

Proceedings

53rd conference of the South
African Society for
Agricultural Extension



“The challenge: Successful land
reform in South Africa and the role of
extension and advisory services”

9 – 11 July 2019

Sol Plaatje University, Kimberley, Northern Cape



agriculture, land reform
& rural development

Department
agriculture, land reform & rural development
NORTHERN CAPE PROVINCE
REPUBLIC OF SOUTH AFRICA



**SOUTH AFRICAN SOCIETY FOR AGRICULTURAL EXTENSION
PROCEEDINGS OF 53RD CONFERENCE
9 JULY – 11 JULY 2019: SOL PLAATJE UNIVERSITY, KIMBERLEY, NORTHERN
CAPE PROVINCE, SOUTH AFRICA.**

Published by the South African Society for Agricultural Extension.

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Convenor: SASAE Editorial Committee

FORWARD

The publication contains the papers presented at the 53rd Annual SASAE Conference held at Sol Plaatje University in Kimberley, Northern Cape from 9th of July to 11th of July 2019. The Conference is the result of many dedicated volunteers: the reviewers, the best paper award judges and the organising committee. We wholeheartedly thank them all. We also wish to thank all the authors who submitted their work and the program participants for their contributions at the conference. We would also like to thank the Northern Cape Department of Agriculture and Sol Plaatje University for their sponsorship and support during the conference.

We hope all of you had a fruitful and enjoyable time in Kimberley.

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SASAE AWARDS: 2019

Awards Committee

Every year the Awards Committee of the SASAE Board sends out letters to Members to solicit nominations for Awards of the Board. During 2019 the Awards Committee proposed the following Awards to Members, which the Board approved:

1. AWARD CEREMONY 11 JULY 2019

During the Gala Dinner of the Annual conference we had an Award Ceremony where Members were awarded according to the criteria in the SASAE Awards Bylaws.

1.1. SASAE Floating Trophy for a Young Professional

A young Extension Officer (with ten years or less service) who has demonstrated a combination of service, leadership and participation in conferences relating to Agricultural Extension will qualify for this award. This year the Award was won by **Patrick M. Ngcobo of the KwaZulu-Natal Branch**.

1.2. Loubie Loubser Floating Trophy

This Award is for the most active Branch of the Society. This year the **Eastern Cape Branch** won this Award.

1.3. Certificate for Co-ordinated Extension

This certificate is for a group of extensionists who, as a team, launched a successful extension programme. This year **W.A. Gillespie of the KwaZulu-Natal Branch** won this certificate.

2. POPULAR PAPER, SCIENTIFIC PAPER & BEST POSTER AT CONFERENCE.

During the conference, the participants were asked to evaluate all the papers that were presented at the Conference according to certain criteria and to nominate the “**Most Popular Paper**”.

The winner was **W. A. Gillespie (with co-author F.J. Mitchell) from the KwaZulu-Natal Branch**. The title of his paper was: “*Extension: To serve and protect – How to achieve sustainable rural development*”.

During the Conference the Editorial Committee evaluated all the papers presented at the Conference according to a set of criteria to determine the “**Most Scientific Paper**”.

This year the winner was **B. Conradie from the Western Cape Branch** for the paper: “*The financial and extension implications of a 30% land redistribution target for one Karoo community*”.

During the Conference we had a Poster Session where a number of posters were displayed. There was a panel who adjudicated the posters to determine the “**Best Poster**”.

The winner was **P.L. Campbell**. The title of their Poster was: “***The challenge: Successful land reform in South Africa and the role of Extension Advisory Services***”.

OPENING SESSION

SCRIPTURES AND PRAYER

Mr Motlashuping (Extension advisor)

THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

WELCOMING ADDRESS

Ms Mantombi Mbongo – President SASAE

THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

WELCOMING BY SOL PLAATJE UNIVERSITY

THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

KEYNOTE ADDRESS

Mr C. Latha (Land Reform Farmer)

THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

SECOND KEYNOTE ADDRESS

Ms. Carol Levendal, Mr. Kuben Moodley and Prof. Maxwell Mudhara (Facilitator: Dr Hlami Ngwenya – Discussion Session)

THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

KEYNOTE ADDRESS

EXTENSION OFFICERS' PERCEPTIONS OF EXTENSION AND INNOVATION IN SOUTH AFRICA

Dr Fernando Landini¹ and Dr Kristin Davis²

ABSTRACT

Extension is evolving, and extension workers' roles and attitudes are changing with global realities. The purpose of this study was to examine South African extension officers' perceptions of their job, views on the objectives of extension, and conception of agriculture. A questionnaire was developed consisting of general demographic and Likert-scale questions regarding perceptions of extension. The survey was emailed to all South African based members of the South African Society for Agricultural Extension (SASAE). The study found that most extensionists considered extension as a professional or technical practice to improve farmer practices followed by those who consider it as "helping farmers" to improve their well-being. The most preferred methods and the area of actual practice were first group and second individual approaches. According to the respondents, productive modernisation aimed at productivity and profitability was the highest extension objective, followed by increasing farmers' knowledge through training. In addition, results provide evidence that extension institutions tend to support conventional agriculture, while extension workers are more concerned with potential negative impacts. Finally, the Likert-scale responses show that while much South African extension work is based on dialogue and horizontal coordination using a participatory approach, transfer of technology still exists, and farmers are blamed for their problems.

Keywords: Agroecology, Diffusion, Extension, Innovation, Perception

1. INTRODUCTION

Extension has been evolving and will continue to do so (Davis, 2008; Davis *et al.*, 2018). Extension workers' roles and attitudes are changing with changing global realities (Davis & Sulaiman, 2014). At the same time, extension is broadening and becoming more holistic. Extension and advisory services are defined here as "all the different activities that provide the information and advisory services that are needed and demanded by farmers and other actors in agri-food systems and rural development." (Christoplos, 2010:2).

Development paradigms that have affected extension have changed over the decades. Extension was first influenced by the linear transfer of technology or diffusionist approach (Davis, 2008; Koutsouris, 2018). This approach assumed that researchers and technical experts had the responsibility to generate new technologies, extension workers to transfer them, and farmers to adopt them. In this context, farmers' empirical knowledge tended to be neglected. The diffusion of innovations theory has heavily influenced extension thinking and practice

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(Rogers, 1995). After this was viewed as sometimes ineffective and irrelevant, along with other criticisms (Rivera, 2001), paradigms shifted to more participatory, farmer-led or demand-driven models (Chambers, 1997; Scoones & Thompson, 1994). Within this model, farmers' empirical knowledge and experience are acknowledged and revalued (Duveskog, Friis-Hansen & Taylor, 2011), and the hierarchical linear relationship between extension workers and farmers was reshaped as a horizontal interactive one (Machado, Hegedus & Silveira, 2006). An older paradigm on which this is partially built is Paolo Freire's educational concept of conscientisation, the view that rural people must be empowered to make their own decisions (Freire, 1970).

More recently, the complex and broad agricultural innovation systems thinking (Davis, Ekboir & Spielman, 2008; Spielman, 2002) changed the way in which we think about innovation processes, from adoption of technologies to a process that takes place in the context of the coordination and articulation between multiple social actors with different types of knowledge, experience, and social roles (Klerkx, Van Mierlo & Leeuwis, 2012; Moschitz *et al*, 2015). Thus, extension officers become facilitators of social learning and inter-institutional coordination (innovation brokers) (Leeuwis & Aarts, 2011; Tarekegne *et al*, 2017).

It is important to note that the diversity of extension practices not only refers to extension models or approaches, but also includes preferred methods and extension objectives. With regards to preferred methods, four general types can be identified. The first two refer to the use of individual methodologies (generally acquiring the form of individual technical assistance), versus the use of group approaches, characterised by participatory processes or horizontal learning (Acunso *et al*, 2016). Beyond individual and group methodologies, extension practice has also acknowledged the importance of using mass media communication strategies such as radio, television, and more recently, internet and mobile phones as a way of reaching farmers and providing up-to-date information (Parvizian, Hosseinnejad & Lashgarara, 2011). Furthermore, in the context of agricultural innovation systems and territorial development approaches, extension officers have also incorporated methodologies for facilitating coordination between different institutions and social actors in the context of rural development/ innovation platforms, a role in line with the idea of "brokering" (Klerkx & Leeuwis, 2009).

Extension objectives are also diverse. Within a traditional transfer of technology approach, agriculture modernisation was the most important objective of extension workers (Altalb, Filipek & Skowron, 2015). However, changes in extension and development models broadened the scope of extension practice. Different institutions incorporated many other objectives to extension practice, such as creation and strengthening of farmer organisations (Landini, 2016a), support to commercialisation of produce (Swanson & Rajalahti, 2010), management and protection of natural resources (Vanclay, 2004), and development of farmers' entrepreneurship capacity (Stevens, 2017).

Authors have frequently studied extension approaches and objectives of specific institutions, policies, and even countries (Minh, Larsen & Neef, 2010; Moschitz *et al*, 2015). However, these studies usually neglect differences between extension officers working in the same programmes or institutions (i.e. interpersonal differences). Even though institutions constrain and guide extension agents' practices, it is also clear that agents have a margin for manoeuvring (Long, 2001) and thus contribute to shaping institutional practices (Landini *et al*, 2014). As a result, understanding the diversity of extension workers' individual approaches, perspectives and objectives will help with understanding their practices.

2. PURPOSE

The purpose of this study was to examine South African extension officers' perceptions of rural extension and innovation as part of an international study that also includes Argentina, Australia, Brazil, Chile, Mexico, New Zealand and Nigeria. The international study was conducted by researchers from the National Council of Scientific and Technological Research as well as the University of La Cuenca del Plata in Argentina, and supported by the Global Forum for Rural Advisory Services. The research objective was to understand the perceptions and opinions of extension agents regarding their work and context in South Africa. Further publications will compare the South African case to those of other countries.

3. METHODOLOGY

A conceptual framework to assess extension agents' perceptions and opinions on extension and innovation was developed and validated by 12 international experts from 11 countries. This framework was used to develop a questionnaire with a Likert-type scale. The scale was validated using exploratory and confirmatory factor analysis using a sample from Argentina (Landini & Beramendi, 2018).

The self-administered questionnaire was translated from Spanish and validated by English-speaking extension experts from South Africa. It consisted of general demographic questions as well as Likert-scale questions regarding perceptions of extension and innovation.

The South African Society for Agricultural Extension (SASAE) is a professional membership association for extension agents in South Africa and beyond. It was thus considered an appropriate target for the survey. A list of all members of SASAE members residing in South Africa was obtained (N=285). Permission was obtained from SASAE to conduct the study. The survey was pilot tested among 13 members from one province to ensure reliability. As the questions were not changed after the pilot, we included their responses with the overall results. Respondents had the option to respond to the survey using an online platform or by completing a fillable PDF form. Emails were sent to the entire mailing list. Reminders were sent after three weeks. Data were entered into SPSS version 21 and analysed.

4. RESULTS

Out of the targeted 285 South African based members of SASAE, 43 respondents (30% female) successfully completed the questionnaire. The majority of respondents (74%) currently work as advisors or rural extensionists. They had worked between 0-44 years as extension workers, with an average of 15 years. Respondent ages varied from 26 to 63 with an average of 44 years of age.

Table 1 shows the educational level of respondents, and Table 2 indicates the organisational affiliation of respondents.

Table 1: Maximum educational level reached

	Frequency	Percentage
Post-secondary school	2	4.7
University degree	17	39.5
Master's degree	19	44.2
Doctorate	5	11.6
Total	43	100

Table 2: Type of current extension institution, organisation or company

	Frequency	Valid percentage
Public (universities excluded)	25	78,1
Farmer organisation or association	2	6,3
Independent advisor	2	6,3
Other	3	9,3
Total	32	100
No response	11	

Table 1 shows that most respondents (55.8%) have a master's degree or a doctorate, which is very high when compared to other developing countries (Landini & Bianqui, 2014). Table 2 shows that most participants come from the public sector. Although these results cannot be generalised to all South African extension agents, high levels of education imply an important potential for the country, especially considering that they work in the public sector.

Following the demographic data, respondents were asked about their perceptions of extension, farmers, and innovation. A set of 26 questions were asked regarding the general perceptions of South African extensionists. The Likert-scale items ranged from one to five, with 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree, and 5=strongly agree.

Landini and Beramendi (2018) showed that the Likert-type scale had five factors. Factor 1 is named "Dialogue and horizontal coordination." It refers to multiple situations where different actors dialogue, interact, coordinate, and work together in a horizontal way to reach different ends in the context of extension practice. The items address the relationships between extension workers, farmers, researchers, and other social actors. Factor 2 is named "Transfer of technology," because it expresses an extension approach that follows the classic diffusionist model. Factor 3 is named "Blame on farmers". It includes items that affirm that farmers are passive, traditionalist, and have handout attitudes. Factor 4 refers to the degree to which extension workers support a participatory, farmer-led extension approach. Finally, Factor 5 (named "Self-critical attitude,") includes items that value individual reflection on practice, as well as asking farmers and peers for feedback on extensionists' work. In our sample, the Cronbach's Alpha of each factor was acceptable, ranging from 0.55 to 0.73.

Table 3: Likert-scale responses to perceptions of extension for the five factors

	Minimum	Maximum	Mean	Standard Deviation
FACTOR 1 Dialogue and Coordination	3.71	5.00	4.45	.34
FACTOR 2 Transfer of Technologies	2.00	4.83	3.72	.73
FACTOR 3 Blame on Farmers	2.20	5.00	3.57	.70
FACTOR 4 Farmer-led Extension	2.00	5.00	4.08	.70
FACTOR 5 Self-critical Attitude	1.50	5.00	3.71	.75

The most valued extension approach by South African extensionists was Factor 1, based on dialogue and inter-institutional coordination. Participatory farmer-led extension (Factor 4) was also valued. In both cases, the mean was higher than four (which indicates an agreement with the factor). These results are important as they show that the extension approach of South African extension agents is in line with recommendations of international literature on the topic (Landini, 2016b). In addition, the results indicate that there was a fair amount of agreement with a traditional, diffusionist approach (Factor 1), and that there was also a slight tendency to blame farmers for their lack of progress (Factor 3). These are also significant results since current academic literature has heavily criticised transfer of technologies as an extension approach (Rivera, 2001). Similarly, the tendency to blame farmers for their problems is also worth considering as it shows the difficulty of extension agents to “put on the farmers’ shoes” and understand their point of view. Understanding farmers’ point of view is fundamental for providing contextualised advice. Finally, results also show that participants have a valuable degree of self-critical attitude, a fundamental aspect for reflecting on practice and developing new strategies to face problems (Landini & Brites, 2018)

Respondents were asked to rank their most preferred to least preferred methods of working with farmers and with other social actors on a scale of 1 to 4. Potential answers included working with individuals, working with groups, inter-institutional and coordination work, and mass media. They were also asked to list the actual methods that they used, with 1 being the most used and 4 being the least used. In this case, participants also had the opportunity to state that they did not use the method at all (5).

Table 4: Preferred and most used extension methods

Type of extension work		Mean	Level of preference and use				“I do not use it” (5)
			1	2	3	4	
Individual	Preference	2.21	39.5%	25.6%	9.3%	25.6%	---
	Use	2.05	37.2%	34.9%	14%	14%	---
Group	Preference	1.93	34.9%	39.5%	23.3%	2.3%	---
	Use	1.74	41.9%	41.9%	16.3%	---	---
Inter-institutional coordination	Preference	2.44	20.9%	23.3%	46.5%	9.3%	---
	Use	2.42	25.6%	16.3%	51.2%	4.7%	2.3%
Mass media	Preference	3.42	4.7%	11.6%	20.9%	62.8%	---
	Use	3.60	9.3%	7%	11.6%	58.1%	14%

The most preferred method and area of actual practice was group work, followed by individual work. Interestingly, group extension work was more practised than preferred, and individual extension work more preferred than practised, perhaps due to institutional requirements. Inter-institutional coordination fell in third place, while mass media in the last place. Considering the importance of mass media (mobile phones and internet) for reaching greater audience numbers at lower costs, these results should be discussed among SASAE with the following potential discussion topic: Is public extension in South Africa missing opportunities to take advantage of the potential of mass media?

Next, respondents were asked to order three statements regarding the role of extension, with the aim of better understanding their professional identities. Results are displayed in Table 5.

Table 5: Perception of extension’s role

Statements	Mean	1 st choice	2 nd choice	3 rd choice
1. A rural extensionist is a worker or professional that helps to improve farmers’ productive, commercial or organisational practices.	1.56	58.1%	27.9%	14%
2. A rural extensionist helps farmers to increase their well-being and improve their quality of life.	1.72	32.6%	62.8%	4.7%
3. A rural extensionist supports farmers so that they are able to overcome situations of injustice and oppression.	2.72	9.3%	9.3%	81.4%

Note: For calculating the mean, 1st choice was assumed to be 1, 2nd to be 2 and 3rd to be 3. The lower the mean, the more preferred the option is.

Most extensionists considered extension as a professional or technical practice to improve farmer practices followed by those who consider it as “helping farmers” to improve their well-being. There were also some who considered extension as a way to fight social injustice. These results contribute to understanding extension workers’ identities and personal motivations. Considering the value given to “helping farmers”, future research should assess the prevalence of paternalistic attitudes on the part of extension agents.

Furthermore, respondents were asked about their perceptions of the most important objectives of extension practice. They only had the opportunity to select three out of 10 options (Table 6). These results indicate what are considered the most important objectives by South African extensionists.

Table 6: Perceptions on the most important extension objectives

Objectives	Percentage
1. Productive modernisation aimed at increasing productivity and profitability.	55.8
2. Increasing farmers' productive and commercial knowledge through training sessions.	46.5
3. Integrating farmers into commercial chains and supporting the commercialisation of their products in conventional markets.	41.9
4. Strengthening of farmers' productive strategies and livelihoods through the funding of small productive projects.	30.2
5. Protection and management of natural resources.	30.2
6. Developing entrepreneurial and business capacity.	25.6
7. Improving farmers' quality of life by helping them to have access to basic services.	23.3
8. Resolution of productive or commercial problems posed by farmers by means of providing advice.	23.3
9. Creation and strengthening of farmer organisations.	11.6
10. Provision of information regarding prices or climate in order for it to be used for decision making	4.7

Productive modernisation aimed at increasing productivity and profitability was the highest objective, followed by increasing farmers' knowledge through training, both characteristic of a traditional transfer of technology approach. The importance of supporting commercialisation of produce in conventional markets appears third. In contrast, supporting the creation and strengthening of farmer organisations, a strategy commonly used to support alternative commercialisation channels, occupies ninth place, showing a clear preference for conventional commercialisation strategies. Finally, two growingly important objectives of rural extension worldwide are in the middle of the chart, namely protection and management of natural resources and development of entrepreneurial and business capacity.

Respondents were also asked about their own opinions with regards to agroecology versus conventional agriculture on a scale of 1-5, with agroecology being 1 and conventional being 5. They were further asked about their perspectives of the organisations or institutions where they worked. Results are displayed in Figure 1.

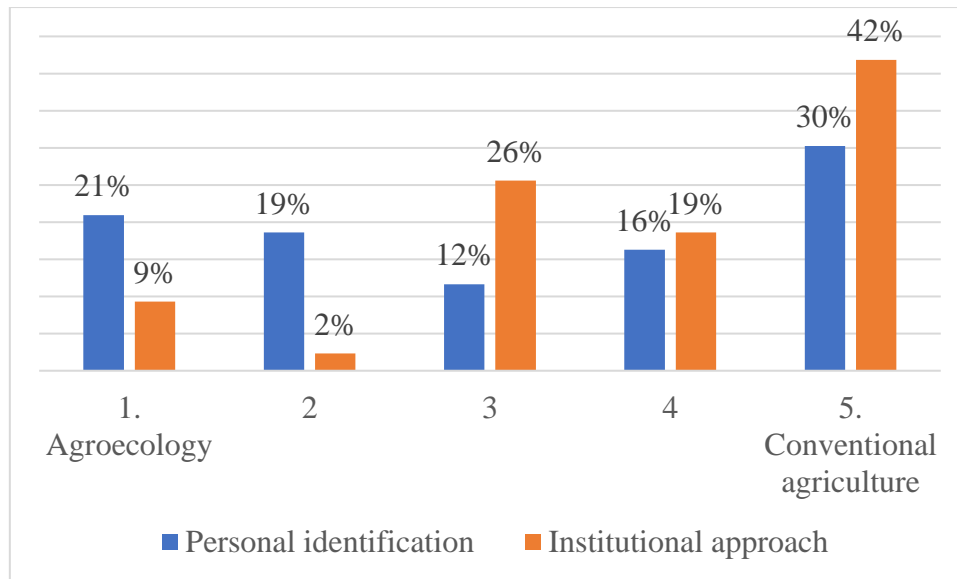


Figure 1: Productive approaches of extension workers and institutions

Results indicate that the extension agents most frequently prefer conventional modern agriculture (30%). However, it is clear that there is no clear tendency towards one pole or the other, although only 12% of participants located themselves in a “neutral” position. This contrasts with the productive approach of their institutions, which seems to be clearly oriented to conventional agriculture. These results show that extension workers tend to be more concerned with potential negative effects of conventional agriculture than institutions.

5. CONCLUSION AND IMPLICATIONS

Extension as a profession continues to evolve with varying attitudes and perceptions towards the profession around the world. As part of an international study, South African extensionists were surveyed regarding their perceptions of their job, their attitudes towards farmers, and their view on the objectives of extension and their conception of agriculture.

The South African extensionists were well educated in comparison with extensionists from other developing countries. They averaged 44 years of age and had an average of 15 years’ working experience. Less than half of the respondents were female (30%) whereas most of the respondents were working in the public sector (excluding universities).

The most valued extension approach by South African extensionists was Factor 1, based on dialogue and inter-institutional coordination. Participatory farmer-led extension (Factor 4) was also valued. There was a fair amount of agreement with a traditional, diffusionist approach (Factor 1). There was also a slight tendency to blame farmers for their lack of progress (Factor 3). The value given to inter-institutional coordination, to establishing horizontal relationships with farmers, and to participatory or demand-driven approaches are considered highly valuable by the international community. In contrast, the persistence of a diffusionist approach and the tendency to blame farmers leads to some concerns. In this line, extension workers’ self-critical attitude constitutes a valuable resource to help to question traditional extension approaches (i.e. a transfer of technologies approach).

The most preferred methods and the area of actual practice were group and individual approaches, respectively. Group extension work was more practised than preferred, while

individual extension work was more preferred than practiced. Inter-institutional coordination was selected in the third place and mass media in last place. Increasing the use of mobile phones and internet in rural extension may contribute to the increase in its effectiveness and efficiency.

Most extensionists considered extension as a professional or technical practice to improve farmer practices followed by those who consider it as “helping farmers” to improve their well-being. There were also some who considered extension as a way to fight social injustice. Additional research is required to understand whether the idea of “helping farmers” is due to a paternalistic attitude.

Regarding perceived objectives of extension, productive modernisation aimed at increasing productivity and profitability was the highest objective, followed by increasing farmers’ knowledge through training. The centrality of these objectives may be connected to a traditional transfer of technology approach.

Finally, regarding their tendency towards either an ecological or a conventional approach, South African respondents were skewed slightly towards the conventional pole. However, at a personal level, extension practitioners in South Africa are much more agroecological in their approach than their institutions. This implies that they tend to be more concerned with potential negative impacts of conventional agriculture than the institutions where they work.

These results are important for extension in South Africa, especially SASAE, to take note of. The attitudes and opinions of extension affect their work and how they go about it. Extension institutions should examine their organisational perceptions of extension and innovation and see how best to equip their staff to meet the stated goals and objectives.

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SECOND SESSION

THE IMPACT OF EXTENSION AND RESEARCH COLLABORATION IN ADDRESSING CHALLENGES EXPERIENCED BY SELECTED GOVERNMENT SUPPORTED FARMERS UNDER CONTROLLED ENVIRONMENT AGRICULTURE (HYDROPONICS) IN THE EASTERN CAPE

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ABSTRACT

Selected farmers who received funding from different spheres of government to produce vegetables under controlled environment agriculture (hydroponics) in the Eastern Cape experience production challenges. This is due to the fact that hydroponics as a technology is in its infancy, hence its success depends more on intensive collaborations between research, extension and training in order to address key challenges. Request based visits to identify and address constraints affecting production, quality and marketing of the farmers' vegetables were conducted by a team of Scientists and Scientific Technicians to four hydroponics vegetable projects around the Eastern Cape Province. Challenges associated with lack of skills from the farmers, poor quality of water used for irrigation coupled with poor control of diseases and pests were observed to be the major constraint to quality vegetable production. It has since been established that without proper knowledge and technical skills, many smallholder farmers will forever struggle to get the best out of their hydroponic vegetable production and will always bear the burden of financial hardship. Based on this, intensive collaborations between research extension and training could be key towards addressing challenges faced by farmers in hydroponics vegetable production.

Keywords: hydroponics, small-holder farmers, technical skills, vegetables

1. INTRODUCTION

Nowadays, traditional farming systems do not meet the current and future demands for food. This is because traditional farming methods may result in degradation and erosion of soil, hence there is a dire need for adoption of alternative farming systems that will cover current and future food demands with less costs and minimum consumption of natural resources (Gashgari et al. 2018).

According to Gashgari (2018), controlled environment agriculture is one such alternative technology where plant production is practiced in environmentally-controlled structures such as high tunnels, greenhouses, growth chambers etc., and thereby allowing year round production of crops which is impossible in most regions. In controlled environment agriculture,

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plants are protected from soil-borne diseases, pests and environmental extremes, hence tremendous improvements in yield and quality are attainable.

Over the years, South African government, in its endeavors to support emerging farmers, has developed several policies and programs but to date there is limited evidence of success in those efforts (Khapayi & Celliers, 2016). It has been noted that different spheres of government implement projects without ensuring that the beneficiaries have access to training and markets (Chirume, 2018). Hence, it is evident that a thorough understanding of factors limiting success of smallholder farmers be understood. In agricultural environment, the most important stakeholders are farmers, extension officers, researchers, trainers and educators. Under normal circumstances, an agricultural problem flows from the farmers to the extension officers and researchers who would come up with solutions (van Niekerk, 2018). It is in this context that authors of this paper feel the need of a strong collaboration between extension and research services in solving challenges experienced by farmers in new technologies supplied through government interventions.

1.1 Objectives of the study

To highlight constraints affecting the production, quality and marketing of vegetables grown in hydroponics.

To transfer skills necessary for hydroponic production based on observations from land reform farmers visited.

2. LITERATURE REVIEW

2.1 Vegetable production in South Africa

Majority of South African vegetable growers are still practicing open filled production, while soilless cultivation in a protected environment has gained popularity due to improvement in yield and quality. In a country with diverse climatic conditions and soil types, producing plants in open-filled soils is unpredictable hence farmers are faced with challenges such as changing temperatures, poor moisture holding capacity, insufficient available of nutrients, poor soil aeration and poor disease and pest control (Maatjie, 2015). These factors affect the growth and development of vegetable crops and hence variation is often observed in the performance of different crops or even between cultivars within the same crop in terms of aspects such as growth rate, vulnerability to pests and diseases, yield and quality of the produce (Mabengwa, 2013). Thus, controlled soilless production systems using growing media, such as under greenhouses would provide opportunities for year-round agricultural production and alleviate some of these problems.

2.2 Hydroponics as a form of controlled environment agriculture

Hydroponics is as a technology where plants are grown in nutrient solutions with or without the use of artificial medium giving mechanical support (Jansen, 2009). Hydroponic system enables vegetable production in small production areas where water and nutrient supply are properly managed to give optimal plant growth, yield and quality (Maatjie, 2015). Another advantage of hydroponic growing systems is that, farmers are able to avoid incidences of soil borne pathogens, especially fungi that cause diseases. The introduction of pathogens and insects pests only happens when people are moving in and out of the greenhouse or contamination may be through dust on the uncovered systems (Paulitz, 1997).

2.3 Role of government supported small-holder farmers through controlled environment agriculture in food security

Controlled environmental agriculture around the world play a major role in food security and reducing poverty. However, challenges like production constraints, lack of investments, lack of storage equipment and postharvest processing as well as of applicable marketing systems and other constraints impose threat to the sustainability of smallholder farmer (IFAD, 2012). Supporting of smallholder farmers under controlled environmental agriculture in terms of capital and training remain the main solution to boost productivity and sustainability to enable farmers to contribute to food security and job creation. Training of smallholder farmers is aimed at capacitating them in order to address hydroponic challenges (FAO, 2012). Factors affecting sustainability of land reform projects indicates that top down approach barriers to access training on time and complicated bureaucratic processes and procedures are highly significant. These factors contribute towards the projects productivity and, therefore, will affect the sustainability of land reform projects (Taoana, 2008).

3. METHODOLOGY

Information presented in this paper was collected on requested visit to address some challenges encountered various smallholders in their hydroponic projects, namely: Kliplaat Hydroponic Vegetable Project, Nomveliso Food Security Programme, Ubunye Youth Co-operative and Qonto Family Co-operative. After encountering production challenges, farmers from these various projects requested technical assistance from Plant and Crops Production Research Directorate of Dohne Agricultural Development Institute, a research wing of the Department of Rural Development and Agrarian Reform in the Eastern Cape Province.

3.1. Background of the visited Projects

3.1.1. Kliplaat Hydroponic project

Kliplaat Hydroponic Vegetable Project is situated at Jansenville in the Sarah Baartman District of the Eastern Cape. The project started in 2009 with nineteen (19) members who are growing tomatoes in eight (8) tunnels while in others there is nothing grown due to financial constraints. The project received funding from the Provincial Department of Agriculture, Provincial Office of the Premier and the Local Municipality.

3.1.2. Nomveliso Food Security Project

Nomveliso Food Security Project is situated at Mxumbu Location outside Xesi Town in Amathole District. The farmers received funding from Provincial Department of Social Development to produce tomatoes through hydroponic system. The project started in 2006 and currently has nine (9) beneficiaries who sell their produce to local retailers that include Pick 'n pay, Spar and Shoprite.

3.1.3. Ubunye Youth Co-operative

Ubunye Youth Co-operative started as a garden project outside Mount Ayliff in Alfred Nzo District of the Eastern Cape in November 2001. After receiving funding from Alfred Nzo District Municipality and attending skills development training, the members started hydroponics project.

3.1.4. Qonto Family Co-operative

Qonto Family Co-operative, situated at Mdantsane NU 12 outside East London in the Buffalo City Metropolitan Municipality started their vegetable project in 2000 with five family members. In 2009, the project was sponsored by Buffalo City Municipality with a multi-span tunnel that accommodates six thousand three hundred (6 300) tomato seedling to start a hydroponics project. Currently, they are selling their produce to the nearby community and hawkers.

4. RESULTS AND DISCUSSION

Challenges such as low level of skills from the farmers, poor quality of water used for irrigation purposes, poor cultivar choice, poor control of diseases and pests and shortage of implements were identified as production constraints in many of the visited projects. Technical challenges such as fruit cracking (caused by too much water and too much fertilizer), pest incidences (caused by poor preparation before transplanting) and other diseases that were caused by poor cleaning inside and outside the tunnels resulted in low quality and unmarketable fruit. In all the identified aspects, farmers were given technical assistance and advice on how to deal with them.

4.1. Kliplaat Hydroponic Vegetable Project

Tomatoes showed signs of nutrient deficiency and was clearly evident in colour of the leaves (Fig. 1) and the farmers were using borehole water to irrigate and was not suitable for tomato production. They also did not have pH meter to measure acidity or alkalinity or acidity of the nutrient solution and its electrical conductivity.



Fig. 1. Yellowish brown tomato leaves denoting nutrient deficiency

4.2. Nomveliso Food Security Project

About 70% of tomato fruit trees were affected by a fungal disease called late blight (Fig. 2). The slope and direction where the tunnel structure is facing also contributed to occurrence of many fungal diseases identified. It is facing East West direction and the slope does not allow drainage water to flow outside the tunnel. As a result drainage water stays inside the tunnel, making the surface wet and creating a conducive environment for the development of spores that lead to fungal diseases. Also, the strong winds come from the East West direction, where the tunnel is facing, and this can lead to a tunnel being blown away by wind. The direction also does not allow sunlight to reach all the plants at the same time and this may result to poor growth of plants. This poses disease threats and huge losses of production may occur when the disease attack the plants. At the entrance there was no disinfectant to dip the feet, this may result in spores of diseases being carried from outside to the tunnel. There was no proper trellising and the tomato plants were found hanging on the floor, this may also result into spread of diseases from the floor to the entire plants. Side shoots were not removed regularly, resulting in a lot of shoots which may also create a conducive environment for causal organisms of diseased.



Fig. 2. Tomato plants affected by blight

4.3. Ubunye Youth Co-operative

As a result of poor cultivar choice, farmers planted a cultivar that was taking too long to produce fruits and when it finally did, it produced small and unmarketable fruits. They also experienced problem of fruit cracking (Fig. 3.) because they applied too much water when irrigating and some of their plants were affected by blight.



Fig. 3. Fruit cracking on tomatoes caused by over-irrigation

4.4. Qonto Family Co-operative

After starting hydroponics tomato production, Qonto Family realized that their tomatoes were affected by early blight but it was in few trees. They also experienced a challenge of white flies (Fig. 4) that sucked sap from the tomato leaves, this was due to warmer temperatures that occurred inside the tunnel. They also didn't have the pH-EC meter to measure of acidity, alkalinity and electrical conductivity of the nutrient solution.



Fig. 4 White flies – are sap-sucking insects that develop rapidly during warmer temperatures

5. CONCLUSION AND RECOMMENDATIONS

The visited projects were funded by government spheres such as municipality, Department of Social Development and Office of the Premier without prior consulting the Department of Agriculture. When the farmers experienced challenges, they did not consult the local Extension Officers but the Scientists and Scientific Technicians who are working at a Provincial level. It was eventually the Scientists and Scientific Technicians who contacted the local extension Officers to accompany them to the farmers so as to attend to the challenges. This then breaks the normal agricultural cycle by van Niekerk (2018) who noted that under normal circumstances, an agricultural problem flows from the farmers to the extension officers and researchers who would come up with solutions. It has also been found that without the knowledge and technical skills, many small-holder farmers will forever struggle to get the best out of their hydroponic vegetable production and will always bear the burden of financial hardship. The farmers were encouraged to involve the Extension Officers at the initial stages of the projects as well to improve their management practices. Also partnership between extension, research and training will yield positive results for farmers due to improved transfer of technology.

Also it is encouraged that technologies developed for small-scale farmers should be simple to use while at the same time produce better results. The vertical hydroponic system developed can be an option for small-scale farmers because of its low costs and simplicity. Farming experience is crucial when practicing hydroponic, this is due to the level of technical skills required to operate the systems. Experienced smallholder farmers are able to adopt to new technologies and become sustainable.

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COMPARATIVE STUDIES ON YIELD AND QUALITY RESPONSE OF SOIL AND SOILLESS GROWN TOMATOES: THE CASE STUDY OF MASIPHATHISANE COMMUNITY PROJECT AND BATHURST EXPERIMENTAL FARM

T.T. Bozo⁶, B. Mpambani⁷, A. Mbenga and S. Mhlontlo

ABSTRACT

Tomato (Solanum lycopersicum L) belongs to the Solanaceae family and is grown worldwide for its edible fruits with antioxidant benefits. A study was conducted in Bathurst Experimental Farm and Masiphathisane Community Project to compare yield and quality of tomato cultivars cultivated with an open bag hydroponic (soilless) system and in-soil system respectively both under a semi-controlled environment. Three tomato cultivars under soilless system, namely Mercury, Merya and Star 9037, and one cultivar, SV4129, in-soil system were used. Marketable and unmarketable yield, total soluble solids (%Brix), as well as the pH of the tomato juice were determined. Results showed that plants in the soilless system developed faster with higher total yield compared with in-soil cultivation. Cultivars Mercury and Merya can be selected and recommended for high yields and high sugar content in %Brix respectively in soilless production. The pH of tomato juice was highest in all cultivars under soilless and the lowest was recorded in-soil production systems. The most promising cultivar with regards to yield and quality under soilless production was Mercury. Results indicate that soilless cultivation can improve yield and quality, with cultivar selection playing an important role when utilising this production system.

Keywords: pH, Sugar content, Tomatoes, Yield

1. INTRODUCTION

In South Africa, tomatoes are not only cultivated commercially, but also grown by subsistence, resource poor farmers and home gardeners. Tomatoes are produced in all South African provinces. Limpopo is the major production area with 3590 ha (Northern Lowveld at 2700 ha and far northern areas of Limpopo at 890 ha). The other main producing areas are Overberg area of Mpumalanga Province and Border area of the Eastern Cape Province at 770 ha. Production is very limited in the winter months and tomatoes can only be produced in frost-free areas during winter or under protection (Department of Agriculture, Forestry and Fisheries (DAFF), 2013). Tomatoes are consumed in diverse ways including raw, as an ingredient in many dishes and sources, and also in drinks. In South Africa, tomatoes are used in stews to complement the staple diet of maize meal. As a result, it is also one of the main vegetables used for hawking by small entrepreneurs in the informal settlement sector. Interestingly, although tomatoes are categorised as vegetables, they are botanically classified as fruit (DAFF, 2013).

Worldwide tomato production extends over 5.2 million ha, producing more than 130 million tons annually. In terms of tomato production, South Africa is ranked 39th in the world, with a total of 421 000 tons of tomatoes produced annually (Food and Agriculture Organisation (FAO), 2009). Soilless cultivation of fresh market tomatoes has gained popularity in recent years in South Africa due to improved growth, yield and quality of commodities grown in such systems (Maboko, Du Plooy & Bertling, 2009).

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The majority of South African producers cultivate tomato in the open field, with a small number producing in soilless systems under protection (Maboko *et al.*, 2009). There is, however, an increase in soilless vegetable production (Raviv & Lieth, 2008) since typical field-based monoculture systems often result in disease build-up, making the use of a soil based system a less suitable cultivation medium.

Many new tomato cultivars are released in South Africa and internationally. This results in a fast turnover rate of cultivars that can complicate cultivar choice. Different cultivars have different characteristics, including sensitivity to temperature extremes, tolerance or susceptibility to insects and diseases and fruit quality and size as well as yield (Niederwieser, 2001). Most tomato cultivars are imported into South Africa and therefore, the optimal growing conditions for specific cultivars need to be determined, as a wrong cultivar choice can lead to large financial loss.

In South Africa, the most popular hydroponic systems are the open-bag and the closed system using the gravel-film technique (Niederwieser, 2001). In closed systems, the excess nutrient solution is recovered, sometimes replenished and recirculated, while open systems do not recirculate the nutrient solution after it has passed the rooting zone. The open-bag system is generally used for production of an indeterminate growth habit, like tomatoes, sweet peppers, cucumbers and runner beans, while closed systems (using gravel-film technique) are generally used for leafy vegetables, such as lettuce, Swiss chards, spring onions as well as herbs.

Soilless cultivation has recently tended towards closed systems to avoid nutrient losses, thereby reducing potentially negative environmental impacts (Schwarz *et al.*, 2008). To date, there is no information available on the performance of indeterminate fresh market tomato cultivars in closed hydroponic systems under local conditions.

