanation that temporary workers only work part of the day, generally early in the morning (6am), until midday. At the statutory hourly rate of R11.66, this suggests such workers (mainly women who undertake weeding and clearing of the field edges) would be expected to earn R70 (R69.96) per day. That is double the average actually paid.

Permanent workers are employed by a majority (85%) of growers, mostly to undertake irrigation. The number of permanent workers employed averaged one for 5.4 hectares, but varied between one worker for 14 hectares to one worker for one hectare. Monthly pay for permanent workers ranged from R300 to R2100 per month, with an average rate of R857 per month. There is some indication that pay may be higher on the more productive farms (Table 24)[4]: average monthly rates were R770 (median R700) for permanent workers on farms producing less than 60 tons per hectare, but R930 (median R800) for workers on farms producing more than 60 tons per hectare. Sixteen of the surveyed growers employ no permanent workers, and essentially run the farm themselves. On some of the largest sugarcane holdings on SSG projects, a substantial permanent workforce is maintained, as in the case of a grower with multiple plots totalling 90ha who employs 22 permanent workers but no temporary labour.

Labour cost estimates used by Akwandze for SSG projects suggest labour for irrigation at a rate of one worker per 9 hectares and paid R1375 per month. This gives a total annual cost per hectare of R1972, whereas the survey data suggests growers' average annual costs for permanent workers are R2067 per hectare (930x12/5.4) in the higher productivity farms, and R1711 per hectare in the lowest productivity class. There is some evidence that monthly pay is correlated (Table 24)[5] with the area per permanent worker (Figure 6). Such a relationship would give a monthly wage of R1042 for a worker managing 9ha, or 31% less that the wage anticipated by Akwandze. However regression analysis suggests that wages are significantly influenced not only by overall farm productivity but also by whether the grower has non-farm sources of income (Table 24).

[4] Pearson R=0.224; P=0.034
[5] Spearman R = 0.519; P=0.01

Table 24: Correlations of wages paid to permanent workers with farm productivity, land/labour ratio, and availability of non-farm income to growers

N=90		Cost per month per worker (Rand)	Average cane yield 2010-2012	Hectares per worker	Income from public or private sector job or own business
Pearson Correlation	Wages per month per worker (Rand)	1.000	.224	.505	.140
	Average cane yield 2010-2012	.224	1.000	-.064	.171
	Land/labour ratio	.505	-.064	1.000	-.146
	Income from public or private sector job or own business	.140	.171	-.146	1.000
Sig. (1-tailed)	Wages per month per worker (rand)	.	.017	.000	.094
	Average cane yield 2010-2012	.017	.	.271	.038
	Land/labour ratio	.000	.271	.	.083
	Income from public or private sector job or own business	.094	.038	.083	.

Figure 6: Relationship between monthly wage and land area per permanent worker

We observed earlier that total labour costs estimated from the survey data were higher than those estimated by Akwandze based on a standard (minimum) wage that a general farm worker would earn. These data are summarised in Table 25 as means for each of the three productivity categories, and it appears that average labour costs on farms producing less than 60 tons of sugarcane per hectare are close to the Akwandze estimates, but 42 and 59% higher for growers producing more than 80 tons per hectare and 60-80 tons per hectare, respectively. Coupled with the analysis above, which suggests actual wage rates at or below the Akwandze figures, this suggests some inefficiency in labour use. There is some evidence to support this in the data for temporary labour employed by SSGs. On average SSGs employed between 58% and 300% more temporary labour per hectare than industry norms. Thus, while temporary labour required for herbicide application and general field cleaning would normally be estimated at 6-16 labour units (LU: 1LU=1 person working for 8 hours) per hectare, depending on the effectiveness of initial herbicide treatments, the surveyed SSGs averaged 25 LU per hectare. This figure masks great variation among individual growers, though also some suggestion of greater labour efficiency on more productive (>80t/ha) farms, which averaged 16.7 LU/ha compared to averages of 30 and 28 LU/ha on farms producing 60-80t/ha and <60t/ha respectively. Due to high levels of variability these differences were not statistically significant, however.

The relative inefficiency of labour use is compounded by the small size of individual holdings. Whereas on a large-scale sugarcane farm irrigation would normally be managed by one permanent worker per 18 hectares (R Armitage, pers comm), Akwandze estimates for SSG costs are based on one permanent worker for 9 hectares because most SSGs employ their own irrigators and on total areas that seldom exceed 9 hectares. In fact, as indicated above, the survey data suggests permanent workers are employed at an average rate of one per 5.4 hectares. This indicates that high labour costs of SSGs are due to employing 68% more permanent labour than needed (and more than three times the labour employed per hectare on large-scale sugarcane farms), albeit at wage rates often lower than the legal minimum.

