



Evaluation of the Appropriateness of the Current Sugarcane Out-grower Support Programs towards Improving Yields in the Lowveld of Zimbabwe

Shirichena Kudakwashe¹, Mavondo Greanious Alfred^{2*}, Moyo Obadiah³,
Chikuse Francis Farai⁴, Mkwanzai Blessing Nkazimulo⁵
and Gwatiringa Calletta⁶

¹Faculty of Commerce, Graduate School of Business, National University of Science and Technology, Bulawayo, Zimbabwe.

²Department of Pathology, Faculty of Medicine, National University of Science and Technology, Bulawayo, Zimbabwe.

³Office of the Honourable Minister, Ministry of Health and Child Care, Harare, Zimbabwe.

⁴Pathcare Namibia, 155 Nelson Mandela, Eros Windhoek, Namibia.

⁵Department of Dietetics and Human Nutrition, College of Agriculture, Engineering and Science, Pietermaritzburg, South Africa.

⁶Department of Nursing and Midwifery Sciences, Faculty of Medicine, National University of Science and Technology, Bulawayo, Zimbabwe.

Authors' contributions

This work was carried out in collaboration among all authors. Authors MGA, SK and GC performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MO designed and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI:10.9734/AJAAR/2020/v13i230101

Editor(s):

(1) Dr. Daniele De Wrachien, The State University of Milan, Italy.

Reviewers:

(1) Hussin Jose Hejase, Maaref University, Lebanon.

(2) Jnandabhiram Chutia, Gauhati University, India.

(3) Moataz EliwMostafa, Al-Azhar University, Egypt.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/56617>

Original Research Article

Received 22 February 2020

Accepted 28 April 2020

Published 14 May 2020

ABSTRACT

Problem: Sugar production has drastically reduced over the years due to several reasons. The effects of the Land Redistribution Program (LRP) on agriculture, price controls, associated inflationary economic conditions, and hostile international foreign policies have formatted years of

*Corresponding author: Email: greanious@gmail.com, greanious.mavondo@nust.ac.zw;

economical upheavals affecting sugarcane production. The infrastructure which had been developed to the point of being among the most sophisticated irrigation systems in the world, is threatened with collapse. Approximately 872 out-grower farmers, largely beneficiaries of the Fast Track Land Reform and Redistribution Program, have acquired sizable tract of land hoping to build the sugar industry but numerous problems beset the sector players.

Objectives: To find solutions to the sugar production through investigating and looking into the appropriateness of the out-grower support for this end.

Methods: Out-growers, beneficiaries of the Land Reform program and targeted sugar producers were observed to be the best source of information on how best to revitalize sugar production in Zimbabwe. Probability random sampling technique to select the out-growers was used. A list of all the out-growers was drawn and using the Kth term every eighth name was picked until a sample of 100 was reached. A self-administered questionnaire was used to collect data from the participants. Five-point Likert scale close-ended questions were used in the questionnaire followed by Cronbach's alpha coefficient analysis for internal validity and reliability testing. GraphPad InStat Software (version 5, GraphPad Software, San Diego, California USA) was used for relative statistical comparisons between estimates with. P values of 0.05 was considered as statistically significant.

Results: The population age groups of out-grower farmers were mixed with majority of them falling between 46 to 55 years with the majority of the farmers having 10 to 19 years of experience in sugarcane farming business. Most out-growers were educated holding at Ordinary (O) level of education. Out-growers who did ordinary level and above proved to be following the standard sugarcane procedures. A relatively high proportion of respondents followed the standard sugarcane growing procedures although the farmers did not possess enough business managerial skills. There was a notable difference in production between farmers that had formal sugarcane growing training than those that did not have. A significant proportion of lending institutions charged rather exorbitant interest rates and lacked flexibility required by the farmers.

Conclusion: The general business operating environment for out-grower farmers was rather hostile with short loan repayment periods, reduced yields per hectare and low profit margins. The sugarcane out-growers were not keen to form syndicates for buying inputs or repairing infrastructures.

Main recommendation: Out-growers should be provided with funding and training to allow them to utilize resources adequately to generate incomes that will allow them to support the agricultural activities efficiently without relying on input support from commercial plantation owners. Out-growers need to be encouraged to form partnerships for to enable them to advantages in reducing production costs.

Keywords: Land reform programme; out-grower farmer; sugarcane; Zimbabwe small scale farming; out-grower agricultural support; input subsidy program.

1. INTRODUCTION

Sugarcane production contributes significantly to the economy of Zimbabwe. It is a source of livelihoods for thousands of people through employment creation along its value chain. However, the sugarcane production set up has changed over the years with the introduction of various economic empowerment programmes such as the land reform programme. This programme resulted in the creation of more and new out-growers whose production levels have not reached potential. This failure to reach potential has led to the development of various pitfalls input subsidy (support) programs (ISPs) in the sugar industry expunction without an increase of sugarcane deliveries to the sugarcane millers [1,2].

1.1 Background to the Sugarcane Production Industry

Sugarcane is a subtropical and tropical crop which needs a lot of sunshine and water for optimum growth. In Zimbabwe, sugarcane production takes place in the South East Lowveld and is grown on an average crop cycle of twelve months. The Lowveld area of Zimbabwe is situated 21° South, and has an average altitude of just over 400 m. It is a semi-arid region, with a continental climate, typified by very hot summers and short cold winters allowing for cane production all year round.

Annual rainfall averages 590 mm, which falls mainly over the summer months, from November to March. Fertile paragneiss and basalt soils

cover much of the area, and when properly managed are capable of sustaining high sugarcane yields. Annual precipitation deficits amount to some 1,400 mm because of the low rainfall and high temperatures necessitating a secure supply of irrigation water for crops to flourish. The Save, Chiredzi, Mutirikwi, Tokwe and Runde Rivers transverse the Lowveld supplying large water resources for the development of the region. These rivers rise in the highveld and pass through granite escarpments offering excellent dam sites.

The country's sugarcane is crushed by two mills which are owned by Tongaat Hulett Zimbabwe (THZ) with one situated at Triangle and another at Hippo Valley Estates. The two mills have the combined capacity to process just over five million tonnes of cane. The two mills can refine up to 140 000 tonnes of sugar while Star Africa (formerly Zimbabwe Sugar Refineries-ZSR) has two refineries with a combined capacity to process up to 250 000 tonnes of sugar per year [3].

The two mills are self-sufficient with respect to their energy needs. Steam from their bagasse fired boilers is used to generate up to 36 megawatts of electricity. The mills also have distilleries which produce ethanol from molasses. The Triangle plant produces fuel grade ethanol and carbon dioxide, whilst the Hippo Valley plant produces potable and industrial spirits. Molasses are also sold to yeast and stock-feed manufacturers. Typically, the milling season runs from early April to late November and the mills have the potential to produce in excess of 600 000 tonnes of sugar which are dependent on both small holders plots and commercial farmers sugarcane production [4,5].

Historically, the Zimbabwe sugar industry used to be highly efficient and productive, producing high yields at low cost. At its peak, it contributed 95% of the Gross Domestic Product (GDP) of Masvingo Province and sustained livelihoods of an estimated 200,000 dependents of employees in the sector [6]. There is increased optimism with bumper harvests in the looming as there are ISPs being contributed by Tongaat Holdings seem to be yielding results [7].

A decline in sugar production from 580,000 tonnes to a historic low of 290,000 tonnes is attributed mainly to the combined effects of the land redistribution, the price controls, the hostile international foreign policies, the associated

economic and inflationary conditions prevailing although no definite cause is known. The sugar producing infrastructure which had been developed to the point of being among the most sophisticated irrigation systems in the world is threatened with collapsing.

Currently 80% of sugarcane production comes from the THZ-owned 28 494 hectares while the remainder is produced by 872 out-growers on 15 880 hectares of land giving total of 44 374 hectares of land dedicated for sugarcane production [8].

1.2 Pre-Independence and Post-Independence Era Sugarcane Production

Large-scale estate production of sugarcane was mainly undertaken by Hippo Valley (HVE), Triangle Limited and Mkwazine Estates. Together they produced over 74% of the country's sugarcane, while white large-scale commercial and newly-resettled black farmers produced the remaining sugarcane [9].

In 1974 Hippo Valley and Triangle purchased Mkwazine Estate from the Government and by 1980 had converted the estate to cane production. Three thousand two hundred (3200) hectares of the estate were sold to 191 small scale farmers and eight large scale farmers.

In 1981 HVE and Triangle estates set up 10-hectare sugarcane sprinkler irrigated plots for a selected 120 indigenous African farmers. This was in line with the two companies' mandate to dedicate 40% of all irrigated land resource at their Mkwazine estate (a joint corporation of HVE and Triangle estates) to be devoted to private growers for full ownership, but on condition that the farmers delivered all their cane to the two mills for sugar extraction [10].