1.1 The objectives of the research study

The research aimed to address the following research objectives:

- Determine the yield and quality of soil grown in a tomato cultivar under a semi-controlled environment.
- Determine the yield and quality of soilless grown tomatoes under a semi-controlled environment.
- Compare yield and quality of tomatoes grown in soil and soilless mediums under a semi-controlled environment.

2. LITERATURE REVIEW

2.1 Production of tomatoes

In South Africa, there are approximately 695 producers in both the commercial and emerging sectors (National Agricultural Marketing Council (NAMC), 2017). The commercial sector contributes 95% of the total produce while the emerging sector contributes only 5%. According to FAO (2009), China is the largest producer of tomatoes in the world, followed by India, the United States, Turkey, Egypt, Iran and Italy. These countries represent more than 80% of world tomato production. Egypt is still the only African country amongst the top 10 world tomato producers (DAFF, 2013; DAFF, 2017). South Africa is a net importer of tomato paste, with the prevailing duties on imports of tomato paste from China which is currently 30% in cans (28% - 30% brix) (NAMC, 2017). Importers feel vulnerable to the reaction of the exchange rates

which is a dominant factor in pricing of imports of tomato paste, of which importers have no control over (DAFF, 2017). Domestic processors are able to produce tomato paste (6 x A10 3 kg tins) at a cost of R210 per unit. The same products can be imported from China at a lower price of R107.30 per unit (NAMC, 2017). In 2005, production of tomatoes in South Africa dropped by 4.5% and during 2007, the output dropped further by 5.1% (DAFF, 2013). From 2008 to 2010, production output increased steadily until 2011. The highest production output was recorded in 2012, and the increase was 9% from the 2011 figures (DAFF, 2012). Over the past decade, tomato production was stable above 400 000 tons per annum.



Figure 1: Total production of tomatoes in South Africa (DAFF, 2017)

2.2 Factors affecting tomato production

There are a number of factors which affect tomato production. Such factors include temperature, light, water and drought. However, these factors can be easily controlled through controlled environments. Factors affecting tomato production are discussed below.

2.2.1 Temperature and light

Cracking of the tomato is significantly caused by a sudden increase in temperature and it increases as the fruit is exposed to higher temperatures. A significant increase in fruit cracking on the upper clusters has been observed by Peet and Willits (1995) with the percentage of fruit affected by cracking increasing from 21% (first cluster) to 38%, 41% and 45% for clusters 5, 6 and 7 respectively. In addition, temperature and radiance were the factors that contributed to greater fruit cracking on the upper clusters. In an earlier review, Domis, Papadopoulos and Gosselin (2002) reported that the fluctuation of temperature, for instance low night temperature, favours a negative pressure in fruit, whereas high day temperature increases both gas and hydrostatic pressure of fruit pulp on the epidermis, resulting in cracking of the fruit. High temperatures play a role in reducing cuticle resistance and firmness (Dorais *et al*, 2004). Under high light conditions, fruit soluble solids and fruit growth rates are higher; both of these factors are associated with increased cracking (Peet, 1992). Pascual *et al* (2000) also confirmed that higher temperatures and higher radiation coincides with the reproductive period ‘summer’, which lead to a greater incidence of fruit cracking.

2.2.2 Drought

Drought is one of the most important limiting factors for agricultural crops and vegetable production all around the world. Large parts of the land in South Africa are semi-arid and are known to receive rainfall during the summer season. Water used for agricultural purposes has become scarcer and more expensive, especially for smallholder farmers and community projects. As a result, the need for efficient water use in agricultural production has become a major concern so as to reduce cost of water and scarcity (Johnson & Leah, 1990). With South Africa's diverse climatic conditions and wide range of soil types, growing plants in open fields is unpredictable due to a wide range of challenges. These challenges include factors such as temperature, soil water holding capacity, cation exchange capacity, soils contaminated with heavy metals, available nutrient supply, proper root aeration, as well as disease and pest control which can be alleviated through the use of a soilless growing media under a protective environment (Du Plooy *et al*, 2012).

During water stress, many physiological and molecular processes are disturbed such as root-shoot growth, water relation, mineral absorption, leaf expansion and orientation, stomata behaviour, transpiration rate, photosynthesis and respiration rate. Due to drought stress, there is inhibition of cell division and enlargement leading to reduction in vegetative and reproductive growth, with leaf area and stem length reduced due to a decrease in cell size (Jangid & Dwivedi, 2016). Many scientific studies have revealed that low water availability decreases the number of leaves, flowers and fruits in tomato cultivars. Fruit quality, shape, diameter and weight decreases under drought stress as compared to the normal condition. It has been noticed that production of tomatoes under protected environments in soilless media can resolve some of the problems faced by open field producers. According to Resh (2017), soilless production compared with traditional field allows the efficient use of water and nutrients by crops.

2.3 Social benefits of soilless cultivation

A soilless farming system is labour intensive, but not as hardy as a soil-based system such that women can easily participate in this farming system. Ploughing and weeding with hoes is also not done in a soilless system. This system has a greater flexibility in work because weather conditions such as rainfall do not hinder working in a soilless system, especially if it is done under plastic cover (Haq, 2009). Advantages of soilless cultures include more efficient regulation of nutrient and water supply, electric conductivity and pH of the nutrient solution, and temperature by the grower. Richard (2006) highlighted that a good growing medium must provide plants with adequate amounts of water, and enough porosity to supply oxygen and other gases to the roots. Most soilless growing mediums are affordable and can be reused for planting another crop after they are sterilised (Maboko, Bertling & Du Plooy, 2013). Soilless culture therefore provides an ideal environment for growth and development of plants which often results in higher yield and quality compared to traditional methods. Growers in South Africa are faced with the challenge of producing high yields combined with good quality in order to satisfy local consumer demand, but due to poor cultivation methods, poor cultivar choice, inadequate plant nutrition, adverse climatic conditions, or pest and disease infestation, these demands are rarely met (Maboko *et al*, 2013).

2.4 Growth substrate

The significance of a hydroponic system in tomato production is that it enables the growers to manage water and nutrient supply and optimise the plant growth in a small production area. Organic growing media, namely sawdust, coir (cocos) and bark, are commonly used in open bag hydroponic systems although rapid corrosiveness and toxic substances found in sawdust are disadvantageous to plant growth and development (Niederwieser, 2001). However, Raviv (2014) affirmed that the use of sawdust has proven to have good plant performance compared to other wood wastes as a constituent of growing media. Maboko *et al* (2013) reported that organic growing media (sawdust and coir) did not have a significant effect on tomato yield as it has high porosity and water retention. In South Africa, sawdust is popular and readily available, especially in forested areas such as Mpumalanga and KwaZulu-Natal provinces.

The big challenge when selecting a growing medium is to combine the aeration and water holding capacity while taking into consideration the decomposition rate of organic matter in the media (Anlauf, Rehrmann & Schacht, 2012; Niederwieser, 2001; Richard, 2006). Plants grown in a medium which is poorly aerated tend to be weaker, less succulent, produce undesirable fruits and are more susceptible to micronutrient deficiencies, root rot pathogens such as *Pythium* spp and *Phytophthora* spp than roots growing in well aerated media (Ingram, Henley & Yeager, 1993). Tomatoes grown in soilless media were reported to outperform those grown in soil in terms of yield (Maboko *et al*, 2009). These researchers also reported that tomato plants grown in soil had a high incidence of fruit cracking and were severely infected by early blight fungal disease.

2.5 Overview of hydroponic suitable for tomato production

Hydroponics is defined as a technology for growing plants in nutrient solutions with or without the use of artificial media to provide mechanical support (Wittwer & Castilla, 1995). The significance of a hydroponic system in tomato production is that it enables the growers to manage water and nutrient supply and optimise the plant growth in a small production area that is generally sub-optimal for plant growth, yield and quality (Maatjie, 2015). A suitable hydroponic for growth of tomato commonly used by most farmers is one that has sawdust (Hadley, Clinton & Schwartz, 2003). However, the growing media must be amended to provide the appropriate physical and chemical properties necessary for plant growth (Mabengwa, 2013). Trellising is also necessary as it supplies an artificial support to a growing plant to get sunlight, which is essential for photosynthesis and it also helps control the direction of the plants and provides a large surface area for growth and fruiting (Mahungu & Otienede, 2004). The area or size of the tunnel is dependent on the preference of the farmer.

3. MATERIALS AND METHODS

3.1 Bathurst Experimental Farm

Mercury, Merya and Star 9037 cultivars were planted in 10 L plastic bags filled with sawdust as a growing medium. They were arranged in double row plots 100 cm apart, where a randomised design was replicated 12 times. Plants were fertigated four times a day using a dripper irrigation. A fertigation mixture consisting of Potassium sulphate, Calcium nitrate and hydrogro (mixture of trace elements) was used at an electrical conductivity of 1.2 mS/cm after planting, 1.8 mS/cm during active vegetative growth, and up to 2.5 mS/cm after fruit formation. After mixing in the tank, the pH (water) ranged between 5.5 to 6. An EC/pH meter was used

to measure the electrical conductivity and pH of the solution. The irrigation system used was a drip irrigation. The plastic bags used to contain the sawdust can be any colour (black, white, colourless), however, the plastic bags in Bathurst were black in colour. They were placed on top of black plastic which is called the mulch in order to prevent germination of weeds as well as soil borne diseases such as nematodes or eelworms. A twine was used to trellis the plants so as to direct them in an upright position until they were 2 m high.

3.2 Masiphathisane Community Project

This is a community based project that has recently been resuscitated in 2018 and it consists of seven members. It is situated in Bathurst under Sarah Baartman District Municipality. The project has three 30 m by 10 m tunnels which were used to plant tomatoes directly in the soil, but soluble fertilizers and drip irrigation for fertilizer application were used. Soil preparation was done by making ridges using spades and rakes and the distance between ridges was 100 cm. SV4129 cultivar was planted at inter and intra row spacing of 40 cm and 30 cm respectively. The seedlings were brought from the local seedling nursery in East London. A fertigation mixture consisting of Potassium sulphate, Calcium nitrate and hydrogro (mixture of trace elements) was used at an electrical conductivity of 1.2 mS/cm after planting, 1.8 mS/cm during active vegetative growth, and up to 2.5 mS/cm after fruit formation. A twine was used to trellis the plants so as to direct them in an upright position until they were 2 m high.

3.3 Data collection

At maturity, fruits were harvested weekly and data were collected to measure yield, sugar content (%Brix) and pH of tomato juices in both sites.

4. RESULTS AND DISCUSSION

4.1 Bathurst Experimental Farm

The results obtained in this study showed differences in yield of the cultivars with Mercury having the highest yield of 9 kg/plant followed by Star 9037 with 8.6 kg/plant and Merya being the least with 6.4 kg/plant. Although the cultivars yielded differently, there was no significant difference between the cultivars (Figure 2). A similar trend was found by Saleem, Asghar and Iqbal (2013). Akinfasoye *et al* (2011) also found a highly significant positive association between number of fruits per plant and fruit yield (kg) per plant. A significantly higher sugar content (% Brix) was obtained in Merya (5.7%) and the lowest was obtained in Star 9037 (4.8%), while Mercury recorded 5.2%. Star 9037 and Merya showed highly significant differences between each other although they both showed no significant difference to Mercury (Figure 3). Therefore, the sugar content of these cultivars is still acceptable, as the %Brix for tomatoes grown in greenhouses, using the film technique, can vary from 4.7 to 5.1 %Brix (Domis *et al*, 2002). Chernet, Belew and Abay (2013) also reported a wide range of differences in number of fruits, yield and quality per plant in tomato cultivars. Generally, association of characters indicated that fruit yield per plant, number of fruits per plant, number of fruit clusters per plant, and shape index are the most important fruit yield components which contributes more to highest fruit yield and quality per hectare. The pH (water) among the cultivars varied from 5.98 (Merya) to 6.08 (Mercury) and there was no significant difference among the cultivars (Figure 4). Jones (2007) reported that the lower the pH, the greater the tartness of the fruit, a factor by which the consumers judge the quality of tomato fruit. Sugars, acids and sugar/acid ratios have been defined as good indicators of tomato flavour. According to Jones

(2007), the acceptable pH range of tomato juice averages between 4.0 to 4.5. Our findings revealed highest pH ranges, which could be a result of harvesting stage as the fruit was ripen during harvesting (Figure 4).

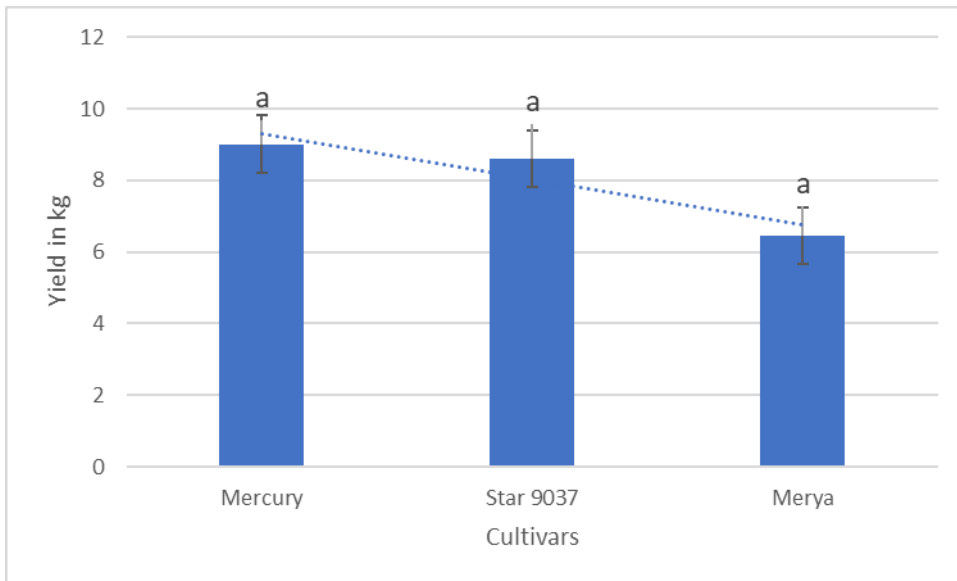


Figure 2: Yield per plant (kg) of different cultivars at Bathurst Experimental Farm

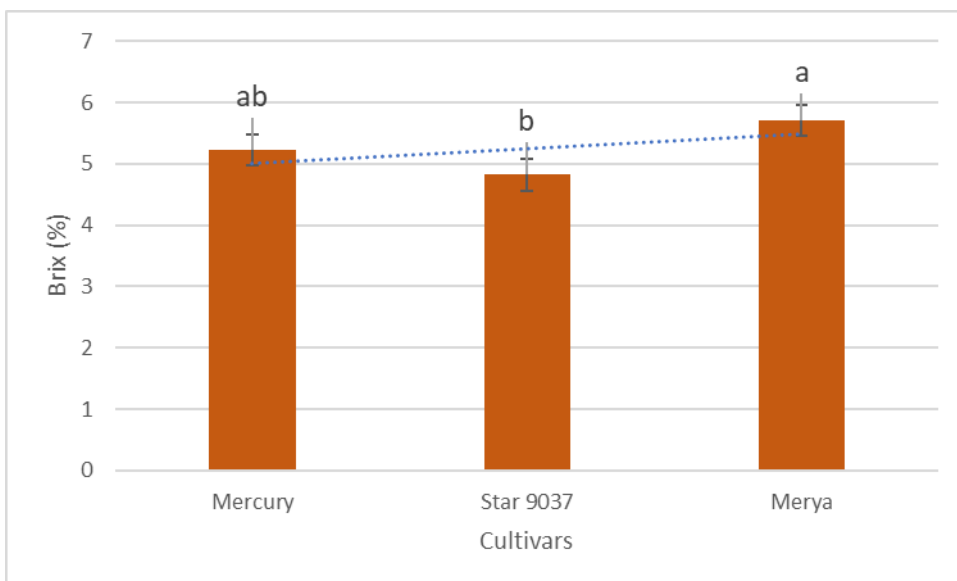


Figure 3: Sugar content measured by %Brix in different cultivars at Bathurst Experimental farm

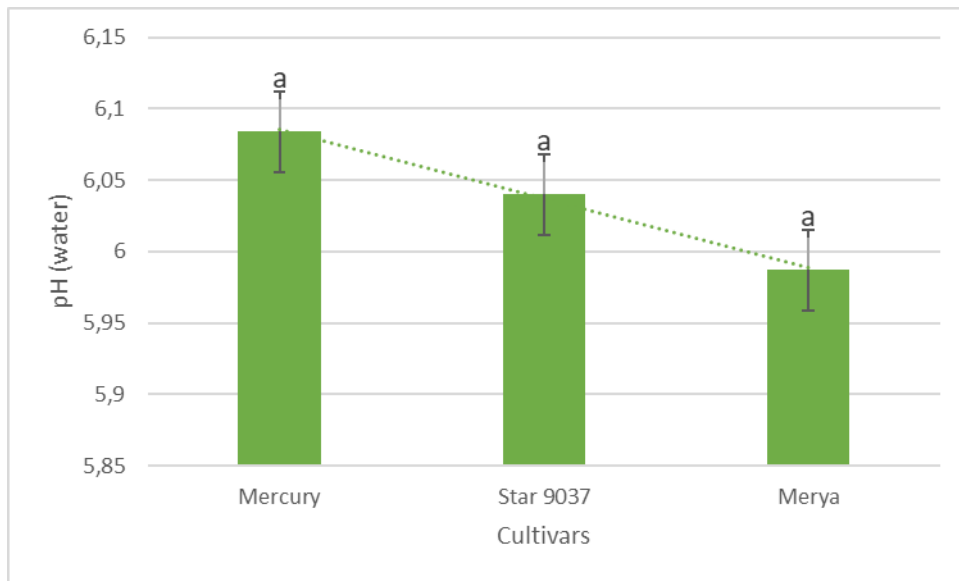


Figure 4: pH (water) in different cultivars at Bathurst Experimental Farm

4.2 Masiphathisane Community Project

The average yield of cultivar SV4129 was 6.5kg per plant, while sugar content as measured by %Brix was 5.1. The pH was found to be 5.52. The yield obtained in Masiphathisane Community Project was similar to that obtained in Merya cultivar (6.4 kg) at Bathurst Experimental Farm. However, this yield is significantly lower than that obtained from Mercury (9kg) at Bathurst Experimental Farm. Similarly, the sugar content of 5.2 %Brix was within the range of 4.8 and 5.7 %Brix in Star 9037 and Merya cultivars respectively.

5. CONCLUSION AND RECOMMENDATIONS

Cultivars Mercury and Merya can be selected and recommended for high yields and high sugar content respectively in soilless production. Cultivar SV4129 has a better pH level of 5.52 compared to other cultivars, namely Mercury (6.09), Merya (9037) and Star 9037 (6.05). Yield obtained from SV4129 at Masiphathisane in soil grown tomato was found to be lower than that obtained in Bathurst Experimental Farm in soilless cultivation, but still within the range obtained in soilless cultivation. However, the cultivar planted in soil conditions was not tested in soilless cultivation. For conclusive results, same cultivars tested in soilless conditions should be tried in soil cultivation. Furthermore, if the soil is not a limiting factor, the system employed in Masiphathisane Community Project can be recommended because it is less expensive yet the yield, sugar content and pH are similar to those obtained under the soilless system.

ACKNOWLEDGEMENTS

Mr B. Kombisa is acknowledged for his assistance during planting, as well as horticulture interns (Mr K.B. Jokazi and Miss Z. Nkolisa) for assisting with information. Dr M. Mbangcolo is acknowledged for the assistance with the statistical analysis.

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AGRICULTURAL EXTENSION AND THE ACCELERATED LAND REFORM PROGRAMME: TOWARDS THE NEW NORMAL

S. Adey⁸

ABSTRACT

To effect sustainable agricultural development under the Accelerated Land Reform Programme, a whole-system approach is needed. This is due to the complexity of the programme, the parallel processes, and the inherent interdependencies. The linkages between the various aspects of sustainable agricultural development need critical attention; and does learning by individuals, and organisations through the establishment of learning networks. For this, Extensionists may need to acquire additional technical, as well as, more critically, functional skills to effect sustainable agricultural development and enable their clients to succeed as beneficiaries of the Accelerated Land Reform Programme.

Keywords: Extension and Advisory Services, Accelerated Land Reform Programme, sustainable agricultural development, whole-system approach, functional skills, learning networks

1. INTRODUCTION

The role of Extension and Advisory Services in the Accelerated Land Reform Programme (ALRP) is both complex and at the same time can be considered to be relatively straightforward. Land reform, in its simplest form, is the re-allocation of land. If the Land Reform process is sustainable, then farming will continue. The Extension and Advisory Services of the Department of Agriculture are well-equipped to deal with the technical aspects of farming. However, the Land Reform Programme is complex as it involves a wide range of actors and it also has a number of parallel processes and interdependencies. These include and are not limited to: the settling of labour tenant applications; providing security tenure; establishing agri-villages for labour tenants; legalising the sub-division of agricultural land; provision of capacity and training support for community entities; and interventions for value chain opportunities to enhance the participation in the mainstream economy (MMEC, 2018). The ALRP of the Republic of South Africa, has three main programmes: land redistribution; land restitution; and increased security of tenure.

It is stated that the programme must be guided by sound legal and economic principles, and must contribute to the country's overall job creation and investment objectives (MIMEC, 2018). Issues relating directly to agricultural production, that will be addressed, include: production patterns that constrain the participation of small-holder farmers; barriers to entry for emerging farmers (infrastructure and water use); and unproductive land. Other short to medium term measures included: reviving agricultural colleges; improving extension services; and giving small-holders priority access to markets, including those provided by state institutions (e.g. schools, prisons and hospitals) (MMEC, 2018).

This paper will present an argument for a whole system approach, the establishment of learning networks, and the individual and institutional functional skills required for the sustainable

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implementation of the Accelerated Land Reform Programme (ALRP). The ALRP is only one aspect of the potentially changing face of agricultural development in South Africa. Farmers are also facing the challenge of a changing climate. Adaptation to new circumstances is critical for survival in the new climate: political, social, environmental and economic.

Given the diversity of processes and interdependencies within the ALRP, and other changes facing agricultural development, the challenge is to re-configure the approach to sustainable farming, in the context of accelerated land reform; and, as suggested in this paper, using a whole-system approach.

2. CONCEPTUAL FRAMEWORK

A whole-system approach represents a shift from an emphasis on technology to the wider process of agricultural innovation. This which includes new ways of producing and applying technology (Van der Ploeg, Bouma, Rip, Rijkenberg, Ventura, & Wisserke, 2004; Adey, 2007). This wider process in turn, is influenced by the institutional and political context in which it occurs. In this case, Extension and Advisory Services and the ALRP. With this in mind, extension should now play a greater role in providing access to information and institutional support (finance, entrepreneurship development and market access); and will require a greater level of flexibility and a wider range of expertise. The goal of extension should move from technology dissemination to 'system management' through building of coalitions of various stakeholders; leading an innovation agenda; and building of learning organizations. However, it is not just Extension and Advisory Services that need to reform, for a whole-system approach, the overarching agricultural organisations usually also need to consider institutional change to effect sustainable agricultural development.

Lawrence (1997) stated that the various elements of sustainability (environmental, economic, social and institutional) are highly interrelated and that the nature of the interconnections should be appreciated in the design and adaptation of sustainable systems. The relationships between the elements are of primary importance and the objects (boundaries of the patterns) are secondary in importance (Checkland 1983). Using this view, it becomes possible to determine trends, norms and fluctuations within systems, all of which are important aspects in determining sustainability (Adey, 2007), which is the required outcome of the ALRP and EAS. Functionality is a property of the whole system of which no particular sub-system is capable of functioning without the co-operation of the other. Thus methods are required that address as many aspects of the situation (in this case, ALRP and EAS) as possible. For EAS to address the challenge of realizing a sustainable outcome to the ALRP, a whole-system approach should be used, one where the institutions have the ability to learn from the experiences and adapt quickly (Pretty, 1995).

The fundamental values underpinning sustainable agricultural development are that both intragenerational and intergenerational equity are important. Key stakeholders are often excluded within the current social systems, and addressing such issues requires renewed focus on emancipatory commitment (Maru and Woodford, 2001:63). In addition, sustainable development has multiple meanings, and reflects emphasis on various dimensions (environmental, economic, and social) and different mechanisms to address these concerns; which brings us back to the need to address these multiple dimensions through using intra- and inter-generational equity as a guiding principle (Maclaren, 1996). Sustainable development argues not only for the possibility of complementary improvement of both the natural resource base and the human condition, but that the long-term human interest necessitates natural resource sustainability. Future generations are by definition disempowered from direct

involvement in the decision processes and must rely on others to look after their interests. Underpinning the concept of sustainable development is an ethical position that future generations have rights and entitlements that require protection (Maru and Woodford, 2001:66). In the light of climate change and the depletion of the natural resource base, and given our political history, this is extremely relevant in South Africa. There are universally applicable strategies to operationalize sustainable development as the issues vary contextually and change across time. Sustainable development is local level ideal of improvement, but one which requires assessment and evaluation (and action) in relation to a larger system (Maru and Woodford, 2001:64, Adey, 2007).

It is widely accepted that the challenges facing sustainable agriculture are not readily solved by technological intervention at the field level only, all systems are linked and the production system and its links to other systems are also important (Adey, 2007; Altieri, 1987; Ekboir, 2001; Lawrence, 1997; Rip and Wiskerke, 2000). Thus, understanding sustainable development and sustainable agriculture requires an appreciation for, and an understanding of, the highly interrelated elements and the nature of the interconnections (Adey, 2007). This calls for a whole-system approach (Checkland, 1983)

In a whole-system approach, it is recognised that innovation comes from multiple sources, and this includes farmers (Biggs, 1990); also that how the agendas of the various stakeholders are represented affects the ‘appropriateness’ of the innovation, or new technology. It is therefore expedient that Extension and Advisory Services reassess their agenda in light of the ALRP. It will be useful and also important to acknowledge that sustainable agriculture results from a broad set of information sources and that there is value in creating systems that assist in the generation and dissemination of knowledge relevant to local context (Sulaiman and Hall, 2002:226). This relates further to the recognition that innovation (sustainable agriculture) is a social process, and innovations emerge from and are defined by specific institutional and historical contexts. Through the use of evaluation and planning of technology development and related activities, it is possible to build locally adapted, collective operational capacities through which institutional concerns can be monitored and sustained (Biggs and Smith, 1998; Hall *et al*, 2001; Adey, 2007). This requires a learning organisation, which is characterised by the commitment to:

- creating a learning environment where all participants can realise their full potential;
- exploring different perspectives and experiences to generate creative thinking;
- working collectively to release creative potential; and
- fostering leadership potential throughout the organisation.

This also relies on a strong element of ‘self-improvement’ where there is not only an ongoing quest for knowledge, but also for self-knowledge (Roper and Pettit, 2002:259).

3. DISCUSSION

A whole-system approach is proposed for Extension and Advisory Services to facilitate the ALRP to ensure sustainable agricultural development. A whole-system approach focusses on connections between system-elements and place strong emphasis on these relationships. The core of this is people. People-centred development involves a process by which the members of a society learn to mobilize and manage resource, in order to produce sustainable and equably distributed improvements to their quality of life (Korten, 1990).

Agricultural modernisation has become the accepted norm in terms of the maximization of production, realised through specialisation, intensification and scale enlargement (Roep and Wiskerke, 2004). Due to the institutionalization and the subsequent promotion of the modernisation model through government policies, the modernisation model has been adopted as the unquestioned, accepted method of agricultural and rural development, despite its unsuitability to many rural, farming communities (Roep and Wiskerke, 2004). Studies in European agriculture showed that the problems created by a focus on modernisation had to be countered through reconnecting agriculture to its social and agro-ecological environment (Roep, 2004) and the rebalancing of agriculture with societal needs (Roep and Wiskerke, 2004; van der Ploeg, 2003). One of the fundamental reasons for the emergence of the concept of sustainable development is the potentially undesirable effect of some human interventions, be they social, economic, technological (Maru and Woodford, 2001:65), or environmental (Khwidzhili & Worth, 2016: 23).

Building on local knowledge and resources reduces the likelihood that a development intervention will 'de-skill' people or increase their dependence on external experts (Korten 1980), in fact, building on local knowledge empowers people by increasing their self-reliance (Van Vlaenderen, 1999). Building on local knowledge readily occurs through learning networks. Ngaka & Zwane (2017) emphasize the importance of learning networks in the Extension and Advisory services within South African Agriculture. In a study, they determined that awareness of learning networks, and making use of such networks varied between Provinces. But that most respondents felt that extension learning networks were an important vehicle for sharing information and best practice among farmers and Extensionists (Ngaka & Zwane, 2017: 34).

Linkages with other programmes and initiatives are valuable in increasing the available resources (human, social, physical, economic and technical) for ensuring multi-level sustainability. Sustainable development is highly contingent upon the establishment of a sound development-orientated and structured institutional environment capable of delivery (Adey, 2007:174). Key factors for this success include: the provision of opportunities for skills development and training; the creation and maintenance of a learning environment; the appreciation for and use of heterogeneous sources of knowledge. As sustainability and sustainable development are ultimately location-specific, these key factors and lessons learned are not presented as a definitive formula for success, but rather a recognition of the multitude of location-specific factors that are important in determining sustainable systems (Adey, 2007:175).

It has been widely accepted, since the early 1980s, that Extensionists play a much larger role than technical agricultural outreach; they also broker and facilitate links and relationships within the agricultural innovation systems and thus require new strategies and capacities to perform these roles (Sulaiman and Davis, 2012:227). For policy-makers, extension is a much needed investment in the human and social capital of the rural population of a nation (Davis and Terblanché, 2016:234). There are increasing calls for the use of participatory approaches (Davis and Terblanché, 2016:235). However, stakeholder participation in decision-making processes is crucial and requires collaboration, partnerships and coordination (Rivera and Qamar, 2003). It is important for extension to build social capital and help to organise community-based groups (Swanson, 2008).

Zwane, Igodan, Agunga & Van Niekerk (2015), in a study on the competencies required by extension practitioners to assist farmers in dealing with the demands of climate challenges,

found that the following skills are required: technical and extension methods; knowledgeable in terms of conflict resolution; negotiation skills; and persuasive communication. Extension practitioners will need to learn new skills to deal with the changes in extension. Stevens (2017:86) calls for a shift from agriculture to agribusiness as essential in the revitalisation of small-scale agriculture. This echoes the way forward as prescribed by the ALRP that calls for the provision of an integrated package for the development of black producer commercialisation programme (MMEC, 2018). Not all farmers or extension personnel are well-versed in entrepreneurship, access to markets and financial management of farming systems. Thus for the transformation of agriculture to agribusiness as an essential factor of the ALRP, new competencies will need to be learned. Successful entrepreneurship requires a strong enabling environment of which political will and leadership is important; as entrepreneurs need a range of competencies, knowledge skills and behaviours (Stevens, 2017:88).

No single extension methodology is suitable for all situations and for all purposes. There is a need to develop location-specific extension approaches in line with developing situation specific food-security strategies (Davis and Terblanché, 2016:232). Studies conducted by Adey (2007) of a number of agricultural development projects, showed that common factors critical to the success of the project, included: capacity building (clients and Extensionist); participatory learning (by the clients, the Extensionist, and the organisation); and the development of entrepreneurship skills for successful market entry. In the context of sustainable agricultural development, capacity building includes critical thinking, problem solving and conflict management/resolution. It was not only clients that needed to obtain these skills, but also in many cases, also the Extension agent.

Agricultural advisors will also be required to facilitate the development of the functional skills of their clients, as they negotiate the multifaceted realities of the ALRP. Especially the negotiations and competencies required for accessing markets, creating linkages, and for information sharing towards a common goal. Sulaiman and Davis (2012) list the following capacities require by Extension Personnel, listing both technical and functional skills.

Table 1: Skills required by Extension Personnel for effective agricultural development (Sulaiman and Davis, 2012).

Technical Skills	Functional Skills
<ul style="list-style-type: none"> • Good knowledge of appropriate and relevant technologies and practices. • Technical options for climate change variability. • Adaptation to changing conditions. • Improved resource-use efficiency. • Agri-business. • Value-Chain Development. • Intellectual property rights. 	<ul style="list-style-type: none"> • Community mobilisation. • Organisation development of farmer-institutions. • Facilitation. • Conflict resolution. • Participatory learning and action. • Problem-solving. • Service-mindedness and commitment. • Critical thinking.

Sulaiman and Hall (2002:225) noted that although the requirements of farmers and rural communities are often beyond just agricultural production technologies, the emphasis of extension and advisory services is often on technical matters. To be fully-effective, Extension and Advisory services need to play an increasing role in non-technical matters to assist in creating an agricultural innovation system adapted to evolving rural economies; and to ensure

the implementation of a sustainable ALRP. For this to be effected, the role of extension will need to be expanded to be better suited to the complex and diverse needs of the ALRP clients, for this reason, Extensionists will have to ensure that they are well-equipped with functional skills.

Functional skills include: ability to predict and manage change; creative thinking in terms of accomplishing goals and meeting growing demands; communication skills (verbal; non-verbal; listening); conflict-resolution skills; and people skills (the development of the total person) (Boyd, 2004:5). Leadership skills will be paramount to guiding our clients, and these skills include: the ability to access the needs of clients and their communities; the ability to turn needs into plans and plans into action; the ability to articulate the accelerated land reform programme's vision to clients and stakeholders; the creative use of technology to ensure impact; planning and organising skills; and a commitment to the vision of the accelerated land reform programme.

Van Niekerk, Groenewald & Zwane (2014:62) propose mentorship by commercial farmers to Land Reform beneficiaries as a way to enable sustainable agriculture development. They quote a study by Harvey (2006) where it was found that emerging farmers that received land did not necessarily have the required experience to make decisions and manage the farms; nor did they possess the depth of knowledge (that comes from experience) required to successfully run a farming project. In their own study, they found that commercial farmers had willingly assisted new farmers with technical, financial management and administrative matters (Van Niekerk, *et al.*, 2014:68). There are some implications for extension and advisory services, as to some extent mentorship is an extension function, but, it should be accommodated in the development project when facilitated by current commercial farmers. There will however be financial implications (some mentors anticipate remuneration), but largely it will free-up Extensionists to rather provide an enabling, learning environment for the mentors and mentees, than to participate directly in the mentorship process. Public-private partnerships that focus on local knowledge and resources should be encouraged, as this enhances the sustainability of the development process.

In terms of the whole-system approach, aspects that should reflect at the organizational level include: creating a positive environment where our clients can prosper; inspiring commitment and eagerness to learn from experiences; a positive attitude and energy to seek success and to help others; relationship skills, where we can motivate and work with others; and trust, trusting that our clients will succeed and encouraging them to trust that success is possible. Many of us already aspire to this, but these aspects need to become embedded in the organizational culture of the Extension and Advisory Services and the processes of the ALRP.

A practical start would be for the ALRP to address issues raised in the past regarding the placement of beneficiaries not equipped to be farmers, and who, as a result did not make a success of their farming enterprises. Beneficiaries should be selected based on their technical- and functional-skills level, to increase their level of success from the start. This would be the beginning of the establishment of a learning organisation, and would more likely result in sustainable agricultural development.

No matter how well-prepared, there will always be unexpected problems, issues, and opportunities. Individuals and institutions need to be able to respond to these reflexively for agricultural development to be sustainable. Nothing happens in a vacuum and the Extensionist and Clients are only as good as their enabling environment. A whole-system approach to

agricultural development realises this and the establishment of learning organisations and enabling networks is paramount for sustainable agricultural development (Adey, 2007; van der Ploeg, 2003; Rip and Wiskerke, 2000).

4. CONCLUSIONS AND RECOMMENDATIONS

A whole-system approach can be seen as being a process of sustainable agricultural development. The dimensions of sustainable processes of development include: social; political; economic; environmental; and institutional aspects. The challenges are multifaceted, and the priorities include:

- Farm infrastructure development
- Improved market access
- Enhanced transfer of technology to new farmers (farmer support centres)
- Human resource development plan
- Access to a comprehensive range of rural financial services.

For this to be realised, individual capacities will need to include technical and functional skills; and at the institutional level, capacity is required to support these changes at the individual level. Institutions need to put policies in place, and to provide services that will enable the extension and advisory services to serve the needs of their clients. These policies and services must support sustainable agricultural practices and enhance market access, to ensure the financial success of Land Reform beneficiaries.

Extensionists need to be well-equipped with functional skills to facilitate the holistic development of their clients to achieve sustainable farming practices and economic success. For rural development practitioners, this is not a new approach, but rather a revisiting of the participatory extension approach; and for Government, learning to incorporate it into our Extension Services. Participation and learning at all levels, is the new normal.

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DATA DEFICIT: THE FISCAL CHALLENGES AND PROSPECTS OF SOUTH AFRICA'S LAND REFORM IN THE AGRICULTURAL SECTOR

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ABSTRACT

The reallocation of land to previously disadvantaged communities has the potential to aid in agricultural development; however, the inverse could be true. Through proper establishment of agrarian reform frameworks and agricultural policies – land reform could yield a fruitful economic progression for all, including peasant farmers in remote smallholdings. This paper addresses the benefits and ill effects of land reform and how land reform policies could lead to the contribution and/or regress of fiscal growth in the agricultural sector. Using a mixed methods approach, data were collected and analysed through qualitative and quantitative means. Our findings indicate that land reform has been relatively slow – nine percent farm land successfully transferred through redistribution. Tenure reform has been extraordinarily ineffective, leaving the poor more deprived. There is also limited data available pertaining to smallholder farming which has seldom been used to better the lives of the poor. Through proper formation and implementation of land reform policies in alignment with the national development plan (NDP) – land reform has the potential to make a significant economic contribution in the agricultural sector. However, this calls for agricultural extension advisors to actively engage in the agrarian reform policy-making proceedings as they are mediators between farmers and policy-makers.

Keywords: Agrarian reform, Extension advisory services, Fiscal growth, Land reform.

1. INTRODUCTION

Agricultural development is necessary for the reduction of food poverty, the strengthening of the economy, and the attainment of the broader Millennium Development Goals (MDGs). Through the reallocation of land, the prospects of curbing these socio-economic divides could potentially be achieved. Despite the fact that South Africa is known to be a food secure country at a national scope; several counties are still faced with the challenge of food insecurity, and further, a declining economy. This could thus be attributed to the existing land reform policies which, over the years, have not been much of a success due to uncoordinated support between the state and other entities – including both the Non-Governmental Organisations (NGO's) and extension services. As it stands, the narrative around land reform is flailing and relative fragmented policies pinpoint key issues that need to be addressed in rural development and land reform – including the expropriation bill, the land protection bill and the regulation of land access, usage and ownership by non-South Africans (Land Reform Policy Discussion Document, 2012:2). In its entirety, the land reform program is unclear. Looking at the expropriation of land for example, no clear frameworks have been established as to how land ought to be expropriated and well identified empirical evidence on land redistribution is scarce (Keswell & Carter, 2013:250). This is besides the South African constitutional premise on section 25(5), which places an obligation to the state to make use of its resources to enable

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citizens to have equal access to land. It is thus argued that the transformation of land ownership has seen little progress since the inception of land policy post-apartheid in 1996. Jankielsohn and Duvenhage (2017:2) argue that it is for this reason that there now exist a rhetoric regarding radical economic transformation under the banner of land expropriation without compensation which has led to the National Democratic Revolution (NDR) ideological framework by the African National Congress (ANC) which in its entirety is anchored in Marxist-Leninism and is defined as, “A process of struggle that seeks to transfer power to the people and transform society into a non-racial, non-sexist, united democratic one, and changes the manner in which wealth is shared, in order to benefit all the people”. In light of this, this paper explores and expands on the land reform policy program and its role on the country’s agricultural advancement and economic development, precisely to the livelihoods of the rural smallholder farmers.