5.4. Net earnings

The structure of costs was compared for different levels of productivity and compared to norms established at the start of the NIEP and with figures obtained from the operators of the Joint Venture large-scale farms on land leased from communities following land restitution.

In general the data show the relatively inflexible costs of sugar growing mean that lower yields involve lower margins. There is some evidence that lower yields are associated with less expenditure on fertiliser and irrigation. In Table 25 and Figure 7, the survey data for each of the three productivity classes is used to estimate a breakdown of the gross value of mean cane yield (these data are calculated from cane delivery statements and farmers' recall of expenditure for fertiliser, labour, equipment and herbicides in the 2012 season). This suggests that although costs for growers

producing less than 60 tons per hectare were 25% less than those producing 80tons per hectare or more, the value of the crop was 35% lower.

Table 25: Comparison of projected (Akwandze)* and estimated production costs and net earnings per hectare for three levels of sugarcane yield**

	Projected earnings and costs per hectare			**Estimated earnings and costs from survey data (average values for farmers in three productivity categories)**		
Sugarcane yield (ton per ha)	**84**	**70**	**55**	**84**	**70**	**55**
gross income (R per hectare)	34106	28421	22331	34543	29736	22768
VAT rebate at R24 per ton of sugarcane (R per hectare)	2394	1995	1568	2020	1680	1320
Total gross income	**36500**	**30416**	**23899**	**36564**	**31416**	**24090**
Production costs (R per hectare)						
cutting, loading and transport	9103	7815	6435	8329	8083	6258
levies	721	656	586	610	973	548
irrigation (electricity, water and maintenance)	3925	3925	3925	4053	3926	3666
fertiliser	4965	4180	3260	4707	3354	3039
herbicide	850	850	850	751	685	632
labour	2511	2511	2511	3583	4007	2505
Gross margin per ha	14425	10480	6332	14532	10388	7456
average loan repayment (R per hectare)				3124	4610	4019
mean net earnings[6] (R per hectare)				**11408**	**5776**	**3374**
loan as % of gross margin				21%	44%	54%
net income as % of gross				31%	18%	14%

**projected costs provided by R. Armitage*

*** the three yield levels are the averages for the three productivity groups: >60t/ha; 60-80 t/ha; and >80t/ha (see table 20)*

[6] These data are slightly different from the 'net payments to grower' in table 20. The latter were estimated as 'gross earnings less deductions' using cane delivery statement figures. The data in this table draw on those data plus farmers' recall of expenditure on production costs. The patterns in the data are essentially the same, however.

Figure 7: Breakdown of gross value of cane deliveries: mean values for three productivity categories of farmer.