1.3 Land Reform Programme

The Programme, which was launched on 15 July 2000, was designed to be undertaken in an accelerated manner and with reliance on domestic resources. The Programme was a fundamental departure from previous philosophy, practices and procedures of acquiring land and resettling people.

Zimbabwe's Fast Track Land Reform Programme (FTLRP) initiated from 2000 extensively redistributed land, mainly to peasants

and working citizens and, in doing so, unravelled the labour reserve economy created over a century of settler-colonial agrarian capitalism. This change has created a broader range of prospects for progressive agrarian transformation, despite the persistence of inequalities and exploitative social relations [11].

In the sugar sector, in particular, there existed out-grower white commercial farmers with land holding sizes of between 40-50 hectares and used to supply about 26% of the sugar mills' requirements before land reform. With land reform, the land holding sizes have been reduced to between 10-20 hectares.

Under the FTLRP, the Government of Zimbabwe created two resettlement models namely the A1 and A2 schemes. The A1 scheme refers to land allocated under a village set up and is intended for subsistence crop growing to achieve food sufficiency while the A2 model is intended for those with the means to run a smaller but viable commercial farm [12]. Most A2 out-grower plot holders in sugarcane production contribute sufficient agricultural outputs to support the fiscus through revenue generation and taxes if the contractual arrangements between sugar out-growers and plantation estates are deliberately skewed towards production and marketing and not the subsisting iniquitous and exploitative tendency in favour of estates owners [13]. Indeed, though constrained, capital formation has been an ongoing process among out-growers and it is prudent to argue that it creates dependence because of its reliance on credit provided by the plantation estate to A2 farmers [14].

Consequent to this reform, sugar output fell by 20% in 2006 from the 1990s' average levels and then by 50 per cent during the hyperinflationary conditions between 2007 and 2008, only for the rate of decline to decelerate by 2011 [11]. Of significance, the structure of sugar production has barely changed as the area cropped by the estates was hardly reduced or increased, while the out-growers' cropped area declined substantially [11].

1.4 Emergence of Out-growers and Support Initiatives

Zimbabwe now has 872 out-grower farmers who are largely beneficiaries of the land reform program that begun in 2000 and 840 small to medium scale out-growers under the Commercial

Sugarcane Farmers Association (CSFA) and the Zimbabwe Sugarcane Farmers Association (ZSFA) [15]. The land reform program was implemented by the Government of Zimbabwe in a bid to redress the land distribution skewedness that had been created by European settlers. These out-growers are divided into three major mill groups namely Triangle, HVE and Mkwasi mill groups. The Mkwasi mill group is further subdivided into Chipiwa, Mkwasi Estate and Mkwasi mill group [16]. However, the capacity to keep the mills running is dwindling.

Sugarcane production on the out-grower land fell drastically after the land reform program commenced. Sugarcane yields on the out-grower land fell to as low as 47 tons per hectare and are only expected to increase to about 75 tons per hectare yet the breakeven yield is estimated at about 63 tons per hectare. Interestingly, according to Shumba, Roberntz and Kuona [17] the cane yields for the Mpapa out-growers were 80 tons per hectare during this same period. The Mpapa out-growers are a scheme that was established in two phases implemented in 1989 and 1998 made up of 17 members the bulk of whom are former Triangle Section Managers [17].

Private growers at one time supplied about 852,915 tons of sugarcane. This is against a potential yield of 1.4 million tons. Resultantly, the development of initiatives aimed at rehabilitating and restoring cane production on approximately 11, 000 hectares of land on the private growers' cane fields has been mooted and rolled out [17-19].

These plans to restore private growers' cane lands hinge on continued access to the European Union (EU) Adaptation Funding program, of which Zimbabwe was allocated €45 million (US\$58 million). Of this, €9.2 million (US\$12 million) was made available for rehabilitation of infrastructure and replanting of 1,200 hectares of private grower cane land has been completed. Further funding for the additional replanting of cane, and the rehabilitation of the Mkwasi rail line has been on going. Unfortunately, the decline in sugar has continued due to a number of causes which may need to be overcome to increase outputs [20].

In addition to the EU initiative, THZ launched the Successful Rural Sugarcane Farming Community Project (SusCo), whose goal was to assist and accelerate private cane replanting in

order to increase sugarcane output to the potential of 1.4 million tons from the entire 15,880 hectares. Together with a local bank, the company has established a four-year, US\$20 million revolving loan facility to enhance sugarcane production. The project is providing inputs on loan to 872 resettled sugarcane growers, assistance with tillage services, replanting of cane and extension services. The private growers' sugarcane yields are expected to increase from 54 tons per hectare to upwards of 90 tons per hectare in the coming years.

Other funding initiatives have been developed in the financial services sector to enhance support to the out-growers and some of the players are the Commercial Bank of Zimbabwe (CBZ), ZB Bank, Agribank and a number of micro finance institutions. These institutions are mainly providing assistance in the form of seasonal finance and are charged at different interest rates.

The out-growers have over the years been given an opportunity to develop their sugarcane farming skills through field days and courses that are run by the Zimbabwe Sugar Association Experiment Station (ZSAES). This effort has also been complimented by THZ's extension staff.

However, the performance of the new out-growers has largely maintained their performance way below the potential. Consequently, gross underutilization of the existing milling capacity has been observed and a need to further help the out-growers to achieve higher yields is imminent. Nevertheless, given the level of support obtaining in the industry and the economic climate prevailing, it is imperative to investigate how performance can further be enhanced to potential with insights from the out-growers. Overall, the enhancement will increase revenue streams for the farmers and lower production costs per unit area with increased incomes for the beneficiaries [21]. Inter-alia, the adequacy of out-growers sugarcane husbandry skills, impact of credit policies on promoting yields improvement, the gaps existing in out-grower support programs, and the development of ideal out-grower support models for Zimbabwe require critical examination and analysis.

Questions on why sugarcane yields among out-growers have remained low in spite of the funding and extension initiatives, which is concern to industry because it translates to a low capacity utilisation of the country's crushing and

refinery infrastructure should be answered. The low sugarcane output translates to more expensive sugar production as fewer tons of sugarcane are available to absorb the obtaining overhead costs resulting in reduced employment levels and reduced contribution to the nation's gross domestic product (GDP) and balance of payment (BOP) position which accounted for 1.4% of the country's GDP before 2000 [17]. When adequately resourced, out-growers can provide wage employees with a living, set up or support existing processing factories and create financial independents for themselves and surrounding areas as well as Zimbabwe as a whole [22].

1.5 Scope of Study

This research was conducted across all the three mill groups namely Triangle, HVE, Mkwasi and the respondents were chosen from a total of 872 out-growers. The Triangle Mill group consists of farmers who are close to the Triangle mill and supply their cane to this mill. The Triangle Mill group is further subdivided into four groups namely Mpapa, Samba/Jatala, Stonehinge and Buffalo range. The Hippo Valley Mill group consists of those farmers located within the vicinity of the Hippo Valley Mill and supply cane to this mill. The Mkwasi Mill group is further subdivided into three namely Mkwasi Estate Mill group, Mkwasi Mill group and Chipiwa Mill group. These are differentiated largely on the time at which they were developed. However, it is important to recognise the fact that the Mkwasi Estate Mill group refers to those out-growers settled on what was Mkwasi Estate as beneficiaries of the FTLRP [23].

1.6 Limitations

The current sugarcane out-growers being beneficiaries of the FTLRP remain very critical and judicious about sentiments they make in the public domain and as a result bias cannot be ruled out in trying to establish the gaps in the current support programmes especially if information find outlets from unofficial sources [24]. This challenge was taken care of by way of explaining to the out-growers the fact that this is not a political study and should thus be viewed strictly in its academic context. Out-grower statistics in Zimbabwe remain incomplete and probably not 100% accurate though they are becoming available. Some of the implied yield improvement by the farmers might not be of the magnitude suggested by farmers. This challenge

should be managed by the use of crop evaluation techniques that judge if the current crop stand is a close resemblance of the information supplied by the farmer since the researchers were trained in sugarcane production. However, while the contribution of the out-growers to the general production of sugarcane, the Hippo Valley Estate Limited, a subsidiary of Tongaat Hulett Limited and primarily involved in growing and milling sugar cane in Zimbabwe, Chairmen's Statement indicated an increase in cane sugar crushing having increased by 21% in the year 2018 [25]. This was followed by an increase in improved sugar production by the sugar milling company in 2018 by 9% to 153 343 tons [26].