1.1 Aim and objectives of the study

The study was aimed at addressing the pros and cons of land reform and how land reform policies could lead to the contribution and/or regress of fiscal growth in the agricultural sector, more especially among the rural poor. The following objectives have been identified for this study:

1. Determining the advancement and overall significance of the land reform program.
2. An in-depth analysis of the impact of the land reform program to the livelihoods of rural smallholder farmers.
3. Exploring the economic contributions made since the inception of the land reform program.
4. Examining the impact of extension services on land reformation and agricultural development

2. LITERATURE REVIEW

2.1 The land reform policy

Although land reform is commonly understood as the redistribution of land rights for the benefit of the landless, labour tenants and farm labourers (Lipton, 2011:323), we concur with Pienaar (2015:2) who states that in its entirety; land reform does not have a single and fixed definition that would suffice in all circumstances. Land reform as adopted in 1996 has three prongs: i) the restitution of land to dispossessed people, ii) the redistribution of land to the landless to undo the skewed ownership patterns imposed by Act 27 of 1913 and iii) the overhaul of tenure arrangements to strengthen the property rights of bona fide occupants (Ntsebeza & Hall, 2007). This is contrary to the infamous Natives Land Act (Act 27 of 1913) which cemented and now signifies the dispossession of land from blacks by the white minority. The overall set of programmes (as stipulated in the national land reform framework bill of 2017) form part of the land reform programme, including; land redistribution, land restitution, land tenure reform, and land development. In the South African context, land tenure reform refers to policies that are aimed at reinforcing the ‘ownership’ rights of people that occupy land under insecure forms of tenure (Lahiff, 2009:93). These property right policies customarily favour labour tenants and those people who reside on communal land. Land tenure follows the restoration of land through the restitution programme, which seeks to restore land to people that were previously dispossessed under discriminatory land ownership laws. This legislation sought to undo the widespread social segregation of the urban and rural poor, including farm workers, labour tenants and emerging farmers. The redistribution strategy is considered as a

means of bridging the gap between the uneven socio-economic strata by providing the poor with land for both residential and agricultural uses as a means of improving their livelihoods.

2.2 The impact of land and agrarian reform on rural livelihoods

Numerous sources (Lahiff & Cousins, 2005, Ntsebeza & Hall, 2007) have affirmed the lethargic advancements of the land and agrarian reform programme and its impact on particularly rural smallholders marginalised by the 1913 Natives Land Act and subsequent legislation. The land and agrarian reform framework was initially enacted to bridge the gap of inequality and to address the structural nature of poverty (monetary, food, and other essential assets that are necessary for a sustainable livelihood) in post-apartheid in South Africa (Cousins, 2007:220). However, looking at the current poor black African population in the country (64.2%) as reported by Statistics South Africa (2017), it has been difficult to achieve land and agrarian reform at a larger scale due to both limited funding for implementation and a lack of coherence between agrarian reform policies and tenure reform policies (Kepe & Tessaro, 2013:272). This failure essentially contrasts the hierarchy of needs theory as outlined by Maslow (figure 1) in a sense that the socio-economic disparities in society either remain stagnant or escalate. Through failure of the land and agrarian reform programme, the attainment of some basic needs necessary for a living are faltered (Manenzhe, Zwane & van Niekerk, 2016:31), food production becomes a challenge due to limited availability, and to some extent total unavailability, of arable land. Capitalisation of that land which is available is also difficult to achieve where tenure security may exist but rights are not formally registered (Meinzen-Dick & Mwangi, 2008:36 & de Soto, 2000:51). Though property rights may exist *de facto*, they cannot be used (through capitalisation) to secure the other resources needed to fulfil the basic needs; conversely, smallholders in high-risk and uncertain environments – frequent flooding, droughts or conflict (Barry & Fourie, 2002) – may be unwilling to use land as collateral due to the high risk of loss of land (Holden & Ghebru, 2016). Failure of these basic needs, as far as the development of rural livelihoods is concerned, spontaneously leads to the decline of psychological and self-fulfilment needs.

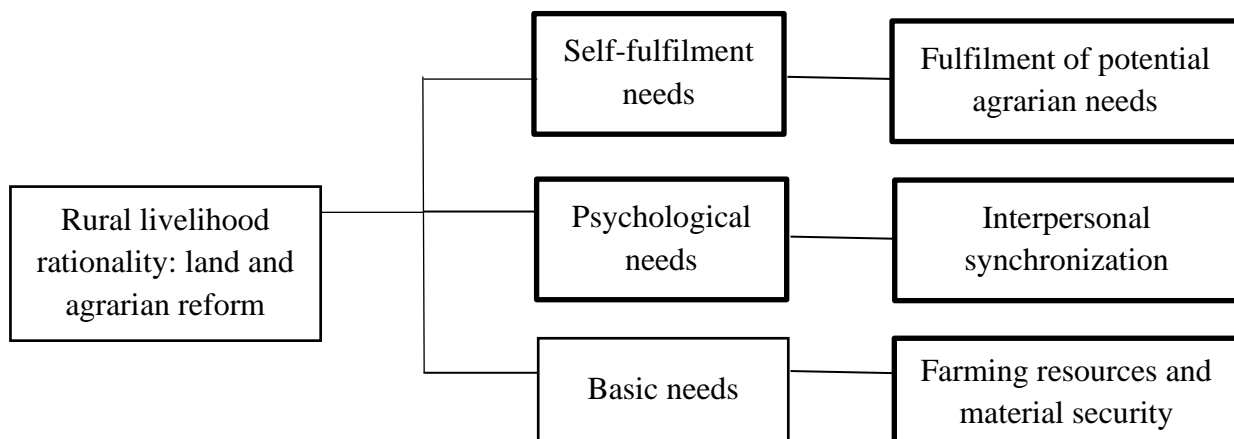


Figure 1: Rural livelihood rationality in relation to land and agrarian reform; modelled from Maslow’s hierarchy theory of needs (Maslow, 1943)

The rural livelihood rationality (figure 1) is applied to provide a philosophical understanding of the rural farmer’s livelihood rationality; Maslow’s hierarchy of needs indicate that the physiological and safety needs form the base for a sustainable livelihood (Maslow, 1943). Through production of agricultural commodities among the households, the physiological needs are fulfilled and without basic material security, the needs are obsolete (Liu & Wu,

2015:65). Generally, South Africa is resilient through land cultivation and agricultural production. Through the endless toiling of the soil and through collaboration; social relationships are formed, allowing for the fulfilment of interpersonal synchronization. Such relationships are vital to the livelihoods of rural farmers whose production is often limited and thus must barter with neighbours or find other activities to supplement their income (Holden & Ghebru, 2016; Lahiff *et al*, 2008). In this regard, interpersonal interaction is of utmost importance. At the pinnacle of Maslow's theory of needs is the sense of self-fulfilment. After having achieved the basic and physiological needs, farmers get a sense of recognition and to some extent honour through their social and economic accomplishments.

2.3 The influence of land reform implementation relapses on agriculture and food security

The universally accepted definition of food security as outlined by the Food and Agriculture Organization of the United Nations (FAO, 2007), describes the term food security as a situation that exists 'when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. This definition breaks down food security into four pillars, namely; food availability, food access, utilization, and stability. Food security and poverty are closely linked and while the national food production proves adequate to meet the needs of the country's 57 million population, food security continues to be a threat at household level (Altman, Hart & Jacobs, 2009:345). This food insecurity challenge is attributable to the limited access to food, and sustainable financial resources that are needed to obtain food sources (Holden & Ghebru, 2016:26). To curb this predicament, agriculture, together with other industries – such as mining and tourism, could aid as a potential solution to address food related challenges (Carvalho, 2017:61), and further; rural development. Preceding findings (Somerville & Long, 2015:32-33) indicate that some of the growing threats to agricultural land include non-food crop uses (e.g. biofuels) and the effect of climate change on agriculture. These challenges contribute pointedly to underdevelopment in the agricultural space, more especially in the disadvantaged areas. The white paper on South African land policy highlighted in its strategic goals that through land reform, not only the redress of the apartheid injustices can be achieved but also economic growth and poverty reduction (1997:7). However, the country still faces numerous challenges hampering the progress of land reform. A study by Manenzhe *et al*. (2016:35) points out six challenges that land reform beneficiaries face towards sustaining their agricultural projects. These challenges include:

- Marketing of produce – due to the reason that some beneficiaries are still under employment and take their farming enterprises as an additional income source, a small percentage that is involved in marketing is not enough to ensure sustainability.
- Government support – lack of support from the State limits the land reform beneficiaries from overcoming farm-related challenges as a means of ensuring sustainability in the agriculture sector. However, this rhetoric remains subjective as too much intervention from the government may promote a culture of dependency.
- Full-time vs part-time – some people only practice agriculture as a matter of convenience and recreational outlet. These are people who are fully employed in different sectors of the economy who do not practice agriculture on a full-time basis, resulting in a challenge to sustainability.
- Resolving farming challenges – like any other business enterprise, the agri-business has its challenges that require skills and expertise, often not always at the disposal of smallholders.

- Agricultural training – the practice of capacitating people with farming skills leads to positive contributions.
- Participation in agricultural training – through programmes such as the Recapitalization and Development Programme (RADP), the sustainability of land reform can be attained through the provision of capacity building programme within land reform projects and agricultural projects that are owned by emerging black farmers.

3. METHODOLOGY

3.1 Data collection

Data was collected through use of structured and unstructured interviews. A total of forty interviews were administered to the Ntuze rural farming community in northern KwaZulu-Natal. Through survey interviews, open-ended questions were intended to understand the holistic understanding of the participants experiences in the context of land reform. Secondary data was derived from existing frameworks and policies in relation to land transformation. As a means of analysing the existing frameworks, policies and literature pertaining to land reform, a qualitative approach was employed. The survey data was also quantitatively assessed to determine the effect policies have in practice on the productivity and financial standing of rural smallholders.

3.2 Data analysis

Data collected from household surveys were captured and analysed through use of multiple coding using the Microsoft Excel Software Package for credibility purposes. The coded data were exported to the Statistica analytics software (StatSoft) for descriptive statistics, wherein graphic summaries illustrating figures related to the sampled population from the Ntuze community were presented. A Chi-Square test at $P=0.05$ was also employed to determine a correlation between variables.

4. RESULTS AND DISCUSSION

4.1 The smallholder farmers' household characteristics and state of land ownership

The following socio-economic findings were obtained from the community under study:

- Most of the household heads in the Ntuze community were female, and mostly above the age of 50. They constituted 90% of the study participants in comparison to their male counterparts – 10%.
- Just over half of the participants (52.5%) have been residing in the community since their inception.
- Seventy percent of the participants received primary education, of which 35% have primary education and 35% percent have secondary education.
- The employment status was negatively skewed due to high unemployment as a result of lack of expertise and limited education.
- Ninety-three percent of the participants indicated that they own the land they occupy. Contrastingly, 7.5% indicated that the land they occupy is under the authority of the tribal leaders.
- Sixty-five percent of the participants generate their revenue through agricultural production.

- Farmers expressed a substantial failure in farming inputs and farming support from government and other stakeholders – 62,5% of the study participants noted that there was limited access to extension services in the area.
- Since the majority participants are predominantly sugarcane farmers, the Chi-square test was conducted to indicate the relationship between sugarcane production and the land size. No significant relationship between the two variables was observed.

4.2 Authoritative influence on land ownership and reformation

Like most of sub-Saharan Africa, land tenure arrangements in rural South Africa are complex: land is held in title either by provincial government, Communal Property Associations (CPAs) or in KwaZulu-Natal, the Ingonyama Trust. The management of use and allocation typically lies with tribal authorities or traditional leaders, while the occupants of the land enjoy the use and fruit of the land as if it were their own (Hornby, Kingwill, Royston & Cousins, 2017). In Ntuzi, the land is owned by the Ingonyama Trust and the people enjoy a form of customary tenure where adjudication of allocation and access is based on need and continued use. Each family is allocated land for both residential and agricultural purposes. During our surveys many respondents indicated that they ‘owned’ the land, in that they had the exclusive use and enjoyment of the allotment, but also conceded that the tribal authorities had authoritative power over all the land in the area. The response of one participant is telling: “... *yes, the land belongs to me, but should I die, if the leaders see fit, they can take back the farming land from those left behind and do as they please with it*”.

While tenure of residential plots is legitimised (Whittal, 2014:22) by the presence of permanent structures, graves and boundaries, the use of agricultural allotments can be revoked. Similar patterns were observed in Ekuthuleni (Hornby, 2017) and Msinga (Cousins, 2011). It is argued that this susceptibility to abuse of power undermines the respondents’ tenure security, while their lack of legality (Whittal, 2014:22) makes capitalisation impossible (de Soto, 2000).

A greater deal of imagination and the inclusion of decoloniality in the debates around tenure reform policy is needed. The authors contend that there are possible means of recognizing individual tenure in customary tenure arrangements in such a way as to be visible to capital (Hornby, 2017; de Soto, 2000). This is challenging where the right to choice of representative and the principles of democracy and participation enshrined by the constitution seem opposed to the authoritarian and prescriptive nature of tribal authorities. While the conversion of land rights into formal freehold appears attractive, it is likely to be opposed by traditional authorities whose autonomy is also protected by the constitution. This is to say nothing of the entrenched power dynamics that could expose vulnerable community members to dispossession. Hull and Whittal (2018) argue for the total overhaul of the tenure system to accommodate customary tenure.

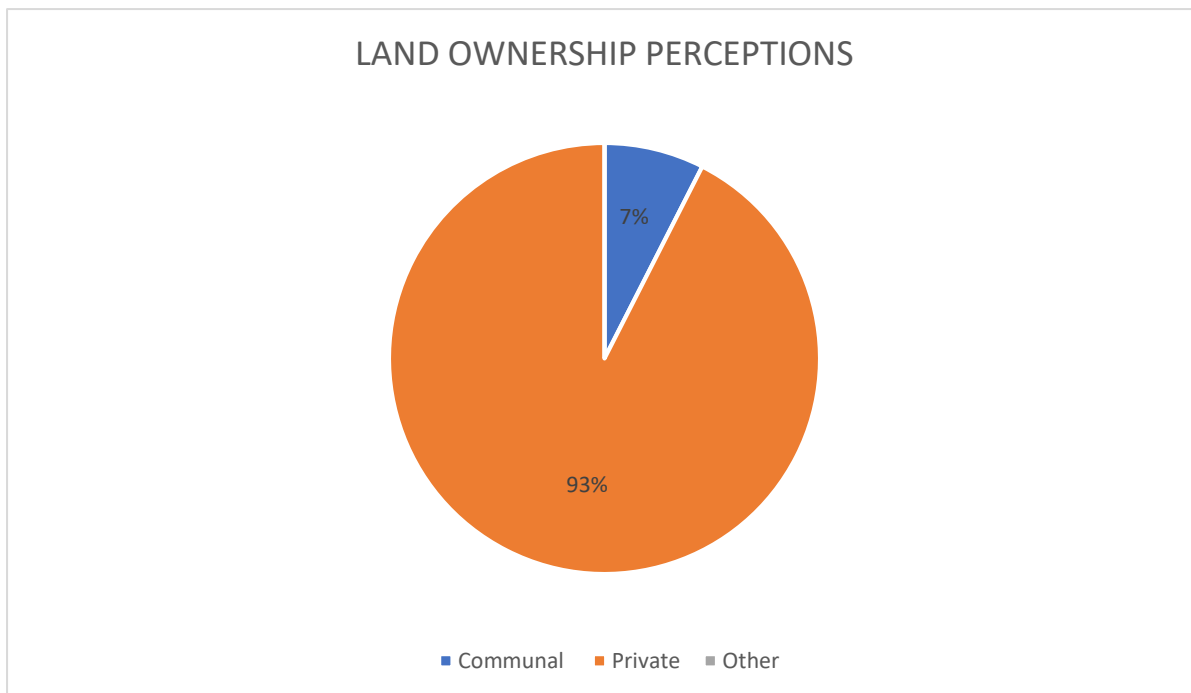


Figure 2: State of land ownership in the Ntuze community

4.3 Land reform in a rural South African context

Although land reform in its entirety is inclusive of property rights and farming land; in the rural communities of South Africa, land reform is perceived as predominantly speaking to agricultural development. As in most rural communities in South Africa, residents of the Ntuze community are faced with a challenge of high unemployment (figure 3) and lack of education. Therefore, in order to be resilient, agriculture plays a vital role to their livelihoods both socially and economically. Figure 4 indicates the extent to which agriculture supports the livelihoods of the people of Ntuze.

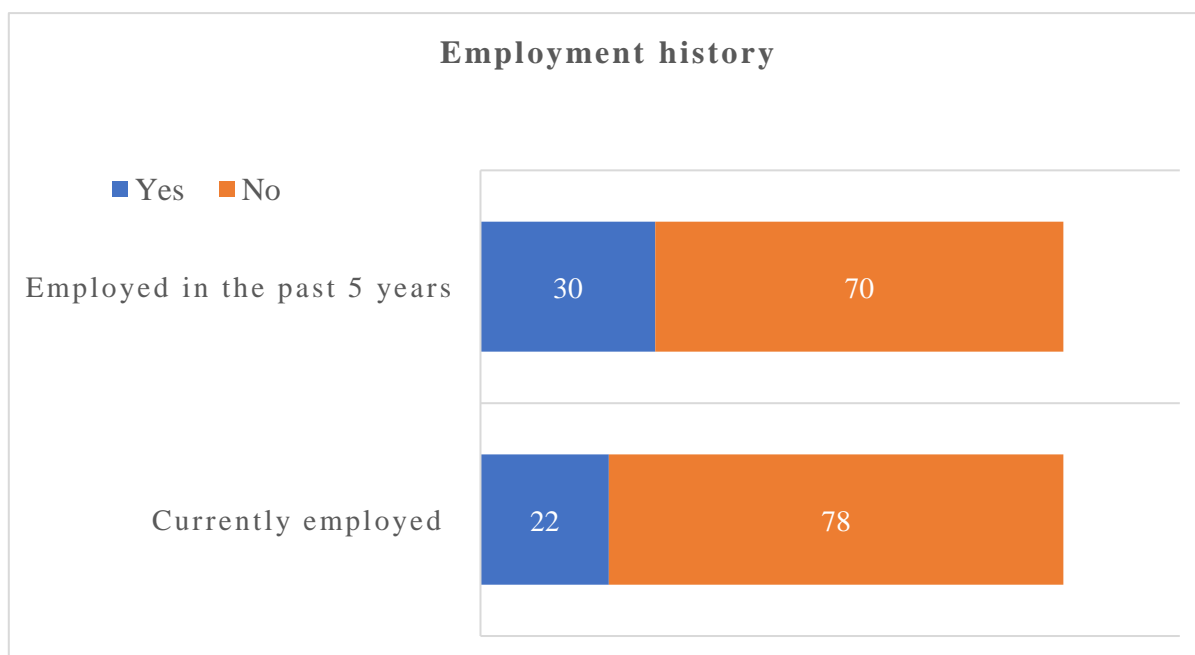


Figure 3: Participant's employment status between years 2013-2017

From our findings, the state of employment corresponds to the participants' level of education. Just as the majority have primary and secondary education, coupled with lack of job skills and experience – the employment status remains negatively skewed. Most of these people are above the age of 50 and are vulnerable to powerlessness, isolation, physical weakness and poverty (Lundy & Adebayo, 2016). Numerous discussions on land policy highlight the restitution of indigenous lands, indigenous land claims, and agricultural development in the rural communities whose survival strategy is pinned around agricultural production (Holden & Ghebru, 2016). Contrastingly, the agricultural component is overlooked in the context of rural communities, yet it forms a greater part of their livelihood. There are little to no agricultural focused development projects in these areas. This study found that in the Ntuze community, only two agricultural projects were in existence, both with a specified market. However, the very same projects were not as beneficial owing to the challenges encountered, with lack of support and limited access to extension services being the major concerns.

4.4 Agricultural contribution on rural economic development

Agriculture has proven to be a stress reliever for poor people in most parts of the world. Through farming, people have become resilient and indirectly devised a coping strategy for their own survival. These findings signify both the impact and importance of agriculture on the livelihoods of rural people.

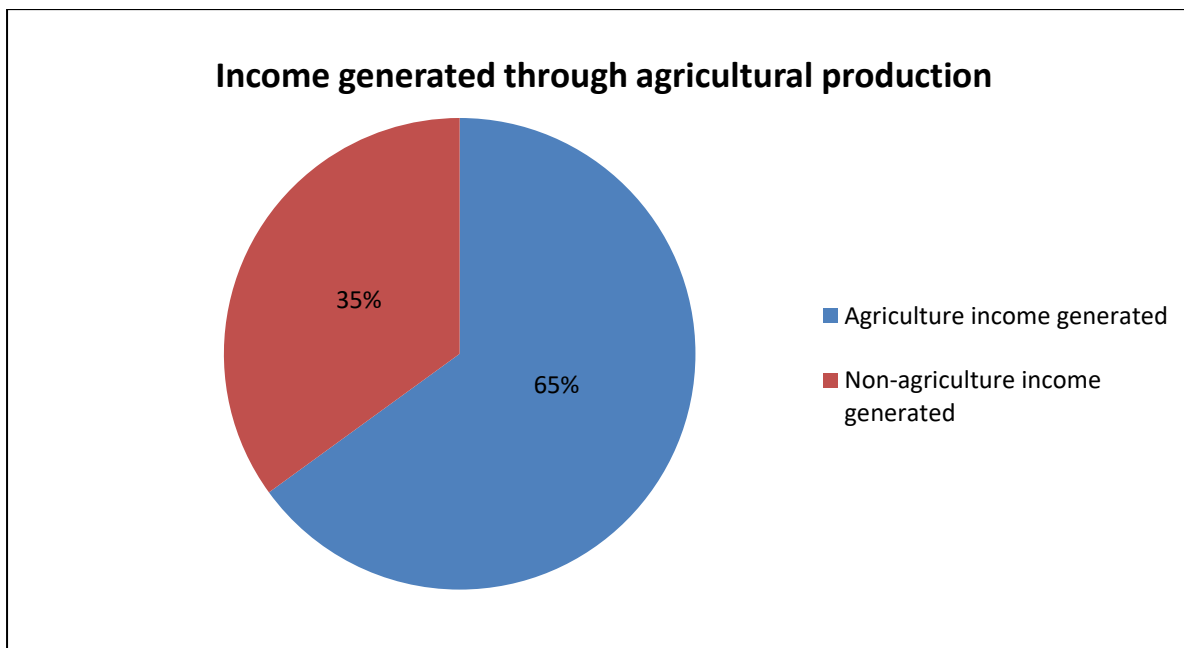


Figure 4: Monetary gains generated through agriculture

Our findings suggest that through agricultural activities rural households can generate income through their own production. However, we argue that due to unclear ownership of land in customary areas, the rate of production is at risk. This contrasts that of which was alluded by the then president of South Africa in the 2019 State of the Nation Address (SONA, 2019) when emphasis was placed on the comprehensive farmer development support as a means of ensuring that communal land is utilised productively. It is therefore of utmost importance that such challenges be thoroughly addressed to achieve not only resilience in the households, but also sufficiency. Additionally, in light of limited access to the markets, governmental policies and legislative interventions can help in the expansion of rural agricultural activities through the promotion of market driven production. The penetration of the produce market by smallholders

then improves not only household food security but also national food security, and meets not only the basic needs of the smallholder, but allows for continued sustainability of inputs and the fulfilment of needs higher up Maslow's (1943) hierarchy.

4.5 Extension service as a key role player on land reform

Agriculture is undoubtedly one of the major economic drivers in South Africa. However, due to unclear sets of policies and frameworks on land reform, agricultural production is hindered. Extension service agents face the challenge of ensuring the effective settling of small-scale and emerging farmers in the land reform program. This thus contrasts the United Nations Sustainable Development Goal (SDGs) to alleviate hunger and poverty through enhancement of food security and the strengthening of the economy. Strong correlations exist between the principles of extension (technical skills and imparting of agricultural knowledge and transfer of technology to mention a few) and the land reform program. However, the slow and disconnected pace of particularly redistribution and tenure reform threatens extension services; the link is evident in theory, but severed in policy and in practice. The Strategic Plan for South African Agriculture (Department of Agriculture, 2001, 15-16) on land reform also becomes a failure as the reform policy and agricultural development are interrelated. Such a predicament also poses a threat on the goals and visions of extension agents whose responsibility revolves around meeting peoples' felt and unmet needs. The productive use of South Africa's agricultural land is a policy priority, even in the face of the debate on expropriation without compensation, that will be hindered by a continued disconnect between complex land reform and extension services.

4.5.1 Extension service in communal areas

Extension service in the context of agricultural development tends to be restricted in areas where the ownership of land is not clearly known and where there is little to no farming support. Our findings indicate that 62.5% smallholder farmers in the Ntuzi area had access to extension services. However, the area only had one extension agent that was responsible for two farming projects that were specifically designed for elderly female farmers. Only 37.5% of the study participants affirmed the existence and functioning of extension agents in the area. The latter group interacted directly with the extension officer at least once every two months and were all involved in the female focused communal projects. These two projects were established in allotments that were approved by the communal leaders. We therefore argue that due to this autocratic leadership, the rate of agricultural development in rural areas and the function of extension agents stands challenged. If the tribal authorities see fit that agricultural projects would not make any significant contribution, they could decide not to allocate land for such initiatives. They are the determinants of access to land and the overall agricultural development in their communities. Therefore; there is a need for the reformation of land, not only in the developed parts of the country but also in poor rural communities where people's voices are silenced by the tribal leaders. However, this calls for change agents to intervene and advocate for change that would allow for tenure of land without any limitations.

4.5.2 The role of government, extension and policy-makers on land reform

Through an increased population and a declining economy, access to land and agricultural production becomes a challenge. It is thus an obligation of the government to ensure that the socio-economic standing of its people is conducive for a sustainable livelihood. However, this can scarcely happen without the freedom to access land and agricultural extension aimed at

assisting land reform beneficiaries. These two limitations alone increase the risk of food and monetary poverty. It is therefore important for government and other policy-makers to consider various factors that are at stake when discussing the implementation of land reform in their holistic complexity. Who should be the beneficiaries? What criteria should be followed? How is the land going to be utilised and who will benefit from it? Should land rather be given to the beneficiary for a certain number of years before granting legal documentation as a means of ensuring it will not be left unused and unproductive? Different factors ranging from sustainable livelihoods to the country's economic growth ought to be considered in the policy decision making and implementation. Care should also be taken that the policies are inclusive of rural residents with regards to the access to land and how their rights of ownership could be guaranteed without a hostile intervention of those that govern them in their respective communities. The involvement of extension agents in policy-making could also be of benefit – they can be powerful agents providing insight into the needs and requirements of the poor rural smallholder. Their regular interaction with smallholders allows them also to assess the appropriateness of policies and the potential consequences and trade-offs these policies could produce. Extension agents comprehend both peoples' felt and unmet needs. The regard for extension agents in the policy decision-making process would, in all fairness, work to the favour of the rural poor whose voices are either silenced or unheard due to limited access to information and autocratic governance in their communal settings.

5. CONCLUSION AND RECOMMENDATIONS

While the objectives of South Africa's land reform programme are aimed at redressing skewed land ownership patterns, their lack of coherence with agricultural policy and food security goals undermine the sustainability of rural smallholder livelihoods. The lack of progress especially with respect to tenure reform leaves rural smallholders in customary areas vulnerable to both dispossession and the perpetuation of poverty. While the tenure reform programme is highly significant, it has not seen any progress. While emphasis has been placed on redistribution, extension services to customary areas has faltered. The economic impact of tenure reform therefore comes to naught. As already highlighted, extension services to rural smallholders must be prioritised to achieve household food security, while the tenure arrangements of rural smallholders must also be addressed, both in terms of improving tenure and in allowing access to capital. To this end, greater synthesis of the tenure reform programme and agrarian reform is needed, while the overhaul of the national tenure system to incorporate customary tenure is another viable, if not necessary exercise.

6. ACKNOWLEDGEMENTS

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PROFILING POTENTIAL LAND REDISTRIBUTION BENEFICIARIES IN SOUTH AFRICA: IMPLICATIONS FOR AGRICULTURAL EXTENSION AND POLICY DESIGN

S. Zantsi¹¹

ABSTRACT

There is a general agreement that land reform has fallen short in achieving its intended objectives. One of the most commonly cited reasons for the slow progress in the land redistribution programme is lack of clear criteria in beneficiary selection. The State Land Lease and Disposal Policy, which is one of the current land redistribution policies, has identified commercial-oriented smallholders in the communal land as one of the land redistribution beneficiaries. However, there is little detailed empirical evidence on their constituents. Such information is crucial for policy-makers including the agricultural extension personnel, as this will enhance effective policy design and appropriate design of extension advisory service which will contribute to the success of land redistribution. The objective of this article is to fill this gap by profiling commercial-oriented small-scale farmers in three provinces that have the highest number of smallholders in South Africa. A survey of 833 farmers from these three provinces was conducted. Descriptive statistics and Binary Logistic Regression were used to analyse the data with the use of STATA software. The results show that a potential emerging farmer is a 55 years old male with primary education. Furthermore, 57% of the farmers are willing to relocate to commercial farms if there is government support and require an average farm of 152 hectares where they want to plant maize. The article concludes with some recommendations and implications for agricultural extension.

Keywords: Aspired farm size, Emerging farmers, Land redistribution, Profile, Willingness to relocate

1. INTRODUCTION

1.1 Background to the problem

When the first democratic government in South Africa came into power in 1994, a three-legged land reform policy was adopted to remedy the injustices of the past (Hall, 2015). The three legs encompassed restitution (restoring of land to those who were forcefully removed from their land), tenure rights (strengthening of farm workers and people living in the former homelands property rights and redistribution), and correcting the racial skewed land ownership (Department of Land Affairs, 1997). Currently, after more than 20 years of implementing different policies trying to pursue the above pillars, virtually all stakeholders come to the same conclusion: land reform has fallen short in achieving its intended objectives of equity, economic growth, rural development and food security.

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1.2 Description of the problem

This article focusses on the land redistribution leg of the land reform policy. Kepe and Hall's (2018) study shows that only 5.46% of the 82 557 220 million hectares¹² of commercial farmland has been acquired and redistributed through the land redistribution pillar alone. Various reasons have been provided for the unsatisfactory outcomes of the land redistribution. These include lack of post settlement support (Binswanger-Mkhize, 2014; Kirsten *et al.*, 2016), overcrowding in farms acquired through the Settlement Land Acquisition Grant (SLAG) (Kirsten *et al.*, 2016), lack of commercial farming skills among beneficiaries (Dlamini, Verschoor & Fraser, 2013), commercial farms are too big for the new land reform beneficiaries (Cousins, 2015), poor coordination between government departments (Lahiff & Li, 2012), insufficient land reform budget, as well as poor and unclear criteria in beneficiary selection (Aliber, 2015; Hall, 2015).

With regards to beneficiary selection, a number of land reform policies including the 1997 White Paper on Land Reform, Land Reform for Agricultural Development (LRAD; 2000-2010), Pro-Active Land Acquisition Strategy (PLAS; 2006-present), and the State Land Lease and Disposal Policy (SLLDP) of the Department of Rural Development and Land Reform (DRDLR, 2013). The SLLDP has identified commercial-oriented smallholders, both in communal land and private land, as major potential beneficiaries of the land redistribution policy. Furthermore, in support of this view, researchers such as Cousins (2015) have argued that commercial-oriented smallholders are suitable potential beneficiaries of land redistribution. This is because these farmers, against all odds, still farm to obtain a main or an extra source of income.

However, very little is known about these specific potential beneficiaries in the literature. According to Statistics South Africa's (SatsSA, 2016) Community Survey (CS), the majority (more than 60%) of smallholders are located in three provinces, namely KwaZulu-Natal, the Eastern Cape and Limpopo. While the CS is one of the few national datasets on smallholders in the country, it offers a fair share of information about smallholders, although it does not contain information on the smallholders' intentions with regards to land redistribution and future farming aspirations. With regards to rural households' views on access to land, a national survey reported in Marcus, Eales and Wilchut (1996) showed that the majority of respondents (67%) wanted small plots of one hectare and below for residential purpose and a small garden. Again, while this provided some insight into the immediate needs of rural dwellers, it provided little information about commercial-oriented farming households' aspirations to relocate to commercial farms outside the former homelands.

Moreover, Ntsebeza (2002) have partially posed the question of relocating to 26 households in Xhalanga, now known as Sakhisizwe Local Municipality. He asked what the livestock farmers thought would be a solution to their shortage of grazing land and their response was that government should buy or lease the white neighbouring commercial farms for them. Again, the question of relocating was not fully explored as it was not the main focus of the study and, therefore, there is a need to further explore potential land redistribution beneficiaries and their willingness to relocate.

¹² Estimated area by Kirsten (2017) using 1993 agricultural census.

1.3 Objectives

Against this backdrop, the objective of this study is to fill this gap in literature by providing a detailed profile of potential land redistribution beneficiaries. In doing so, the study addresses the following research questions:

1. What are the demographics of the potential land reform beneficiaries?
2. How many are willing to relocate to commercial farmland and under what conditions are they willing to relocate?
3. What are the factors determining if a farmer will be willing to relocate?
4. What farm size do potential emerging farmers aspire for and what farm activities would they want to pursue if they relocate?

1.4 Justification and outline

Answers to these questions are important for policy design, planners and for the agricultural extension staff for a number of reasons. Knowledge of the beneficiary is important for planners to ensure the success of the planned initiatives. This ensures that initiatives are tailored for the needs and circumstances of the beneficiaries. These issues have been prominent in many policies implemented for small-scale farmers in South Africa that failed because of poor understanding of the intended beneficiaries, as argued by Modiselle *et al* (2005) and Kleinbooi (2013).

2. LITERATURE REVIEW

2.1 Agricultural extension

Agricultural extension is defined by Davis (2008:16) as “the entire set of organisations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods”. While there are many typologies of agricultural extension in South Africa (Davis, 2008), the most common type of agricultural extension is the training and visit approach. Furthermore, while there is a growing demand for private agricultural extension services, mainly by commercial farmers, most of the smallholder farmers rely on the government extension services. There are also Non-Governmental Organisations offering agricultural extension services such as Lima Rural Development (Lyne, Jonas & Ortmann, 2018).

2.2 Envisaged role of agricultural extension in developing emerging farmers

The role of agricultural extension in serving emerging farmers is well recognised in literature (Kock & Terblanche, 2013; Mmbengwa *et al*, 2009; Van Niekerk *et al*, 2011). Given the current conditions of emerging farmers, where most are part of the potential land redistribution beneficiaries, it is apparent that as they move from communal farming to commercial farming, they will face a number of challenges. In this regard, the National Development Plan emphasises the need to capacitate agricultural extensionists to serve this group of farmers in order to make a smooth transition to the commercial farming world, and to achieve the objective of the land reform policy of equity, productivity, improved livelihoods and food security (National Planning Commission (NPC), 2011). As such, there are several roles that agricultural extension will have to play in supporting emerging farmers.

Firstly, the role of agricultural extension service is focussed on managerial aspects of the farm (Swanepoel, Van Niekerk & Blum, 2016; Zwane & Kekana, 2014). Van Zyl (1996) has shown evidence from literature that better farm management correlates with larger farms. There is a large difference between smallholder and commercial farm size in South Africa. The smallholder farm size ranges between half a hectare and 20 hectares (Pienaar & Von Fintel, 2014), while a commercial farm size is on average 2000 hectares (Liebenberg, 2013). This is therefore challenging for emerging farmers and it is one of the cited reasons for the failure of land reform farms (Hebinck, Fay & Kondlo, 2011).

Secondly, another aspect of agricultural extension is on formalising farm businesses. This includes record keeping, however, most of the emerging farmers in communal land hardly keep records. Record keeping is important for farm business assessment and planning and these records are required by banks in cases of application for credit. The issue of formalising farm business and instilling entrepreneurship was argued by Stevens (2017), where it was acknowledged that there is a need for training in handling administration of the farm business which requires some degree of literacy.

As the farm business grows, effective communication becomes especially important to increase an understanding, cooperation and mutual trust. Some farmers find the transformation from a small informal business to a larger, more formal business structure daunting. Extension should be geared to offer training programmes where farmers are helped to become more aware and understand the transformations required (personal and business transformation) (Stevens, 2017:92-93).

A third critical aspect that emerging farmers would require from agricultural extension is the diffusion of innovation and technology transfer. One of the prerequisites in commercial farming that enables farmers to be competitive is the understanding of current technology and its use (Van Rooyen, 2014). Apart from mechanisation, this includes new seed varieties and pesticides, for example. With regards to diffusion of innovation, this means that agricultural extensionists need to have a complete understanding of their clients (De Beer, 2000).

Lastly, the final important role that agricultural extensionists are required to play in the development of emerging farmers is dissemination of information and marketing skills (Mmbengwa *et al*, 2009). One of the requirements in commercial farming is to acquire market information and understand their market very well to meet the specifications and be competitive (Mabaya *et al*, 2011). This calls for one to develop marketing skills, communication and negotiation skills. However, this was found to be lacking in agricultural extension staff (Mmbengwa *et al*, 2009). Overall, these roles can be achieved only if the extension staff are competent, well equipped and organised.

2.3 Can the current agricultural extensionists deliver the above roles?

There is a general agreement that public agricultural extension in South Africa is weak and incompetent (Worth, 2008; Zwane, Groenewald & Van Niekerk, 2014). There are various assumptions as to what is lacking with government's extension services. In government's own view, much of the problem is too few extension officers, inadequate skills amongst extension officers, and inadequate co-ordination between government and private sector extension services. The issue of fewer extension officers, especially for small-scale farmers, was also prominently found by Lukhalo (2017), while the incompetence of the extension personnel was noted by Zwane *et al* (2014) in Limpopo Province.

Another perspective, which government itself has indirectly acknowledged, is the extension methodology, which is dominantly the training and visit approach. In an attempt to address the above challenges of agricultural extension service, the government has implemented programmes to improve the agricultural extension service. These include the Extension Recovery Programme launched in 2008/09 (Department of Agriculture, Forestry and Fisheries (DAFF), 2013), the Strategic Plan for Smallholder Support (DAFF, 2015), and the National Policy on Extension and Advisory Services (DAFF, 2015). However, there is no adequate evidence of success of these programmes in strengthening the public agricultural extension service. Overall, the capability of the current public agricultural extension staff in rendering services that meet the needs of emerging farmers is highly contested (Van Niekerk, Groenewald & Zwane, 2014).