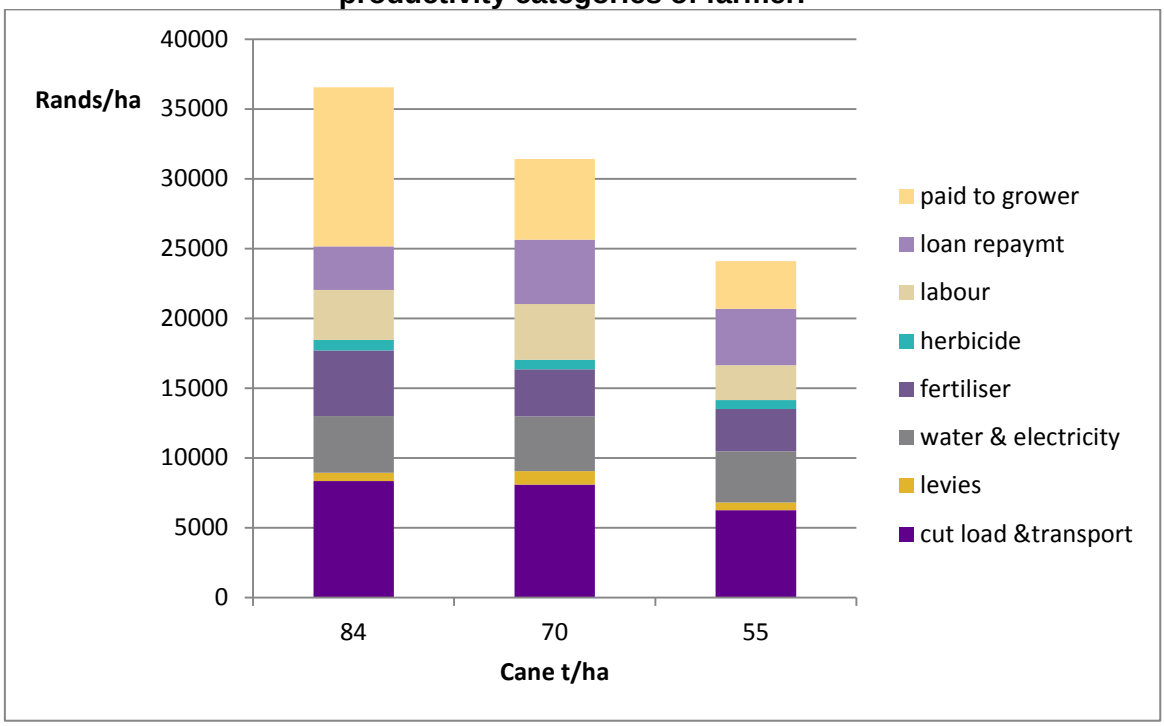
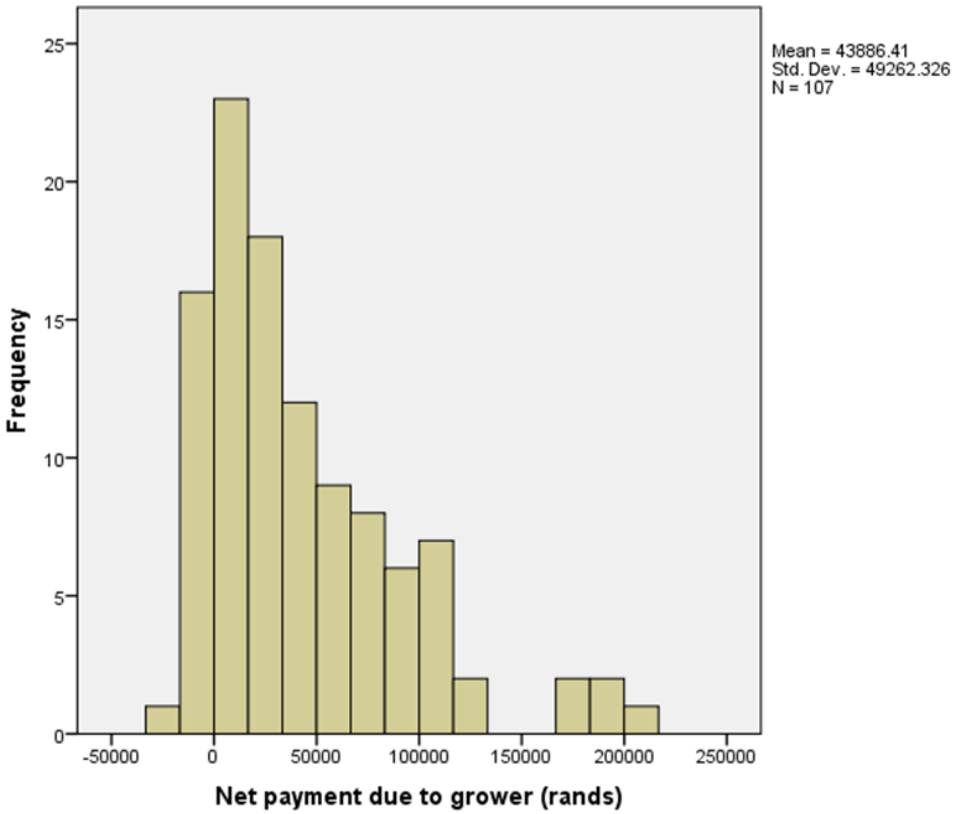


Figure 8: Net payments (gross earnings less deductions) in 2012 to growers in survey sample



In fact, about a quarter of the sampled growers earned nothing, in terms of net revenue after deductions from their cane delivery earnings in 2012, and a large majority were earning less than R30000 from their sugarcane in 2012 (Figure 8), although as discussed above, it is possible that a portion of labour payments (out of the retention savings fund) was actually a payment to the grower or members of the grower's family. There is also an industry subsidy of R5000 paid to small-scale growers from a levy on large-scale farmers. This cannot be used to repay debt, so constitutes an income to SSG irrespective of their productivity.

The survey provided no direct estimate of total net income from cane for each grower. Cane delivery statements provided figures for net payments ('due to you'), but for growers with multiple plots this was an incomplete picture.

Sugarcane yields per hectare and productivity were not strongly correlated to the area farmed (see Figure 8), although larger areas will evidently increase the gross income for a given level of productivity. The survey provided data on total area farmed within the SSG projects by each grower, but did not give an unequivocal picture of the amount of this land which was producing cane. Estimates of total net income from cane were estimated in two ways:

1. Total area per grower was multiplied by net income per hectare derived from the survey to give a figure for total net income (totnet).
2. TSB data for total RRV for each grower was obtained by adding together the RRV for each each of the grower's codes (a separate code for each plot). This was used to calculate total gross income (RRV tons x price/ton). From this and the figure for deductions as % of gross income (derived from cane delivery statements during the survey) total net income (rrvcost) was estimated.