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Research design

This research used the survey design approach. Respondents provided information about themselves by completing a self-administered questionnaire. Large amounts of data were collected over short space of time. The data was analysed as quantitative data from close-ended questions to faithfully reflect the opinions of the respondents.

2.1.2 Population

The population of study comprised of all the 872 sugarcane out-growers across all the sugarcane milling groups in the Low Veld who had been involved with the Land Redistribution Process which started in 2002 according to guidelines given elsewhere [27].

2.1.3 Sample size and sampling technique

A probability systematic random sampling technique was used to select the out-growers study sample. A random sample allowed a known probability that each out-grower could be selected, irrespective of location, gender, position or qualifications. The random selection eliminated the possibility of sampling bias. A list of all the out-growers was drawn and using the K^{th} term every eighth name was picked until a sample of 100 was reached using a technique described before [27].

2.1.4 Research instrument

This study used questionnaires as a research instrument. In the self-administered

questionnaires, closed questions were included to capture both quantitative data.

2.1.5 Questionnaire survey

In this study, self-administered questionnaires enabled the research to contact a large number of people quickly, easily and efficiently. The questionnaires method was relatively quick and easy to create, administer, code and interpret. Standardization of the questionnaire was easy and respondents were asked exactly the same questions which made the method reliable. The Cronbach's alpha averaging 0.67 was obtained when testing for internal reliability and suitability of the questions asked showing a good α coefficient. Information which respondents may not have been unwilling or uncomfortable to disclose, discuss or to be associated with were explored through respecting the respondents and being sensitive to the silent cues and omissions observed. Respondents were kept anonymous and completed the questionnaire in private. However, it was not possible to ascertain that the questionnaire was filled by the person to which the questionnaire was sent to and it was difficult to know whether or not the respondent had understood the question properly and, in the manner, intended.

2.2 Methods

2.2.1 Questionnaire development [28]

The questionnaire was developed using 5-point Likert Scale questions whose end points were strongly disagreeing and strongly agreeing. The respondents indicated their degree of agreement by checking one of five response categories. A chance of checking the intended response was higher. The responses were quantifiable and subjected to mathematical analysis computation. By using of a degree of agreement, the questionnaire did not force the participant to take a stand on a particular topic making question answering easier on the respondent. Also, the responses presented accommodated neutral or undecided feelings of participants. A single number represented the participant's response making it easy to code when accumulating data. The high versatility built into the Likert Scale questionnaires allowed them to be sent out through mail, over the internet, or delivered and collected in person. However, the hand delivery and collection of questionnaires was used ultimately.

The Likert Scale was two-dimensional giving five options of choice, and the space between each choice could not possibly be equidistant, therefore may have failed to measure the true attitudes of respondents [29]. More so, it is not unlikely that the respondents' answers were influenced by previous questions, or were heavily concentrate on one response side (agree/disagree). Notably, frequently respondents avoid choosing the "extremes" options on the scale, because of the negative implications involved with "extremists", even if an extreme choice would be the most accurate. The questionnaire was designed with the target respondents in mind, taking into account their educational level and experience. The questionnaire was divided into four parts namely demographics, adequacy of crop husbandry skills and gaps in support programs.

2.2.2 Validity and reliability

Establishing the validity and reliability of the instrument was an important aspect of instrument development and testing. Validity and reliability are the benchmark criteria for assessing the quality of the instruments and instrument testing was done before the instrument was administered to the target population [30]. Validity tests of the instrument measured what it was supposed to measure whilst reliability considered the consistency of the instrument [31]. Reliability was used synonymously with accuracy, dependability, consistency, and stability. In order to test for validity and reliability the questionnaire was administered to 10 people to serve as a panel of experts. The respondents reviewed the instrument in terms of content, format, wording, suitability, clarity and audience appropriateness. The respondents provided their comments and suggestions for revision and the instrument was revised using the panel's comments for guidance. In addition, a Cronbach's alpha coefficient was determined to examine the internal validity of the questionnaire as described elsewhere [32].

2.2.3 Data collection process

Data collection was the process of gathering and measuring information on variables of interest, in an established systematic fashion that enabled answering stated research questions, and evaluate outcomes. The questionnaires were hand delivered and collected in person to the out-growers. The process established a systematic way of gathering information and increased the response rate. Confidentiality of

the out-growers was emphasised in order to give the out-growers an opportunity to freely express their opinions on the questions asked. Any queries or questions which were not clear to the respondent were given an immediate response and missing information was filled in on collection. Point persons who were familiar with the location of the out-growers were consulted due to the complexity around their geographical spread. The follow up and accurate data collection proved to be essential in maintaining the integrity of research. Clearly delineation of instructions for their correct use reduced the likelihood of errors occurring and allowed possibility to repeat and validate the study in the future. A lead time of seven days was allowed from the day the questionnaires were delivered to the respondent before they could be collected back.

2.2.4 Data presentation and analysis

The data collected using questionnaires was analysed in order to describe the data in meaningful terms. Analysis work after tabulation was generally based on the computation of various percentages, coefficients and applying various well-defined descriptive statistics which converted data into picture of the information that was readily understandable. Furthermore, GraphPad InStat Software (version 5, GraphPad Software, San Diego, California USA) was used for relative statistical comparisons between estimates. Probability levels at P values of 0.05 was considered as statistically significant.

2.2.5 Ethical considerations

A distinction between acceptable and unacceptable behaviour taking into consideration protection of privacy, confidentiality and informed consent was employed. In an effort to ensure research ethics were followed, the participants were not forced to take part in the study but an informed consent was made including a briefing of the study and the nature of information that was needed. Their anonymity was granted as well as confidentiality of the information was provided. Researchers' opinions were not considered so that personal biases and opinions would not get in way of the research.

3. RESULTS

The research questions on the adequacy of husbandry skills among sugarcane out-grower, the impact of the credit policies on promoting yield improvement, gaps that exist in the out-

grower support programs and the ideal sugarcane out-grower support model for Zimbabwe, were presented and answered. The response rate at 60.3% which may tend to be low when compared to the expected 80%+ responses as questionnaires were hand delivered and collected.

3.1 Study Sample Demographic Information

At 35% of the respondents the aged 46-55 years were relatively over represented in the sample when compared to those in the 56-65 years, or 35-45 years, or < 35 years or 66-75 years age groups (**P = 0.05, 46-55 years vs 56-65 years or vs 36-45 years or vs < 35 years or vs 66-75 years, respectively). The age group 56-65 years had a relatively higher prevalence in sample when compared to the 35-45 years or < 35 years or 66-75 years age groups (**P = 0.05, 56-65 years vs 36-45 years or vs < 35 years or vs 66-75 years, respectively.) The 36-45 years age group was three times overly represented as compared to the 66-75 age group (**P = 0.05, 36-45 years vs 66-75 years) (Fig. 1).

Fig. 2 shows percentage of out-growers who had 10-19 years sugarcane husbandry experience formed a relatively higher prevalence as compared to those with 0-4 years' experience, or

those with 5-8 years' experience, or those with >20 years (**P = 0.05, 10-19 years', or vs 0-4 years', or vs 5-9 years', or >20 years' experience, respectively). Out-growers with >20 years' sugarcane husbandry experience was relatively out numbering those with 0-4 years' experience and those with 5-9 years' experience by 36 times and 6 times more, respectively (**P = 0.05, >20 years' vs 5-9 years' or vs 0-4 years' experience). Also, those out-growers with 5-9 years' experience were relatively greater than those with 0-4 years' experience in sugarcane production study sample.

Being an out-grower in the sugarcane industry gave one a much higher relative chance of holding an Ordinary level (O Level) education when compared to either holding a Standard 8-Grade 7 (Std 8-G 7) or Advanced Level (A-Level) Education (**P = 0.05, O-Level vs Std 8-G 7, or vs A-Level), or compared to Diploma (**P = 0.05, O-Level vs Diploma), or compared to Degree Education Level (*P = 0.05, O-Level vs Degree Level). The out-growers holding either Grade 7 or Standard 8 Education Level certificate were overly represented in the study sample when compared to those who held Diploma Level Education (*P = 0.05, G7-Std 8 = 4 times Diploma Level Education) or when compared to Degree Level Education (*P = 0.05, G7-Std 8 = 10 times Degree Level Education).