2.4 A need for alternative approaches

In light of the current weak and incompetent public agricultural extension, Farmer Field Schools (FFS) can offer alternative, feasible and cost effective approaches (Duveskog, 2013). The FFS started in Indonesia in the late 1980s, and are a group-based learning process whereby producers meet on a weekly basis at a site they provide, assisted by a facilitator who may or may not be a qualified extension officer (Pontius, Dilts & Bartlett, 2002). The FFS approach has yielded positive results in many parts of the world, mainly Asia and Africa. Although its application in South Africa has been scarce, recent evidence from Alice in the Eastern Cape has shown that participation in FFS study groups improve farmers' knowledge and yields (Apleni, 2017). This approach could address the challenge of insufficient numbers of extension officers and weak agricultural extension.

Therefore, in order for these roles to be achieved by agricultural extensionists, there needs to be complete understanding of the clients. In other words, knowledge of emerging farmers' background and environment under which they operate their farming (Modiselle *et al*, 2005). The understanding of the extension clientele is a prerequisite to a successful design of development initiatives, hence there is a need for the present study.

3. METHODOLOGY

3.1 Study area, sample size and data

This study was conducted in rural parts of three provinces in South Africa, namely the Eastern Cape, KwaZulu-Natal and Limpopo. These provinces were chosen because jointly they house the majority (61%) of smallholders in the country according to Statistics South Africa's Community Survey in 2016. Therefore, they arguably offer a large pool of potential land redistribution beneficiaries. Within these three provinces, district municipalities which have a high density of smallholders were chosen. According to Aliber and Hart's (2009) analysis of the Income and Expenditure Survey and the Labour Force, the following districts have high a density of smallholders: Amathole, Chris Hani and Oliver Tambo district municipalities (Eastern Cape Province); Umkhanyakude, King Cetshwayo, Harry Gwala and Zulu Land districts (KwaZulu-Natal); and Vhembe (Limpopo Province). A sample of 833 farmers was randomly chosen from the eight districts of the three provinces. Table 1 displays the sample size in each selected district and province.

Table 1: Summary of sample size per selected district

Eastern Cape		KwaZulu-Natal		Limpopo	
District	N	District	N	District	N
Amathole	175	Umkhanyakude	125	Vhembe	89
Chris Hani	120	King Cetshwayo	80		
OR Tambo	84	Harry Gwala	56		
		Zulu Land	104		
Total	379	Total	365	Total	89

Commercial-oriented farmers were randomly selected and interviewed in each of the districts. A semi-structured questionnaire compiled in English and translated into local languages spoken in the study areas was used for the interviews with farmers.

3.2 Variable selection and data analysis methods

According to Modiselle *et al* (2005), production and investment decisions in smallholder farming are not only determined by economic factors and availability of natural resources, but by a range of factors including social, economic, biological and institutional factors in which the farmer operates. Thus, background of the farmer with regards to production and aspirations are important determinants of decision making and in turn affects production (Chipfupa & Wale, 2018). In the case of the Land Redistribution Programme, these factors seem to be underappreciated by policy-makers and a top-down approach is often followed. A selection of the variables used in this study was influenced by the above background, hence socio-economic, production and aspiration variables were mainly chosen.

Mostly descriptive statistics, tables and charts were used together with Binary Logistic Regression. Binary Logistic Regression is used to analyse the relationship between multiple independent variables and a dependent categorical variable. In this study, a Binary Logistic Regression was chosen since the dependent variable has only two outcomes, namely willing or not willing to relocate to a commercial farm. The cumulative logistic probability model is econometrically specified in Equation 1 (Gujarati, 1995):

$$L = \ln\left[\frac{P}{1-P}\right] = \alpha_0 + \alpha_1 X_1 + \dots + \alpha_n X_n + \beta_1 D_1 + \dots + \beta_n D_n + e \dots\dots\dots(1)$$

Where,

I = Household_i = 1, 2, .. , n

Ln = Log of the odds ratio

P = Probability that a household is willing to relocate to a commercial farm

1- Pi = Probability that a household is not willing to relocate to a commercial farm

$\alpha_1 \dots \alpha_n$ = Coefficients of explanatory variables (X_1, \dots, X_n)

$\beta_1 \dots \beta_n$ = Coefficient of explanatory dummy variable

e = an error term

4. RESULTS AND DISCUSSION

4.1 Socio-economic information of the farmers

The sample of this study consisted of 61% males and 39% females (Figure 1). This is consistent with the literature (Aliber & Hart, 2009). The average age of the household head was 55 years old where the oldest respondent was 86 years and the youngest was only 21 years old with a

deviation of 11.42 from the mean. These results are not far off from the smallholder Community Survey, which reported an average age range of 45-54 years (StatSA, 2016). Furthermore, Sinyolo, Mudhara and Wale (2016) have also found similar results in KwaZulu-Natal. Moreover, these results show that the potential emerging farmer is on average four years younger than his commercial counterpart (DAFF, 2017).

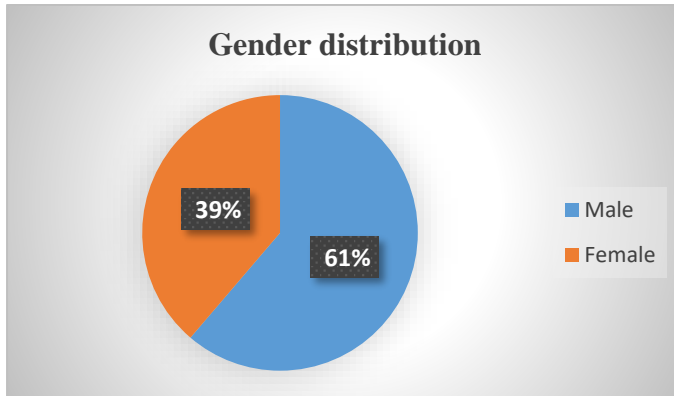


Figure 1: Gender distribution

In terms of education, which is one of the important variables for planning and designing extension service, it was found that most farmers have primary and secondary education, while few claimed to have tertiary level (Figure 2). It is also interesting to note that a fair share of potential emerging farmers have no formal education at all.

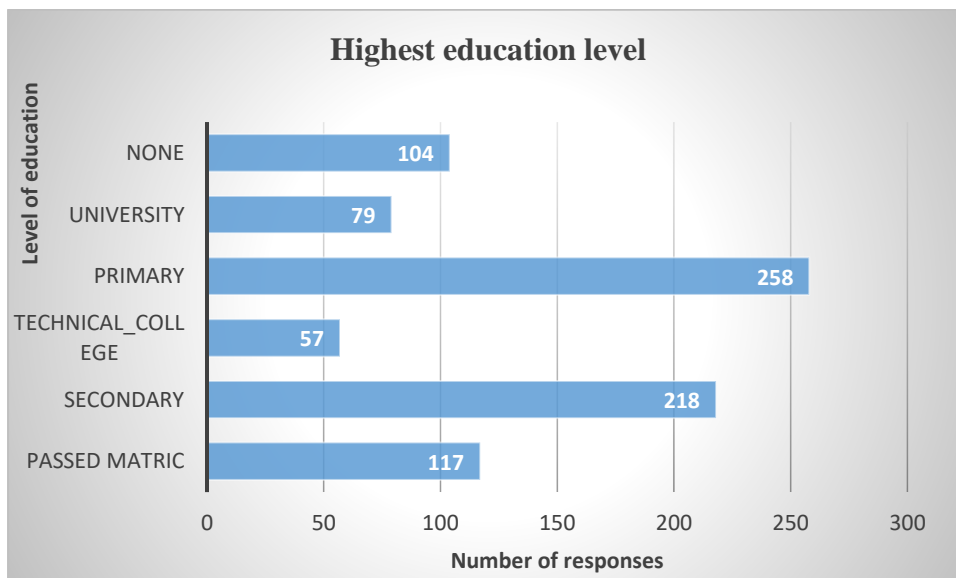


Figure 2: Distribution of education level of the farmer

The income in the study sample was not uniformly distributed. The household with the highest monthly income had R66 000 while the lowest income was R1200. It is clear that there is high income inequality in the sample, however, it is not unique to the study areas, but cut across the whole country. As such, South Africa is among one of the highest income inequality countries in the world (Keeton, 2014). Households in the sample obtain their income from a variety of sources ranging from farming to non-farm and off-farm sources as depicted in Figure 3. The majority (32%) of households obtained their primary income from crop sales followed by old age grants and salaries, while a small proportion obtained their income from other forms of grants such as foster care and disability grants.

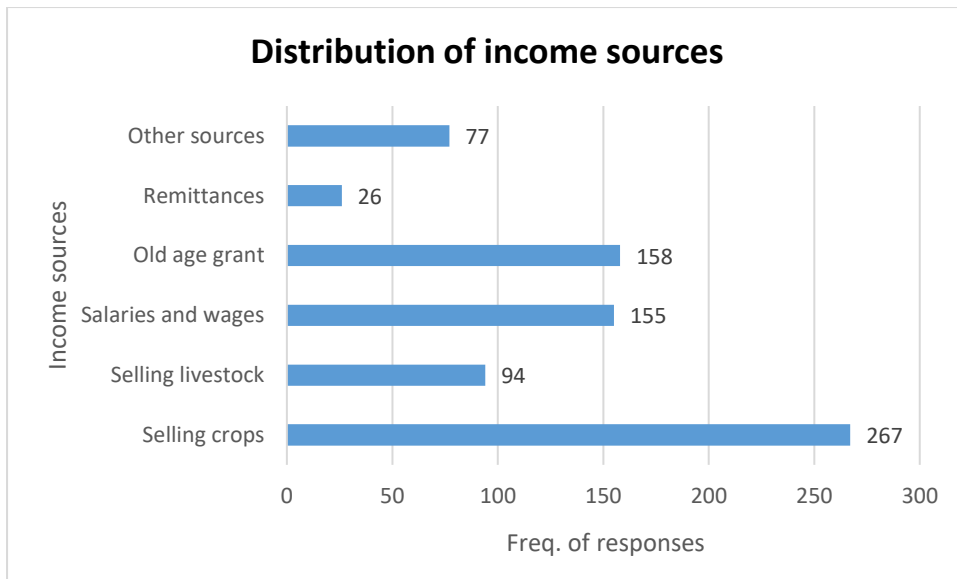


Figure 3: Distribution of income sources

4.2 Willingness to relocate

Whilst the aspirations of smallholders have been taken into account by some studies (Chipfupa & Wale, 2018; Mearns, 2011; Nieuwoudt, 2000; Senyolo, 2007), few have partly considered whether smallholders would be willing to move from their communal farm, and if so, under what circumstances (Ntsebeza, 2002). It is assumed that they would be willing to participate in land reform projects given the constraints faced by them, such as limited access to capital due to insecure property rights (Cousins, 2015), high transaction costs (Khapayi & Celliers, 2016), smallholding size (Fourie, Mahlako & Van Der Westhuizen, 2018) and the overutilization of shared rangeland (Vetter, 2003). In this study, respondents were asked whether they feel constrained by these factors.

The majority (57%) indeed felt constrained by farming in the homelands citing a variety of reasons such as land shortage, both for grazing and arable land, as well as drawbacks of unsecure property rights as they have no title deeds on the land they are currently using which they can use to secure loans from the private commercial banks. With regards to shortage of land, this finding is interesting concerning the overwhelming literature on abandoned arable field cultivation in most rural former homelands of the country (Andrew & Fox, 2004; Connor & Mtwana, 2017; De La Hey & Beinart, 2017).

While the majority felt constrained, a small proportion (32%) did not share the same sentiment and others were not sure about how they felt, claiming they have never thought about it (Figure 4). However, they did share sentiments about poor and/ or lack of agricultural support from the government including agricultural extension service.

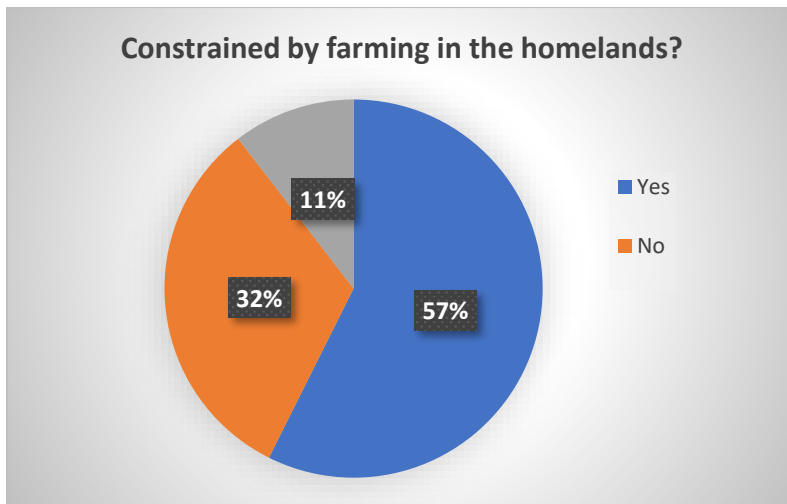


Figure 4: Farmers' perception of communal land farming

For the total sample, just over half of the respondents (57%) were willing to relocate, while the remaining 43% were not willing. Furthermore, in terms of provinces, in the Eastern Cape, 72% were willing to relocate and only 28% were not. In KwaZulu-Natal, there was only a slight difference between those willing to relocate and those who were not. In Limpopo, 51% were not willing to relocate, while 49% were willing.

Moreover, to take this discussion a step further, respondents were asked an open ended question as to under which conditions they would be willing to relocate. The majority (43%) were not interested in relocating at all, while 35% were willing to relocate if there is government support which is what is currently happening with the land redistribution pillar. Of interest is the minority group of 22% who are willing to move even if it means they have to rent land as shown in Figure 5. The other interesting feature about this group is that they also express that they only need land, then they will be able to finance production going forward.

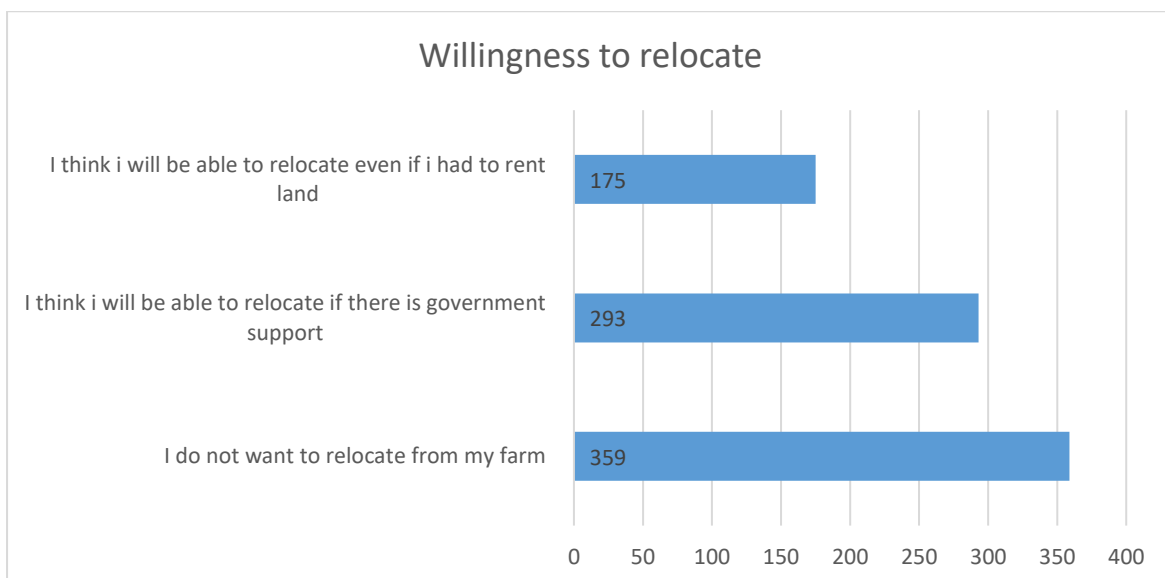


Figure 5: Willingness of the farmer to relocate

4.3 Determinants of willingness to relocate

While it is assumed that potential emerging farmers aspire to take their farming operations a step further and move to commercial farming so as to improve their livelihoods, not much is known about what factors would determine if they would want to relocate or not. Van Rooyen and Njobe-Mbuli (1996), drawing from international experience of land reform, suggested factors that should be considered in selecting potential emerging farmers for a productivity based land redistribution programme. The factors they suggested were age of the farmer, education level, and net worth, which in this study sample, the variable of 'total household income' could be taken as proxy for net worth. Furthermore, Sihlobo and Kirsten (2018) recently emphasised the importance of a proper beneficiary selection framework and again touched on the above points.

The results of the Binary Logistic Regression of the present study are presented in Table 2 and indicate that these three factors are statistically significant determinants of relocation. With regards to age, while an average farmer in South Africa is in the late-middle age category, the potential land reform beneficiaries would need not to be too old for a sustainable land reform. This is particularly true given the low levels of youth participation in agriculture. Furthermore, it has been a concern of the provincial departments of rural development and land reform to ease pressure on the communal grazing lands by considering communal farmers owning large herds and flocks of livestock. Following this objective, it was expected that the number of animals owned would be a significant determinant of the willingness to relocate. However, both large stock and small stock livestock widely kept in communal areas showed a negative relationship to the dependent variable.

While education is important in doing business negotiations, current results showed a different picture. Although 'Passing matric' is statistically significant, the relationship to the dependent variable (willingness to relocate) is negative. Surprisingly, 'no formal education' shows a positive correlation and is significant albeit at 90% confidence interval. This might be a result of tacit knowledge of farming generated over the years as it has been shown that the majority of farmers were relatively nearing pension.

The capacity to aspire is sometimes related to one's proximity to their role models. Two KwaZulu-Natal district municipalities, King Cetshwayo and Zulu Land, show a positive correlation and were statistically significant. This brings to attention that location of the farmer influences his/her farming aspirations, for example, close proximity of potential emerging farmers to commercial farms could influence their farming aspirations.

Household income is also a significant determinant of willingness to relocate. This is important because relocation implies cost and as such it will be difficult for low income households for a couple of reasons. Firstly, farming is a risky business and returns do not come immediately. Secondly, post settlement support takes some time while households need to incur living costs. This might be made even more difficult by poor network or extended family ties as it is likely that the fam will be far away from the original home of the household beneficiary.

Table 2: Results of Binary Logistic Regression

Variable name ¹³	Odds ratio	Std. Err.	Coef.	p>z
Age in years	1.048933***	.0102216	.043	0.000
Total household income (monthly) (R)	1.000019*	.0000104	.000	0.068
Total number of cattle owned	.9983799	.0027746	-.001	0.560
Total number of goats owned	.9993264	.0036348	-0.000	0.853
Total number of sheep owned	.9970982	.0022249	-.002	0.193
No formal education	1.695874*	.5172608	.528	0.083
Pass matric	.4149815***	.1289567	-.879	0.005
Primary	.8205271	.1784712	-.197	0.363
Technical college	.6207202	.222626	-.476	0.184
University degree	.8543109	.2595785	-.157	0.604
Amathole	1.695874	.3279707	.026	0.934
Chris Hani	1.431557	.527596	.358	0.330
Harry Gwala	1.813837	.6923323	.595	0.119
King Cetshwayo	2.046289**	.7014578	.716	0.037
OR Tambo	.7509516	.2871573	-.286	0.454
Vhembe	1.218096	.4141198	.197	0.562
Zulu Land	3.535847***	1.21111	1.26	0.000
Constant	.049	.545	-3.01	0.000
Number of observations	718			
Prob>chi ²	.0000			
Pseudo R ²	0.095			
Log likelihood	-437.14			

Notes: * = P<0.10, ** = P< 0.05 and *** = P < 0.01

4.4 Land demand and aspired farming activities

One of the reasons cited for the poor performance of the redistributed land reform farms is that the current commercial farms are too large for emerging farmers (Cousins, 2015). However, it is not known how big or small should the land reform farms be to best suit and enable the potential of emerging farmers. In an attempt to gain insight on this issue, respondents who claimed to be willing to relocate were asked what farm size they require and what farming activities they would want to pursue once they have relocated. A variety of farm sizes were given by the respondents, with the smallest farm size being 3 hectares and the biggest being

¹³ Two dummy variables, namely ‘Secondary education’ and ‘Umkhanyakude district’ were omitted for collinearity.

5000 hectares. The average farm size was 152 hectares. The majority (49%) of respondents wanted a farm between one and 51 hectares, while 29% wanted a farm between 100 and 200 hectares. Only 15% wanted a slightly bigger farm size between 300 and 350 hectares as shown in Figure 6. Although different land potentials in the interviews were not taken into account, these results indeed show that the current commercial farms are beyond the aspirations of the potential emerging farmers.

Observations from the interviews have shown that some respondents, particularly in the Eastern Cape, were not familiar with the quantification of farm size into hectares. For those who wanted to pursue livestock if they relocate, some cited smaller farm size such as 10 hectares, while they own a relatively larger herd/flock. This shows a lack of understanding of rangeland management. Furthermore, it is clear that the gap between the average potential emerging farm and current commercial farm is arguably too wide. Liebenberg (2013), using agricultural census data, found that the average commercial farm size is 2000 hectares and it is possible that this figure has increased as the number of commercial farmers has further decreased from 39 000 to about 35 000 (DAFF, 2017).

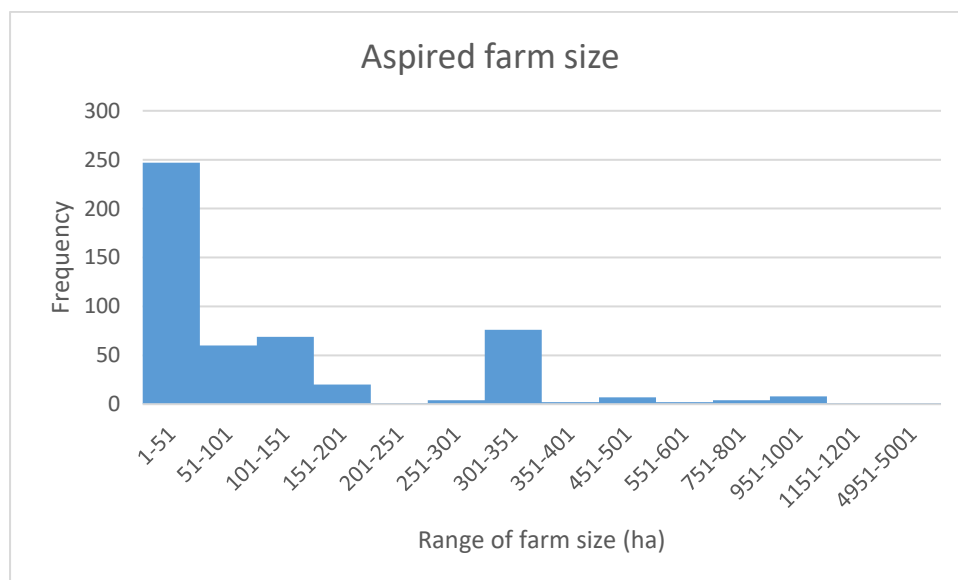


Figure 6: Histogram showing aspired farm sizes

In terms of aspired farming activities, Figure 7 provides a summary of the responses, with the majority (56%) of the respondents wishing to plant maize and 15% wishing to plant vegetables. These results are in line with Mearns' (2011) results about a potential SLAG group who had submitted a proposal for funding in Mpumalanga in 2002. About 15% had an interest of pursuing small stock farming and 8% wanted to venture into dairy farming. However, in terms of livestock activities, Mearns' (2011) results showed that respondents wanted to farm with beef cattle, although many had not owned cattle. What was clear in the case of this study, is that most of these activities were related to what the farmers were currently doing on their farms, except for dairy farming. This shows that most of the land reform beneficiaries will have to start new farming activities. This will be accompanied by a risk as farmers will have to learn new methods of farming with the new farming activity. In this regard, extensionists will have to play a role in knowledge transfer. This is perhaps the reason for why most of the farmers want to continue with the same farming activities and eliminate the risk and cost of learning new farming methods.

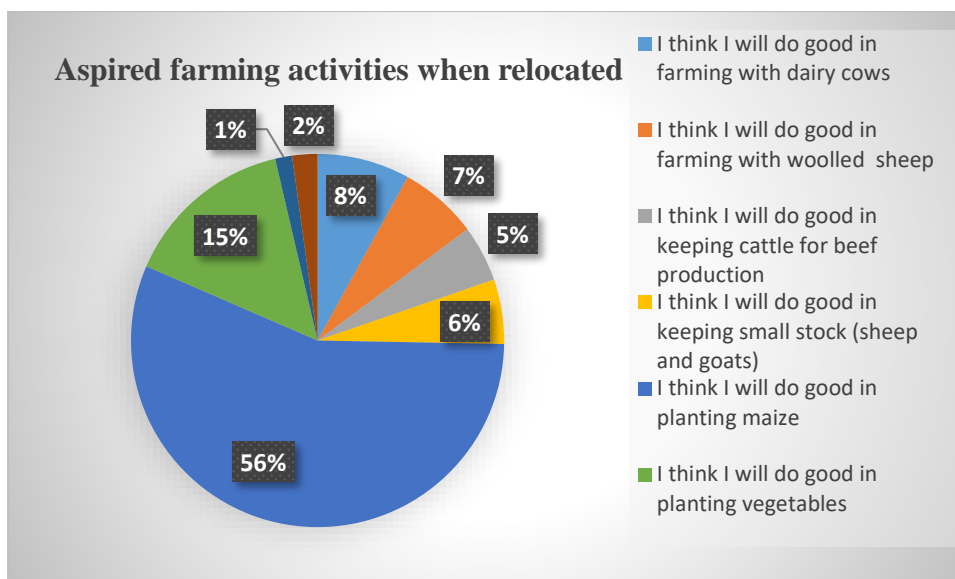


Figure 7: Aspired farming activities when relocated

5. CONCLUSION, IMPLICATIONS FOR EXTENSION AND RECOMMENDATIONS

5.1 Conclusion

The objective of this article was to contribute to the scant literature on the constituents of potential land redistribution beneficiaries currently farming in communal land. Three provinces which jointly house more than 60% of smallholders in the country were chosen. The results show that a potential emerging farmer is a 55 year old male with low education level, mostly primary or secondary education. Most obtain their primary income from the selling of crops. Furthermore, more than half of the sample felt constrained by farming in communal land, citing several reasons therefore, including the inadequate land. Nevertheless, about half of the respondents were willing to relocate to commercial farms on condition of full government support including agricultural extension.

Results of the Binary Logistic Regression confirm suggestions of Van Rooyen and Njobe-Mbuli (1996) and Sihlobo and Kirsten (2018) that age, household income and education are three of the most important factors to be considered in the selection criteria as they have also shown to be significant determinants of the willingness to relocate. The average desired potential emerging farm size is much smaller than the current commercial farm size. Potential emerging farmers want to farm with maize, vegetables and small stock when they relocate to commercial farms.

5.2 Implications for extension and recommendations

Based on the results of this study, it is clear that agricultural extension will have to play a major role in the development of emerging farmers as envisaged in the NDP in order to achieve a successful land redistribution. As such, agricultural extension services should be aligned with the needs of emerging farmers. The following factors should be considered:

- Transfer of knowledge should be at a level appropriate for the low levels of literacy.
- Efforts should be made to subdivide the existing commercial farms to suit emerging farmers' potential, or multi-enterprise large-farm management skills should be put in place by extensionists and be transferred to emerging farmers.

- Appropriate training of rangeland management will be required for the potential emerging farmers to ensure sustainable use of natural resources to avoid rangeland degradation.
- Since an average potential emerging farmer is 55 years old, the long lease agreement in the SLLDP needs rethinking for sustainability purposes.

ACKNOWLEDGEMENT

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed, and conclusions arrived at, are those of the authors and are not necessarily to be attributed to the NRF.

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FACTORS AFFECTING SMALL-SCALE SUGARCANE PRODUCTION IN NKOMAZI LOCAL MUNICIPALITY IN MPUMALANGA PROVINCE, SOUTH AFRICA

H. Metiso¹⁴ and C.Z. Tsvakirai¹⁵

ABSTRACT

As the South African government forges ahead with its plans for land redistribution, there have been questions raised around factors that currently affect smallholder farmers' productivity as a means of preparing for the perceived future increase in farmer numbers. Answering these questions is critical for the sugarcane industry that holds a strategic value in South Africa. The present study uses Nkomazi Local Municipality, a prominent sugarcane production area, as a case study to answer some of these questions. The yield and socio-economic characteristics of 127 small-scale sugarcane farmers from the area were collected during one-on-one interviews and the former variable regressed against the later using the Cobb-Douglas production function. The average farmer in the sample produced 201 tonnes of sugarcane, on six hectares of land, applied 13.4 kg of fertilizer per hectare and employed seven labourers. The results of the regression analysis revealed the age of the farmer, farm size, fertilizer quantity, Land Bank's credit provision, the use of sprinkler irrigation, and land ownership significantly affected the yield of respondents. In light of the findings, the study recommends that efforts be increased to provide the production inputs (fertilizer and land), affordable credit, and advanced and affordable technological inputs as these were found to increase output. Furthermore, the study recommends that farmers' access to credit be increased in order to increase their agricultural output.

Keywords: Cobb-Douglas production function, Productivity, South Africa

1. INTRODUCTION

The sugar production industry is one of the most important industries in the whole world. Its importance is seen in many protectionist policies that have been established across borders of different countries. According to the South African Sugar Association (SASA, 2019), South Africa is cost competitive and tiers amongst the top 15 high quality sugar producers out of 120 global producers. The industry produces an average of 2.3 million tonnes of sugar per year (Department of Agriculture, Forestry and Fisheries (DAFF), 2016). This equates to 50% of field crop gross farming income across the Mpumalanga and KwaZulu-Natal provinces (SASA, 2019). The industry produces an estimated average of 20 million tonnes of sugarcane per season and about 75% of this sugar is marketed in the Southern African Customs Union (SACU) region (DAFF, 2016). South Africa's sugar industry generates an average annual income of R12 billion from the SACU region sales and the export market (DAFF, 2016). On the local platform, the industry provides sustainable livelihoods for over 2% of South Africans (DAFF, 2016). The sugar industry is a major contributor to the total agricultural workforce in the country. According to SASA (2019), it provided up to 85 000 workers with direct

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employment (production and processing) and indirectly (input suppliers) employs up to 350 000 workers.

Despite positive indicators of the industry's activities, South Africa's sugarcane production industry has been experiencing chronic yield decreases (Dubb, 2013). The negative output trend has been attributed to a number of different factors such as high input cost, limited use and availability of recommended technologies, droughts, unstable global economy, poor infrastructure and social challenges (Girei & Giroh, 2012). The combined effects of these factors led to a steep decline in small-scale sugarcane growers from a former peak of 50 000 to lower than 13 044 between the early 2000s and 2011 (Dubb, 2013). Between the 2014/15 and 2015/16 production periods alone, the industry experienced a 12.7% drop in yield due to drought (SASA, 2019). The enduring production woes threatened farming productivity, processors' profitability, as well as the livelihoods of households that depend on the industry.

Due to the value of the sugar industry and the pivotal role of smallholder agriculture, government has extended agricultural assistance (financial grants, equipment and farming implements, and extension services) to aid in addressing the challenges faced by sugarcane producers. Despite the government's efforts, the small-scale sugarcane producers are still facing challenges in improving their production levels. This study is aimed at investigating the factors that affect the farmers the most in Nkomazi Local Municipality, one of the main sugarcane production regions. It was envisaged that a detailed assessment of the challenges faced by farmers would provide knowledge for more effective government intervention. The research also seeks to identify the factors of production that would yield the highest productivity gains in the event of their increased employment. This objective is relevant in the current situation where the government aims to not only increase production and intensification, but to also increase the land available to formerly disadvantaged societal groups and smallholder farmers.

2. ANALYTICAL PROCEDURE

2.1 Study area and population

The study was conducted in Nkomazi Local Municipality in Mpumalanga Province, South Africa (Figure 1). Nkomazi Municipality is located in the eastern part of Ehlanzeni District. The municipality is linked to Swaziland by two provincial roads and by railway line and the main national road (N4) to Mozambique which forms the Maputo corridor (Nkomazi Municipality, 2006). According to City Population (2016), the municipality covers a surface area of 4786.7 km², with a population size of 410 907, where 1.6% are white and 97.7% are black. Furthermore, 47.3% of this population are male and 52.7% are female (City Population, 2016).



Figure 1: Map of Nkomazi local municipality

Source: James and Woodhouse (2017)

2.2 Sample size and sampling procedure

This study targeted small-scale sugarcane producers in Nkomazi Local Municipality; that is farmers producing on less than 18 hectares of land. A total of 1243 farmers met this criterion in the study area (Thabethe, 2014). A random sampling method was used to select a representative sample of the small-scale sugarcane farmers in Nkomazi Local Municipality. The random sampling method was chosen because it ensures that each individual is chosen entirely by chance and each member of the population has an equal chance of being included in the sample (Owino, Odondo & Obange, 2018). The Raosoft scientific calculator was set to include a margin of error of 10% with confidence interval of 99%. A sample of 147 was calculated, however, only 127 correctly complete questionnaires which were used for the study.

2.3 Data collection

This study used primary data collected through one-on-one interviews. A structured questionnaire was used to obtain information on farmers' production inputs use and the socio-economic characteristics of the farmers. Questionnaires were structured into section A which captured socio-economic characteristics, section B which captured information on labour and land utilisation, and section C which captured information on farm operations. The questionnaires were prepared in English and translation was made available to respondents that did not understand the language very well. Data were collected from July to August 2018. Each interview took approximately 10 minutes to complete. Ethical clearance was granted by the North West University.

2.4 Method of data analysis

The relationship between sugarcane yield and the socio-economic and production factors was modelled using the production function. The Cobb-Douglas functional form was utilised as it provides an adequate representation and reflects the relationship between its inputs and the amount of output produced. The model took the form as represented in equation 1.

$$\ln Y_i = \beta_0 + \beta_x \sum \ln X_{in} + u_i \dots\dots\dots(1)$$

Where: Y_i = total output quantity of sugarcane

X_{in} = independent variables

u_i = error term

β_0 = parameters to be estimated

β is the elasticities of production with respect to production inputs

The multinomial regression model was run using STATA version 12.

3. RESULTS AND DISCUSSION

3.1 Descriptive statistics

Most of the farmers that were interviewed were female (59%), married (77%), and had received some formal education (95%). The average household in the sample had nine individuals and had a household-head who was about 58 years old. Half (50%) of the interviewed farmers owned the land they farmed and the majority of the farmers (48%) used micro-finance services provided by Akwanze. Most farmers used modern irrigation systems (48.8% drip irrigation and 40.9% sprinkler irrigation) as opposed to the flood irrigation. A typical farmer produced 201 tonnes of sugarcane on 6 ha of land and applied 13.4 kg of fertilizer in one season and employed seven labourers.

3.2 Empirical findings

Table 1 displays the results of the multinomial regression analysis which was performed to analyse the factors that affect production of small-scale sugarcane. Ten explanatory variables were included in the model. Results from the regression model indicate that seven of the variables (marital status, farm size, age, fertilizer, source of agricultural credit, family labour, and remittances) had a statistically significant influence on the sugarcane production levels of the interviewed small-scale farmers.

Robust standard errors were used to control heteroscedasticity with the purpose of ensuring robust estimates. Reliability tests were run to measure the goodness of fit, multicollinearity and the joint variation of the explanatory variables on the estimated model. As shown in Table 1, the model had an F-statistic p-value of 0.000 which indicates a very good measure of fit. This implies that joint variation in explanatory variables included in the model explained the variation in the dependent variable to a great extent. VIF mean value of 1.14 was acquired and this value shows that the model was free of multicollinearity between the explanatory variables. The p-value test was used to determine the effect of each explanatory variable and major findings drawn from the analysis are discussed below.

Table 1: Regression results

Variables	Coefficient	P value	Robust Standard Estimates	VIF	Marginal values	
					$\partial y/\partial x$	Standard Estimates
lnFarmSize	0.428	0.000* **	0.113	1.17	0.4017	0.1159
Age	0.916	0.038* *	0.437	1.11	0.7796	0.4158
lnFertilizer	0.259	0.018* *	0.108	1.10	0.2875	0.1108
Land bank	0.647	0.003* *	0.210	1.11	0.6865	0.2033
Remittance	0.503	0.007* *	0.184	1.10	0.4860	0.1719
Lease	-0.416	0.050* *	0.211	1.14	-0.4009	0.2172
Marital status	-0.169	0.305	0.165	1.08	-0.1549	0.1616
Irrigation hired labour	0.723	0.690	0.181	1.21	-0.2343	0.1544
Harvesting family labour	-0.450	0.051* *	0.228	1.12	-0.4601	0.2212
Sprinkler	0.305	0.083* *	0.175	1.28	0.3053	0.1617
Constant	0.734	0.683	1.795		0.4017	0.1159
F statistic	0.000					
p-value						
VIF mean	1.14					
R-squared	0.3034					

*** = Variables significant at 1%; ** = Variables significant at 5%; * = Variables significant at 10%

Source: Field survey (2018)

Results presented in Table 1 indicate that farm size of respondents had a statistically significant (p-value = 0.000) and positive influence on sugarcane production output. This finding is in line with the results found by Baiyegunhi and Arnold (2011), as well as Thabethe (2014), which indicated that increasing the land size has a significant and positive impact on agricultural output. As another factor that is in line with prior expectations, the farmers' age had a statistically significant (p-value = 0.038) and positive influence on sugarcane production output. The coefficient of the farmers' age implies that as a farmer grows older, he/ she will become more productive. These results are in line with the findings obtained by Kabwe (2012) who found that older farmers have more knowledge on production and have established the necessary contacts which enable them to do their business more productively than younger farmers.

In concurrence with the findings of Baiyegunhi and Arnold (2011) and Owino *et al* (2018), the quantity of fertilizer applied by respondents had a positive and statistically significant (p-value = 0.018) influence on sugarcane production output. Fertilizer is used for improving productivity and in the intensification of agricultural production as a whole. It also plays a large role in regions where the scarcity of farmland is a problem. The results also show that access to agricultural credit directly from Land Bank had a positive statistically significant (p-value = 0.003) influence on the production output of small-scale sugarcane. Farmers who had obtained their agricultural credit from Land Bank were more likely to increase their productivity as compared to farmers that received credit from other sources. This might be because of the low interest rate that the Land Bank offers. Lower interest often lowers the cost of production and this means that the farmers are more likely to use their money productively as they will use less of it to service debts.

The farmers who received additional funds through remittances were more likely to produce efficiently as compared to farmers that did not receive this. These findings are in line with those acquired by Baloyi (2011) which showed that financial resources play a significant role in efficient production since sugarcane production often uses hired labour, irrigation equipment and hired tractors which need to be paid for. Receiving alternative sources of funds also means that the farmer is able to purchase the required farming implements at a time that is not dictated by the production season, which removes the seasonality constraints experienced in farming.

The results presented in Table 1 show that the use of the sprinkler irrigation method was positively statistically significant in influencing sugarcane production levels of small-scale sugarcane producers. This was found to be significant at the 10% level of probability reflecting a 90% level of confidence. As shown by the results, farmers that use this method were 0.305 times more likely to experience an increase in output as compared to those who received the drip and flood irrigation systems. The reason for this finding is that the method strikes a balance between costs and efficiency as it is relatively cheaper compared to drip irrigation and water-saving compared to the flood irrigation method.