In practice, these variables are highly correlated (r=0.976). They both suffer from the assumption that the same relationship between production and cost applies across fields farmed by a particular grower, but we are unable to test this on the basis of the data obtained thus far. However, apart for a minority of growers with large holdings and significant equipment (Pumps, tractors), the only 'fixed cost' that would be spread across an expanded production unit is the grower's own managerial effort. We therefore feel that we do not introduce much error by only considering variable costs of increased landholdings. The data discussed below are derived from growers' total RRV.

As might be expected, both average yield and the addition of new areas are strongly associated with the level of total net income (Table 26 and Figure 10). Since the net earnings take into account the cost of loan repayments, this suggests that those using loans to purchase additional cane fields are able to cover their loan costs. In terms of actual level of earnings achieved, the data represent a considerable simplification of a complex and dynamic picture in which those who have acquired additional fields may have replanted (producing high initial yields), or may be harvesting cane that has been neglected by the previous owner (producing low yields). Some caution is needed,

therefore in interpreting the data. Figure 9 suggests that in all but the highest productivity class cane yields per hectare were slightly lower for growers who had increased their land area, suggesting at least a period of adjustment is required for growers acquiring land to undertake replanting and rehabilitation of farms that are likely to have been poorly managed by their previous owners. In terms of total earnings, however, the increased area seems, on average, to outweigh any, albeit temporary, lower yields per unit area (Table 26 and Figure 10).

Figure 9: Comparison of average cane yields for those with and without additional land

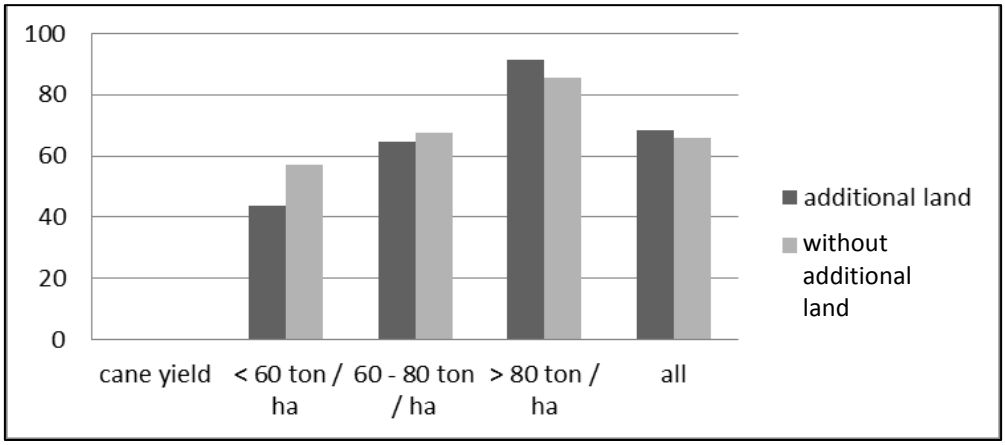
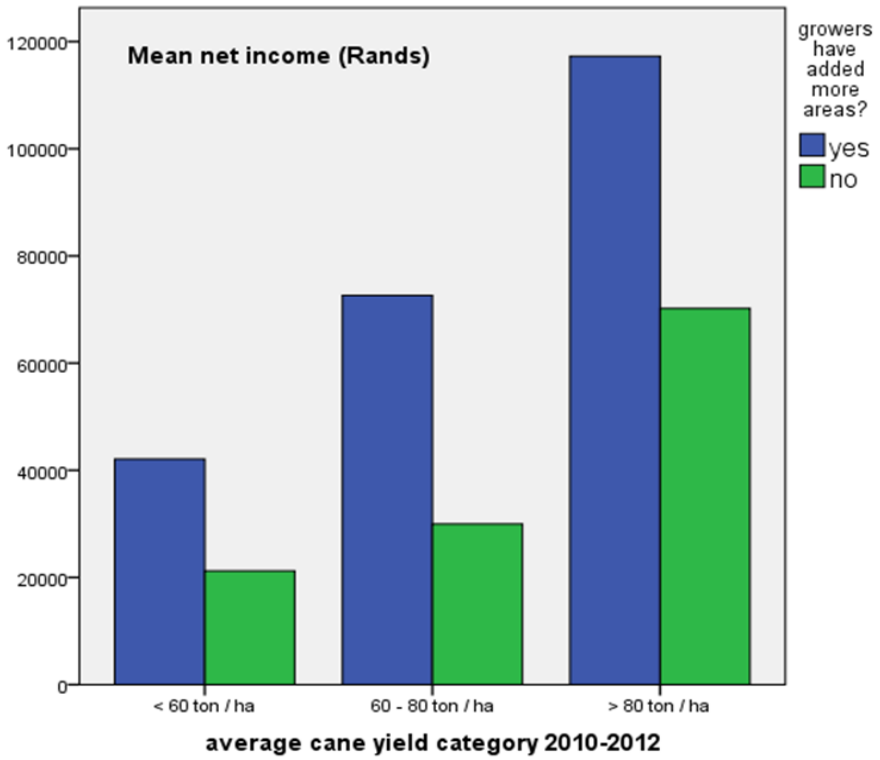