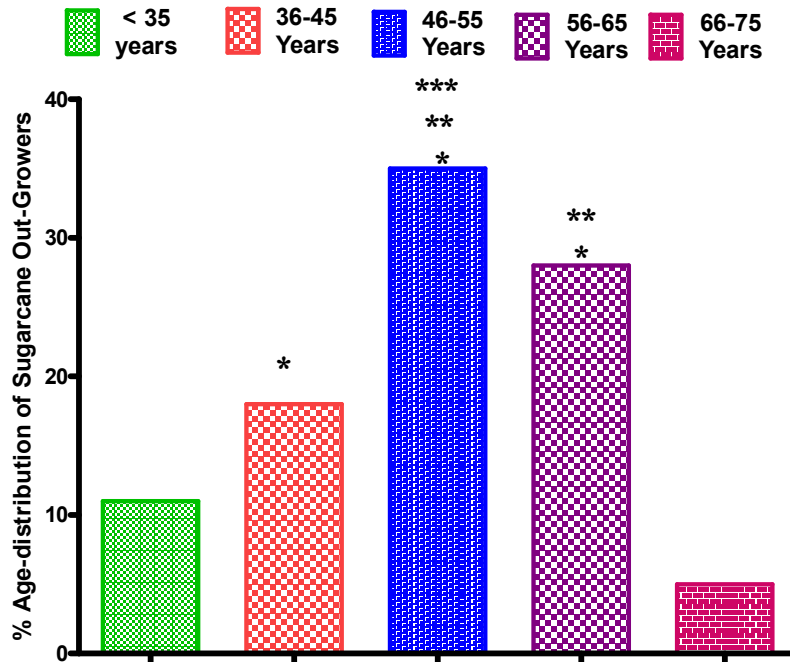


Fig. 1. Age distribution of sugarcane out-growers as a %

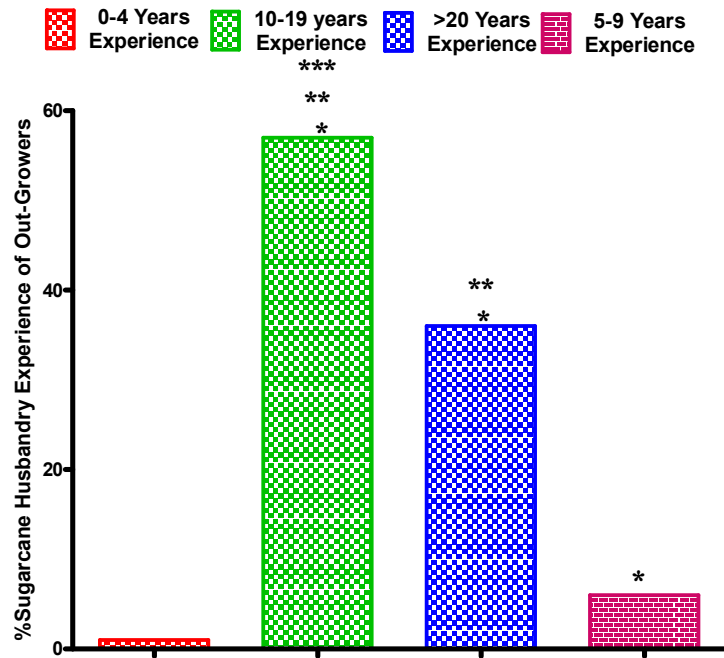


Fig. 2. Percentage distribution of sugarcane out-growers husbandry experience

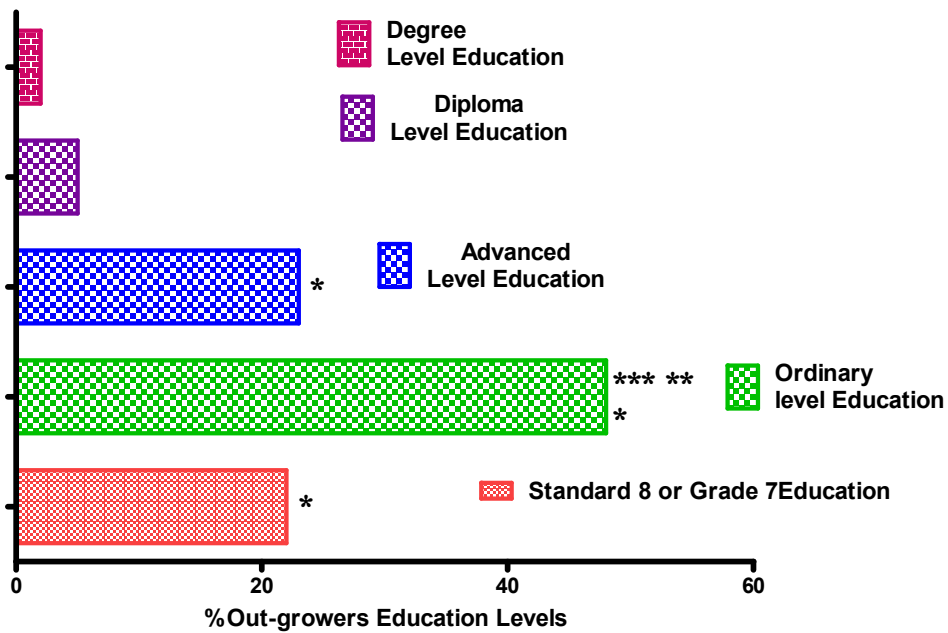


Fig. 3. Percentage representation of out-growers' education level distribution

3.2 Gender Distribution of the Sugarcane Out-grower Farmers

The sugarcane out-growers in the randomly selected sample had a gender distribution and

female to male ratio of 1:3.6 (22:78%). There were four men for every one woman amongst the sugarcane producers with an out-growers status in the industry.

3.3 Adequacy of Sugarcane Husbandry Skills

The questions posed to the respondents on the sugarcane husbandry skills adequacy sought to elicit positive sentiments or agreements latitude. Table 1 shows that a relatively higher section of the respondents agreed to following standard sugarcane growing procedures compared to those who strongly agreed (**P = 0.05, agreed vs strongly), or those who did not always use the procedures (**P = 0.05, agreed to using vs not always used). On the issue of taking soil samples for laboratory analysis, responses of combined agreed and strongly agreed were relatively higher the combined negative responses of not always, disagreed and not sure (*P = 0,5, Strongly agree + Agreed > Not always + disagree + Not sure).

On whether skills were monitored and mentored after training most farmers highly agreed as compared to those who strongly agreed (**P = 0.05, agreed vs strongly agreed) or when compared to those who were not always monitored or mentored (*P = 0.05, agreed vs not always). A relatively higher response existed between those who either strongly agreed and agreed to having adequately trained manager and supervisors and those who disagreed that there were trained managers and supervisors [58% compare to 41%] (*P = 0.05, agreed vs disagreed).

Amongst those who agreed, strongly or otherwise, and those who were disagreed, in all forms, to that farmers attended all training

programs offered to them, those who agreed were relatively higher (56% compared to 43%) in comparison (*P = 0.05, agreed vs disagreed). Farmers also accented by their relatively high collective agreement that there were adequate management skills amongst them (58%) as compared to the remainder who disagreed (*P = 0.05, agreed vs disagreed). To buttress the adequacy of managerial skills, farmers resoundingly agreed (85%) that there was a difference between farmers that have gone for some training and those that have not when compared to the contrary (*P = 0.05, agreed vs not always).

3.4 Impact of Credit Policies

In Table 1 a relatively higher proportion of respondents (67% agreed varying degrees) did agreed that the loan facilities were available at the banks and lending institutions which helped them to improve yields as compared to those who indicated that it was not always so (*P = 0.05, agreed + strongly agreed vs not always). On the aspect of loan repayment plans being conducive for independent continuity of the farm, a higher percentage of the out-growers indicated that it was not always the case when compared to those who agreed (*P = 0.05, not always vs agreed + strongly agreed) and differed notably with those who strongly disagreed (**P = 0.05, not always vs strongly disagreed).

When combined (strongly agreed + agreed + not always), respondents who agreed and compared to the respondents who did not feel the pinch of bank loan repayment, the latter group was

Table 1. Perceptions of skills adequacy levels among the sugarcane out-growers

Questions	Strongly agree	Agree	Not always	Disagree	Not Sure
Farmers follow the standard sugarcane growing procedures	15 **	66	18	0	1
Farmers take soil samples to the laboratory for analysis regularly	12 *	45	32	10	1
Farmer skills monitoring and mentoring is done after attending a training program	12 ** *	50	29	8	1
Farmers engage adequately trained managers or supervisors	10 *	48	35	6	1
Farmers attended all training programs offered to them.	12 *	44	40	3	1
Farmers have adequate farm management skills	10 *	48	35	6	1
There is a difference between farmers that have gone for some training and those that have not	15 *	70	14	0	1

Table 2. Views on the impact of credit policies

	Strongly agree	Agree	Not always	Disagree	Strongly disagree	Not Sure
The loan facilities available at the banks/lending institutions have helped me to improve my yields	4	63	32	0	0	1
The loan repayment plans are conducive for independent continuity of the farm	1	39	55** *	0	4	1
The loan facilities have seriously reduced my income due to high interest rates	5	35	37	22	0	1
The loans provided enable me to pay my wages between periods of no revenue	3	63	33	0	0	1
The current credit facilities allow for new development during the life of any loan	0	61***	32	6	0	1

relatively over represented in the study (87% vs 22%). Translated to the represented population that over 700 farmers suffered to the bank loans burden to a certain degree or latitude.