The use of family labour for harvesting was found to be statistically significant at the 5% level of probability and negatively correlated with the dependent variable. This result means that the higher the number of family members used for harvesting, the lower the sugarcane output attained. This may be due to the fact that family members often slacken at the task as they are not adequately compensated for their work when compared to hired labour. The results show that farmers who use family labour to harvest their produce were 0.450 less likely to increase their production compared to those who used hired harvesting labour. This finding is in line with that of Baloyi (2011) who also found that the use of family labour can reduce labour costs, but it can have a negative impact on output at the end of production season.

Results show that the variable “leasing a farm” had a negative correlation with agricultural output. This was statistically significant at the 5% level of probability reflecting a 95% level of confidence (P=0.050). It means that farmers who had a farming lease did not perform as well as those who had title deeds to their farms. Such results may be because farmers with property rights are able to make long-term fixed investments and are able to have a longer planning horizon as compared to farmers without farm ownership. These factors lead to better efficiency in farming, thus higher output.

4. CONCLUSION AND RECOMMENDATIONS

The study showed that factors affecting small-scale sugar production in Nkomazi Local Municipality were farmers' age, credit, fertilizer usage, farm size, labour, and agricultural assets. The study concludes that sugarcane production can be improved by employing more production inputs, securing farmers' property rights, and providing credit at an affordable interest rate. The study arrives at this conclusion because results revealed increase in agricultural input use has a great response to the farm output. Farm size had a significant influence on sugarcane production output, thus increasing the land size of farmers and provision of property right to land enhances output. Provision of access to credit with low interest rates can also increase farmers' output.

The study recommends that farmers' access to credit be increased through provision of lower interest rates. Access to credit will help the farmers to increase their output. An example of such a facility is the Land Bank credit as it offers low interest rates. If farmers have access to low interest rate credit, they will be able to purchase more inputs such as fertilizer which have been identified as an input that can result in a positive impact on farm output. With access to credit, farmers will also be able to hire more labourers to help in the production process.

As increase in farm size was found to positively influence output, therefore consideration should be given to the allocation of larger farms to small-scale producers. In addition, farmers should be given property rights as this will assist them in making long-term decisions and investments which have a positive effect on the output. The study also recommends an increase in agricultural input use as the results showed that these inputs were elastic. It is envisaged that these efforts will result in the renewed growth of the Nkomazi Local Municipality's small-scale sugar production.

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AGRICULTURAL PRODUCTION INPUTS SUPPORT PROGRAMME AS A SOCIO-ECONOMIC DEVELOPMENT STRATEGY

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ABSTRACT

This paper presents the impact of the Agricultural Production Inputs Support Programme on crop yield, and reflects challenges and opportunities for improving agricultural production to ensure socio-economic development and sustainability. Policy-makers assume that farmers who receive subsidised agricultural inputs produce high yields, generate income to sustain production, and reduce poverty. A structured interview schedule was used to collect data from horticultural crop farmers who received agricultural production inputs from the provincial agricultural department during the 2014/15 season in Mopani District. Findings indicate no significant linear relationship between agricultural production inputs received and crop yield. In addition, there was no significant linear relationship between agricultural production practices and horticultural crop yield. However, the study observed that production practices such as soil testing for nutrient content, fertilisation, irrigation scheduling, use of hybrid seeds, and nursery propagated seedlings are critical for farmers to experience high crop yield. This highlights the importance and need to strengthen extension services to improve production practices. It is therefore concluded that provision of production inputs is a necessary strategy to ensure improved agricultural production. This study thus recommends a careful selection of recipients with skills to farm, sound farming experience, improved level of education, and capacity building of the farmers.

Keywords: Agricultural production inputs support programme, Crop yield, Production practices, Small-scale farmers

1. INTRODUCTION

This study focuses on the South African Government's Agricultural Production Inputs Support Programme (APSP) to small-scale and emerging commercial farmers. Policy-makers often assume that farmers who receive subsidised agricultural inputs produce high yields, generate income enough to sustain production, and reduce poverty (Ricker-Gilbert, Jayne & Thomas, 2011). This study aims to investigate the impact of the APSP on crop yield. The findings are important for policy development on farmer support to enhance the socio-economic development of farming communities.

The APSA is a strategy by developing countries. Governments across the globe assist small-scale farmers to acquire agricultural inputs at reduced prices or free. The programme has the potential to support national economic growth strategies by stimulating small-scale farmers' agricultural productivity and elevating food insecurity (Xu *et al*, 2009), creating of job opportunities, lowering food prices, and stimulating non-agricultural supply and demand (Dorward *et al*, 2013).

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These programmes tend to be costly, and may markedly boost agricultural output. For this reason, it justifies close analysis and understanding of its impact as a socio-economic development strategy (Shively & Ricker-Gilbert, 2013:1). Furthermore, the Department of Agriculture, Forestry and Fisheries (DAFF) spends billions of Rands to assist small-scale producers to improve crop production, and enable the rural household to generate income and food insecurity. The Government Communication and Information System (GCIS) indicates that the agriculture sector contributes about 2.5% to the country's gross domestic product (GDP) and represents about 7% of formal employment (GCIS, 2015). The DAFF plans to spend over R7.9 billion to support farmers with infrastructure, production inputs and capacity-building, improved extension services, good agricultural practice farm certification, revitalisation of agriculture colleges, and disasters relief (GCIS, 2015).

2. LITERATURE REVIEW

2.1 Impact of Agricultural Production Input Support Programme

Agriculture is central to economic development, and fertilisers and agrochemicals are critical for increasing production and productivity. However, higher costs of agricultural inputs limit crop production for small-scale and emerging commercial farmers. Karamba and Winters (2015) found that both male and female farmers increased agricultural production by participation in the farmer support programme, but did not set apart female farmers to overcome gender differences.

A study conducted by Pederson, Chung and Nel (2014) to determine the microeconomic effects of a state-funded loan participation programme on farm productivity and investment supports the argument that subsidies are good for small-scale farmers. The authors found that a 1% increase in credit received by credit constrained farmers under the state loan farmer support programme increased their gross income. Furthermore, Lunduka, Ricker-Gilbert and Fisher (2013), in their evaluation of Malawi's Agricultural Production Inputs Support Programme, found a modest increase in maize production at the farm level, although there has been a large increase in the efficiency of maize production at the national level. This is attributed to the increase in the number of participants. Contrary to this finding, there was a continued relative increase in maize prices and importation of maize into the country. Jayne and Rashid (2013) considered 10 African countries' agricultural production support programmes since the mid-2000s amounting to 28.6% of the government public expenditure to agriculture, and established that the costs of production inputs support to farmers outweighed their benefits.

Mason, Jayne and Mofya-Mukuka (2013) report that in Zambia, 55% of subsidised fertilizers go to farmers with more than 2 ha of production units and ends up subsidising the wealthier households than the intended beneficiaries. Although the programme promotes the intensive production of maize, the report indicates that only 1.88 kg of maize per kg of an additional subsidised fertiliser is achieved. Ramaila, Mahlangu and Du Toit (2011) reported that Poonyth *et al* (2001) contests that return on investment in agriculture is far less than in the non-agriculture sector, while Ricker-Gilbert *et al* (2013) argue further that the inputs support programme in both Malawi and Zambia had minimal effect on the retail price of maize.

According to Dorward and Chirwa (2009), maize production in the 90th and 10th percentile of total crop output per kg of subsidised fertiliser indicates an increase of 2.61 kg and 0.75 kg of maize respectively. The researchers argued that the significance of the programme markedly boosts maize production and reduces poverty. However, Ricker-Gilbert *et al* (2011) report that

the impact of the production inputs supports programme on Malawian well-being beyond the year of receipt applies only to crop production output, not to overall household income.

Challenges with regards to accessibility by target groups were discussed by Karamba and Winters (2015). Other challenges were discussed in various areas including farmer participation (Liverpool-Tasie, 2014), labour supply and wages (Ricker-Gilbert, 2014), retail maize prices (Ricker-Gilbert *et al*, 2013), farm productivity and investment (Jayne & Rashid, 2013; Lunduka *et al*, 2013; Pederson *et al*, 2014), participants livelihood (Ricker-Gilbert *et al*, 2011), and commercial purchases of fertilizers (Ricker-Gilbert, Jayne & Shively, 2013). Nevertheless, Labadarios *et al* (2011) raise concern that despite the reduction in the level of food insecurity, the proportion of people at risk of experiencing food insecurity remained practically unchanged. The rural provinces including the Eastern Cape, Limpopo, Northern Cape and North West show a higher level of food insecurity.

Although return on investment in the agricultural sector is less than in the non-agricultural sector, it remains critical since growth in agricultural productivity is important for rural development and stability and other dependent sectors such as the agro-processing industry. The review above casts doubt on this strategy to enhance small-scale and emerging commercial farmers' crop yield, income and reduce food insecurity. This research's objective is to investigate the influence of the Agricultural Production Inputs Support Programme on small-scale and emerging commercial farmers' crop yield in the Mopani District so as to outline strategies to enhance the impact of the programme.

3. METHODOLOGY

A cross-sectional time horizon survey was conducted amongst small-scale and emerging commercial farmers of horticultural crop in the Mopani District of the Limpopo Province. Saunders, Lewis and Thornhill (2016) define a research survey as a strategy for data collection. Surveys and interviews are mainly to determine the incidence, frequency and distribution of certain characteristics of a population.

3.1 Research instrument

A survey was used to collect data from the target population, through interviews using a structured interview schedule.

3.2 Research population

Saunders *et al* (2016) defines a population as the research subjects that the researcher wants to study; it contains all the variables of interest of the study. Data was collected from horticultural crop farmers in Mopani District of the Limpopo Province who were provided with agricultural production inputs during the 2014/15 financial year.

3.3 Sample size

The sample size was confirmed using the central limit theorem which suggests a sample size of 30 or more usually results in a sampling distribution for the mean that is very close to a normal distribution (Saunders *et al*, 2016).

3.4 Data analysis

Descriptive statistics and inferential statistics were used to analyse the collected data using the statistical software programme, Statistical Package for the Social Sciences (SPSS, version 25).

3.4.1 Hypothesis testing

Significant testing is used in testing the probability of a pattern or hypothesis such as the relationship between variables occurring by chance. It consists of a test statistic, degree of freedom (*df*), and the probability value (*p-value*) of the test result or more extreme occurring by chance alone. If the probability of the test statistics or more extreme having occurred by chance alone are very low or less than 0.05 (i.e. $p < 0.05$), then it is considered there is a statistically significant relationship between the variables. This requires the researcher to reject the null hypothesis or accept the alternate hypothesis. If the *p-value* is higher than 0.05 (i.e. $p > 0.05$), the relationship is not statistically significant. This requires the researcher to fail to reject the null hypothesis (Saunders *et al*, 2016).

3.4.2 Assessing the strength of relationships between two variables

To assess the strength of the relationship between two variables, the correlation coefficient is used to quantify the strength of the linear relationship between two ranked or numeric variables. A *+1 value* represents a perfect positive correlation while a *-1 value* represents a perfect negative correlation. This means that if the variables are related, if the value of one increases, the value of the other increases too and vice versa respectively. Correlation coefficient values between *+1* and *-1* represent weaker positive and negative correlations respectively while a value of *0* indicates a perfect independence (Saunders *et al*, 2016).

3.4.3 Assessing the strength of numerical dependent and independent variables

To assess the strength of a numerical dependent variable and a numerical independent variable (cause-effect relationship), the coefficient of determination is used. The coefficient of determination (r^2) takes the value of 0 and +1. They measure the proportion of variation in a dependent variable that can be statistically explained by the independent variable. If all the variations can be explained, $r^2 = 1$; if 50 % can be explained, $r^2 = 0.5$; and if none can be explained, $r^2 = 0$. The process of calculating the coefficient of determination and regression equation using one or more independent variable is known a regression analysis or multiple regression analysis respectively (Saunders *et al*, 2016).

4. RESULTS AND DISCUSSION

The Cronbach's alpha is used to measure the consistency of responses across a set of questions designed together to measure a particular concept. It consists of an alpha coefficient with a value between 0 and 1. Values of 0.7 or above suggest that the questions in the scale/ concept are measuring the same thing (Saunders *et al*, 2016).

Table 1: Reliability analysis of the research tool

Reliability Analysis Statistics	
Cronbach's Alpha	N of Items
0.814	26

In the study, the reliability analysis results revealed a Cronbach’s alpha of 0.814 (Table 1) implying that the research tool is very reliable.

4.1. Demographic information

The study shows that all participants (100%) received agricultural production inputs from the Limpopo Department of Agriculture and Rural Development (LDARD) farmer support programme. Furthermore, 76% of the participants were male and 24% were female. The age group of above 60 years of age constitutes 42% of the sample, while the remaining groups made up the rest of the sample as follow: 50-59 years (22%), 35-49 years (31%), and 30-34 years (4.5%). There were no respondents in the age group of 29 years and lower (Figure 1).

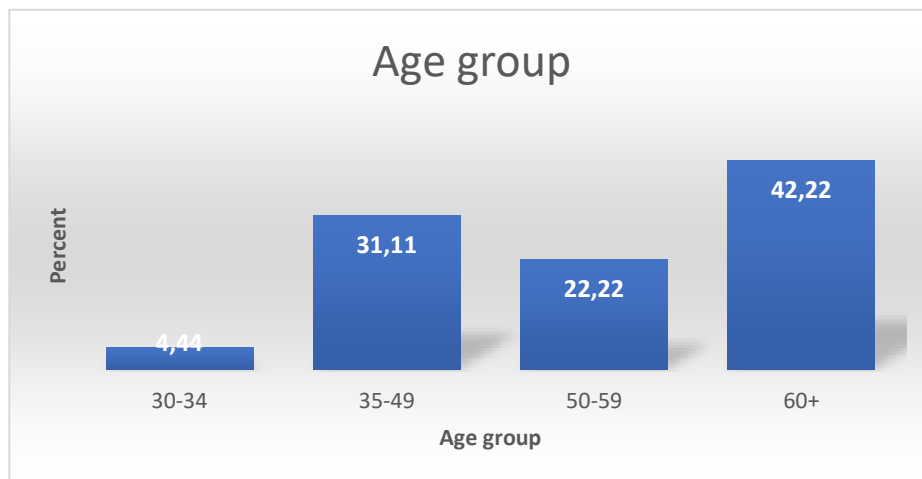


Figure 1: Respondents’ age groups

Furthermore, the data indicates that 88.9% of the respondents are married, 8.9% not married and 2.2% are windowed. The most spoken languages are Sotho (53.3%), Tsonga (42.2%), English (2.2%), and the combination of Tsonga and Sotho (2.2%). The highest educational qualification is secondary schooling at 51.16%, tertiary education (23.26%), primary schooling (13.95%), without formal schooling (9.3%), and 2.33% with Adult Basic Education and Training (ABET) as indicated in (Figure 2).

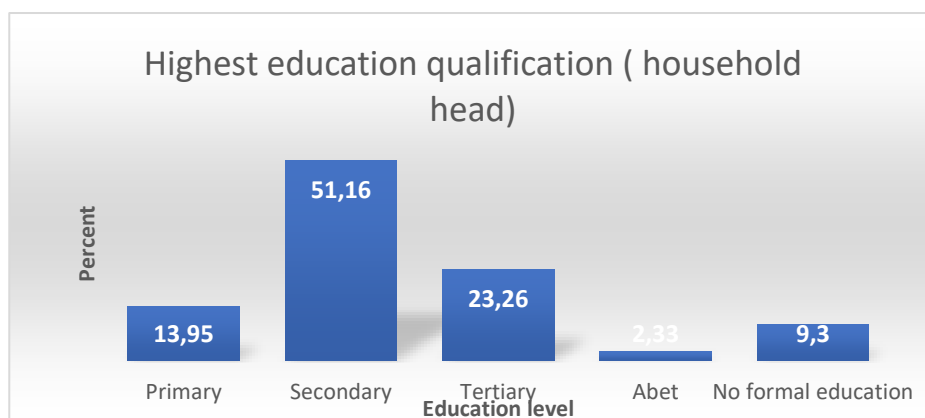


Figure 2: Education level

The majority of the respondents (83.7%) make their living through full-time farming. Overall farming experience ranged between four and 30 years.

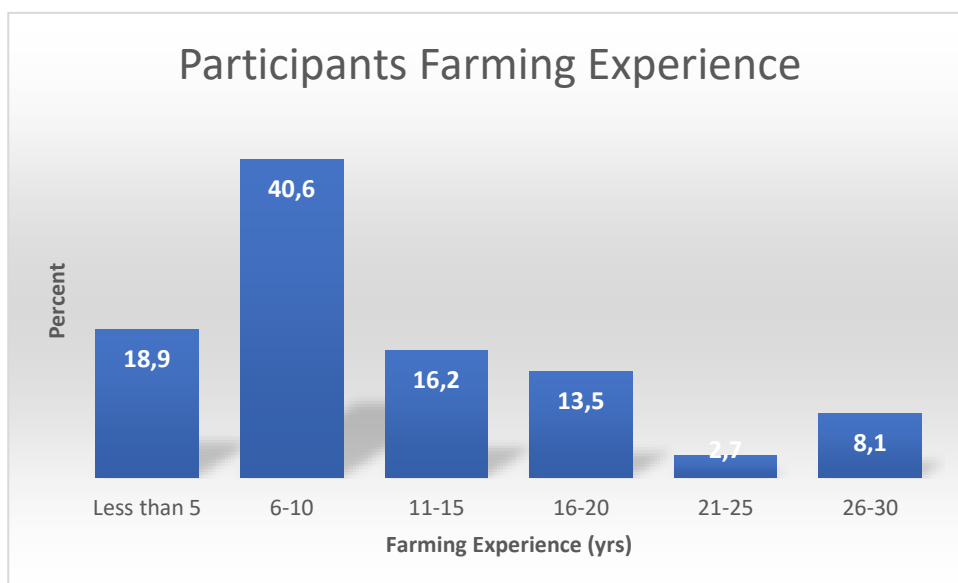


Figure 3: Farming experience

Farming experience (Figure 3) peaks at the 6-10 years category and is followed by those with less than 5 years of farming experience.

4.2 Inferential statistical analysis

This section deals with the impact of the APSP on horticultural crop yield.

Hypothesis Statement: H1₀: The agricultural inputs support programme has no impact on horticultural crop yield.

A regression analysis approach was used to test for the impact of the agricultural inputs support programme on horticultural crop yield. This is useful to determine the strength of a cause and effect relationship between dependent and independent variables (Saunders *et al*, 2016).

Table 2: Production input impact on crop yield

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.865	.411		2.105	.041
	Production inputs you receive?	.146	.113	.194	1.294	.203

^a Dependent Variable: How was the crop yield obtained affected?

There was no significant linear relationship ($p=0.203$, >0.05) between agricultural inputs received from the support programme and crop yield. The R-square value for the model is only 3.7%, which is negligible. This indicates a lack of evidence for a cause-effect relationship between the agricultural inputs received and changes in the crop yield.

Regression analysis was further used to test for the impact of the agricultural production practices used by the farmers and horticultural crop yield.

Table 3: Impact of farming practices on crop yield

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.448	.537		2.695	.010
	Soil testing for nutrient content	-.070	.138	-.081	-.508	.614
	Irrigation scheduling	.134	.175	.146	.767	.448
	Pest scouting	.093	.175	.101	.531	.599
	Use seeds to plant	.006	.176	.005	.032	.975
	Use nursery seedlings	-.241	.208	-.186	-1.159	.254

^a Dependent Variable: How was the crop yield obtained affected?

There was no significant linear relationship ($p=0.655$, >0.05) between agricultural production practices used by the farmers and their horticultural crop yield. The R-square value for the model is only 8%, which is negligible. The p-values for all the agricultural practices used by the farmers are greater than 0.05, indicating that there is no cause-effect relationship between the agricultural practices used by the farmers and changes in the crop yield.

4.3 Testing and describing the association between variables: Farming practices

In this section, a cross-tabulation was used together with clustered bar charts. Cross-tabulation is a statistical tool that is used to analyse categorical data (Williams, nd). The clustered bar charts provide a pictorial view of the association between variables and this helps in checking for interdependence or an association between variables of interest. Variables of interest for this study include crop yield and farming practices (i.e. soil testing, irrigation scheduling, pest scouting, use of hybrid seeds, and use of nursery propagated seedlings).

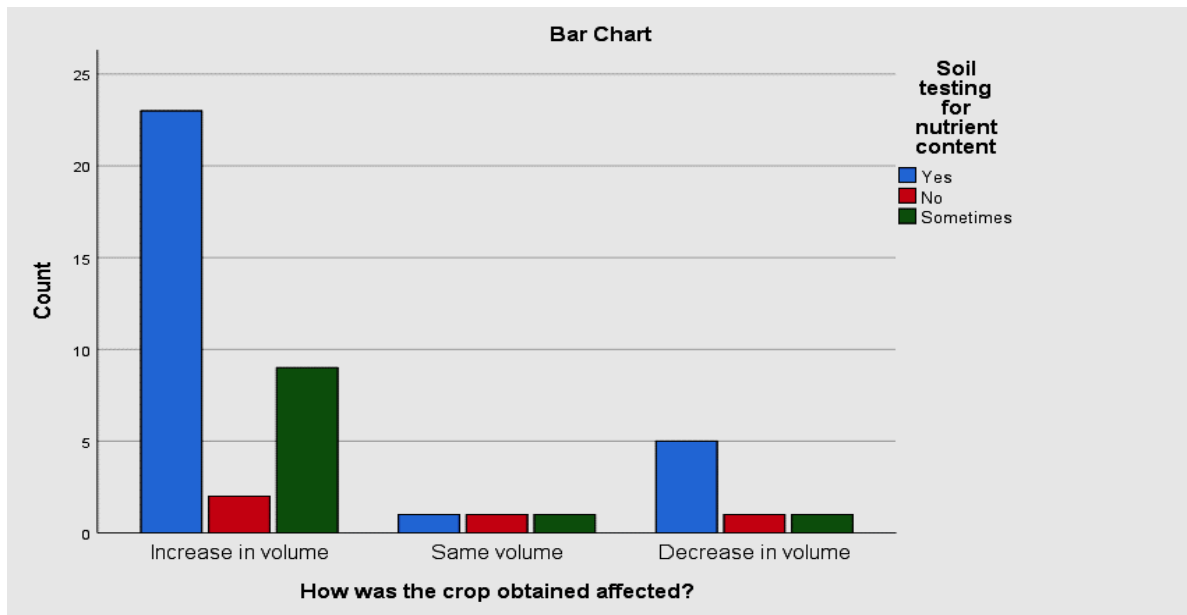


Figure 4: Soil testing for nutrients

The majority of small-scale farmers who practice soil testing for nutrient content experienced an increase in the volume of their crops (Figure 4).

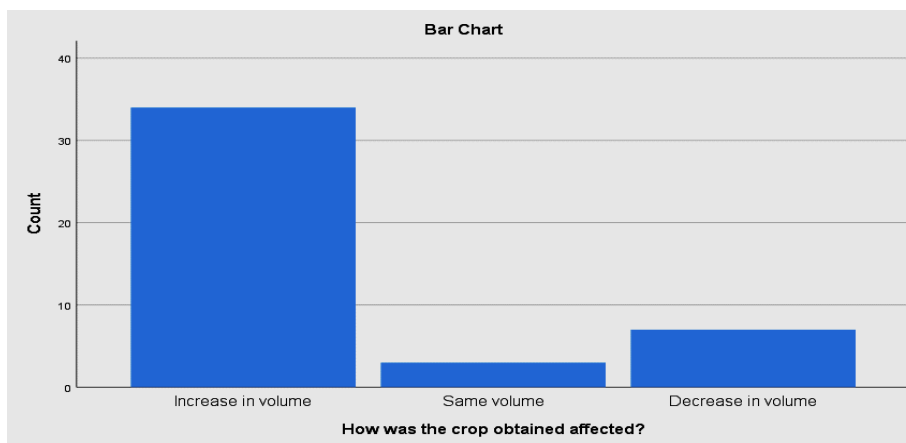


Figure 5: Fertiliser application

Figure 5 indicates that the majority of small-scale farmers (over 70%) who practice fertiliser application experience an increase in the volume of their crops.

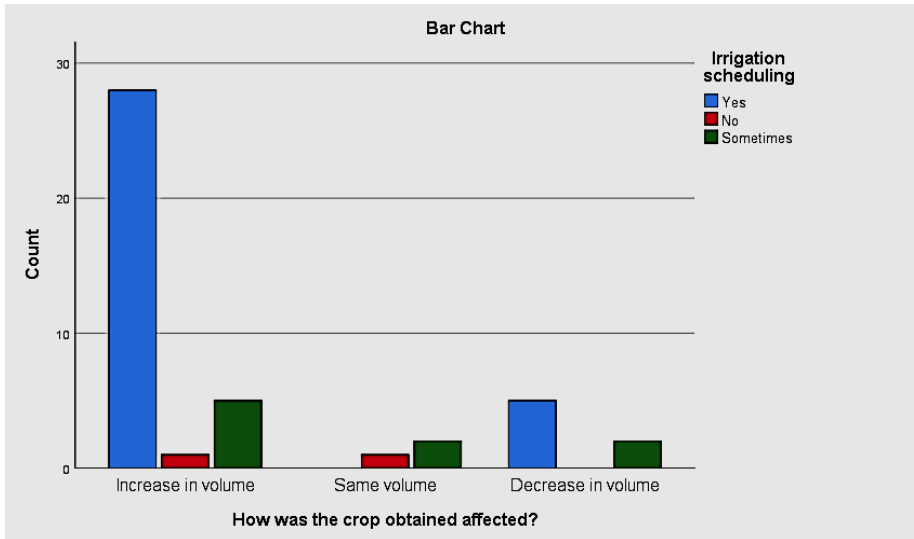


Figure 6: Irrigation scheduling

Figure 6 shows that small-scale farmers who practice irrigation scheduling experienced an increase in the volume of their crops.

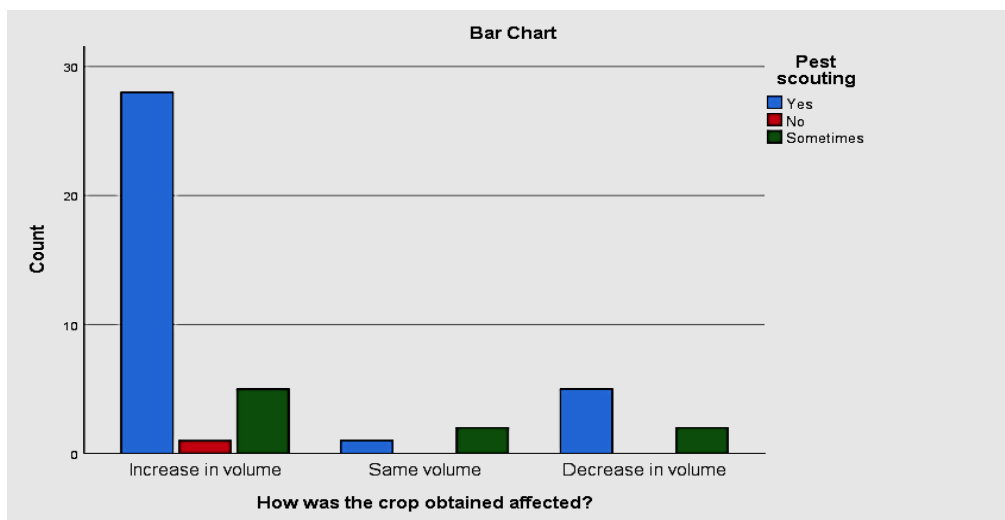


Figure 7: Pest scouting

Figure 7 shows that the majority of small-scale farmers who practice pest scouting experienced an increase in the volume of their crops. In addition, Figure 8 shows that the majority of small-scale farmers who practice the use of hybrid seeds to plant experienced an increase in the volume of their crops.

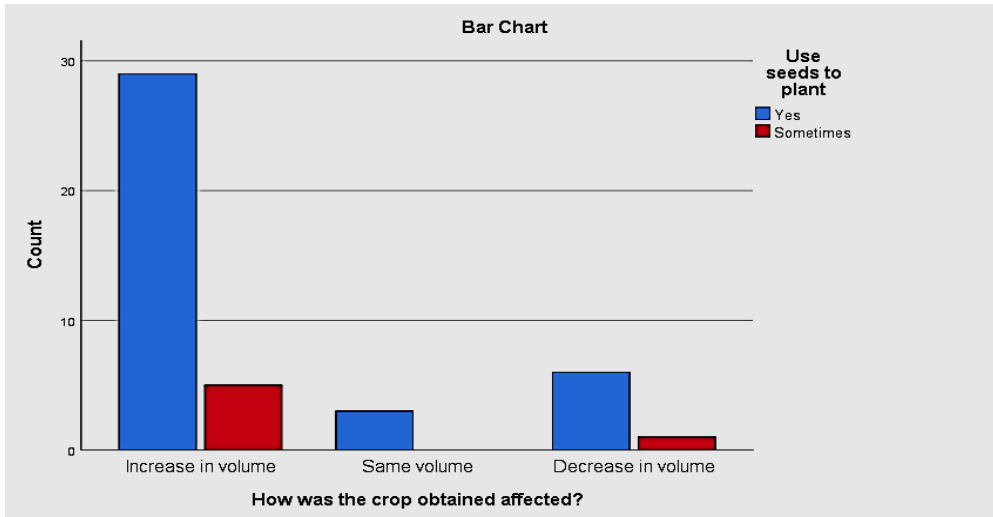


Figure 8: Use of hybrids seeds

Figure 9 indicates that the majority of small-scale farmers (over 65%) who practice the use of nursery seedlings to plant experienced an increase in the volume of their crops.

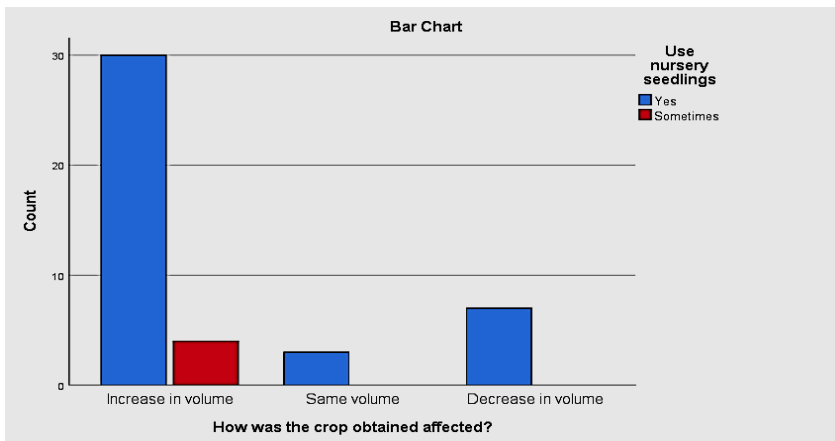


Figure 9: Use of nursery seedlings

5. CONCLUSION AND RECOMMENDATIONS

This study compares the impact of the APSP on crop yield. There was no significant linear relationship between agricultural production inputs received and crop yield. This indicates a lack of evidence for a cause-effect relationship between the production inputs received and changes in the crop yield. There was also no significant linear relationship between agricultural production practices used by the farmers and their horticultural crop yield. This indicates that there is no cause-effect relationship between the agricultural practices used by the farmers and changes in the crop yield. Taking into account the null hypothesis, the Agricultural Production Inputs Support Programme has no impact on horticultural crop yield.

The researcher therefore fails to reject the null hypothesis. This is in line with the findings that argues the significance of the programme to markedly boost crop production and reduce poverty since maize production in the 90th and 10th percentile of total crop output per kg of subsidised fertiliser indicates a marginal increase of maize yield. This trend of fertiliser use and low crop output raises the question of the ability of the small-scale farmers to effectively

use agro-chemicals. Therefore, the role of extension services by all stakeholders is brought into disrepute.

However, it was observed that soil testing for nutrient content, fertiliser application, irrigation scheduling, use of hybrid seeds, and the use of seedling to plant is important for small-scale farmers to experience an increase in the volume of their crops. The contradictory findings in this study may however be related to the integrity of the respondents to the questionnaire.

The study has revealed a gender disparity in the provision of agro-chemicals to small-scale farmers as implemented through the production input support programme. The current generation of farmers is above the age of 50 years with less than 11 years of schooling. The low level of education may result in the inability to take their farming businesses to commercialisation which is needed for the improved socio-economic status of society.

Small-scale farmers rely on government sponsored extension services and/ or own farming experience. The current results indicate that the majority of farmers have an adequate number of years' farming experience and these farmers attend crop production study groups and have access to extension services. However, the lack of a causal relationship between the support provided (production inputs and extension services) and crop yields is worrisome. This could perhaps be due to the mismatch of the calibre of farmers and programme expectation.

As such, more emphasis should be placed on the selection of beneficiaries to promote gender equity, focus and attract graduates and experienced candidates in farming. Development of selection criteria and classification systems of recipients is suggested. It is advisable to support small-scale farmers, however, a reporting mechanism to identify progressive farmers is a necessity. An incubator programme in partnership with the private sector is thus suggested.

Furthermore, production practices are found to be instrumental in increasing crop yield by the farmers. Good agricultural practices demand adherence to these production practices at all times. The delivery of advisory support and farming to meet the national objectives is highly dependent on human resource capacity and finance. Therefore, there is a need to continuously improve human resource capacity in terms of competence, skills and qualifications to render high quality services to farmers. Thus, comprehensive farmer training, monitoring and accountability are suggested. Moreover, training programmes provide valuable information, skills and knowledge for the farmer, and study groups help farmers to resolve farming issues together, which indicates that farmer experience is critical for farm productivity. Although farming experience is sufficient for the participants, the low level of education might be a hindrance for planning and organisation for efficient production at a farm level. It is plausible that the entrepreneurial spirit of the farmer is the one factor overlooked in many previous studies.

Programmes such as the APSP requires stronger extension services. The low level of farming skills and the indication that the majority of government extension and advisory service officers have a diploma or lower qualification may be contributory to low levels of success. According to the National Development Plan for South Africa, there is a need for the training of a new cadre of agricultural extension advisors that will respond effectively to the needs of smallholder farmers. An effective and efficient extension and advisory service is essential for successful rural development in South Africa. Knowledge sharing is critical to support social, economic and environmental development, and extension is a vital knowledge-sharing institution.

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EVALUATION OF A SMALLHOLDER BEEF IMPROVEMENT PROJECT: PROVIDING ACCESS TO SUPERIOR GENETIC BREEDING MATERIAL

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ABSTRACT

Different stakeholders and role players have established a source of superior genetic breeding material for beef cattle farming in the Western Cape through good co-operation. This genetic material was provided to smallholders in the form of Bonsmara stud bulls at a nominal cost with continual support. The project benefitted the participating farmers regarding increased beef production and economic gains. It should continue with the same collaborative spirit and support that have been demonstrated between all parties concerned. More emphasis regarding farming information systems and the use thereof in decision-making for improved efficiencies is required.

1. BACKGROUND

Livestock production is a major contributor to global food and nutritional security. Livestock systems occupy 45% of the global surface area and are regarded as significant global assets. Livestock industries are organized in a long market chain that employ at least 1.3 billion people and directly support the livelihood of 600 million poor smallholders, globally. It provides 17% of global energy consumption and 33 % of the global protein consumption (Herrero, et al., 2010). It is further reported that the livestock industry in developing countries contribute more than 33 % to their agricultural GDP and is one of the fastest growing agricultural sub-sectors. Population growth, urbanization and an increase in income has resulted in an increased demand for livestock products (Swanepoel, et al., 2010).

Beef production in the Western Cape contributes 4% to South African national beef production (A Status Quo Review of Climate Change and the Agriculture Sector of the Western Cape Province, 2015). Many smallholders keep beef-type animals, utilizing pastures on commonages and on odd lot land. Land reform has enabled these farmers to access commercial farming land, bringing in crossbred animals to start production. These enterprises need upgrading of the genetics of their stock to ensure efficient beef production per unit of land.

One of the goals of the Western Cape Department of Agriculture (WCDoA) is to establish and assist developing farmers in the region. The Western Cape is divided into six municipal districts according to which the services of the WCDoA are decentralized. Although the initiative to improve the genetics of beef type animals was initiated in the Eden district, it was decided that it must be expanded to other districts where production of beef also takes place.

Consequently a project was structured that supplied selected registered beef cattle bulls (Bonsmara) to the smallholders on a three-year rotational base, while simultaneously providing

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training in terms of recordkeeping, health, management and production as the progress is monitored.

2. PROJECT RATIONALE AND INSTITUTIONAL ARRANGEMENTS

Cattle farming by smallholders in South Africa is hampered by a lack of good genetic material. Normally these farmers can only afford cross or mixed breed heifers for farming purposes. The purpose of this project is to provide selected registered Bonsmara bulls to smallholders, to produce upgraded beef type heifers and improve the performance of weaned beef calves. Bonsmara cattle (bred in RSA for beef) make up 27.6% of stud registered beef animals in the RSA (Logix, SA Stud book, 2015). The current price of Bonsmara bulls is in the region of R 55 000 or more per bull, which make it difficult for farmers to obtain these bulls. It must also be kept in consideration that bulls should be changed every two - three years to prevent inbreeding.

The Western Cape Agricultural Research Trust (WCART) was founded in 1998 to assist the WCDoA in research and development projects in the province. It is managed by six trustees that represent different industries and academic institutions in the province. WCART together with officials from Research Technology and Development (RTD) and Farmer Support and Development (FSD) of the WCDoA developed a project whereby selected Bonsmara bulls from a source herd are being rented by smallholders to improve the genetics and performance of their beef cattle herds. WCART owns a registered Bonsmara herd that is stationed at the Kromme Rhee and Nortier research farms. Initially, superior genetic material was acquired by embryo transfer to a commercial beef cattle herd. Cull cows from stud breeders (so-called golden oldies), were also purchased to establish the herd. Artificial insemination was done to introduce the required genetic material into the herd. The Agricultural Research Council (ARC) assisted in the initial selection of embryos and semen. The herd is managed according to guidelines supplied by the Bonsmara Cattle Breeders Association and the Beefpro program. Hence, a scientific breeding program is followed with specific breeding objectives for example, short inter-calving period and low birth weight. Scientifically calculated breeding values are being used at present, and an initiative to determine the genomics of each bull is already underway. This will provide even more accurate information on genetics (Brand and Grobler, 2011).

Male offspring from these studs are distributed to smallholders in the province. Income from used and additional, or redundant bulls and cows are utilised to support the project in the long term. The project is currently supported by WCDoA, but will be independent after five years. Thereafter funds from the industry and WCART will be used for further support.

3. CURRENT STATUS OF THE KROMME RHEE BONSMARA STUD

Registered Bonsmara herds in South Africa are evaluated by SA Stud Book according to estimated breeding values regarding specific characteristics. Selection traits are then determined against the averages of the breed which is represented by a value of 100.

Table 1. Selection index values of the Kromme Rhee Bonsmara stud (2019)

Selection trait	Average of herd
Ease of calving	103
Calf growth	94
Milk production	98
Maintenance	107
Fertility	102
Maternal value	100
Growth value	100
Production value	99

The index value of above 100 for ease of calving indicates a smaller calf at birth compared to the average of the national herd, hence easier calving. The higher value for maintenance means smaller frame animals with lower mature body mass, while higher fertility indicates that cows or their daughters will calf earlier and/or more regularly.