Table 26: Estimated net total income* from sugarcane for farmers with and without additional cane areas in each of three productivity (cane t/ha) categories

Average cane yield 2010-2012	Additional areas of cane	Total net income (Rands per grower)			
		Mean	N	Std. Deviation	Median
< 60 ton / ha	yes	42100	11	48387	31379
	no	21231	37	30757	5229
	Total	26013	48	36074	15676
60 - 80 ton / ha	yes	72618	10	103105	29220
	no	29987	18	30354	20536
	Total	45212	28	67501	20536
> 80 ton / ha	yes	117254	13	53254	111750
	no	70189	16	61724	61748
	Total	91287	29	61837	78752
Total	yes	79811	34	75380	62557
	no	34483	71	43773	20780
	Total	49161	105	59555	30375

** total income across all plots (milling RRV data) x 1-deduction%/100 (excludes VAT rebate)*

Figure 10: Net earnings (for 2012 excluding VAT rebate) from cane for farmers who have increased land holdings compared to those who have not, for three different productivity categories



The net earnings for those producing less than 60 tons per hectare are nonetheless low, averaging R42,000 for 2012 for those who are adding new areas, and half as much for those without additional fields. Earnings for those producing more than 80 tons per hectare averaged R70,000 for those without additional land, and R117,000 for those with additional land. As noted above (section 5.1), gross margins for these growers are in line with industry expectations for the levels of yield being achieved. In the final section of this report we consider the likely future of sugarcane production at this scale. Before that we consider briefly the issue of irrigation.

6. Irrigation

Water is the key constraint to sugarcane production in the Mpumalanga lowveld, and the questionnaire responses make clear that growers' own perceptions of problems with irrigation systems. The question of water management is the subject of another paper, but it is necessary to make a brief summary of the situation of irrigation as it has proved a key factor in the mounting problems of small-scale grower projects.

Three important elements may be identified. Firstly, the cost and management of the irrigation infrastructure has proved more challenging than originally foreseen. The NIEP

project design documents[7] are explicit in their expectation that infrastructure costs would be repaid over 8 years and the system replaced after about 15 years. In the event, the systems were degraded more quickly, particularly by flood damage in 2000, requiring replacement of pumping stations and weirs that had been constructed to increase the depth of the river at the pumping points. Long delays in replacing pumps meant that the crop effectively suffered drought following the flood. In at least one project growers noted an important downstream weir washed away by floods had not been replaced due to the high capital replacement cost, leading to problems with water abstraction from the river. Subsequent years of drought (2003-2005) created difficulties for small-scale producers to re-build their finances, and maintenance and replacement of irrigation equipment suffered.

As a consequence, even though water supply from the Maguga and Driekoppies dams has been adequate to meet demand of the entire irrigated sugar area over the past 8 years, irrigation efficiency has tended to be low on many SSG projects. More generally, it is evident that the collective ownership of pumping and pipe infrastructure has proved problematic in the repair and maintenance decision making process, and especially in arranging payment for repairs or maintenance. It is generally accepted (not least by the growers themselves in a workshop at Elangeni in August 2014) that the small scale growers have not invested in routine maintenance of their irrigation infrastructure, and instead use their institutional savings for maintenance to attend to breakdowns or failure of infrastructure. Pump breakdown and the rising cost of electricity are frequently mentioned reasons for poor productivity. Eskom has imposed increases in electricity tariffs, amounting to 30%, 25%, and 18% in each of the past three years. For the next three years Eskom has indicated a 12.8% increase per year.

A second factor that has resulted in low productivity (and actual cessation of sugar production) on the most recent projects, constructed in 2002-4 with funding from the Land Bank (eg Phiva, Mzinti, Ntunda and Skhwahlane) is poor technical design, including non-viable projects built by an ‘unscrupulous developer’ who ignored soil quality problems (too sandy, shallow and/or poorly drained) and consequently specified inappropriate irrigation schedules. In at least one project TSB staff observed “a basic design mistake” that the pumping height required for water to be delivered from the river to the fields was greater than the design capacity of the pumps that were installed. More generally, the capital cost of this group of projects was greater than could be repaid from sugarcane production, so that high debt levels meant that they were doomed from the start.