The loans provided enabled payment of wages between periods of no revenue in all the respondents (99%) to a certain degree when those who strongly agreed, agreed and those who said at times were combined. None disagreed. Also, the credit facilities allowed for new development during the life of any loan to a relatively higher majority of the respondents when compared to the contrary (*P = 0.05, agreed vs not always) and to all affirmative respondents (93%) at varying extents compared to those who disagreed (6%) (**P = 0.05, all agreed vs disagreed).

3.5 Gaps in Support Programs

Support program were intricately built into the out-grower program aiming to maintain or increase sugarcane production. Table 3 shows respondents' views on the available skills development support infrastructure. On the extension services provided in the industry being adequate, there was a generally higher consensus on the affirmative (agree and strongly agree) respondents (61%) compared to those who said services were not always available (*P = 0.05, agreed > not always). The extension officers' farm visits regularity was rated as positive by a relatively high 65% of respondents when compared to those who said the visits were not always regular (*P = 0.05, agreed + strongly agreed > not always available).

A higher majority of respondents reported that not always were there well experienced technical staff in place in lending institutions that had adequate knowledge and knowhow about sugarcane production as compared to those who agreed and strongly agreed (*P = agreed + strongly agreed < skilled personnel not always present). A higher percentage (55%) responded that the training programs provided for out-growers were not always adequate as compared to the affirmative responses (*P = 0.05, all agreed < disagreed adequacy of training).

73% of the respondents agreed to the testimony of training programs having helped to improve yields as compared to the contrary (*P = 0.05, all agreed training improved yields > not always training increased yields). 90% of the respondents confirmed training aspects covered business management related skills such as record keeping and financial management compared to those who disagreed (*P = 0.05, all agreed on training adequacy > all disagreed).

Table 4 shows how the out-growers responded on the quality of financial support banks and lending institutions gave to them. A relatively higher proportion of the respondents (61%) agreed to varying degrees that finance lending institutions provided funding when needed as compared who felt to the contrary (*P = 0.05, agreed + strongly agreed > mot always + disagreed). Also, a relatively higher margin of respondents (56%) indicated that sufficient funding was made available to the out-growers when compared to those who perceived differently (*P = 0.05, agreed + strongly agreed > not always + disagreed).

Table 3. Views on the skills development support

	Strongly agree	Agree	Not always	Disagree
The extension services provided in the industry are adequate	8 *	53	39	0
The extension officer visits the farm regularly	21 *	44	35	0
There are well experienced technical staff in place in lending institutions that have adequate knowledge and know how about sugarcane production	8	34	56 *	2
The training programs provided for out-growers are adequate	6	39	53 *	2
The training programs have helped me to improve my yields	6 *	67	27	0
The training aspects have covered business management related skills such as record keeping and financial management	9 **	81	9	1

Table 4. View on financial support provided

	Strongly agree	Agree	Not always	Disagree	Strongly disagree
The lending institutions provide funding when needed	4 *	57	38	1	0
Lending institutions provide sufficient credit options	4 *	52	42	2	0

Table 5. Views on the input support provided

	Strongly agree	Agree	Not always	Disagree	Strongly disagree
The support programs have enabled me to access all the inputs that I require	16 *	52	32	0	0
The inputs provided by the support programs are cost effective	2	41	52 *	4	1
I am willing to form buying syndicates for input procurement	18	14	9	52 *	7

68% of the respondents agreed to varying degrees that the support programs received had enabled them to access all the inputs that they required as compared to those who said inputs were not always available (*P = 0.05, agreed + strongly agreed > not always support available). There was a relative higher majority (57%) which viewed the inputs provided by the support programs as not always cost effective or out rightly disagreed that support programs were cost effective compared to those who agreed (*P = 0.05, not always + disagreed > agreed). 59%

of the respondents disagreed, to varying degrees, to being willing to form buying syndicates for input procurement as compared to those who agreed (*P = 0.05, disagreed > agreed).

A combination of the respondents who did not always have a challenge transporting their inputs with those who disagreed and strongly disagreed that transporting inputs from the supplier to the farm was a major challenge formed a relatively higher proportion when compared with those who

agreed and strongly agreed (32%) that transport was a challenge for them (*P = 0.05, not always + disagreed + strongly disagreed), as depicted in Table 6. On the supply of machinery provided under a support program having been supplied on time, respondents who disagreed, strongly disagreed or said not always were marginally over represented at 56% in comparison to those who agreed or strongly agreed (*P = 0.05, disagreed + strongly disagreed + not always > agreed + Strongly agreed).

Respondents who agreed or strongly agreed that facilities available on the market for out-growers to buy machinery had very short repayment periods form a relative minority (47%) proportion in comparison those who disagreed or strongly disagreed (*P = 0.05, agreed < disagreed). Respondents who viewed hiring farm machinery such as tractors and loaders as not being costly or not affecting viability (61%), where relatively over represented as compared to those who felt the costs where high and prohibitive to business viability (*P = 0.05, [disagreed, very strongly disagreed, not always] > [agreed, strongly agreed]).

Table 7 shows that when combined, those who agreed and those who said not always were there conflicts over sharing of infrastructure that hindered production showed a higher representation (92%) when compared to respondents who disagreed and those who said not always were there conflicts (*P = 0.05, strongly agreed + agreed + not always > disagreed + not always). Those who disagreed, strongly disagreed and those who said not always were irrigation in bad conditions were relatively overly represented (74%) when compared with a combination of those who said not always, strongly agreed and agreed with the statement (*P = 0.05, [disagreed + strongly disagreed + not always] > [strongly agreed + agreed + not always]). On there being no support for maintaining shared infrastructure such as canals, those who agreed, strongly agreed or not always agreed were under represented (45%) when compared to those who disagreed, strongly disagreed or were not always disagreed (*P = 0.05, [agreed + strongly agreed + not always agreed] < [disagreed + strongly disagreed + not always disagreed]).

Table 6. View on the machinery support services provided

	Strongly agree	Agree	Not always	Disagree	Strongly disagree
Transporting inputs from the supplier to the farm is a major challenge	1	31	13 *	48	7
Machinery that has been provided under a support program has been supplied on time	2	44	44 *	8	2
The facilities available on the market for out-growers to buy machinery have very short repayment periods	1	46	51 *	2	0
Hiring farm machinery such as tractors and loaders is costly and affects viability	2	37	57 *	4	0

Table 7. View on infrastructural support

	Strongly agree	Agree	Not always	Disagree	Strongly disagree
The sharing of infrastructure such as dams and canals has been a source of conflict and hindrance to production	1	45*	46	8	0
Irrigation infrastructure is in a bad condition	4	22	20	50 *	4
There is no support for maintaining shared infrastructure such as canals	4	32	9	51*	4

4. DISCUSSION

A sugarcane out-growers were mostly likely to be a person 46 years or older in age which may point at good working experience if age is anything to go by. If the acquisition of the out-growers land during the land reform period took place in 2000, most of these farmers would have been within the 35 years old and above range which leaves them upwards of 10 years sugarcane husbandry experience. Fewer younger people (<35 years) have managed to take up sugarcane out-growing business as well as older people (>66 years old) showing that the people on the land are by far still within the most productive generation by age and capable of reviving the industry significantly. Some of the out-growers with >66 years old may have been outside the groups that had received the land through the agrarian reform process and may have been workers in the sugarcane estates giving them longer years of sugarcane husbandry experience.

The respondents showed that 93% of them have more than 10 years sugarcane growing experience and this means that farmer experience is no longer the limiting factor to efficient production. Farmers engaged in sugarcane production need about three years of experience before they are efficient sugarcane farmers [21]. In the study population, being a sugarcane out-grower referred to a farmer with relatively high cane sugar husbandry experience of within 10-19 years or >20 years and being 46 years minimum age, showing a lot of potential in the sugar production.

The level of education is also very high amongst the respondents with 75% having reached O' Level. The level of education impacts significantly on how farmers carry out their farming activities [33]. The percentage education levels distribution indicated highly literate community which was conversant with the sufficient communication levels required in the agricultural industry to guarantee a fair understanding of the potentials of success. In general, the randomly selected respondents were representative of all the education levels offered in Zimbabwe and were mostly able to comprehend the questions sufficiently enough to respond as they intended.