The stud received a gold medal in 2017 (top 10%) and a bronze in 2018 (top 30%) from SA Stud Book, based on the genetic value as well as the accuracy of recordkeeping of the Kromme Rhee stud.

4. IMPLEMENTATION OF BONSMARA BULL PROJECT

The project was implemented by the RTD, FSD as well as the Veterinary Services (Vet Services) programmes of WCDoA.

Additional funds were however needed for the maintenance of the source herd, maintenance of infrastructure, the feeding of the bulls during their growing phase, feeding of heifers, veterinary costs, medicine, transportation costs, infrastructure, labour fees, etc. Financial support was provided by the WCDoA through their FSD programme and is continuing to support the project at present.

Participating herds are identified according to specific guidelines developed by officials from FSD, RTD and Vet Services. Criteria include for example, at least 20 breeding cows and access to land and infrastructure. These herds are also tested for diseases as prescribed by Vet Services and formal inspections will take place at least once in two years. At least three monthly general inspections by FSD officials are required to track data collection and progress of the selected receiving herds which will be analysed on a scientific basis.

A total of 30 Bonsmara bulls have been distributed to date. Bulls are provided to farmers at 18-24 months of age. These bulls are distributed to smallholders under contract at a nominal amount of R100 per year and will be rotated on a three year basis between farms.

Administrative functions as well as financial management are the responsibilities of the trustees of the WCART, while officials of the WCDoA are involved in the day-to-day management of

the project. Monitoring of progress by farmers as well as support and training are done simultaneously with the distribution of the bulls to beneficiaries.

5. EVALUATION OF THE PROJECT

5.1 Rationale

The Department of Agriculture Western Cape provided financial support to the project for three years. Another request for funding was received in 2018 and it was decided that an evaluation by survey at all the participating farmers must be conducted in order to determine the merit of the project for further support.

5.2 Methodology

Interviews by questionnaire were conducted with 21 farmers, which include all farmers that have taken part in the project (30 bulls were delivered to these farmers).

Experienced officials of FSD developed the questionnaire which consisted of two parts. Firstly, to gather basic information regarding the current production situation and secondly to determine the merit of the project according to specific indicators. Interviews were done by assigned FSD agricultural advisors. The survey was concluded in November 2018.

The current number of participating farmers/bulls per district are: Cape Winelands (1/1), Garden Route (2/2), Little Karoo (4/4), Overberg (6/9), Swartland (8/14).

5.3 Results (Part 1 – basic information on current production)

- Total number of beef cattle involved: 1280
- Total number of breeding cows involved: 796
- Average number of breeding cows/farmer: 38

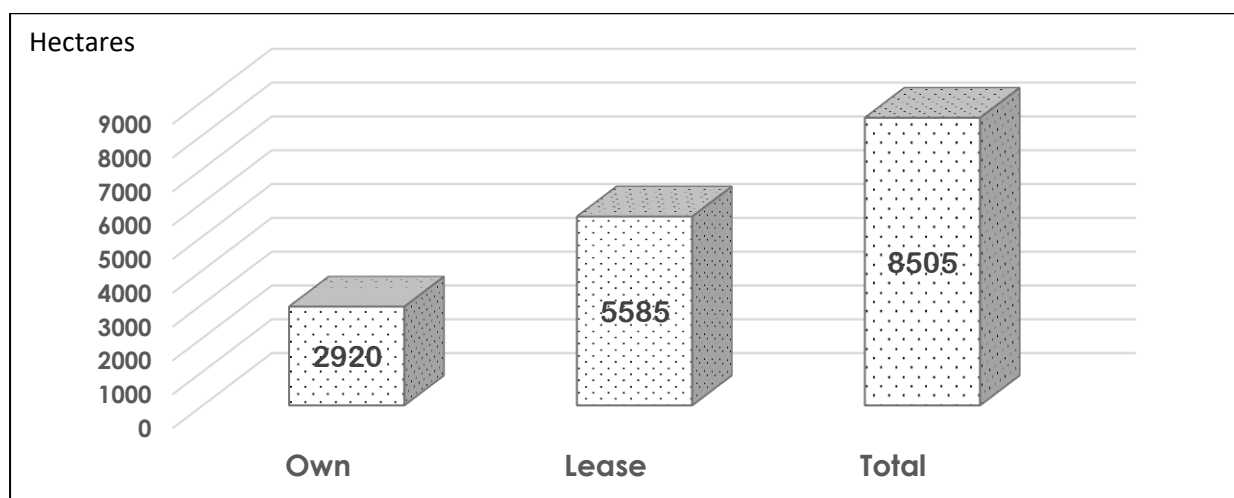


Figure 1. Access to land by farmers that participate in project

The smallholders own about 34% of land used by these participating farmers.

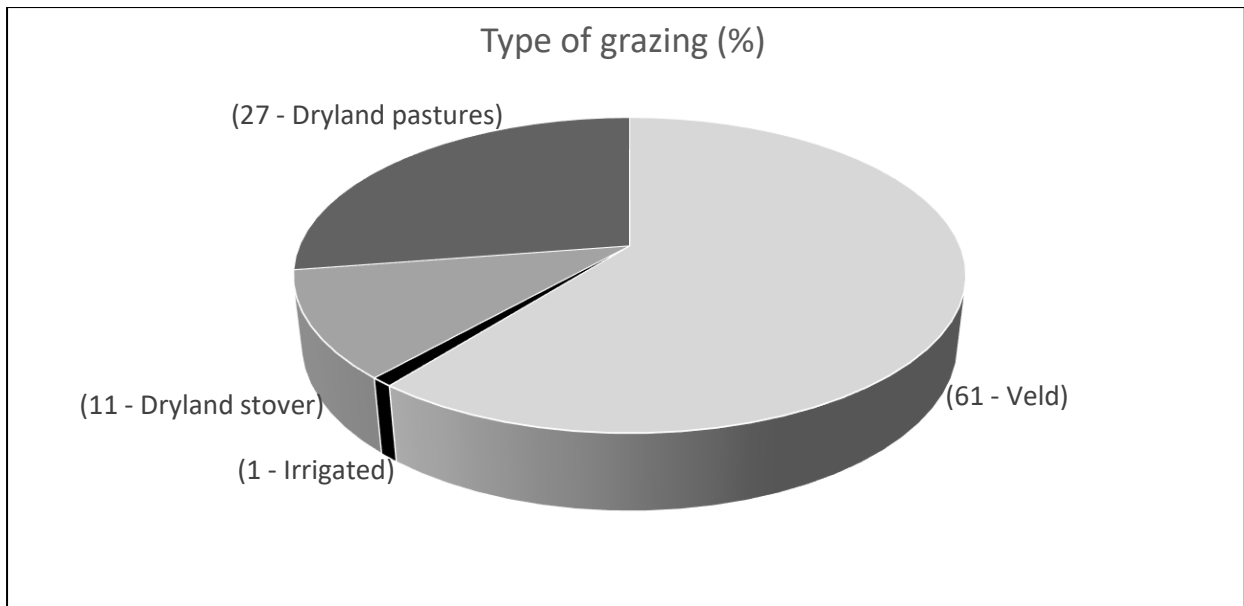


Figure 2. Type of grazing as percentage of total hectares available

Natural grazing comprises about 61% of productive land, but would not provide the bulk of feed because of its inherently low grazing capacity (30 – 70/ha/Large Stock Unit and even more).

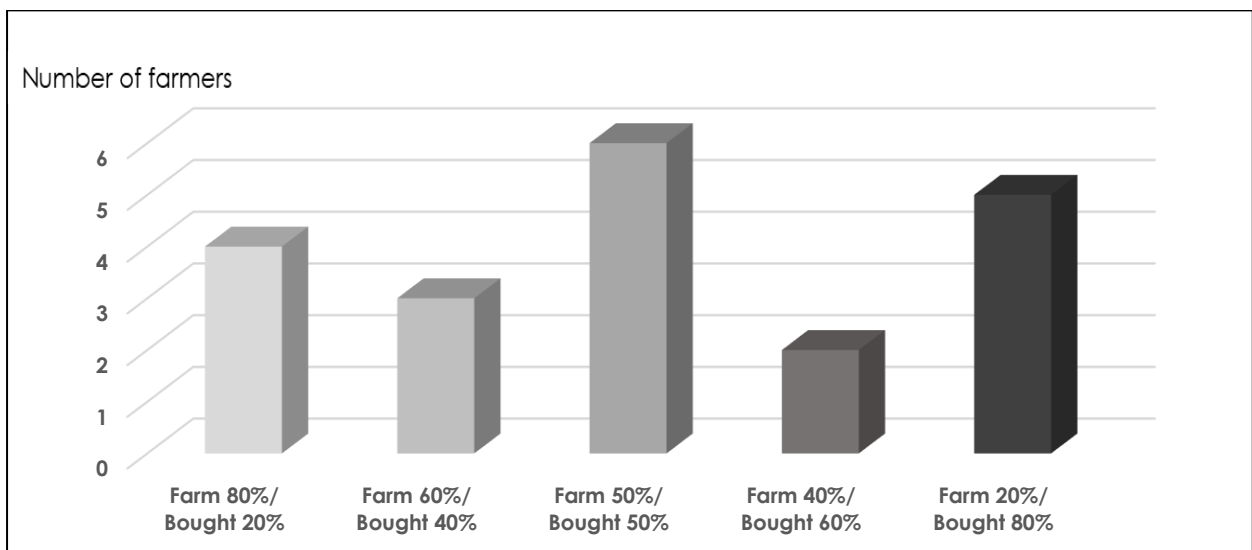


Figure 3. Sources of fodder supply to farms, past 12 months

About 65% of farms provide 50% or more of fodder to livestock while only 20% of farmers indicated that 80% of fodder supply came from the farm. At first glance, it does not provide a good picture regarding the ability of farms to sustain their viability, but more information is needed to fully understand the situation. The aftereffects of the drought could be one of the factors that may have influenced these results.

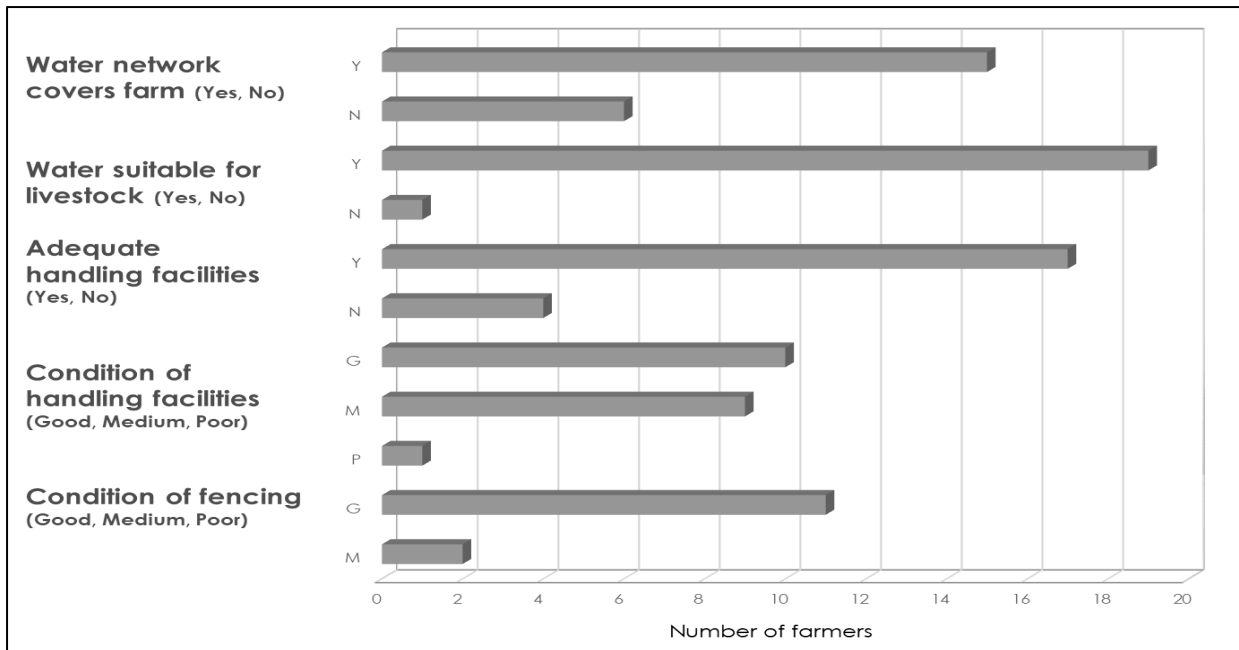


Figure 4. Infrastructure for livestock production

Infrastructure for livestock farming in general seems to be sufficient while it is advisable to consider improvements for the few farmers where it seems inadequate.

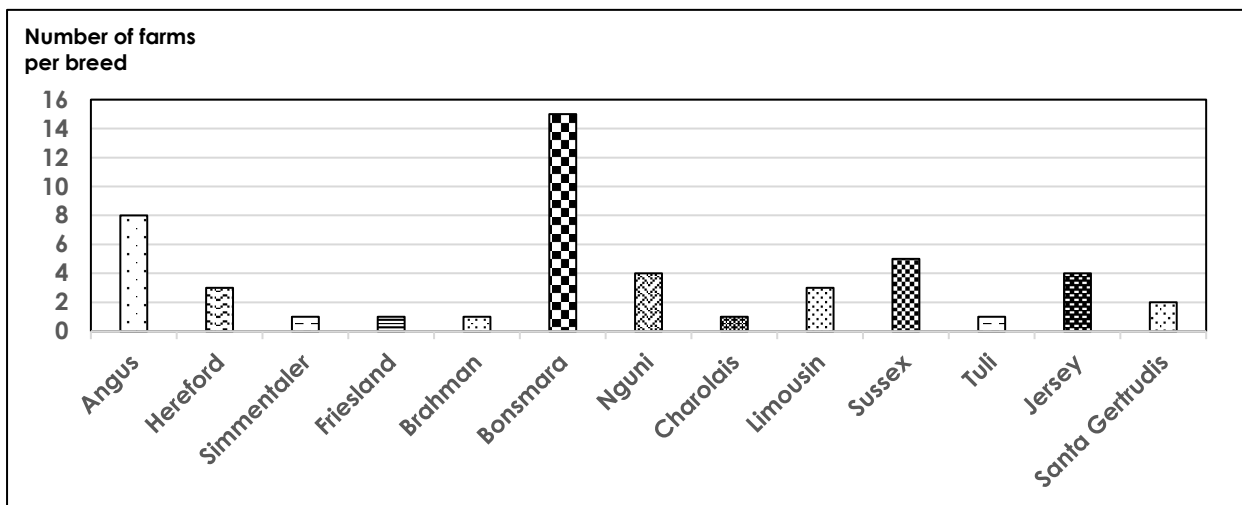


Figure 5. Genetic representation of cattle breeds on farms of participating farmers

The genetic representation of breeding cows is spread across quite a number of breeds. Although this is not necessarily an accurate display of the actual proportions thereof, it is noted that Bonsmara genetics are present at more than 70% of farms.

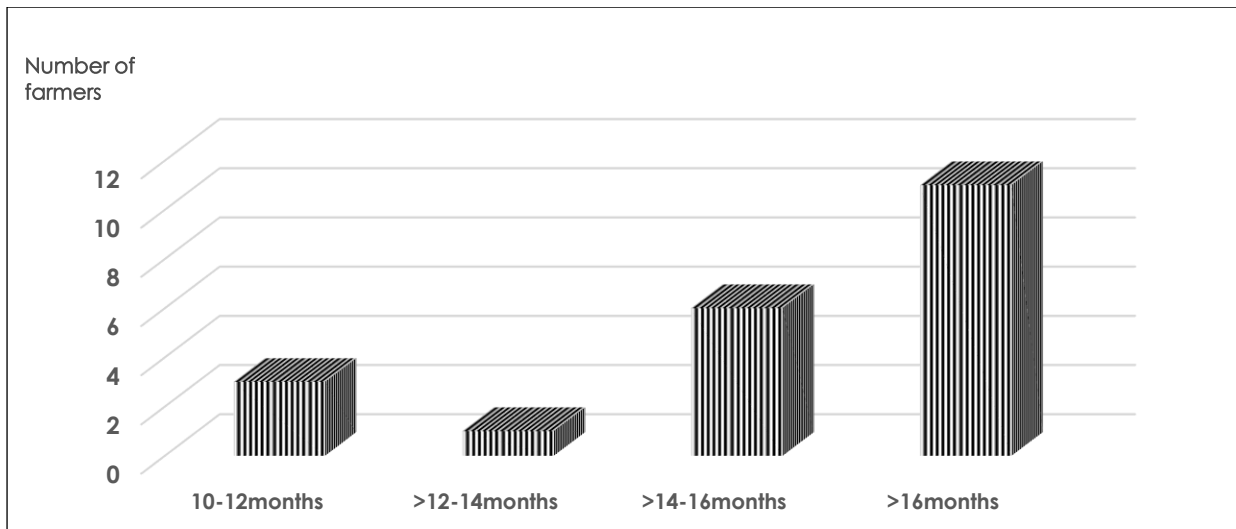


Figure 6. Average age of heifers with first mating

Heifers with first mating should be 20 -24 months of age according to De Brouwer (pers. commun. 2019). This is correlated with lifelong production while earlier matings would have a negative effect on production over the life span of such heifers. Nearly half of the farmers indicated that mating is being done up to 16 months. There could be additional farmers in the group where heifers are mated after 16 months but before 20 months. A follow-up on this aspect is required.

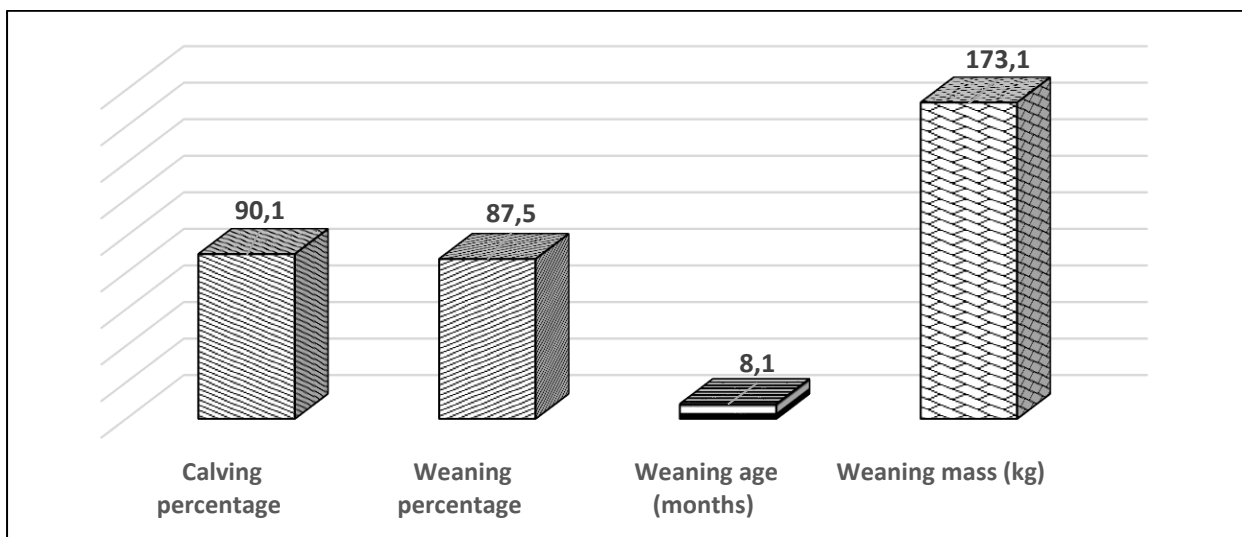


Figure 7. Average reproduction and production figures of participating herds

Calving and weaning percentages seem rather high in comparison with the figures reported by the industry, which are around 80% for calving. Due to insufficient recording, calving of individual cows are observed to occur within a calendar year masking extended inter-calving periods. Weaning age and mass do not reach the industry's targets of seven months and 180 – 220 kg respectively (De Brouwer, pers. comm., 2019), hence there seems to be potential for improvement.

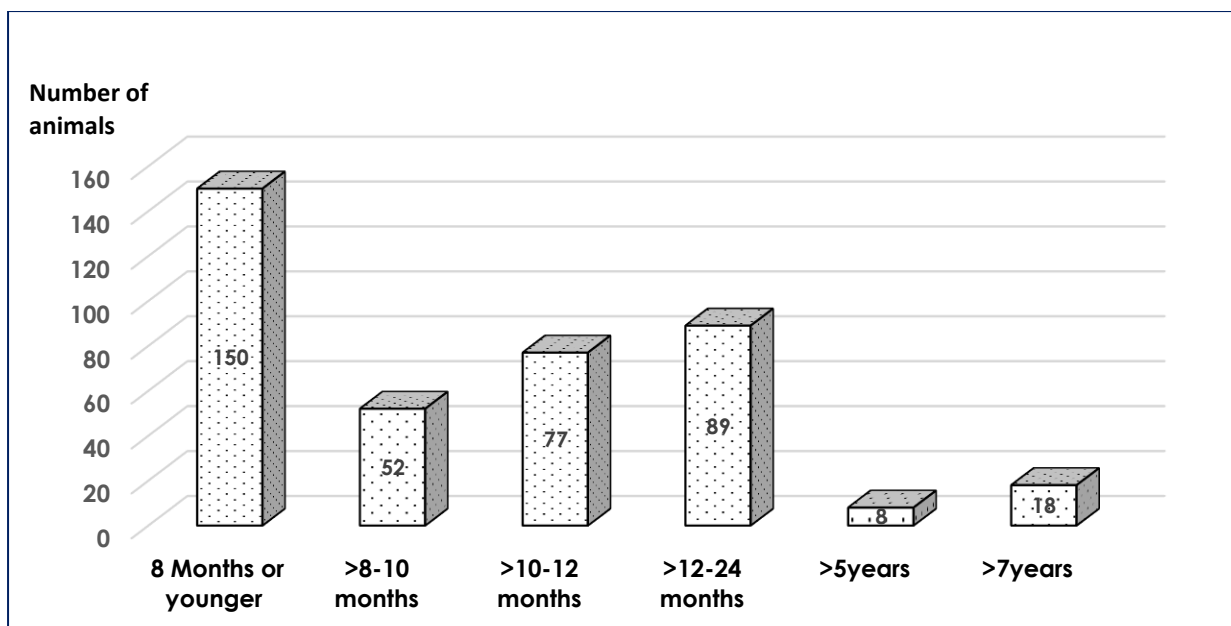


Figure 8. Total number of animals, all farmers, marketed or sold (per annum)

About half of the animals are marketed up to 10 months of age. More specific and verified information is needed on weights and age of marketing to determine the current efficiencies. Information on the structure of the herds namely number of females and males per age group and production cycle was not provided satisfactorily and a follow-up is required.

Record and bookkeeping

Recordkeeping systems regarding animal production are all manual except for one farmer that makes use of Microsoft Excel. Typical traits that are recorded are weight, date of birth, parents, dipping of cattle, sales and feed.

Bookkeeping systems being used for business transactions are Pastel, Excel, bookkeepers, manual and the Financial Record Keeping Programme of WCDoA.

It seems that more attention is required to improve the Farm Management Information Systems of these farmers, which would detect areas that need improvement to influence their decision making for increased effectiveness and efficiency. Agricultural advisors and economists should be involved in such a concerted endeavour.

5.4 Results (Part 2 - degree of satisfaction by farmers with the Bonsmara bull/s received through the project)

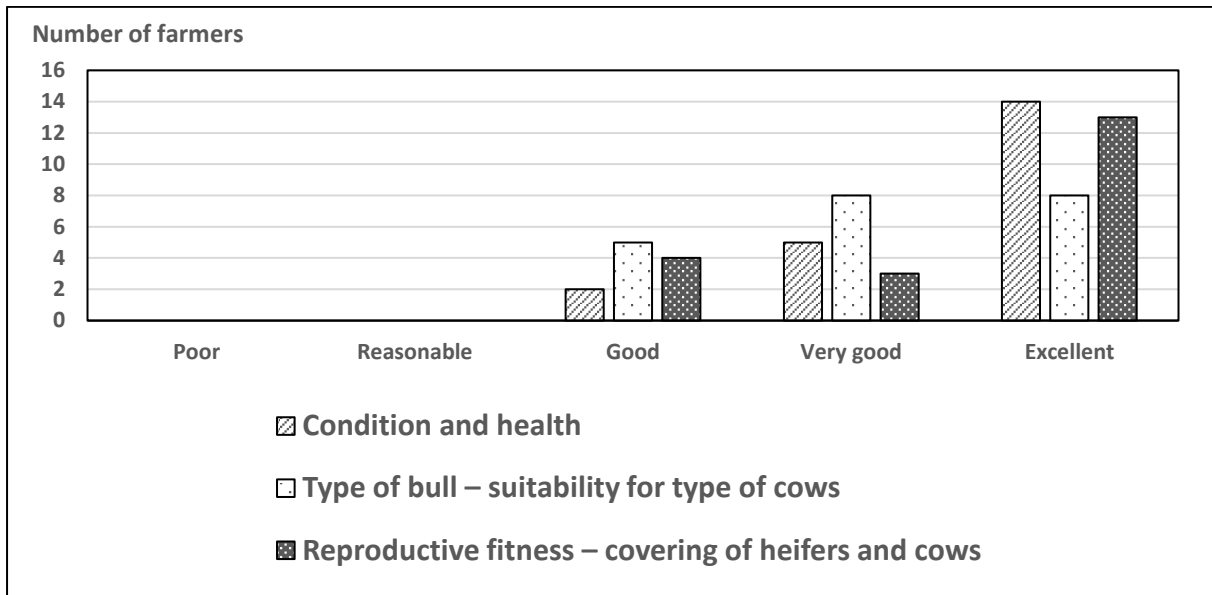


Figure 9. Rating by farmers; Bull/s: Condition, suitability, fitness

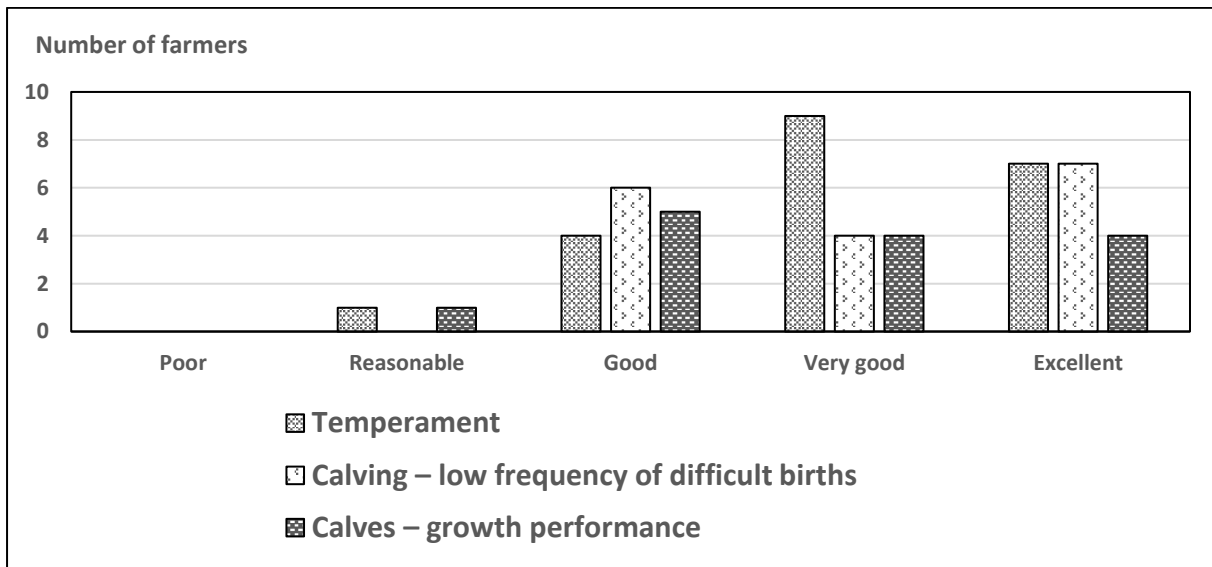


Figure 10. Rating by farmers; Bull/s: Temperament, difficult births, calves' growth

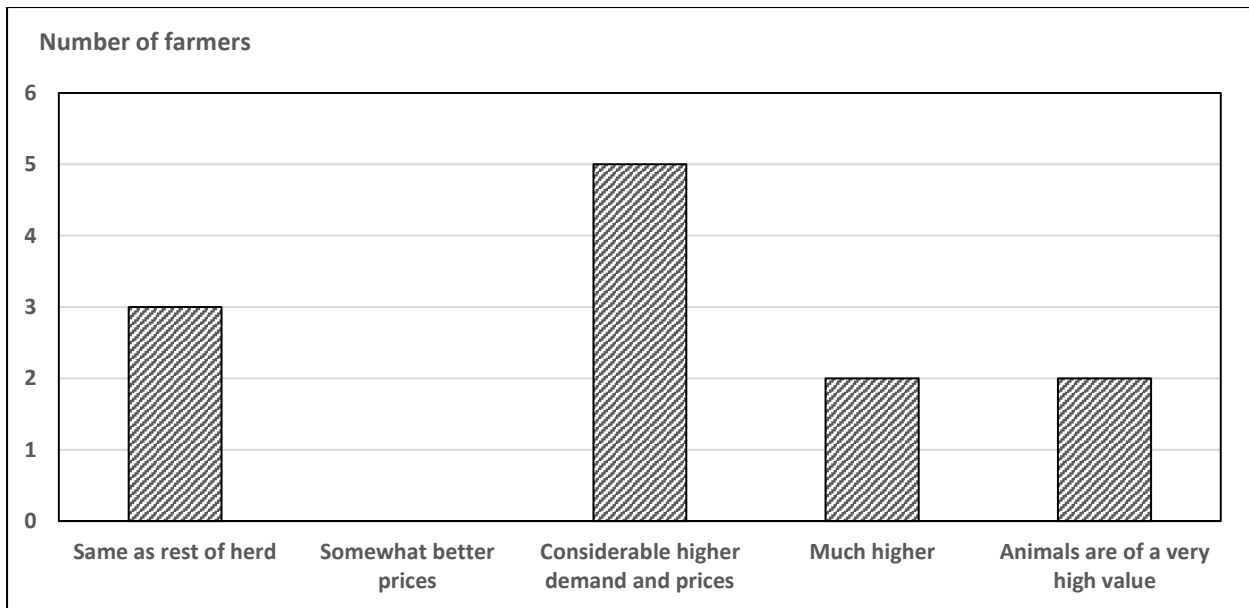


Figure 11. Rating by farmers: Marketability of offspring of bull/s (calves, steers, heifers, cows): Demand and prices in comparison with other cattle in the herd.

The rating of all aspects by farmers seems quite good which is a positive for the project. The frequency of difficult births was surprising low, which was one of the aspects that was a concern to farmers because of the size of some of the bulls. The same could be said for reproductive fitness – where no problems were reported with the covering of heifers or cows even while some breeding cows were classified as small frame animals.

Perceived benefit and merit of project

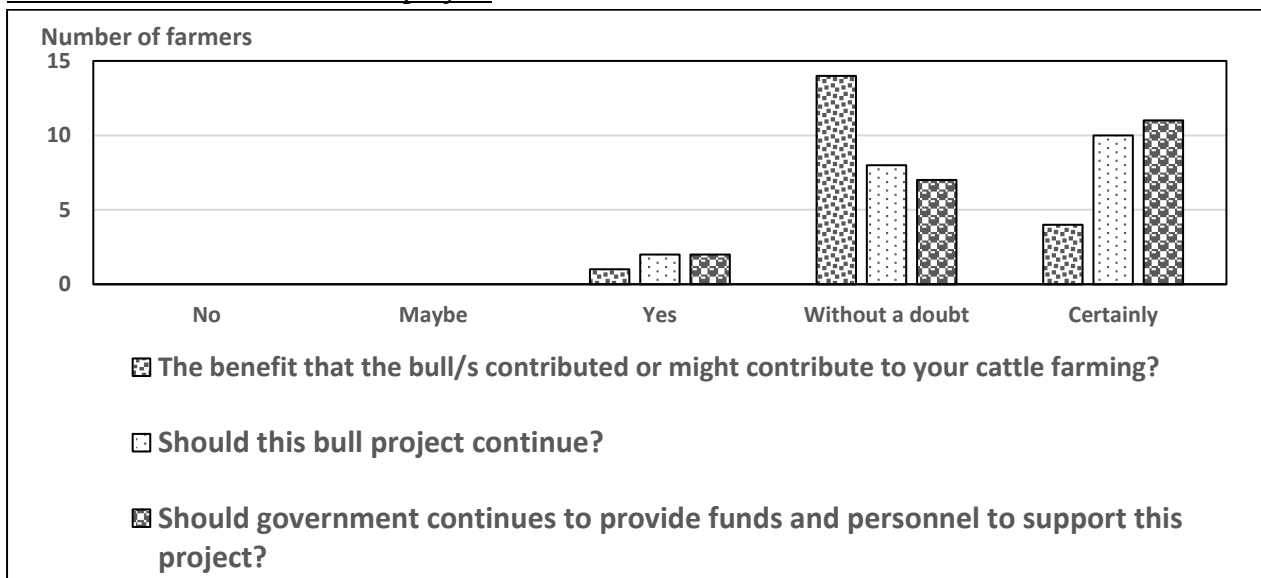


Figure 12. Rating by farmers: Benefit and merit of project

Results indicate that there is value in the project for the participating farmers and that it should continue.

Farmers' comments

- *Very good project, if ones does not have money to buy a bull, tends to keep it too long – inbreeding*
- *The project benefitted from the bull project and anticipate a positive reaction on genetics*
- *The general herd quality has improved due to the initiative*
- *The offspring of the previous bull reach maturity at an early stage*
- *The bull will make a huge contribution on the farm because it is the only bull I am using currently*
- *Start Bonsmara heifer project alongside bull project*
- *This is a very good project and we benefitted from this intervention*
- *The bull project is recommendable and is benefitting us*
- *Good assistance for emerging farmers*

5.5 Conclusions

- The project is making a positive contribution to increase the level of beef production of participating farmers.
- The potential benefits of the project must be communicated to farmers. They provided excellent cooperation once they have realised the gains such as higher prices at auctions and heavier calves been weaned.
- The success of the project is dependent on the co-operation between RTD, FSD and Vet Services of the WCDoA. The project will not succeed in the long term without good relationships and continual support from each division.
- Current efforts by officials and other stakeholders to establish sound records and facilitate comparisons with industry norms and the effective use of such information by farmers seem inadequate and will have to be improved.

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FOURTH SESSION

PARTICIPATION OF SMALLHOLDER FARMERS IN AGRO-PROCESSING INDUSTRIES: WHAT ARE THE IMPLICATIONS FOR THE EXTENSION SERVICES OF GAUTENG PROVINCE?

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ABSTRACT

The study aimed to evaluate the levels of participation of smallholder farmers in the agro-processing industries of Gauteng Province. The main objective was to determine the implications of participation or lack thereof for the extension services, using an exploratory mixed sequential design. Four focus group sessions were conducted to account for qualitative data collection, and the survey data was gathered from three regions of Gauteng Province (West Rand, Pretoria, and Germiston). A sample of smallholder farmers (n=78) was purposively selected across the three regions to select participants. The results revealed that factors such as institutional design, condition of participation, and collaboration were critical in influencing these farmers. However, the results also revealed that leadership did not affect either of the levels of participation of these farmers. Therefore, these results suggest that the level of participation in smallholder farming could be improved, should the influential factors be taken into consideration during the development planning of these farmers. It is recommended that strategic plans formulated by the supporting institutions consider these influential factors as the tools for the transformation of the agro-processing industries. These factors could stimulate participation by smallholder farmers in this sector.

Keywords: Agro-processing, Condition, Institutions, Participation, Smallholder

1. INTRODUCTION

Smallholder farmers are known for their critical role in potentially meeting household food security requirements and providing marketable surpluses (Akidi, Wamala & Mugonola, 2018; Masamha, Thebe & Uzokwe, 2018). According to Akidi *et al* (2018), these farmers are characterised as entrepreneurs who could be applauded for their consistent subsistence level of production for household livelihood and food security. Measures taken to enhance their education and knowledge, and developing networks for their participation at all levels of agro-processing value chains, while simultaneously reducing transaction costs, could significantly influence small-scale agripreneurs to their benefit (Thindisa & Urban, 2018). However, smallholder farmers have been criticised for producing lower quantities that cannot promote consistent supplies of food materials to the commercial markets, as well as for their limited

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potential to preserve their surplus food in the form of agro-processed products. It is also not known whether these farmers do conduct food processing of their products.

The construct of agro-processing participation is difficult to define in the context of the South African agricultural smallholder farming sub-sector because there is limited empirical evidence to show its existence. Participating in the agricultural and agro-processing value chain has the potential to enhance the competitive advantage of small-scale agricultural enterprises in South Africa (Thindisa & Urban, 2018). Increasing market participation among smallholder farmers has the potential to lift them to better income levels through increased productivity and surplus production (Moono, 2015). It is increasingly being recognised that the proper exploitation of agro-processing entrepreneurial opportunities has the potential to enhance the competitive advantage of agribusinesses (World Bank, 2016).

It is also unclear if these farmers desire to participate in the established value chain and agro-processing industries (Min *et al*, 2018). Agro-processing is conceptualised in South Africa as being part of the renewed effort to improve industrialised agriculture (Department of Agriculture, Forestry and Fisheries (DAFF), 2015). Several benefits of integrating the primary agriculture and agro-processing industries have been noted in the literature. These include local economic growth and development via backward and forward linkages through providing opportunities for earning income in food production, processing, distribution, retailing, and thus job creation that is encouraged by increased productivity from lower transaction costs (Dorosh & Thurlow, 2013; Fan, Brzeska & Halsema, 2013). This paper will use the definition of participation as espoused by numerous experts across the globe and sectoral divide (Pope, 2014). Various experts have broadly defined participation as comprising of activities that relate to involvement in contractual, consultative, collaborative, collegial; and farmer or community-initiated interactions (Biggs, 1989; Lilja, Ashby & Sperling, 2000). Therefore, the study aimed to evaluate the levels of participation of smallholder farmers in the agro-processing industries of Gauteng Province and to ascertain the implications of participation, or the lack thereof, for the smallholder farmers.

1.1 Problem statement

In South Africa, smallholder farmers are known to be marginalised (Mmbengwa, 2009; Mmbengwa *et al*, 2018) and thus have limited scope for participating in the agro-processing sub-sector and the entire agricultural sector. The undemocratic, apartheid South African government (before 1994) had forced these farmers to participate in agricultural activities only for their household food security (i.e. livelihood) at a subsistence level (Mmbengwa, 2009). Consequently, these farmers are intricately associated with the term ‘subsistence farming’. Despite the potential benefits that might accrue from participation in agro-processing and value addition activities, these farmers are mainly confined to the informal sector and focus on primary agriculture, whereas participation in agro-processing and value addition activities could enhance their profits (Thindisa & Urban, 2018).