A third factor that has disabled irrigation in many projects in recent years has been theft of electrical cables, transformers and other electrical equipment necessary for irrigation. This is reported to be promoted by the high price paid for scrap metal. In

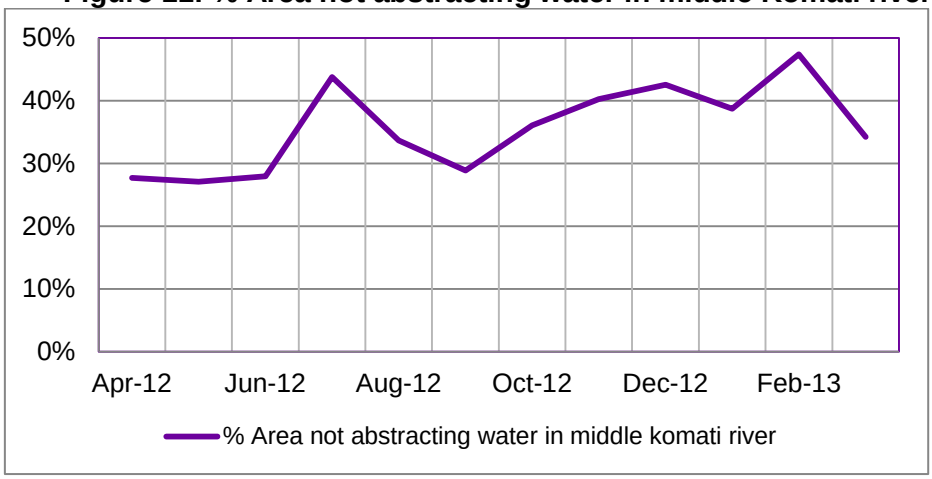
[7] Du Plessis and Burger (1995) Loan Application to DBSA from the Mawewe Tribal Authority and Agriwane for Sibange Irrigation Development (381ha) as part of Nzomazi Irrigation Expansion Programme. Du Plessis and Burger (Pty Ltd) Consulting Engineers, Nelspruit.

some cases, theft has occurred immediately equipment has been replaced, and a number of projects have been unable to finance repeated replacement of equipment.

Finally, it was evident from a number of interviews both within the questionnaire survey and outside it that collective management of shared infrastructure has not proved resilient in the face of the challenges identified above, leading some growers to adopt individual strategies that have proved counterproductive, such as increasing the number of sprinklers on their sugarcane plots with the aim of better coverage, but in the process bringing about a drop in overall pressure in the system and hence a reduction in the water supplied to the fields as a whole.

As a consequence of these problems, monitoring data on pump operation compiled by van de Merwe (Figure 11 and Table 27) suggest that, although river flows have been adequate, in 2012-2013 between 30 and 40% of the small-scale grower area irrigating from the Komati (and supplying the Komati Mill) was not able to irrigate, and was therefore reliant on rainfall. The problems are not evenly distributed between projects, but in some cases (eg Spoons 8 and Sibange), more than half the irrigation potential was being lost at the time of maximum evapotranspiration (December-March).

Figure 11: % Area not abstracting water in middle Komati river 2012-2013



Source: A. van de Merwe, 2013[8]

Table 27: Days of lost irrigation each month in 2013: sampled projects supplying Komati Mill

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total (8 months)
Spoons 8	22	20.5	15.5	9	3.1	3	3.1	4.6	80.8
Sibange	22	23	15.5	10.75	15.5	11.25	7.75	7.75	113.5
Madadeni	0	0	0	0	0	0	0	0	0
Figtree B	13	18.1	10.54	10.2	5.44	5.44	2.38	0	65.1
Figtree C & D	2.5	2.24	4.04	2.4	2.48	2.4	2.48	2.48	21.02
Mbunu B	15.2	14.8	3.72	3.6	2.28	3.6	2.28	0	45.48
Walda	31	16.75	5.05	7.5	6.75	15	12	12	106.05

Source: A. van de Merwe, 20139

[8] Data provided by Andre van de Merwe (TSB)

It seems clear that the improvement of irrigation reliability is the key challenge confronting any initiative to raise SSG incomes from sugarcane. In part, this may be achieved through better technical management, as proposed by TSGro (see section 7). It is also clear that the relentless rise in electricity costs are forcing a re-appraisal of irrigation techniques throughout the irrigated sugarcane growing area. Two candidates to raise efficiency are centre pivot and drip systems. Both have been used on SSG projects and neither are entirely without disadvantages. Centre pivot is reckoned to be the cheapest and easiest to manage, but inevitably involves a higher degree of shared infrastructure and coordination between individual growers if cost savings (economies of scale) are to be achieved. Drip is widely used by SSG and allows considerable autonomy of management despite shared pumping systems. Drip also offers scope to reduce overall water demand, but renders the crop more vulnerable to pump breakdown as it must be irrigated every day. Moreover, the relatively narrow spread of water from driplines means drip does not work well for crop establishment (when root systems have not yet developed) unless driplines are installed underground so that a broader row can be wetted more efficiently. The relatively high capital costs of drip (R16,000/ha) is beyond what many SSGs can afford and places a premium on the careful maintenance (flushing regimes) needed to maintain a drip system in operation beyond more than three years.