Agriculture being a muscle intensive profession, it is a given that the highly educated people in Zimbabwe historically shunned this field,

although the trend is somewhat changing with the revelation of the high financial gains to be made from it. The colonial dictates have a historical indelible contribution to this malaise through its appropriation of arable land and ostracising the Black Communities to small non-productive pieces of land according to the Native Land Husbandry Act of 1951 [34]. This inexorably instilled the notion that agriculture, let alone sugarcane production, was not a suitable and viable undertaking unless one was a highly educated professional employed by a commercial white farmer [35-38].

The gender inequality and bias against the females in the study population owning agricultural land has an historical undertone where, although women have remained the highest number on the land tilling the fields, they did not hold title to the land and its produce. The security of tenure was offered to male rural and industrial workers (to create a loyal urban and rural African class balance), in the reserves for stable landowning upper middle peasantry to complement an elite in the townships, which land was worked on by women and children [34]. The same imbalances are portrayed in sugarcane out-growers scheme in part through that the Agrarian Reform and Land Redistribution of the 2000 era were often violent and women invariably shy away from such scenarios hence their possible lower representation in the study [12].

Farmer skills monitoring and mentoring is done after attending a training program to ensure that there is skills consolidation and adoption. A relatively high percentage (91%) of the respondents agreed, to varying degrees, that monitoring and mentoring existed after attending agricultural training programs. However, an equal percentage to that seen with soil testing question disagreed categorically to having received post training guidance. This is significant as it portrays the same margin of 100 farmers whose farming behaviours are not accounted for and may pose significant reduction in yields and mill utilization.

A relatively significant percentage (58%) of the respondents agreed to having adequately trained managers or supervisors which may indicate they said so based on their out-growers productivity and the minority of 6% may also have used the same criterion to disagree. Reasons for not always engaging adequately trained managers by 35% of the respondents

may stem from inadequate remuneration for qualified personnel which could be addressed by financial capacitation of the farmers which will strengthen output and viability [39]. Trained managers and supervisors guarantee that sugarcane growing procedures are followed and increasing yields and profitability especially when farmers grow older.

Mentorship is an important aspect of skills enhancement. A good majority of the respondents indicated that they were getting some form of mentorship but one would encourage more mentorship support initiatives to help increase production. India has taken a lead in this approach where a lead farmer provides extension and advisory services to neighbouring farmers [40].

Moreover, 81% of the out-grower farmers seem to be aware of what standard sugarcane growing procedures were. None of the farmers disagreed with this although a minor % did differ on the frequency rather than on the procedures being followed. There may be need for a follow up ascertaining whether the out-growers are able to describe standard sugarcane growing procedures uniformly [41] or maintaining standard operation procedure manuals.

The 10% of out-growers who indicated that they were not taking their soils for testing are quite substantial as it works out to be approximately 90-100 farmers of the study population. Soils deteriorate with continuous tillage. Resultantly, methods of land utilization will require modification in conformity with soil changes. If a 100 out-growers did not send their soils for testing regularly, it may follow that failure to follow common commercial agricultural practices may affect outputs, increase production costs, cause failure to pay back loans and generally make out-growing business non- viable.

Fifty-six percent of the respondents agreed and strongly agreed, that they attended all the training programs that were carried out with a small relatively insignificant but critical 3% renegeing on training. In developmental programs, success depends not only on those conforming to the requirements but more so on those renegeing on the processes as negative attitudes tend to be emulated faster than good behaviours. It is imperative that those of the 40% who said that they did not always attend all training programs be encouraged to attend as

that will positively tilt the pivot of sugarcane production [42].

85% of the respondents asserted that those who attended training programs did perform better than those who did not. However, 35% of the respondents said that they did not always have adequate farm management skills, which category dropped to 14% when it came to there being a difference in production between trained and non-trained farmers, showing possibly the existence of various other factors contributing to one's production outputs. Nevertheless, it is expected that when one is trained, they acquire managerial skills and hence their sugarcane production outputs out match of those not trained. Farmers who will not be able to be trained in person (42%) may either employ trained personnel or send the ones they have for training as the human influence is critical for successful sugarcane production [39].

The awareness by respondents that there is a difference in production when one attends all training programs or not but still having some people not attending training is worrisome. Moreover, 58% of those missing training had inadequate management skills. This observation is in line with the findings found in South Africa that farmers lacked business skills, had no aspirations to commercialise, were not organised and had no best practise mindset [43].

Sixty-seven percent of the respondents' improved yields after accessing loans and this situation is in agreement with assertions that agricultural finance creates access to resources needed for effective performance [44]. It is, however, of concern that the majority of the respondents cite that the repayment plans are not conducive for the independent continuity of the farm. A viable business is one that is able to meet its operational and financial obligations and be able to sustain itself; a situation found equally challenging for the Swaziland out-growers [45,46].

The cost of funds was cited as having reduced the respondents' income levels significantly indicate that the out-growers in Swaziland have similar problems that have resulted in a high debt burden [47,48].

Overall, the respondents felt the positive impact of the credit facilities advanced to them as out-growers. However, the loan repayment plans were not generally conducive for independent

continuity of the farm with the majority asserting that the facilities had seriously reduced their income due to high interest rates, an aspect that needed serious consideration from the bankers and lenders, alike. The dependence of the out-growers on the loans is unmistakable. Most claimed that the loans provided enabled them to pay wages between periods of no revenue collection which is most likely before harvest. The credit facilities also allowed for new developments, bridging finance, during the life of any loan which is critical and reduces farmer redundancy which seen when farmers work mainly to pay off the loans remaining [49,50].

The farmers needed adequate extension services to be provided, regular extension officer visits to the farm, well experienced technical staff with suitable knowledge and knowhow about sugarcane production in place in lending institutions and adequate training programs provided for out-growers to improved yields. Farmers would, therefore be able to operate their sugarcane plantation with businesses management skills and good record keeping and financial management. However, the decreased yield and decreasing sugar production seem to agree with the inferior percentages of respondents who said extension services provided were not always adequate, extension officer visits to farm were not always regular, inexperienced technical staff with inadequate knowledge and knowhow about sugarcane production manned the lending institutions and inadequate training programs were provided for out-growers [51].

The skills development support programs are, in the view of the respondents, generally adequate though the respondents highlight the fact that lending institutions did not have well experienced technical staff that are knowledgeable in sugarcane production [52].

While the majority of respondents did not experience transportation of inputs from the supplier to the farm as a major challenge, those who did experience the movement of inputs drawbacks may have had inputs not being delivered on time or not at all with negative effects on production. Transportation is a major constraint for small-middle scale farmers who may find hiring farm machinery such as tractors and loaders being costly and affecting viability. A good 45% testified that the machinery that has been provided under a support program were not supplied on time, tending to affect land

management resulting in low yields [53]. More so, the facilities available on the market for out-growers to buy machinery had very short repayment periods with very high premiums. Business profitability was affected in the long run although it had been shown that farmers were able to run other programs during the subsistence of other loans [54] which increased the debt burden.

The ISPs enabled 68% of the respondents to access all the inputs that they required. However, it is of concern that the respondents did not want to become part of a buying syndicate despite the benefits that would accrue to them [55]. This is particularly important given the fact that 52% of the respondents said the inputs supplied under a support program were not always cost effective [54].

Infrastructure sharing of dams and canals is inevitable on shared farm land. More so, land that may have been owned by an individual and then gets redistributed amongst many smaller plot holders have been a source of conflict and hindrance to production. Proof is given by the higher representation amongst the respondents who confirming that conflict arose over shared infrastructure. The economic climate contributes to irrigation infrastructure being in a bad state but respondents generally disagreed at relatively higher rates for maintenance showing possibly that some farmers had developed some coping mechanism aiming at increasing productivity even during hostile periods and non-competitive agricultural environment [56]. Although some agreed that there was no support for maintaining shared infrastructure such as canals, the majority disagreed. Most likely canals in other areas were well looked after from time to time which is possible where resources are not sufficient for even distribution [4].

Adequacy and timely availability are key components of a financial lending scheme to farmers. Out-growers felt that funding was provided in sufficient quantities when needed which is quite an incentive if the funding did not prove to be expensive to the farmers. Adequacy and timely loan disbursement need to be balanced with the farmer's ability to repay on time. Funds issued out without professional guidelines from lenders with insufficient knowledge of the sugarcane business, who will not gauge the appropriateness of the loan before it is disbursed, who will not ensure the borrowed amounts do not end up unnecessarily burdening

the farmer, normally “strangle” the farmer’s productivity as was happening.