2. CONTEXTUALISATION OF THE STUDY

Previous studies have advocated numerous benefits that smallholder farmers could gain when participating in the agro-processing sector (Alene *et al*, 2008; Mmbengwa *et al*, 2018; Thindisa & Urban, 2018). Alene *et al* (2008) as well as Figueroa, Mahmoud and El-Enbaby (2018) outlined the benefits associated with participation in agro-processing, which vary and range from improved cashflow to market access, viable farming entities, and job creation. Thus,

participation in agro-processing is catalytic to gaining access to the markets and the sustainability of smallholder farming (Thindisa & Urban, 2018). According to Smith (1983), participation gives farmers the right to be consulted, involved, and be informed by other stakeholders. This kind of interaction has the potential to enrich the farmers' decision-making processes and to build trust and networks amongst the participating farmers.

Arnstein (1969) explained the theory of participation as a stepladder process and portrayed it at various levels and stages of participants' development. Arnstein's theory portrays a hierarchy of participation, where non-participation is the lowest level, which is defined by manipulation and therapy (healing). The participants who are in the lower level of participation have to demonstrate certain qualities to graduate to a moderate level of participation (the second stage of participation). This level is described as tokenism (Hurlbert & Gupta, 2015). At this level of participation, information, consultation, and placation (conciliation) are highly prioritised for the participants (Arnstein, 1969).

According to the Arnstein theory, to develop to the tokenism stage, a participant has to show a grasp of the mentioned priorities. Lastly, the highest level of participation is described as citizen power, and it is constituted by the partnership, delegated authority, and citizen control. A participant at this stage of participation is regarded as a seasoned or high-quality participant (Rowe & Frewer, 2000). Theoretically, these stages of participation are classified in the baseline theory of participation (Hurlbert & Gupta, 2015). Given the participation of smallholders in agro-processing, none of the levels of participation have been documented nor published, making it difficult to assess the level and the impact of the participation. This knowledge gap makes it impossible to ascertain where future innovations, which seek to trigger impactful participation and which could alleviate socio-economic challenges, might take place.

3. RESEARCH METHOD

3.1 Research design

The study adopted an ontology philosophy which subscribes to multiple realities. These realities were influenced by the multiplicity of the material conditions in which smallholder farming in South Africa finds itself. Another philosophy that the study adopted was epistemological philosophic position. This philosophy was designed to be both constructivist and positivist. The constructivism philosophy in this study seeks to provide learning on how to enhance the participation of these farmers in the agro-processing sector. While the positivist seeks to provide certain ("positive") knowledge of the participation of smallholder farming in the same industries which is based on natural phenomena. Hence, an exploratory mixed sequential design was used. In this regard, four focus group sessions were conducted to account for qualitative data collection, and the survey data was gathered from three regions of Gauteng Province (West Rand, Pretoria, and Germiston). Accordingly, the study used both qualitative and quantitative research approaches. These approaches were used to yield relative and comparative advantages. During the initial phase, qualitative approaches were preferred since a large amount of exploratory information was required to delineate this study. The results of the focus group sessions provided the context, understanding, themes, and constructs of the study. The latter was used to provide the variables considered in the follow-up quantitative design. This method was compatible with Participatory Action Research (PAR), which was applied at the beginning of data collection. Qualitative data were collected through focus group sessions, and quantitative data were collected through the administration of the questionnaires to the smallholder farmers. The closed-ended items of this questionnaire were validated

through a peer review mechanism where experts in the agricultural industry discussed and critiqued aspects of the survey and the relevance to the research objectives. In addition, validation of the research instrument was achieved through triangulation of both qualitative and quantitative information.

3.2 Sampling procedures

A sample size of 78 smallholder farmers participated in the study. The eligibility to participate was based on three criteria. Firstly, respondents should be farming in one of the three regions of Gauteng. Secondly, the farm had to be functioning, in other words, producing agricultural products for the markets. Lastly, the farmers had to be linked to the Gauteng Department of Agriculture and Rural Development (GDARD) for extension support services. Non-probability sampling techniques were used in the collection of data. During sampling, a purposive sampling technique was used. According to Palys (2008), a purposive sampling technique is a technique linked to the strategic choices of the researcher's study design. In purposive sampling, selecting the sample elements is based on the researcher's judgment or expertise (Sarstedt *et al*, 2018). Furthermore, the researcher only includes elements he or she deems appropriate for the analysis of the effect under study. Stakeholder purposive sampling enables more data to be collected from an identified stakeholder (Saunders, Lewis & Thornhill, 2016). The study used this sampling technique to select the appropriate stakeholders for the study as participants in the survey processes.

3.3 Measurement of constructs

A factor analysis was used to identify the factor loading of the latent variables (unobserved variables). A multiple linear regression model for the analysis of the composite factors of the high and low-level participations was used. These were considered as being the dependent variables in this study. Furthermore, the composite factors of variables, such as the condition of participation, institutional design, collaborative participation, and leadership were considered as being the independent variables.

3.3.1 High-level participation

Six items were used to measure High-Level Participation (HLP). These items included delegation, consensus, vocal, trained, access to training, and membership. The selection and measurement of this construct followed a theoretical framework, as prescribed in Ansell and Gash (2008). Furthermore, the Kaiser-Meyer-Olkin (KMO) test is a measure of how data is suited for factor analysis, and it measures sampling adequacy and the reliability of the data in the model. The measure of sampling adequacy was also used to justify whether it was appropriate to conduct factor analysis on this construct. The results of the KMO analysis revealed that all the items were more significant than 0.6, and the overall KMO for all the items was found to be 0.771 (Table 1), implying that factor analysis for the items was warranted. Although the results of the HLP item reliability was found to be lower than a Cronbach's alpha of 0.7 ($\alpha = 0.682$), it was deemed to be moderately reliable. The factor loading of each factor revealed that each of the items identified in this construct was higher in all the items under consideration, implying that all items had higher contributions to the construct mentioned above.

3.3.2 Low-level participation

Four items were used to measure Low-Level Participation (LLP), namely being informed, meeting participation, debts, and consultation. The selection and measurement of this construct followed a similar theoretical framework as that for HLP. The KMO was also used to justify whether it was appropriate to conduct factor analysis on this construct. Table 1 indicates that the KMO of each of the items was more significant than 0.6, and the overall KMO for all the items was found to be 0.721. These results implied that factor analysis for the items was warranted. The item reliability was conducted, and it was found that the Cronbach's alpha was greater than 0.7 ($\alpha = 0.765$), implying that the scale used was highly reliable. In addition, the higher factor loading revealed that each of the items identified in this construct was valuable for consideration.

3.3.3 Condition of participation

Six items measured the Condition of Participation (CP), namely resource, knowledge, mutual trust, membership, association, and linkages (network). The theory of participation guided the selection of these items (Ansell & Gash, 2008). These items were measured by responses on a five-point Likert scale, where one represented 'strongly agree' and five represented 'strongly disagree'. The KMO was used to find out if a factor analysis was warranted in each item. The results (Table 1) of the KMO analysis for each item indicated that the KMO of each of the items equalled or exceeded 0.6, and the overall KMO for all the items was found to be 0.622. These results implied that factor analysis for the items was justified. The item reliability was tested, and the results of the Cronbach's alpha was greater than 0.7 ($\alpha = 0.732$). This implies that the scale used was considerably reliable (i.e. there is better internal consistency of the scale). The factor loading of each factor revealed that each of the items identified in the CP had significantly higher factor loadings when analysed through principles of factor analysis (PFA).

3.3.4 Institutional design

The Institutional Design (ID) was measured by six items: inclusive, vision, mission, transparency, cultural beliefs, and access to experts. As with the other constructs, the selection of the items was informed by the theory of participation and intuition (Ansell & Gash, 2008). Similarly, these items were measured by responses on a five-point Likert scale. Table 1 indicates that all the items exceeded 0.6, implying that factor analysis was justified. Furthermore, the results of the item reliability analysis showed the right internal consistency within the items under consideration ($\alpha = 0.814$). Moreover, a higher factor loading was found, implying that each factor identified had an excellent contribution to the construct.

3.3.5 Collaborative participation

Six items measured the Collaborative Participation (CLP) construct which included mutual trust, mission, strategic planning, transparency, individual participation, and stakeholder participation. Similar theoretical consideration was made in selecting the factors that constitute this construct. Table 1 indicates the KMO as exceeding 0.6, implying that factor analysis for the items was warranted. In a similar vein, it was found that the item reliability was acceptable ($\alpha = 0.781$), implying that there is correct internal consistency within the items that constitute the construct. Higher factor loadings also confirm that each item plays a vital role in the building of the construct in question.

3.3.6 Leadership

Like other constructs, Leadership (L) was measured by five items, namely leadership roles, influence, participation, consensus, and constitution. The selection and measurements of this construct were also theoretically informed (Ansell & Gash, 2008). The higher KMO confirmed the justification of factor analysis. The item reliability was tested, and it was found that the Cronbach's alpha was less than 0.7 ($\alpha = 0.682$), implying that the scale used was considered reliable. Given the higher factor loading value, each factor was deemed valuable to the composite construct.

Table 1: Reliability and factor analyses of indicators of constructs in agro-processing

Items	KMO	Factor loading	Scoring coefficient	Alpha	SMC
Indicators of conditions of participation					
Resource participation	0.699	0.624	0.239	0.717	0.377
Knowledge participation	0.585	0.829	0.318	0.647	0.744
Mutual trust	0.608	0.762	0.293	0.678	0.675
Membership	0.711	0.505	0.194	0.723	0.290
Association	0.578	0.566	0.217	0.703	0.503
Linkages	0.652	0.609	0.234	0.695	0.404
Overall reliability	0.622			0.732	
LR Test Chi-square = 184.29, P<0.000					
Indicators of institutional design					
Inclusive participation	0.741	0.546	0.169	0.741	0.254
Vision	0.701	0.888	0.275	0.701	0.848
Mission	0.850	0.892	0.276	0.850	0.728
Transparency	0.751	0.884	0.277	0.751	0.821
Cultural beliefs	0.620	0.476	0.148	0.620	0.372
Access to expects	0.712	0.579	0.180	0.712	0.381
Overall KMO	0.741				0.732
LR Test Chi-square = 277.09, P<0.000					
Indicators of collaborative participation					
Mutual trust	0.941	0.704	0.234	0.759	0.315
Mission	0.723	0.839	0.279	0.724	0.651
Strategic planning	0.824	0.709	0.236	0.759	0.371
Transparency	0.688	0.874	0.290	0.712	0.718
Participation	0.800	0.463	0.154	0.804	0.154
Stakeholder participation	0.815	0.575	0.191	0.781	0.224
Overall KMO	0.766			0.781	
Indicators of leadership					
Delegation	0.791	0.678	0.214	0.802	0.363
Consensus	0.789	0.672	0.213	0.803	0.362
Vocal	0.846	0.697	0.220	0.797	0.338
Trained	0.824	0.812	0.257	0.767	0.493
Access to training	0.789	0.753	0.311	0.783	0.399
Membership	0.771	0.735	0.126	0.788	0.611

Overall	0.801			0.819	
LR Test Chi-square = 147.85, P<0.000					
Indicators of low-level participation					
Informed	0.695	0.844	0.358	0.649	0.4607
Meeting participation	0.703	0.740	0.314	0.729	0.3475
Debts	0.785	0.778	0.330	0.700	0.3380
Consulted	0.710	0.699	0.297	0.751	0.2983
Overall	0.721			0.765	
LR Test Chi-square = 80.24 P<0.000					
Indicators of high-level participation					
Leadership roles	0.629	0.866	0.378	0.577	0.621
Influence	0.592	0.872	0.381	0.561	0.626
Participation	0.631	0.712	0.311	0.661	0.399
Consensus	0.421	0.289	0.126	0.702	0.627
Constitution	0.455	0.437	0.191	0.638	0.611
Overall	0.541			0.682	
LR Test Chi-square = 170.95, P<0.000					

Legend: SMC = Squared multiple correlations of variables with all other variables, KMO = Kaiser-Meyer-Olkin Measure of sampling adequacy, and Alpha = Cronbach's alpha.

3.4 Analytical framework

Hierarchical multiple linear regression models were developed to determine the factors that have an impact on the level of participation of smallholder farmers in agro-processing industries in Gauteng Province. A leadership construct was excluded in the model because the analysis found it to be insignificant at all levels of participation. The specified levels of agro-processing smallholder participation models are set out below:

Where:

$Y_{1modelc}$ = Low level participation (LLP), $Y_{2modelc}$ = High level participation (HLP), α = constant, e = residual (error term), X_1 = Institutional design (ID) (CP), X_2 = Condition for participation, X_3 = Collaborative participation (CLP), X_4 = Leadership (L).

Low-level agro-processing participation model:

The model commenced with the evaluation of institutional design as a factor that influences the lower level of participation of smallholder farmers:

$$Y_{1ModelA} = \alpha_1 + \beta_1 X_1 + E_1 \dots \dots \dots (1)$$

Furthermore, the model tested both institutional design and condition for participation as factors that influence lower participation of smallholder farmers in agro-processing industries of Gauteng Province:

$$Y_{1ModelB} = \alpha_2 + \beta_1 X_1 + \beta_2 X_2 + E_2 \dots \dots \dots (2)$$

Lastly, the model tested institutional design, condition for participation, and collaborative participation as factors that could influence lower participation of smallholder farmers in agro-processing industries:

$$Y_{1Modelc} = \alpha_3 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + E_3 \dots \dots \dots (3)$$

High-level agro-processing participation model:

The model commenced with the evaluation of institutional design as a factor that influences the higher level of participation of smallholder farmers:

$$Y_{2modelA} = \alpha_1 + \beta_1 X_1 + E_1 \dots \dots \dots (4)$$

Furthermore, the model tested both institutional design and condition for participation as factors that influence higher participation of smallholder farmers in agro-processing industries of Gauteng Province:

$$Y_{2modelB} = \alpha_2 + \beta_1 X_1 + \beta_2 X_2 + E_2 \dots \dots \dots (5)$$

Lastly, the model tested institutional design, condition for participation, and collaborative participation as factors that could influence higher participation of smallholder farmers in agro-processing industries:

$$Y_{2modelC} = \alpha_3 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + E_3 \dots \dots \dots (6)$$

4. RESULTS AND DISCUSSION

The agricultural extension (also known as agricultural advisory services) is a crucial, non-formal educational function involved in bolstering agricultural productivity, increasing food security, and improving rural livelihoods by acting as a mechanism for pro-poor economic growth (Dhehibi, Werner & Moyo, 2018; Rivera & Qamar, 2003). Thus, extension services enhance effectiveness in increasing productivity, profitability, and food security (Ragasa & Mazunda, 2018). The current study sought to determine the participation of smallholder farmers in agro-processing industries, and to uncover the implications relating to participation in extension services in Gauteng Province. The results and discussion presented below seek to address the objectives by presenting both descriptive and inferential analysis results.

4.1 Descriptive analysis of the study participants

The descriptive analysis of the participants was presented to provide a picture of the representativeness of the sample of the study. These results were presented to show that the researchers have removed the participants' bias and to enhance the credibility and trustworthiness of the study. According to the results, the respondents were dominated by males [53.85% (n=42)], with female participants comprising the remainder of the sample size [46.15% (n=36)]. The average age of the respondents in this study was 53 (SD=14.514). The youngest respondents were 23 years old, while the oldest was 83 years old. Most of the participants [26 (33.3%)] came from Emfuleni Local Municipality, followed by Ekurhuleni [21 (26.92%) in the East Rand region and Mid-Vaal [17 (21.79 %) in the Sedibeng region. The study also found that smallholder farmer participation in agro-processing industries was at the highest [39 (50%)] in the category of 'other', followed by 'processed vegetables' [30 (38.46%)].

4.2 Inferential analysis of the factors that influence levels of participation in agro-processing

Agricultural Extension Services (AES), defined as a system of providing advice, information, and training to farmers, is critical for enhancing agricultural productivity and development (McCormack, 2018). Ngaka and Zwane (2018) have advocated for a partnership between extension service officials and farmers to promote the participation of farmers in industries of their choices. Within the partnership context, the study explored the factors that could be

associated with the participation of smallholder farmers in agro-processing industries in Gauteng Province. Inferential analysis was conducted, and the results are presented in Table 2. The results present both low and high levels of participation. This was undertaken to objectively compare the factors that could enhance the levels of participation of these farmers, with the understanding that lower participation could transform into higher participation where extension services are deemed valid.

As seen in the results, institutional design, condition of participation, and collaboration consistently appeared to be influential factors that affect the participation at all levels of participation of smallholder farmers in agro-processing industries. This observation is in agreement with participatory theories (Ansell & Gash, 2008; Smith, 1983). Above all, Ansell and Gash (2008) highlighted that institutional design provides the basic ground rules for collaboration and participation. Macqueen *et al* (2014) further suggested that institutional design is instrumental in the creation of an enabling environment for participation.

However, Ansell and Gash (2008) caution that the rules that govern the participation in the institutions should be democratically and transparently formulated to curb any possible abuse or lack of support by the participants. Without transparent processes during and after the formation of the institutional arrangements or design, participation could be at risk of collapse or become unsustainable (Speelman *et al*, 2014). Furthermore, the institutional design should be able to deal with collective interest in relationships amongst the participants, and informal lobby networks amongst the participants (Munksgaard & Medlin, 2014). These collective interest and lobby networks are often referred to as group dynamism in South African agricultural sectors (Mmbengwa, 2009) and have been seen to be more influential in collapsing some of the institutions and collective farming ventures in the South African smallholder farming sector.

Various authors (Ansell & Gash, 2008; Jordaan, 2012) have confirmed the importance of these indicators for the condition of participation in enabling participants to participate. Furthermore, this study has added to the existing body of literature on participation by providing the level of importance of these indicators in enhancing the participation of smallholder farmers in the agro-processing industries. Furthermore, it appears that in the South African smallholder farming sector, financial support, skills development and infrastructural support (i.e. resources) take priority over the knowledge of the participant, mutual trust, and linkages (Mmbengwa, 2009). Hence, there are limited regulatory frameworks that seek to provide direction regarding these latter factors.

Notably, collaboration amongst other stakeholders was found to have a reduction effect on the participation of these farmers. This seems to imply that a unit increase in collaborative activities amongst smallholder farmers and other stakeholders could disturb their growth and development. Surprisingly, leadership was found to play no role in the participation and the promotion of smallholder farmers in agro-processing industries. These results contrast with the existing theories of participation. For example, Ansell and Gash (2008) argue that the existing participation theory seems to suggest that leadership is instrumental in ensuring that the participants achieve their goals when led by leaders as facilitators. To explain the opinion of these farmers regarding this particular finding is quite challenging and complex. However, the results in question may seem to be indicative of a lack of visible leadership, and so the smallholder farmers tend to see no reason for leaders to become involved.

Moreover, these opinions of smallholder farmers may relate to political leadership, rather than the leadership from within their sector or from their members who could be elected as leaders. In this regard, it is entirely unclear whom the smallholder farmers are basing their reasons upon as to why leaders are not influencing their participation in agro-processing. The lack of agro-processing structures may also compound the problem, to the extent that the necessity for leadership may be questionable.

Table 2: Multiple regression analysis of the factors that influence levels of participation in agro-processing by smallholder farmers in Gauteng Province

Dependent Variables	Low participation			High participation		
	Model A β (SE)	Model B β (SE)	Model C β (SE)	Model A β (SE)	Model B β (SE)	Model C β (SE)
Inst Design	0.658*** (0.086)	0.328*** (0.096)	0.686*** (0.188)	0.601*** (0.092)	0.388*** (0.114)	0.965*** (0.219)
Condition participation		0.515*** (0.096)	0.583*** (0.123)		0.332*** (0.114)	0.541*** (0.143)
Collaboration			-0.524*** (0.225)			-0.792*** (0.261)
Leadership			0.146 (0.103)			0.032 (0.120)
Cons	0.24	0.000	0.000	0.000 (0.091)	0.000 (0.089)	0.000 (0.083)
RMSE	0.758	0.649	0.630	0.805	0.768	0.733
Observations (N)	78.000	78.000	78.000	78.000	78.000	78.000
F-Statistics	58.018	53.816	30.193	42.961	27.839	17.571
P-Value	0.000	0.000	0.000	0.000	0.000	0.000
R ²	0.433	0.589	0.623	0.361	0.426	0.491
Adj R ²	0.426	0.578	0.603	0.092	0.114	0.261
-hat	0.999	1.035	1.032	0.00	0.000	0.000
P-Value	0.000	0.000	0.000	0.992	0.099	0.127
-hat sq	-0.113	0.103	0.105	0.805	0.768	0.733
P-Value	0.426	0.399	0.358	78.000	78.000	78.000

Legend: *P<0.05, **P<0.01, ***P<0.001, β = coefficient of variation, SE = Standard error

5. IMPLICATIONS FOR EXTENSION SERVICES

For the National Development Plan (NDP), participation by smallholder farmers remains one of the primary vehicles that the government could utilise to reduce poverty, create jobs, and reduce inequality (NDP, 2013). Therefore, the participation of smallholder farmers in agro-processing has the potential to address the imperatives of the NDP, specifically in light of fostering economic development in the country. Its importance in ensuring sustainable agriculture is therefore of great significance (Botlhoko & Oladele, 2013).

Taking into account the numerical advantages of the smallholder farmers in South Africa and their strategic positions (Aliber & Hall, 2012), it could be deduced that including smallholder farmers into the mainstream agro-processing activities may provide some additive and comparative advantages to their farming enterprises in rural provinces. Therefore, legislative

processes to ensure that smallholder farmers participate in agro-processing industries in large numbers should be put in place and be timeously monitored and evaluated. Currently, very little is known about the participation of these farmers in this sector. Institutional designs and conditions for participation must be proposed to ensure that these farmers participate in large numbers. In order to enhance participation, extension services remain an essential mentorship programme. In the context of the findings of this study, extension services could be impactful, if the influential factors of agro-processing participation are integrated into the service level agreements or policies of extension, such that the consideration of these factors is not only legislated for, but form part and parcel of the extension delivery framework.

6. CONCLUSION AND RECOMMENDATIONS

This study aimed to evaluate the levels of participation of smallholder farmers in the agro-processing industries of Gauteng Province, to find out the implications of participation, or lack thereof, for the extension service. The study has successfully ascertained the factors that might positively and negatively affect the increase of participation by smallholder farmers in the agro-processing industries in Gauteng Province. The factors that positively influence the participation were found to be the institutional design and conditions for participation. These factors provide an essential challenge for the extension services since they relate to the creation of a unique institutional framework and implementation of comprehensive support programmes. In fostering these factors, the extension service should carefully design service provision protocols that should enhance resource mobilisation, knowledge transfer, trust building, and social and human capital within the context of the existence of different cultural and governance practices in the smallholder farming sector.

ACKNOWLEDGMENT

We wish to acknowledge the Gauteng Department of Agriculture and Rural Development (GDARD) and the National Agricultural Marketing Council (NAMC) for their support.

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**THE LAND SOLUTION: FARMERS AND OTHER ROLE PLAYERS
PERSPECTIVES OF REVIVING RURAL AREAS**

S.E. Terblanche

**THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS
PRODUCED.**

COORDINATION AND FACILITATION AS DRIVERS OF FOOD SECURITY AND FORMATION OF AGRICULTURAL ASSOCIATION AT CHRIS HANI DISTRICT, XOLOBE A/A, BENGU VILLAGE, EASTERN CAPE.

B.X. Mhletywa²⁵

ABSTRACT

The agrarian transformation of the department was realized through a designed cropping programme wherein the farmers made contribution in completing the department's support. Meetings were arranged by the group of (3) community members who committed themselves to champion/initiate the project, first meeting was held at Mbongiseni location and the second meeting was held at Bengu location where committees were formed in each village then the umbrella committee was formed and the project was established and was named Ethafeni Agricultural Association. The intention was to start something in the same year but the turn up was only 12 members who managed to contribute R1800.00 in our first submission around end of September. Method of data collection done based on the experience and observation in the sector through the rendering of services and programs from the source of discovery to the farming rural community. We have big dreams for engaging in agricultural activities as groups with improved house-hold gains economically, leading to changed health conditions of local inhabitants. The main aim of this paper is therefore to share the significant and impact of the efforts produced by the members in improving socio-economic status through maize production. Due to facilitation, coordination and formation associations in the process of promoting rural development and land reform with the aim of ensuring food security, through thick and thins in the grain commodity especially maize yielded good results so far since 2016.

Keywords: coordinate, facilitate, agricultural association, rural development, food security, norms and standards, extension services, maize production

List of Acronyms

ADM	Amathole District Municipality
ALM	Amahlathi Local Municipality
CHDM	Chris Hani District Municipality
DRDAR	Department of Rural Development and Agrarian Reform
EAA	Ethafeni Agricultural Association
Eso	Extension Suit Online
GSA	Grain South Africa
Ha	Hectares
IDP	Intergrated Development Plan
IYLM	Intsikayethu Yethu Local Municipality
Kg	Kilograms

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LAN	Lime Ammonium Nitrate
NDP	National Development Plan
SACNASP	South African Council for Natural and Scientific Profession
SASAE	South African Society for Agricultural Extension

1. INTRODUCTION

Coordination and facilitation are the main concepts used in the rural development and in the process of food security. Formation of agricultural and farmers association are also vital instruments. After the definition of the key concepts, background of the established association, part of the paper shall be an example of the Agricultural Association founded by the author from its formation up to the current status, the paper cover the literature review linked to the concepts of the topic, methodology, results and conclusion. Referencing quoting the relevant authors of quotations and citations that are directly related to the theme and the subtheme deemed to be relevant to the purpose and topic of the paper. Part of the paper shall be an example of the Agricultural Association founded by the author from its formation up to the current status.

Coordinate is to organize the different parts of an activity and the people involved in it so that it works well (Hornby, 2010). Coordination is the act of making parts of something, groups of people, work together in an efficient and organized way: the ability to control your movements well (Hornby, 2010). With a multiplicity of service providers, coordination is essential to ensure quality and adherence to minimum norms and standards. The provinces should coordinate (through a forum) the various types of service providers linking with the community institutions (e.g. local municipalities or farmer organizations) (Norms and standards, 2005).

Facilitate or facilitation is to make an action or a process possible or easier (Hornby, 2010)

Facilitator is a person who helps somebody do something more easily by discussing problems, giving advice rather than telling them what to do (Hornby, 2010)

The goal of setting norms and standards is to contribute towards achievement of the vision of 'a united and prosperous agricultural sector' by enabling participants and clients to acquire the necessary skills and technologies for efficient and productive farming. The norms and standards will also facilitate attainment of the Department's mission through:

- Improved access to agriculture support services (information, finance, inputs, regulatory services, technical expertise, markets, etc.) which will create an enabling environment for improved agricultural productivity;
- Endowing farmers with skills and knowledge for ensuring sustainable resource management;
- Facilitation of access to new technologies and awareness thereof;
- Enhancement of communication channels with farmers and farmer organizations, mentors and advisors (Norms and standards, 2005)

Driver is a software that controls the sending of data between a computer and a piece of equipment that is attached to it, such as printer; one of the main things that influence something or cause it to progress (Hornby, 2010).

Food security is the condition in which all people, all times, have physical social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Over the coming decades, a changing climate, growing global population, rising food prices and environmental stressors will have significant yet highly uncertain impacts on food security (Global Food Policy Report, 2015).

Agricultural association refers to a formal organization of people or groups of people whose primary goal is generally to promote the various segments of the agricultural sector. Furthermore defines as any nonprofit or cooperative association of farmers, growers, ranchers, incorporated or qualified under applicable state law which recruits, solicits, hires, employs, furnishes, of transports migrant or seasonal agricultural worker (Wills and More, 2016).

1.1. Example of Agricultural Association established and its formation Background

The Ethafeni Agricultural Association (EAA) was established in July 2014 after a group of champions attended a community meeting at Chief Ngcongolo's place, wherein the Department of Rural Development and Agrarian Reform (DRDAR from Stutterheim) presented its programmes. Meetings were arranged by the group of (3) community members who committed themselves to champion/initiate the project, first meeting was held at Mbongiseni location and the second meeting was held at Bengu location where committees were formed in each village then the umbrella committee was formed and the project was established and was named Ethafeni Agricultural Association including the documents required by the Department under Cropping program. The intention was to start something in the same year but the turn up was only 12 members who managed to contribute R1800.00 in our first submission around end of September. Meetings were convened by the interim committee in the two (2) of the seven (7) participating locations in the ward, Ward 3 of Intsika Yethu Local Municipality (IYLM) under Chris Hani District Municipality (CHDM). Before the local government elections on 03 August 2016, the area was under ward 12 of Amahlathi Local Municipality (ALM) which was under Amathole District Municipality.

All 2014 activities were preparation for great impact in the subsequent years in as far as maize production is concerned, for example, letters to the Headman and Chief asking for permission to use the unutilized land which is about 150 hectares; application letters for assistance were also submitted to ADM and DRDAR (Head Office and Stutterheim) in preparation for the 2015 ploughing season; and meetings held with DRDAR extension officer Mr Mgetyengana. Indeed, DRDAR acceded to our request for financial assistance (mechanization) in 2015, for 25 hectares. Regarding inputs, members raised R48 000.00 which could not take the whole 25 hectares. Total cost of inputs based on the production plan came to R156 410.00. (R160 000 round figure) ADM came in very handy by assisting us with the shortfall which was R120 000.

Members in the end of 2015 beginning 2016 had to rush fencing the entire area in, using the fence material which was donated by ADM in 2005. The donated fence material could not finish the total area but had to fundraise to fence it all. The 25 hectares were planted in 2015 but due to drought in the year and the other part of the area not fenced in, (since planting done whilst fencing was still in progress and also the time of the year which was end of November beginning of December, project members lost focus on the fencing activity and animal owners to control the animals, due to seasons rituals) we lost everything which germinated. Animals were caught, owners were made to pay for them and money collected was used to buy

additional fence material needed. On 25 December 2015, a meeting for members set after we realized that we lost all in the year. It was a very painful experience. The revived spirits from the meeting to continue with the project in the following year is what made EAA members to soldier on and prepare for 2016 planting season.

In 2016, 41 members joined EAA (where R77 900 was collected for input contribution *where R1900/ member*). DRDAR in Stutterheim committed to assisting us with 20 hectares (with mechanisation) and had to seek another potential sponsor for the other 21 hectares. The Mayor and Municipal Manager of IYLM listened to our cry of funding and responded positively by providing us with contractor for mechanisation. Strategically, we partnered with Grain South Africa (GSA) in 2016 to assist us with inputs.

In 2017, the number of members increased to sixty-seven (67) where 39 were old members contributed with R3300.00 with a total of R128 700.00 and 28 were new members contributed with R2260.00 with a total of R63 280.00 with the grand total amount of R191 980.00 from the farmer contribution. In June 14 of the same year, a farmers day was held (for the first time) wherein Councillor Vimbayo, the Executive Mayor of CHDM was the guest speaker. It was in this occasion that Cllr Vimbayo committed to assisting EAA with additional seventy-one (71) hectares in the next planting season. Indeed, IYLM honoured the commitment made by the executive mayor, partnered with GSA for 67 hectares and seventy-one 71 partnered with IYLM.

The 2017 harvest has made a meaningful impact in improving the lives of members and non-members who assisted during the harvest time.

During the year 2018 on the 14th June, a second farmer's day was held and IYLM Mayor recommitted to continue supporting the flagship project of the ward and municipality.

We intend to form a cooperative to strengthen the association. We conduct monthly meetings, with elected executive and constitution.

As the project members, we have been capacitated by GSA through an introductory course to maize production with certificates; crop production; diet and bean/soya bean production. We have big dreams for engaging in agricultural activities as groups with improved house-hold gains economically, leading to changed health conditions of local inhabitants.

With the close support from ward councillor, DRDAR in Tsomo & Cofimvaba, IYLM, CHDM, local people and GSA, we have a bright and sustained future.

2. PURPOSE

The main aim of this paper is therefore to share the significant and impact of the efforts produced by the members in improving socio-economic status through maize production including others as follows:

- To promote culture of coordination and facilitation in the field of extension.
- Grouping of farmers into association lead to better output of food production.
- To explore opportunities lies to SASAE to write and present scientific papers, SACNASP to gain points in publication of articles and promote use of Eso.

- To share potential experiences with the colleagues, management and other stakeholders.

3. LITERATURE REVIEW

Health care, food, water and social security –

- (1) Everyone has the right to have access to
 - (a) health care services, including productive health care;
 - (b) Sufficient food and water and
 - (c) social security including, if they are unable to support themselves and their dependents, appropriate social assistance (section 27, 1996).

There is high enthusiasm amongst our farmers in appreciation of the Agricultural Economic Transformation strategy adopted in 2017/18 financial year, with respect to food security, the province, with strategic partners supported farmers to plant 201 000 ha of maize over the term with a yield of 600 000 tons, this is against the target of 300 000 ha. A total of, 3 474 smallholder producers were supported with technical advice. The partnerships resulted in 691 jobs and placement of 28 unemployed agricultural graduates and 60 out of school youth into learnership programme. In pursuit of the freedom charter commitments to banish famine and land hunger; the state shall help the peasants with implements, seed, and fertilizer (Policy Speech 2018/19).

Land Reform Programme in South Africa – it is designed to redress the grave racial imbalance in land holding and to secure the rights of historically disadvantaged people. The three main pillars of the programme are land redistribution, tenure reform and land redistribution (Rural Development Strategy, 2010).

The DRDAR Mission is to promote, support and coordinate rural development and agrarian reform interventions to reduce poverty and underdevelopment through job creation, integrated food security programme and equitable participation in development by all rural communities (Service delivery charter, 2014).

The department is mandated to champion and coordinate rural development and to implement agrarian reform and food security programmes (Qoboshiyane, 2015).

The agrarian transformation of the department was realized through a designed cropping programme wherein the farmers made contribution in completing the department's support (Ngada, 2015).

In both the rural development strategy (2010) of the Eastern Cape and the National Development NDP "Vision 2030", agriculture is identified as a key driver for job creation, food security and sustainable economic development in these rural areas. These development strategies prioritize the development of smallholder production systems to achieve the greatest

impact on overcoming poverty and making full use of the natural agricultural resources potential (Strategic plan, 2014 – 2019)

Sustainable agriculture is a concept that is strived after. The requirements whereby agriculture must be practiced to be sustainable are as follows:

The biological productivity must be maintained and if possible increased.

The level of risk must be decreased to ensure larger security.

The quality of natural resources must be protected.

It must be economically viable.

It must be socially acceptable and accountable (Groenewald, 2012)

Agricultural Advisor Key Performance Areas

KPA 1: Create enabling environment for effective management of extension and advisory services

KPA 2: Facilitate extension and advisory services to improved equitable agricultural productivity for food security, economic growth and development

KPA 3: Promote sustainable rural communities through coordinating the provision of support programs for agriculture and rural development

KPA 4: Facilitate coordination with other stakeholders towards sustainable agricultural development

KPA: Facilitate the implementation of triangular approach (Farmer - Extension -Research)

The traditional approach to rural development and improving farm income in poor countries helps farmers move up the value chain by supporting forms of agro-processing, but in South Africa, a highly centralized, vertically integrated agro-processing sector already exists for staple foods: maize, wheat, sugar, sunflower oil, tea, flour, peanut butter, cigarettes, beer, fruit juices, canned goods, and so on (National Development Plan, 2011)

Field Crops and Horticultural Crops (basics of productive crop production)

1. Soil texture, depth, fertility, physical limitations and pH.
2. Slope – recommended slope ranges from 0-5%.
3. Water – source and quality.
4. Climate requirements – temperature (cool, warm, optimum), rainfall and humidity (reliability, distribution and intensity), frost (occurrences and sensitive crops), hail (occurrences, severity, frequency), drought (drought resistance crops), sunshine and day length, drainage, wind (direction, speed and protection).
5. Planting date (temperature, frost, availability of water)
6. Growth requirements (optimum temperature, availability of water and nutrients until harvest).
7. Yield potential (cultivar selection, plant population, weed, insects, diseases, nematodes, correct fertilization).
8. Harvesting and storage (crops mature at different times, timing of harvest, safe storage, market requirements).
9. Yield target (determine achieved or not).
10. Marketing (market existence, market requirements, consumer preference)

(Silwana, 2011)

Given the diversity of our country, the Norms and Standards therefore recognizes different approaches to organize, plan and implement the advisory services as the situation may demand, but conforming to the national Norms and Standards. The planning at district and local municipalities need to be aligned with the Integrated Development Planning (IDPs).

Accessibility of information and knowledge support to all clients and staff is given priority. The advisory services will take advantage of technological facilities like Gateway and internet and Community Centers to make information available to clients. As part of ensuring knowledge support and transfer, a mentorship programme for land and agrarian reform beneficiaries is recommended for implementation in the provinces. The delivery of advisory support is highly depended on human resource capacity and finance. There is an urgent need to improve the human resource in terms of competence and skills and qualifications to render high quality service to our clients. The upgrading of competence and skills programmes must be designed based on needs assessment. The extension officers are encouraged to become professionals and experts in their fields and rewarded accordingly for excellent performance (Norms and Standards, 2005).

4. METHODS OR DATA SOURCES (reasoning used in theoretical / philosophical papers)

This idea came when the author found to be purchasing 50 kg maize in 2014 May by R220.00. The asked myself we have land lying, net wire, poles, potential human capital, potential climate, potential natural resources, then the only thing left was to facilitate the coordination of the available resources to become something that would be beneficial to our livelihood. Thereby these resources were combined and achieved the common goal of having maize project that process maize with the help of the departmental vision and program cropping, traditional leadership, extension officer, people who share the same vision as initially admired by the initiator, community general, community based organization, state organs available in the surrounding villages of Xolobe Administrative Area.

Method of data collection done based on the experience and observation in the sector through the rendering of services and programs from the source of discovery to the farming rural community. Also based in the involvement through meetings, interviews, on the agricultural association managed to be championed by the author also the fact that the nature of work allows one to be creative, observant and enthusiastic about development.

5. RESULTS

The aim of forming Ethafeni Agricultural association through coordination and facilitation was to yield results, to harvest maize and take the produce to our household. During the year 2016/17 and 2017/18, we managed to plant 41 and 67 hectares respectively where every farmer shelled more than 80 bags of 50 kg bags, where the portion of maize was used for animal feed, human consumption, and marketing to local surrounding villages at an average price of R150.00. Some farmers confirmed publicly that with the income received, managed to buy household basic items, purchased school uniform, purchase cattle, purchase sheep. During

2017/18 production season there was an addition of 41 ha planted by municipalities with full free package of inputs and mechanization.

In the current season 2018/19, planned to plant 60 ha ready with everything, due to drought, inputs had to be kept, farmers agreed to postpone planned operations due to hardening of soil, because there was no enough rain until mid-January 2019, good rain came on the second day of February. Only 60 ha planted this year by municipality.

Through partnership with Grain South Africa the association received training during 2017 where certificates of attendance were issued. We had farmers day in 2017 and 2018 on the 14th day of June both years to celebrate the success and continuity of our project with the results yielded that's far. Our project was represented at NAMPO Grain SA in 2017 at Free State. In addition to the success of our association is the impact on job creation created seasonal since its existence in 2014 where we employed a caretaker to our fields with an amount of R750.00 per month, hiring of labor to load and offload inputs like Lime, fertilizer, seed, assist in harvesting and LAN local tractors and trucks to transport produce. Livestock received additional fodder during winter months from left over after harvest like maize stove and grass remain from the arable fenced land benefited livestock which improved their production and long lasting period of grazing than the case before as it was continuous grazing. Farmers and community members are appreciative and support the project.