7. Future directions for small-scale sugarcane growers

This report has focussed on the findings of a survey of small-scale growers. It forms part of a wider study of the impacts of sugarcane growing on livelihoods in Nkomazi. Evidence from other parts of this study suggests that the generation of men and women who gained access to irrigated fields for sugar production in the 1980s and 1990s have been able to make significant investments in housing and education. This study suggests that relatively few of the next generation are following them to take over these sugar fields. Since this survey focussed on growers who are actively producing, it did not generate information about those who have given up and sold their cane fields.

However, during a workshop held in August 2014 with survey participants to discuss the initial findings of this survey, two explanations were offered for why so few young people were taking over the sugarcane farms. Firstly, it was asserted that the income generated was insufficient to support a household. Secondly, it was suggested that there is mistrust between the older growers and their younger relatives, such that the older growers fear that if they let the young people take on the sugarcane farms, they will also take all of the income, leaving the older people without even the small amount of sugarcane income they have now. From this second perspective, older growers are treating sugarcane income as little more than a pension. From the first perspective, the workshop enabled a discussion of how much income would be needed for sugarcane production to be regarded as a worthwhile full-time job. A fairly strong consensus suggested that monthly earnings of R15,000 are needed to pay household expenses,

[9] Ibid

including school fees and the cost of running a vehicle. This suggests an annual income needed of R180,000. Using the average figure of about R10,000 per hectare obtained by the more productive small-scale growers in this survey, this implies a minimum sugarcane area per grower of at least 18ha producing more than 80 tons per hectare.

In practice, the survey suggests some of those who are actively engaged in sugarcane production are taking steps to increase their areas. This is producing a process of differentiation among growers, whereby a minority of around 30-35% of growers are purchasing additional cane fields and effectively increasing the size of their operations, albeit often in dispersed plots, rather than in contiguous areas. The data from this survey suggests this third of original growers may now operate 50% of the cane area in small-scale production. A smaller proportion still of growers have become 'medium-scale' sugar growers with areas of upwards of 30ha. At a number of points in this report we have noted that growers with access to non-farm income (excluding social grants) may be of particular significance in this process of accumulating land, and such growers also feature disproportionately among those producing the highest yields (Table 28).

Table 28. Distribution of growers with non-farm income (excluding social grants) among productivity categories of small-scale growers.

		Average cane yield 2010-2012			Total
		< 60 ton/ha	**60-80 ton/ha**	**> 80 ton/ha**	
Income from public or private sector job or own business	**No**	47 (92%)	23 (82%)	21 (72%)	91 (84%)
	Yes	4 (8%)	5 (18%)	8 (28%)	17 (16%)
Total		51	28	29	108