Viable and good agricultural support systems enable farmers to access all the inputs that they require for productivity as indicated by the majority of the out-growers. However, the dissenting minority at 32%, who said that support program did not always enable accessing of requirements, may mean that some out-growers (± 270) were disadvantaged. If the scarcity of requirements happened at critical times like planting season, it may mean some farmers were working out of synch with seasonal sugarcane growth which could affect production and yields. On cost effectiveness of inputs, the majority who did not outrightly concur were rather critical in assessing value for money of the input support services. Naturally all farmers are expected to agree with the effectiveness of the support to such an extent that not a single out-grower should have contrary views. The absence of this consensus shows a possible drastic downstream, if not immediate, reduction in output and outcomes.

5. CONCLUSION

5.1 Adequacy of Out-grower Skills

Considerable level of crop husbandry skills existed amongst the respondents though the managerial aspect remains significantly lacking. This aspect was found lacking in the farmers themselves and in their failure to employ adequately trained managers and supervisors. Both the farmers and their managers may need to consider going for training since sugarcane is specialist plantation crop. An imperative for the millers of sugarcane is to play an active role in creating an awareness for the need for farmers to make time available to attend training programs available. Farmers should also be encouraged to make formal mentorship arrangements with a lead producer in their neighbourhood in order to accelerate the rate of yield improvement. Mentorship and partnerships should be done through service providers such as suppliers of herbicides to improve yields for the farmer and also increased sales volumes for the supplier [57].

5.2 Impact of Credit Polices

Borrowed funds from financial institutions improved yields. However, the repayment plans for these loans seem not ideal for the

independent continuity of the farm. Lending institutions may need consider revising lending policies to allow for reduced instalments and reduce interest rates accordingly as the cost of funding was being cited as one major challenge.

5.3 Gaps in the Current Out-grower Model

Lending institutions seem not to have staff adequately trained in sugarcane production and consequently will not be able to relate their banks policies to the requirements of the out-growers needs. Lending institutions may need to send staff to some basic sugarcane farming appreciation courses to help influence policy formulation as the financiers will have a better understanding of the crop.

Training programs did not always address farmers’ needs with implications on effective needs assessment. Training needs assessment necessitates being carried out in order to deliver training programs translating into more sugarcane yields, failure of which may lead to perceptions translating into reasons for low attendance by farmers.

Lending institutions have contributed significantly to the turnaround of sugarcane production on the out-growers’ land but the failure to release funds when they are exactly needed by the farmer is a serious drawback to production. Financiers need to relook at their liquidity issues and look for funds to meet the growers’ requirement. Prescriptive financing plans implemented by financiers, without sufficient options to choose from, require banks to commit more time and resources towards customised product development for a market niche with a very low rate of default due to agreements existing between farmers and the miller.

Input access modalities have resulted in only 68% of the respondents accessing all the inputs that they require and there is a need to review these arrangements to enable all out-growers to access all the inputs they need for the benefit of the crop. Inputs supplied under support programs should always be cost effective and farmers’ procurement discretion of the farmers should be allowed. Farmers should be allowed to identify a supplier of inputs and the financier or the millers pay the supplier instead of restricting out-growers to inputs supplied by the miller. The proposal, when managed properly, may contain the debt burden through allowing growers actively cost management.

Infrastructure (canals) is one of the major constraints faced due to lack of partnerships among the out-growers. Out-growers may need to form syndicates and use them to hire private companies to repair their infrastructure. Through partnerships, not only are tangibles shared but also the skills on how to boost sugarcane production will be collective. Major out-grower awareness programs need to be carried out showing the benefits associations bring to the farmers as compared to working alone. Also, loans to out-growers need be divided into long term (20 years), medium term (10 years) and short term (or seasonal) loans for running their ventures [58].

ACKNOWLEDGEMENTS

Acknowledgements are made to all individuals and organisations that have assisted in preparation of this dissertation. To complete a project of this scope naturally requires the assistance of many people. The list of expression of thanks may not be exhaustive but the assistance of all is greatly acknowledged.

I also wish to thank the Agricultural Director, Mr A J Bosch, the Agricultural Operations Manager, Mr F Chifombo, Senior Area 2 Manager, Mr O Mhondiwa, Senior Section 8 Manager P T Machida and the Sugarcane out growers for their invaluable contribution towards the completion of this dissertation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kuhudzayi B, Mattos D. A model for farmer support in Zimbabwe - Opportunity for Change. in N Agricultural Economics, Economics C, Editor. University of Nebraska-Lincoln Nebraska, Lincoln; 2018.
2. Mlambo AS. From an industrial powerhouse to a nation of vendors: Over Two Decades of Economic Decline and Deindustrialization in Zimbabwe 1990–2015. *J Developing Societies*. 2017;33(1): 99-125.
3. Sibanda N. Overview: Zimbabwe's sugar industry. *Africa Business Insight: TAGS: SUGAR, Zimbabwe*; 2010.
4. Chidoko C, Chimwai L. Economic challenges of sugar cane production in the Lowveld of Zimbabwe. *Int J Eco Res*. 2011;2(5):1-13
5. Sugar TH. Tongaat Hulett Sugar focuses on cane growing, sugar milling and refining throughout the Southern African region; 2020. Available:<https://www.tongaat.com/our-business/sugar/>.
6. Kreamer R, Esterhuizen D. The report focuses on the production and usage of sugar in Zimbabwe. *Gloabla Agricultural Information Network: United States of America*; 2012.
7. Mangoma T. Cane farmers eye bumper harvest *The Herald: Hararwe, Zimbabwe*. 2018.
8. Dasva A, Mapira J, Ngaza N. Sugarcane production among A2 farmers in the Hippo Valley Estate and the quest for sustainable development in Zimbabwe *European J Social Sciences Studies*. 2018;3(3): [S.I.]
9. Dubb A, Ian Scoones I, Woodhouse P. The Political Economy of Sugar in Southern Africa – Introduction. *Journal of Southern African Studies*. 2017;43(3):447-470. DOI:10.1080/03057070.2016.1214020
10. Deininger K, D. Byerlee D. The rise of large farms in land-abundant countries: Do They Have a Future??. *World Development*. 2012;40(2012):701-14.
11. Moyo S, Nyoni N. Land and Agrarian reform in former settler colonial Zimbabwe; 2013. [cited 2020 17.01.2020]; Available:http://www.codesria.org/IMG/pdf/6-Land_and_Agrarian_Reform_in_Zim_Moyo_and_Nyoni.pdf
12. Cliffe L, Alexander J, Cousins B, and Gaidzanwa R. An overview if Fast track Land Reform in Zimbabwe: Introduction. *J Developmental Studies*. 2011;38:907-938. DOI:10.1080/03066150.2011.643387
13. Mazwi F, Muchetu RG. Out-grower sugarcane production post fast track land reform programme in Zimbabwe. *Ubuntu: J Conflict, Social Transformation*. 2015; 4(2):17-48.
14. Eaton C, Shepherd AW. Contract farming: Partnerships for growth-A Guide. in *Agricultural Services Bulletin* 145. Food and Agricultural Organization of United Nations: USA; 2001.