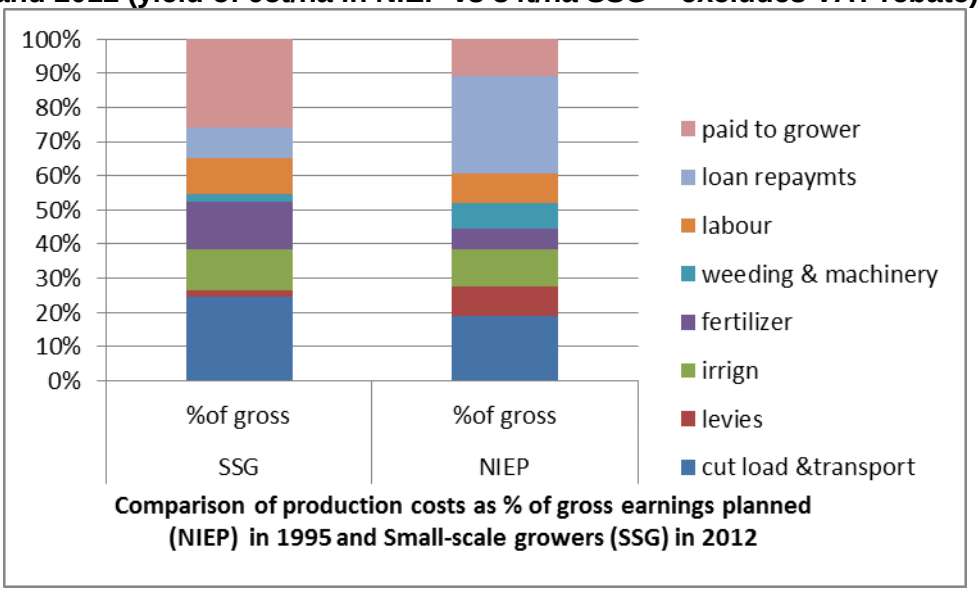
Pearson X^2= 5.56, P=0.062

Against this trajectory of consolidation of small-scale production to form larger-scale operations, an alternative intervention seeks to maintain the existing project membership as partners in a joint enterprise or cooperative, receiving dividends (or possibly rental income for their land) while the sugar production itself is undertaken by professional managers. On one count there can be little doubt that the irrigation infrastructure needs renewal both in terms of hardware but also in terms of the design of its management. Alternative designs have been tested and should be considered, since new approaches (eg drip) have been grafted on to pre-existing infrastructure designed for other technology (sprinkler systems). The establishment of TSGro as a company that will offer water supply to the field edge for a fixed fee would appear to be a means of resolving the chronic difficulties of pump and infrastructure maintenance on SSG projects, and the experience of this service initiative will be of great significance to the viability of small-scale production. This was as yet untested at the time of our research, but it seemed clear that, should TSGro be successful in delivering a water 'service' to the field edge, there will be a strong rationale to extend this service to cover the entirety of irrigation management.

However, one key question is whether existing growers will benefit from the cooperative model. Certainly, a view widely heard, including in our workshop

discussions, is that the cooperative will create a cap on small-scale growers' earnings. Comparison of contemporary sugar production costs with those envisaged by the NIEP[10] suggest that, although costs of contractors, fertilisers and labour have all risen, relative to the value of the crop, net earnings of small-scale growers today are relatively high because re-investment in irrigation (or repayment of loans used to make that investment, in the case of the NIEP) have been too low (Figure 12).

Figure 12. Comparison of cost structure of small-scale sugar production in 1995 and 2012 (yield of 95t/ha in NIEP vs 84t/ha SSG – excludes VAT rebate)



The current net earnings per hectare among the more productive small-scale producers average about 30%, compared to 11% as envisaged under the NIEP (and 8% profit after tax on large-scale sugarcane farms). At current levels of output this generates a net income for SSGs of about R11000/ha per year. At higher levels of yield, this would increase, but it is questionable whether higher yields are possible without more investment in irrigation (ie higher costs, at least in the short term).

Representatives of TSGro and of Mpumalanga Canegrowers argue that the cost of a professional manager for a 'cooperative' would be easily covered by the value of increased production. This is illustrated by considering an increase of 30tons of sugarcane per hectare (e.g. by raising productivity from 70 to 100 tons per hectare), which would correspond to an increase in gross income of about R11700/ha (assuming 13% RV and R3000/ton of RV), or R2.34 million on an area of 200ha. Management costs of R400,000 would reduce that to R1.94 million. If it is assumed that 70t/ha is a rough break-even yield (i.e output value equal to cost of production) and that the additional 30t/ha could be achieved with little increase in production costs (and the comparisons with Akwandze crop budgets suggest this is plausible), then such an increase would offer an annual profit share of about R65,000 for each of 30 members with 7ha holdings. This is still well below the goal of R180,000 annual income identified by growers as needed to bring younger people into sugarcane growing. It suggests that

[10] du Plessis and Burger, 1995

a cooperative member could only achieve such an income if s/he held three such plots (21ha), and thus leads in much the same direction as the 'consolidation' already taking place among individual SSGs via the land market.

However, in practice, the rationale for formation of cooperatives is to recover debt, and this is likely to absorb any profit for a number of years. At Langloop 2, for example R1.4 million is owed to Akwandze and R7.5 million to Land Bank, suggesting it may be at least seven years before existing members see any return beyond a 'rental' payment of R150/ha/month (R12,600 per year for a 7ha holding) currently paid to them by the cooperative.

Beyond this somewhat discouraging prospect, establishment of reliable irrigation for a sugarcane crop may provide a platform for diversification into more profitable (but risky) crops that would offer the possibility of higher incomes. This development hinges on access to appropriate markets but could conceivably offer opportunities for a range of employment (e.g. in marketing, packing etc) beyond the immediate 'farm production' of crops. This study found examples of SSGs who had small portions of their land planted to mangoes (sold to manufacturers of *achar* pickles in Durban) and who had planted a catch crop of cowpea (for the local market) prior to re-establishing a new planting of sugarcane. The option of diversification from sugar has been mentioned by TSGro and it seems that, as long as the amount of cane required by the mills is assured – and in 2013 cane production amounted to 94% of the combined capacity of Malalane and Komati mills – then this may feature more strongly in production plans by both SSGs 'consolidating' to medium scale and by TSGro as managers of 'cooperative' projects. Historically, the problem of diversification has been the lack of secure markets for crops other than sugarcane. However, the Molatek animal feed subsidiary of TSB at Malalane offers a potential local buyer for crops such as soya, which have begun to feature in TSGro and Akwandze thinking.

These considerations suggest that the existing pattern of SSG sugarcane production is unlikely to remain the same as that designed two decades ago. That arguably benefitted and transformed the prospects of the SSG and their children but whether it can now evolve to provide a platform for agricultural livelihoods for a new generation remains to be tested.