15. Zvoutete P. Fluctuations in the Levels of SMUT (*Ustilago Scitaminea*) in Response to Changes in Disease Management Strategies in the Zimbabwe Sugarcane Industry. Proceedings of South Africa Sugar Technological Association. 2008; 81:381-387
16. Mutanga M, Ramoelo A, Gonah T. Trend analysis of small-scale commercial sugarcane production in post resettlement areas of Mkwazine Zimbabwe, Using Hyper-Temporal Satellite Imagery. *Advances in Remote Sensing*. 2013;2:29-34.
DOI:10.4236/ars.2013.21004
17. Shumba E, Roberntz P, Kuona M. Assesment of sugarcane outgrower schemes for bio-fuel production in Zambia and Zimbabwe; 2011.
[cited 2020 18.01.2020]
Available from: http://www.tabef.or.tz/wp-content/uploads/2011/10/Sugar-cane-outgrower-publication-WWF_Final_low-res.pdf
18. Sukume C. Economically viable sugarcane based smallholder out-grower scheme model in Zimbabwe. in Consultancy commissioned by WWF Zimbabwe Country Office, Harare. WWF Zimbabwe Country Office: Harare, Zimbabwe; 2010.
19. Shumba EA, Carlson H, Kojwang M, Sibanda M, Masuka M. Bio-fuel investments in Southern Africa: A situation analysis in Botswana, Malawi, Mozambique, Zambia and Zimbabwe. WWF. Harare, Zimbabwe: Harare, Zimbabwe; 2009.
20. Madzokere F, Mutambara J, Zirenga VL. An Investigation into the Factors Affecting Outgrower Sugarcane Farming in the SouthEast Lowveld of Zimbabwe. *Business & Social Science J*. 2018;3(1):1-11.
21. Sonneveld E. Sugarcane contract farming with small holders in Xinavane, Mozambique: Neo Colonialism or development opportunity?; 2012 .
[cited 2020 18.01.2020]
Available:<https://edepot.wur.nl/WebQuery/clc/2001832>
22. Johnston C, Meyer RL, Curtis A. Value chain governance and access to finance maize, sugarcane and sunflower oil in Uganda, microREPORT # 88; 2007.
[cited 2020 18.01.2020]
23. Dasva A, Mapira J, Ngaza N. Sugarcane production among a2 farmers in the hippo valley Estates And The Quest For Sustainable Development, Zimbabwe. *European Journal of Social Sciences*. 2018; 3(3):[S1]
24. Murambiwa S. Zimbabwe sugarcane farmers accuse cane lands trust of converting US\$900 000. in *News of the South. Africa Business Slider*: Harare, Zimbabwe; 2014.
25. Marokane DL, Mhere A. Hippo Valley Estates (Zimbabwe) crushes 1 862 000 tons of cane during the 2019 season, up 21% Chairman's Statement from 2019 abridged report of Hippo Valley Estates Limited (HIPO.zw), listed on the Zimbabwe Stock Exchange). 2019.
[cited 2020 25 Jan 2020]
Available:<https://africanfinancials.com/hippo-crushes-1-862-000-tons-of-cane-during-the-2019-season-up-21/>.
26. Financials A. Hippo Valley Estates' sugar production improves 9% to 153 343 tons; 2018.
[cited 2020 25 Jan 2020]
Available:<https://africanfinancials.com/hippo-valley-estates-sugar-production-improves-9-to-153-343-tons/>
27. Marczyk G, DeMatteo D and Festinger D. *Essentials of Research Design and Methodology*. Hoboken, New Jersey: John Wiley & Sons, Inc; 2005.
28. Bolarinwa OA. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Niger Postgrad Med J*. 2015;22:195-201
29. Jamieson S. Likert scale; 2017.
[cited 2020 April 26, 2020]
Available:<https://www.britannica.com/topic/Likert-Scale>
30. Bolarinwa O. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Nigerian Postgraduate Medical Journal*. 2015;22(4):195-201.
DOI:10.4103/1117-1936.173959

31. Litwin MS. How to measure survey reliability and validity. Thousand Oaks, California: SAGE Publications, Inc; 1995.
32. Goforth C. Using and Interpreting Cronbach's Alpha; 2015.
Available:<https://data.library.virginia.edu/using-and-interpreting-cronbachs-alpha/>
33. Khan F. Role of various factors in sugarcane production in selected area of Khyber Pakhtunkwa, Pakistan. *J agricultural research*. 2017;55(3):577-584.
34. Duggan WR. The native land husbandry act of 1951 and the rural african middle class of Southern Rhodesia. *African Affairs*. 1980;79(315):227-239.
35. Arrighi G. Labour supplies in historical perspective the proletarianization of the African peasantry in Rhodesia. *J Development Studies*. 1970;6.
36. Phimister I. Peasant production in Southern Rhodesia. *African Affairs*. 1974; 73.
37. Wright M. Production mixes in Zimbabwe 1800-1908 (Seminar Paper). in Fernadn Braudel Centre. Binghamton: State University of New York; 1978.
38. Palmer R. Land and Racial Domination in Rhodesia.: Berkeley. 1977;243-244.
39. Nzima M. Zimbabwe Sugar Association Quartely Newsletter No. 65 June 2013. in Zimbabwe Sugar Association Quartely Newsletter Zimbabwe Sugar Association: Harare, Zimbabwe; 2013.
40. Meyer J. Good Management Practises Manual for the Sugar Industry; 2011.
Available:http://www.ifc.org/wps/wcm/connect/486cf5004953685e8586b519583b6d16/IFC_GMP_ManualCaneSugarIndustry.pdf?MOD=AJPERES
41. Owino OE, Odondo A, Obange N. SOCIO-economic determinants of sugarcane production among small scale farmers in nyando sugarbelt of KENYA. *International J Economic and Business*. 2018;6.
42. Owens T, Hoddinott. The impact of agricultural extension on farm production in resettlement areas of Zimbabwe; 2001. [cited 2020 25 Jan 2020]
Available:<http://www.csae.ox.ac.uk/workinpapers/pdfs/2001-06text.pdf>
43. Sibiyá TGKMH. Sustaining Small-scale Sugarcane Cooperatives in South Africa through Clustering, Collaboration, Goal Alignment and Record-keeping; 2008. [cited 2020 25 Jan 2020]
Available:<http://www.sacanegrowers.co.za/wp-content/uploads/2011/02/2011-IAPSIT-Sustaining-Small-scale-Sugarcane-Cooperatives-in-South-Africa-through-Clustering-Collaboration-Goal-Alignment-and-Record-keeping.pdf>
44. Church AD, Groom GM, Thomson DN, Dlamini VR. Small scale cane grower development models: some lessons from Sub Saharan Africa Proceedings of the South African Sugar Technologists Association. 2008;81:116-127.
45. Masuku MB, Kirsten J F, Van Rooyen C J, and Perret S. Contractual Relations Between Small-holder Sugarcane Growers and Millers in the Sugar Industry Supply Chain in Swaziland; 2003. [cited 2020 25 Jan 2020]
Available:http://repository.up.ac.za/bitstream/handle/2263/2288/masuku_contractual%282003%29.pdf?sequence=1
46. Tsabedze K. Factors affecting the viability of small scale sugarcane business: A case study of the Komatsi Downstream Development Project; 2006. [cited 2020 25 Jan 2020]
Available:http://www.fidafrique.net/IMG/pdf/Factors_viabilityKDDP.pdf
47. Dlamini S, Rugambisa IJ, Masuku MB, Belete A. Technical Efficiency of the Small-Scale Sugarcane farmers in Swaziland. A Case for Vuvulane and Big Bend Farmers. *African J Agricultural Research*. 2010; 5(9):935-940.
48. Dlamini MM, Dlamini MB. Explanatory variables associated with yield performance gap among small to medium and large scale sugarcane (*Saccharum Officinarum*) growers at Ubombo sugar, Big Bend, Swaziland. *Asian J Agricultural Sciences*. 2012;4(1):32-39.
49. Henning JF, Bougard DA, Jordaan H, Matthews N. Factors Affecting Successful Agricultural Loan Applications: The Case of a South African Credit Provider. *Agriculture*. 2019;9:243. DOI:10.3390/agriculture9110243
50. Nikaido Y, Pais J, Sarma M. What hinders and what enhances small enterprises' access to formal credit in India? *Rev Dev Financ*. 2015;5:43-52.
51. Masuku MB. (Determinants of Sugarcane Profitability: The Case of Smallholder Cane Growers in Swaziland,). *Asian Journal of Agricultural Sciences*. 2011;3(3):210-214.

52. Meyer E, Nothard BW. Logistics and challenges in developing small scale grower sugarcane in KwaZulu Natal; 2006. [cited 2020 25 Jan 2020] Available:http://www.sasa.org.za/Libraries/SA_Sugarcane_Industry_Agronomists_Association/Logistics_And_Challenges_In_Delivering_Small-Scale_Grower_Sugarcane_In_KwaZulu-Natal_Eddie_Meyer.sflb.ashx
53. Meyer E. Machinery systems for sugarcane production in South Africa. 2005. [cited 2020 25 Jan 2020] Available:<http://www.sasta.co.za/wp-content/uploads/essential%20reading/Agriculture/2005%20Meyer,%20Sugar%20Mechanisation.pdf>
54. Baltzer K, Hansen H. Agricultural input subsidies in Sub Saharan Africa. Agricultural input subsidies in Sub Saharan Africa; 2011. Available:<http://www.oecd.org/derec/49231998.pdf> [cited 2020 25 Jan 2020]
55. Richardson B. Trade, aid and rural development, EU sugar policy and the experience of Swaziland; 2012. Available: <http://www.ecdpm.org/dp133>
56. Tyler G. Competitive Commercial Agriculture in Sub-Sahara Africa (CCAA) Study. J The African Sugar Industry. 2011;3:21-33.
57. Chaumba J, Scoones I and Wolmer W. FromJambanja to Planning: The Reassertion of Technocracy in Land Reform in South-Eastern Zimbabwe? J Modern African Studies. 2003;41(4):533-554.
58. Scoones I, Mavedzenge B, Murimbarimba F. Sugar, People and Politics in Zimbabwe's Lowveld. Journal of Southern African Studies. 2017;43(3):567-584. DOI:10.1080/03057070.2016.1187972

© 2020 Kudakwashe et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/56617>*