Due to facilitation, coordination and formation associations in the process of promoting rural development and land reform with the aim of ensuring food security, through thick and thins in the grain commodity especially maize yielded good results so far since 2016.

6. CONCLUSION AND EXTENSION IMPLICATIONS

Due to facilitation, coordination and formation associations in the process of promoting rural development and land reform with the aim of ensuring food security, through thick and thins in the grain commodity especially maize yielded good results so far since 2016.

Grain production has got a bright future and still relevant in the current state of the country's present and future security of food and land reform.

Our country's adopted and governing constitution states clearly that everyone has a right to have enough food, also freedom charter reflect that the land shall be shared among who work it. These pillars of our nation are still relevant even today since their existence.

Challenge that are currently experienced by the association is the fact that farmers do not attend meetings consistently, do not come to fields during operations, lack of capital, difficult to get water for spray, access road.

It is highly recommended to government to strengthen work force to ensure that arable land get utilized and try strategies to change mindset of the communities to assist one another in formulating the similar projects and association and the issue of inequality, unemployment and poverty will be hugely reduced. To the colleagues in the entire country, there is no other

profession or professional except agricultural advisors or extension officers who can contribute in the process of persuading farmers through adoption processes to produce food and reform our land because agriculture has got no alternative, this is a challenge going forward as the agents of change, catalyst, foot soldiers, face of the department against commercial and private sector in the process of reducing unemployment, poverty and inequality considering vision 2030 and sustainable development goals.

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BENEFITS AND CHALLENGES OF MAGUGA DAM RESETTLEMENT SCHEME TO DISPLACED PEOPLE IN HHOHHO REGION OF ESWATINI

A.A. Jibowo²⁶ and M.A.A. Mncina²⁷

ABSTRACT

Land development features land redistribution, construction of dams, land resettlement of displaced persons, as well as improvement of land fertility status through measures such as planting of grasses, herbs and trees. These features often result in benefits and encounter challenges. The purpose of this study was to identify the benefits derived from, and challenges encountered in the Maguga Dam resettlement scheme in Hhohho Region of Eswatini. Out of the 66 family members who were relocated, 58 took part in the study by providing data through interviews conducted using an interview schedule. A six-point Likert-type scale was used to measure the benefits, challenges and attitudes of the people to the new place of settlement. The benefits derived from the resettlement scheme included assistance in building new houses (100%) and provision of fertile land (100%). Over 90% benefitted from increased visits by extension agents, and formation of associations. The majority of the respondents (86.2%) indicated that compensation was adequate. Some challenges faced by most of the displaced people were poor water supply (91.4%), inadequate crop storage facilities (96.6%), inadequate farm inputs (94.8%), theft (98.3%), crop pests (96.6%), and transport facilities (100%). The majority (80.54%) had positive attitudes towards the new place of settlement. Some socio-economic characteristics had moderate and low associations with benefits derived from the resettlement scheme. In conclusion, many benefits and few challenges were experienced in the resettlement scheme. It was recommended that extension agents should intensify their contact with farmers to remove farming challenges such as inadequate farm inputs, storage facilities and access to markets.

Keywords: Attitude, Benefits, Challenges, Dam, Resettlement scheme

1. INTRODUCTION

1.1 Background situation

Swaziland was renamed Eswatini in 2018. The development programmes before the re-naming of the country continued. One of the projects was the establishment of the Maguga Dam which involved displacement of 124 homesteads from the Ekuvinjelweni Traditional Authority in Hhohho Region (Komati Basin Water Authority (KOBWA), 2002). There were three resettlement options, namely (i) resettlement to a designated host area and an in-kind compensation; (ii) local relocation within the displaced homestead's chiefdom and in-kind compensation; and (iii) free choice resettlement to an area identified by the displaced homestead and cash compensation. A land area located approximately 20 km downstream of the dam wall on the southern bank of the Komati River was identified for resettlement after an investigation was carried out for its suitability. Representatives of the proposed re-settlers visited the site and agreed that it was suitable for resettlement. Their major consideration was

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that the site had adequate and suitable land area for crop farming and rearing of livestock (KOBWA, 1996).

1.2 Benefits and challenges of constructed dams

Benefits that are derived by the local communities as a result of dam construction include increased generation of funds from irrigated land and tourism, increased infrastructural development which accompanies the project such as road and house construction, water supply and sanitation, provision of health clinics and sports facilities, and increased job skills imparted through the project (Government of Swaziland (GoS), 2008). Other benefits include increased income, electricity supply, fuel wood and timber, and fodder for livestock. The productivity of the land will increase significantly; water supply will also increase for irrigation, industries, human and animal consumption (KOBWA, 2002).

Construction of dams also results in a number of challenges. People who have settled in a place for decades are forced to move away. In addition, the shock of resettlement takes some time to disappear. Resources which have been accumulated over the years are destroyed or disrupted. Houses and farmlands are flooded. Permanent crops such as mangos, and perennial crops such as bananas are damaged. The land with grasses is no more suitable for livestock grazing because grasses have been submerged by water. According to Manyatsi (2005), dam issues are not confined to design, construction and operation alone, they also include social, environmental and political choices with consequent benefits and challenges to the people.

Since the construction of the Maguga Dam, no systematic study was identified by the authors on the benefits derived and challenges encountered by the resettled people displaced from the dam area. This study was conducted to fill this gap.

1.3 Objectives of the study

The objectives of the study were to:

1. Identify the benefits derived from the Maguga Dam resettlement scheme;
2. Describe the challenges encountered by the displaced people as a result of resettlement;
3. Identify the problems of socio-economic adjustment encountered by the resettled people; and
4. Assess the attitude of respondents to their new environment where they were resettled.

1.4 Hypotheses of the study

Null Hypothesis: There is no association between personal and socio-economic characteristics of resettled people and benefits derived from the resettlement scheme.

Alternative Hypothesis: There is an association between personal and socio-economic characteristics of resettled people and benefits derived from the resettlement scheme.

2. METHODOLOGY

2.1 Population and sample

The target population consists of the household heads who were resettled as a result of displacement from their settlements as a result of Maguga Dam construction. Purposive sampling was used to select the respondents for this study. Out of 124 households displaced by

the dam construction, 66 were relocated to the designated host area. All 58 heads of households and their representatives who were available in the host community during the period of the study were included in the study. The sample included 17 respondents from Ngonini, 17 from Emtototshe, 15 from Ekwakheni, and nine from Emganwini.

2.2 Instrumentation

An interview schedule was constructed to measure the different objectives of the study. A 6-point Likert-type scale was used to measure the variables. Benefits derived from the resettlement scheme was measured by the levels of agreement as 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, and 6 = Strongly Agree to each benefit listed. Similarly, respondents were asked to indicate their levels of agreement to challenges and socio-economic adjustment problems faced as a result of resettlement from the list of challenges and problems provided in the interview schedule. Attitudes of respondents to their new environments were also measured by their levels of agreement to positive attitude statements towards the places in which they were resettled.

2.3 Reliability, validity and ethical considerations

Reliability of the instrument was established by asking 30 farmers who experienced resettlement after displacement by another dam construction to complete the interview schedule. Test-retest method (Van Dalen & Meyer, 1966) was used to calculate the reliability coefficient of 0.75, which indicated that the instrument was reliable. Content validity of the instrument was determined by asking two lecturers from the University of Eswatini who were familiar with the problem of the study, as well as an Extension Agent who was familiar with the problem, to complete the interview schedule and suggest amendments. Their suggested amendments were incorporated into the instrument. Face validity was ensured by using an appropriate cover of one of the resettled communities for the questionnaire. Unambiguous and understandable expressions were also used. Ethical consideration was facilitated by not requiring respondents to disclose their identities. According to Creswell (2009), researchers need to protect their research participants, earn their trust by ensuring that the information will not be used against the participants, promote integrity, and guide against misconduct.

2.4 Data collection and data analysis

The researcher and a trained enumerator collected the data by interviewing 58 resettled respondents through the use of the valid and reliable interview schedule to collect quantitative data. Qualitative data were also collected by writing down observations and relevant information not requested in the interview schedule in field notebooks. Data analysis was carried out by using the Statistical Package for Social Sciences, version 20. Means, standard deviations, frequencies and percentages were generated to describe the data. Correlation analysis was carried out to test the hypotheses.

3. RESULTS AND DISCUSSION

This section presents the analysis, description and discussion of data for the study. Specifically, it covers benefits derived from the resettlement scheme, challenges and adjustment problems encountered as a result of the resettlement, attitude towards the new places to which they were resettled, and association between personal and socio-economic characteristics and economic benefits derived from the resettlement scheme.

3.1 Benefits derived from the resettlement scheme

Figure 1 indicates that most of the respondents derived many benefits from the resettlement scheme. All the respondents (100%) agreed that assistance on new house building, provision of fertile land, and provision of electricity were benefits. Over 90% agreed that formation of associations and increased visits by extension agents were benefits. Other benefits derived by the majority of the respondents included improvement in education, assistance in citrus farms (60%), employment creation, and easy access to water supply. Over 90% disagreed that landless people were allocated lands, and receiving assistance in establishing new sugarcane farms. Over 70% did not agree on the provision of roads. Few respondents disagreed that the other benefits were derived.

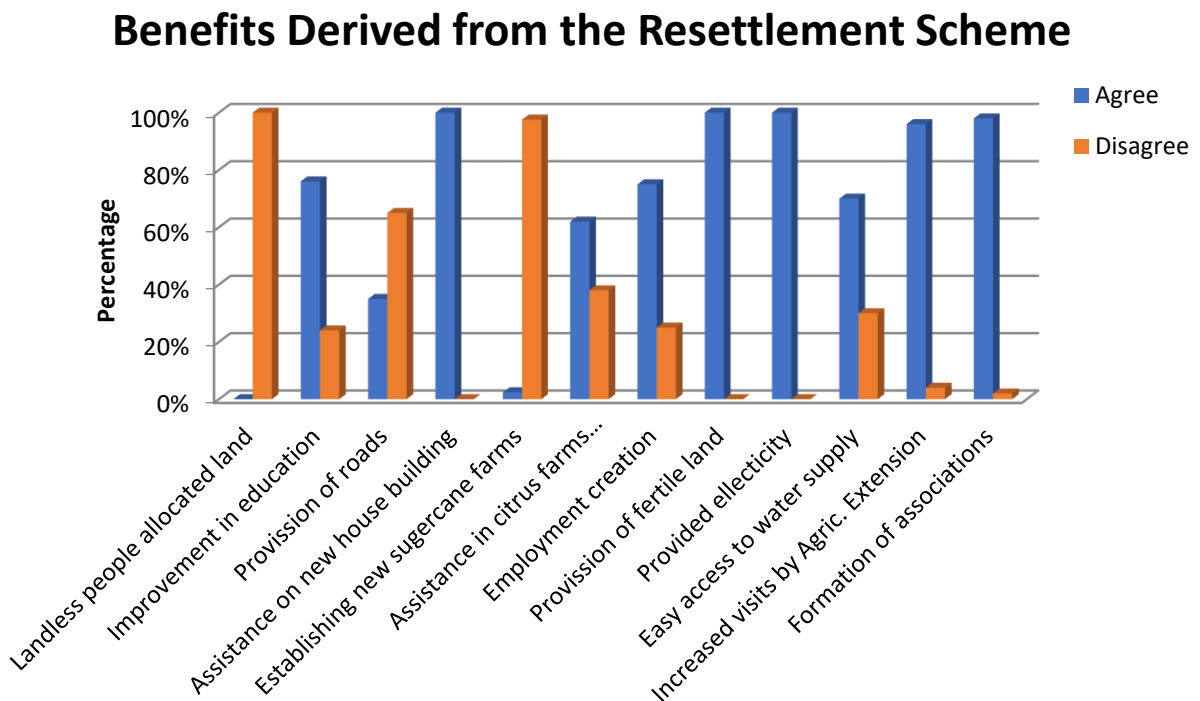


Figure 1: Benefits derived from the Maguga Dam resettlement scheme

3.2 Adequacy of compensation

Figure 2 shows that the majority of respondents (86.2%) indicated that the compensations paid for improvements on the land from which respondents were displaced such as houses and crops were adequate. A few of the respondents (13.8%) indicated that the compensations they received were not adequate. The respondents were therefore adequately compensated for the losses they sustained as a result of the resettlement scheme.

Compensation

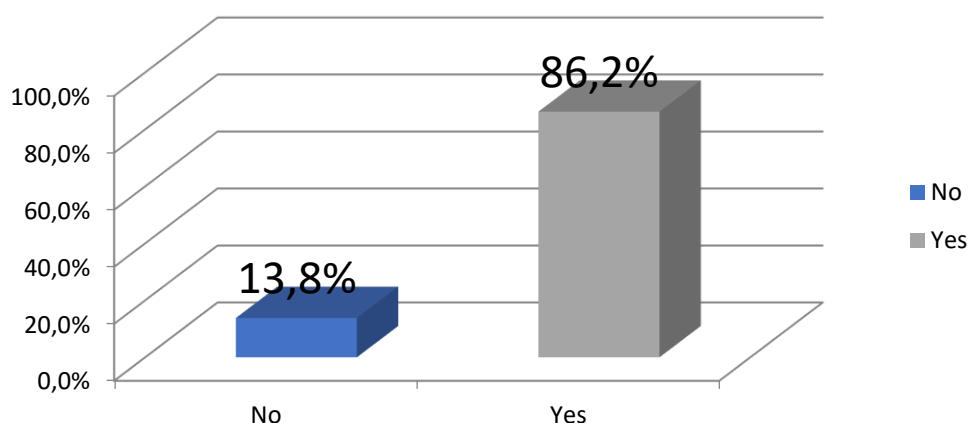


Figure 2: Adequacy of compensations received by respondents

3.3 Problems of socio-economic adjustment encountered

Data in Table 1 indicates that the majority of the respondents did not encounter problems of socio-economic adjustment in their new places of resettlement. The only problem mentioned by 50% of the respondents was far distance to school. The majority of the respondents did not encounter problems with visiting family members (94.8%), distance from Rural Development Area offices (75.9%), availability of recreational facilities (75.9%), visiting neighbours (74.1%), membership of social clubs (61.3%), visiting friends (60.3%), and nearness to church (55.2%).

Table 1: Problems encountered in adjusting to the new environment (n=58)

Problems	Yes (%)	No (%)
Visiting friends	39.7	60.3
Visiting family members	5.2	94.8
Visiting neighbours	25.9	74.1
Nearness to church	44.8	55.2
Nearness to school	50.0	50.0
Nearness to RDA	24.1	75.9
Availability of recreational facilities	24.1	75.9
Membership of social clubs	39.7	61.3

3.4 Challenges encountered by the displaced people as a result of resettlement

Data in Table 2 shows that the majority of the respondents agreed that they encountered five (29.4%) out of the 16 challenges indicated. Most of the respondents (70.6%) did not encounter many of the challenges. The challenges encountered were increased morbidity (100%), theft (98.3%), pest infestation of crops (96.6%), shortage of storage facilities (96.6%), and shortage of farm inputs like seeds (94.8%). It was observed that the challenges faced by the respondents in the places of resettlement were few. It is necessary to assist the respondents in removing the challenges by providing adequate medical facilities, security of lives and properties, controlling

crop pests, providing needed farm inputs at subsidised rates, and storage facilities for farm products.

Table 2: Challenges faced by resettled people (n=58)

Statement	Agree (%)	Disagree (%)
Inadequate farm land	25.9	74.1
Infertile soil	30.2	69.8
Cultivation	22.4	77.6
Storage facility	96.6	3.4
Inputs like seeds	94.8	5.2
Bad climatic condition	0	100
Theft	98.3	1.7
Jealousy from other people	41.3	58.7
Natural disaster	1.7	98.3
Pests	96.6	3.4
Disease outbreaks	27.6	72.4
Storage losses	0	100
Loss of livelihood	31	69
Increased morbidity	100	0
Access to market	35	65
Transport to town	0	100
Mean	43.8	56.2

3.5 Attitudes of respondents towards the new environment into which they were resettled

Data in Table 3 shows that the majority of the respondents had positive attitudes towards the resettled environment. This is because an average of 80.5% agreed to the 10 positive attitude statements to each of which they were required to indicate their level of agreement. Only some respondents with a mean percentage of 19.5% who disagreed, had negative attitudes. The notable positive attitudes were reflected in agreement by all (100%) respondents to three of the statements including “life is relatively pleasant”, “farmers are regularly visited by change agents”, and “the settlement is a good place to live in”. The only statement to which the majority of respondents (56.9%) disagreed was “people trust one another”. If most of the people do not trust one another, yet it is easy to get along with other settlers (69%), it may be because it does not take long to get over feeling bad (72.4%). Regardless of the preceding explanation, it is necessary to find out causes of lack of trust among the people, and introduce measures to bring about improvement in trust.

Table 3: Attitudes of respondents towards the resettled area (n=58)

Statements	Agree (%)	Disagree (%)
Any man prepared to work hard can get a good living	98.3	1.7
Times are getting better	75.9	24.1
Life is relatively pleasant	100	0
People trust one another	43.1	56.9
It is easy to get along with other settlers	69	31

Farmers are visited by change agents	100	0.0
Does not take long to get over feeling bad	72.4	27.6
I prefer staying in the resettlement area	86	14
Life is relatively safe	60.7	39.7
The settlement is a good place to live in	100	0.

3.6 Demographic characteristics of respondents

Data in Table 4 portrays the demographic characteristics of respondents.

Headship of households: The majority of respondents (83%) were heads of households; few (17%) were not heads of households. This was because house-heads were deliberately selected for the study. Those who were not heads were included where the heads were not available during the entire period of the study.

Sex: About three quarters of the respondents (74%) were male, while 26% were female. This result is consistent with the universal culture that most households are headed by males.

Age: The majority of participants (55.2%) were between 30 and 49 years of age, with a mean age of 43.7 years. The resettled people were therefore middle-aged and strong enough to take an active part in agricultural and other development programmes in the areas.

Marital status: About three quarters of the respondents (75.9%) were married, 10.3% were single, and the remaining few were widowed (8.6%), divorced (3.5%) and separated (1.7%). It should be noted that the occurrences of divorce and separation were very few in rural areas, hence the respondents still observe the culture of marital stability. This finding is contrary to the impression that marital stability is disappearing in Eswatini. It is necessary to find out percentages of divorce and separation in urban marriages.

Highest formal education: Most of the respondents (93.1%) had formal education; only 6.9% had no formal education. Out of those who had formal education, 37.9% had high school education, 19% had secondary school education, and 12.1% had vocational training. It was gratifying that 24.1% had tertiary education. The respondents were therefore perceived to be well educated.

Occupation: About a quarter of the respondents (25.9%) were full-time farmers. Furthermore, 8.6% were part-time farmers while 20.7% were farm workers. The remaining respondents (44.8%) were made up of civil servants (32.8%) and those who were employed in the private sector (12%).

Table 4: Demographic characteristics of respondents (n = 58)

Headship of households	Frequency	Percent (%)
Head of household	48	83
Not head of household	10	17
Total	58	100
Sex	Frequency	Percent (%)
Male	43	74

Female	15	26
Total	58	100
Age (Years)	Frequency	Percent (%)
20-29	8	13.8
30-39	12	20.7
40-49	20	34.5
50-59	10	17.2
Above 60	8	13.8
Mean = 43.2 years		
Total	58	100
Marital status	Frequency	Percent (%)
Single	6	10.3
Married	44	75.9
Divorced	2	3.5
Widowed	5	8.6
Separated	1	7.1
Total	58	100
Highest education	Frequency	Percent (%)
No formal education	4	6.9
Vocational education	7	12.1
Secondary school	11	19
High school	22	37.9
Tertiary education	14	24.1
Total	58	100
Occupational status	Frequency	Percent (%)
Full-time farmer	15	25.9
Farm worker	12	20.7
Part-time farmer	5	8.6
Private sector	7	12
Civil servant	19	32.8
Total	58	100

3.7 Testing of hypotheses

The null hypothesis that there was no association between demographic characteristics and benefits derived from the resettlement scheme was tested against the alternative hypothesis that there was an association. Table 5 contains the Davis (1992) scale of descriptors which was used to interpret the findings of the correlation analysis.

Table 5: Davis scale of descriptors

Correlation Coefficient (r)	Description
1.0	Perfect association
0.70 to 0.99	Very high association
0.50 to 0.69	Substantial association
0.30 to 0.49	Moderate association
0.10 to 0.29	Low association
0.01 to 0.09	Negligible association

Data in Table 6 shows a moderately positive association ($r = 0.341$) between farming experience in years and benefits derived from the resettlement scheme. This means that the greater the years of farming experience of respondents, the more the benefits derived from the resettlement scheme. This is consistent with expectation since respondents with many years in farming must have acquired enough resources and experiences to apply in using the resources provided through the scheme. However, the association between sex and benefits shows a moderately negative association ($r = -0.384$). This means that males derived less benefits from the scheme than females. This is contrary to expectation as there were more males in the scheme than females. It is possible that females were more efficient users of the benefits. A future study should provide concrete reasons for this finding. The associations between the other demographic characteristics studied and benefits were low and largely negligible.

Table 6: Inter-correlations among selected demographic characteristics and benefits derived from the scheme (n = 58)

	Y	X ¹	X ²	X ³	X ⁴	X ⁵	X ⁶	X ⁷	X ⁸	X ⁹
Y	1.00									
X ¹	-.103	1.00								
X ²	-.384	-.311	1.00							
X ³	-.199	.137	-.159	1.00						
X ⁴	-.092	-.236	.256	-.036	1.00					
X ⁵	.082	-.053	.006	.145	-.084	1.00				
X ⁶	-.031	.141	-.073	-.264	.128	-.307	1.00			
X ⁷	-.047	.287	.119	-.120	-.099	-.120	.117	1.00		
X ⁸	.341	-.149	.413	-.345	.123	-.016	-.203	.359	1.00	
X ⁹	.006	-.068	-.032	-.015	.217	.029	.197	.238	.133	1.00

Dependent variable: Y = Allocation of land, improvement in educational facilities, provision of external markets, provision of road system, construction of new house, establishment of sugarcane farms, establishment of citrus farms, provision of fertile farming land, construction of modern houses, provision of electricity, access to water supply, increased visits by officers, and formation of associations. (Nominal: 1 = *Strongly Disagree (SD)*, 2 = *Disagree (D)*, 3 = *Slightly Disagree (SLD)*, 4 = *Slightly Agree (SLA)*, 5 = *Agree (A)*, 6 = *Strongly Agree (SA)*).

Independent variable: x¹ = Household headship (Nominal: 0 head, 1=not head); x² = Gender (Nominal: 0 = female, 1 = male); x³ = Age (Interval: 1 = 20-29 years, 2 = 30-39 years, 3 = 40-49 years, 4 = 50-59 years, 5 = 60 years and above); x⁴ = Annual income (Ordinal: 1 = 10 000-19 000, 2 = 20 000-29 000, 3 = 30 000-39 000, 4 = 40 000-49 000, 5 = 50 000-59 000, 6 = 60

000 and above); x^5 = Marital status (Nominal: 1 = Single, 2 = Married, 3 = Divorced, 4 = Widowed, 5 = Separated); x^6 = Level of education (Ordinal: 1 = No formal schooling, 2 = Vocational, 3 = Primary, 4 = Junior certificate, 5 = O'level, 6 = Tertiary); x^7 = Occupational status (Nominal: 1 = Full-time farmer, 2 = Part-time farmer, 3 = Farm worker, 4 = Private sector employee, 5 = Civil servant); x^8 = Farming experience (Nominal); x^9 = Household size (Nominal).

4. CONCLUSIONS

Based on the objectives and findings of the study, the following conclusions were made:

- Resettled people derived many benefits from the resettlement scheme. These included assistance on new house building, provision of fertile land, provision of electricity, increased visits by extension agents and formation of development associations. Compensations received for the resources lost as a result of the dam construction were adequate.
- Resettled people encountered many challenges in their new settlement. These challenges included increased morbidity (death), theft, pest infestation, inadequate storage facilities, shortage of inputs like seeds, and poor water supply.
- Far distance of school to the resettled area was the only problem of socio-economic adjustment experienced by the respondents.
- Resettled people had positive attitudes towards their new environment. They agreed that the new settlement is a good place to live in. Any person who is prepared to work hard can get a good living in the new area, thus they preferred staying in the resettled area. However, they did not trust one another.
- The majority of the resettled respondents were heads of households, males aged 30-49 years, married, with high school and tertiary education, engaged in civil service and farming.
- Adequate compensations had been received by the resettled people for properties lost as a result of the resettlement.
- A moderately positive association was obtained between farming experience in years and benefits derived from the resettlement scheme. Hence, as the years of farming experience of the respondents increased, the benefits they derived from the resettlement scheme increased. Furthermore, sex and benefits showed a moderately negative association. The associations between the other demographic characteristics studied and benefits were low and largely negligible.

5. RECOMMENDATIONS

The following recommendations can be put forward:

- Management of the resettlement scheme should focus on sustainability and improvement of the many benefits derived from the resettlement scheme by the resettled people including increased education, housing, employment creation, visits by agricultural extension agents, and provision of electricity.
- Agricultural extension should assist farmers to benefit more from establishment of sugarcane and citrus farms. Farmers should be assisted to have adequate storage facilities, farm inputs like improved seeds and fertilizers. They should also be assisted to control crops and livestock pests.
- Resettled people should be assisted to have improved security of life and properties as well as farm resources. They should have improved access to social services like medical facilities and schools in their settlement area.

- Programmes should be put in place in the resettled areas to increase trust among the people. This can be through improved security, formation of associations that should meet regularly and other means of increased positive social and economic interactions.

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THE FINANCIAL AND EXTENSION IMPLICATIONS OF A 30% LAND REDISTRIBUTION TARGET FOR ONE KAROO COMMUNITY

B. Conradie²⁸

ABSTRACT

This study evaluates the new “National Policy on Comprehensive Producer Development Support” (May 2018 www.daffweb3.gov.za) and some ideas on how to implement redistribution in a district where a land register was easy to develop. Farmland sells for R1188 per hectare while lifestyle land can be three times more due to inappropriate investment. All farmers in the district are smallholders according to DAFF’s definition, despite size and income varying by a factor of four. Three redistribution scenarios are investigated: 1) proportional distribution, 2) redistribution that targets 30% large bona fide farms and 3) redistribution that targets 50% of lifestyle farms. Scenario 1 empowers the largest number of beneficiaries while scenario 2 redistributes land at the lost cost per beneficiary, but if lifestyle land can be secured at the same price as bona fide farmland, scenario 3 becomes the dominant strategy. The total cost of redistribution will be less than R400 million. The government has committed to about R100 million. More than 60% of the target can be filled from land that has already been redistributed or is earmarked for redistribution, land that is rented out or for sale and land that is deemed to have a low reservation price. Banks will have to build a book of potential investors, the local land committee will have to appoint a dedicated land buyer to initiate negotiation and producer organisations will have to enter into PPPs with the Department’s FSD programme to embed the thirty or so new farmers into the wool and red meat supply chains to protect the region’s prior investment in agriculture and achieve meaningful transformation of the sector.

Keywords: land reform, lifestyle farming, land use, cost of settlement

1. INTRODUCTION

South Africa’s land debate is mostly argued on principles with specifics often woefully lacking. This fuels uncertainty in the farming community and obfuscates practical problems with and gaps in the plans. Even Lyne’s (2014) recent review of twenty years of lived land reform experience goes no further than just echoing earlier conceptual designs like those put forward in Kirsten and Van Zyl (1999) during the great push forward to get land reform started in the new South Africa. Refreshingly the Department of Agriculture, Fisheries and Forestry’s “National Policy on Comprehensive Producer Development Support” seems like a genuine attempt to be practical and proactive. Recently Vink and Kirsten (2019) engaged with this document to put forward their own set of practical guidelines on how to get the job done. Both plans make a nod to Pringle’s (2013) observation that agriculture is hugely diverse without

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putting forward specific examples of how their plans would work out in different production contexts.

The essential elements of the two plans are that a comprehensive register of land ownership should be compiled, recipient farms should cover a spectrum of sizes and must be subsidized to a degree but must also have bankable farm plans. Both envisage ongoing support for land recipients over a period of up to five years, provided by means of public-private partnerships. The Vink-Kirsten model envisions sourcing land through a combination of donations, sales, forced sales and expropriation, while DAFF clearly feels that land acquisition is outside of their mandate, which of course implies expropriation. Neither plan really creates the impression that the 30% target is manageable over the short to medium term.

This paper is an attempt to provide a practical example to reveal the strengths and weaknesses of the current plan. It describes the process and costs of compiling a land register, presents the distribution of typical farms in the district, discusses three main and one ancillary redistribution scenarios and price these out both in terms of capital requirements and likely returns.

2. METHODS

The analytical approach was descriptive and textual. It reconciled the historical data in the farm census with GIS sources such as Cape Farm Mapper 2.1.2.2 (gis.elsenburg.com/apps/cfm/#) to develop a land use register for Laingsburg district in the Central Karoo of the Western Cape. The process was informed by survey data and field notes compiled for the Karoo Management Survey, a four-wave panel study of sheep farming in the area that was conducted in the period 2012-2016. The Karoo Management Survey collected financial and production records (Conradie and Landman, 2015; Conradie and Piesse, 2015) and attitudinal data (Conradie and Natrass, 2017; Conradie and Piesse, 2016; Natrass and Conradie, 2018) from forty farms that cover an area of 3640 km². Field notes confirmed by Cape Farm Mapper added the number and sizes of a further 50% to bring the total known land use to 5682 km², or 81% of the 7044 km² remaining farmland in the district.

Three redistribution scenarios were considered of which the first was 30% proportional redistribution that maintains the current size distribution and bona fide-lifestyle division. All lifestyle farms to be redistributed was treated as if they would be converted back into bona fide farming. Scenario 2 involved a 30% targeting of large-scale bona fide farms (>15000 ha) The remaining land to be redistributed followed the same process as scenario 1. Scenario 3 also departed from proportional redistribution, this time by targeting half of lifestyle holdings for redistribution, with the balance assigned to bona fide farms.

To arrive at reference models for each scenario, the calculation applied a specific target to the total amount of land in each category. Total area divided by average farm size according to the register gave the number of target farms in each land use class. The appropriate stocking density from the Karoo Management Survey applied to the average farm size, gave flock size, which was valued at R1200 per breeding ewe. Land was valued at the average sales price recorded in

the period since 2013 (R1188 /ha in constant 2015 prices) for bona fide farms and R3050 per hectare for lifestyle farms. The latter is a current spot price in constant 2015 prices for a game-fenced property and the difference covers about 75% of the fence's construction cost. The cost of fence maintenance and repairs was based on the real cost of large public works project on bona fide farms (Nattrass et al., 2015) of R15.21/ha. Per-hectare turnover and net farm income figures were taken from the Karoo Management Survey and productive value was calculated at a real discount rate of 3%, which assumes political stability and minimal negative climate change impacts.

3. RESULTS

This section begins with a description of the production context in agri-ecological and historical productivity terms. This includes unit costs and revenues. The register is presented in subsection 2 and subsection 3 describes how the land to meet these targets could be sourced and how new beneficiaries could be embedded into the existing value chain.

3.1 THE REDISTRIBUTION CONTEXT

Topography, rainfall, vegetation and grazing

Laingsburg district covers an area of 7753 km² in and to the north of the *Swartberg* Mountains (lat -33.187787, lon 20.849450). The escarpment forms its north-western boundary and the *Dwyka* River its eastern boundary. The *Dwyka* River joins the *Gamka* River near the village of Prince Albert and cuts through the *Swartberg* Mountains via *Gamkaspoot*. The other large ephemeral river system, the *Buffels* River passes through Laingsburg village and flows through the *Swartberg* Mountains via *Vleiland*, a small irrigation settlement in the mountains. Small scale irrigation from groundwater is found around Merweville, Laingsburg and at *Vleiland* in the *Swartberg*. The *Vleiland* area produces almost not livestock.

Grazing conditions are summarised in the plant biome map in Figure 1. In the west Fynbos intrudes into the Succulent Karoo biome which transitions into the Nama Karoo biome along the *Buffels* River, considered to be the boundary between winter and summer rainfall areas. Fynbos only occurs in high rainfall areas (>300 mm), but has a low grazing value, while Nama Karoo vegetation supports livestock at a density of 39 hectares per large stock unit (ha/LSU) on precipitation of as little as 120 mm per year. The performance of Succulent Karoo vegetation is intermediate to these two, due to lower palatability and a higher prevalence of poisonous plants. The area in the immediate vicinity of Laingsburg villages, whose rainfall record indicates an expected rainfall of 112 mm per year with a coefficient of variation of 46% over the period since 1913, has an official carrying capacity of 39 ha/LSU. Temperatures vary with elevation, daily maximums from 12-22°C at higher elevations to 18-35°C in the lowlands. The mountains are not suitable for grazing because they are steep and covered in fynbos which also persists in refuges along the escarpment whose carrying capacity is equally low.

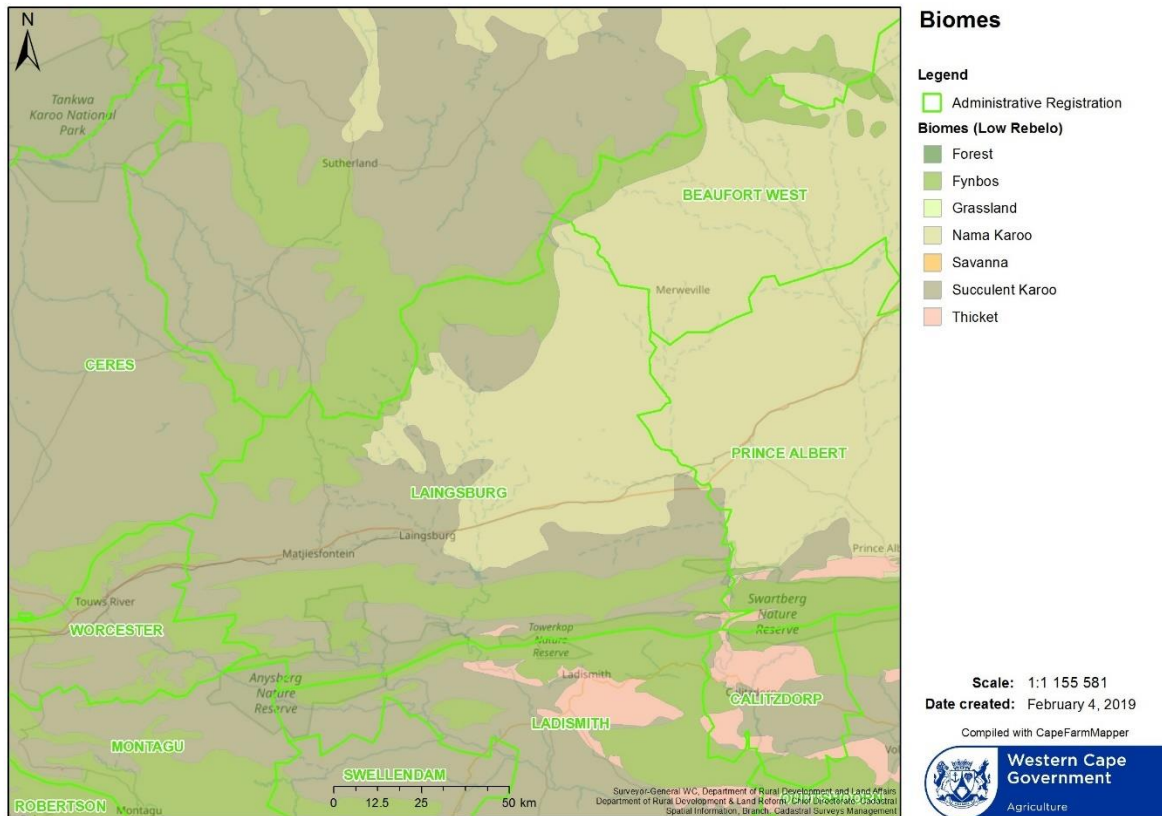


Figure 1: A basic description of the grazing potential of Laingsburg district

Livestock are kept out in large paddocks throughout the year and most producers do not observe strict lambing seasons except to avoid births during the hottest part of the year (Jan-Feb). In the winter rainfall west rained small grains were widely produced until the early 1980s and crop stovers were an important source of fodder during the arid summer. With grain production now virtually gone, stocking density had to be adjusted downwards on these farms. In the summer rainfall east, winters are the most difficult season. The traditional response was to trek livestock to the winter rainfall part of the district for the three winter months to take advantage of short-lived vegetation in the Succulent Karoo part of the district. Although much reduced from its former extent, remnants of the system are still visible.

Land and livestock holdings and financial performance

The dominant livestock types are mutton sheep (Dorpers), woolled sheep (Merino types) and boer goats. The district was overstocked by 40% during the wool boom of the early 1950s, which despite the government’s best efforts to reform stocking density in the late 1960s, caused lasting damage. By 1988, the district had lost 30% of its carrying capacity and by 1993 this figure had gone up to 40% (this is in Figure 2). The Karoo Management Survey estimates the current loss to be in the order of 60%, of which 30% is due to a loss of land. The loss of carrying capacity on the remaining land could be as much as 75% of pre-boom capacity.

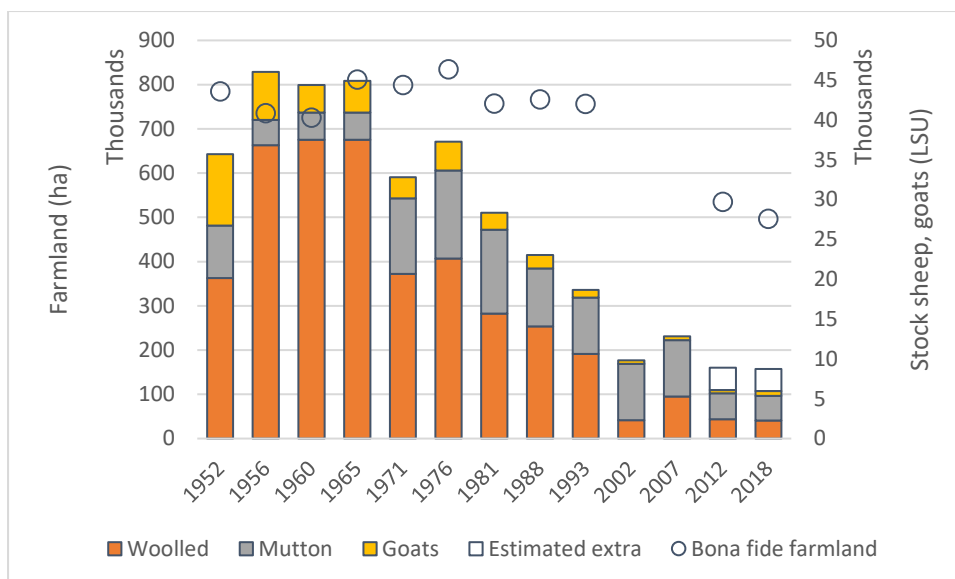


Figure 2: The size and composition of Laingsburg’s sheep and goat flock and the amount of land held by bona fide farmers, 1952 – 2018 (Source: Farm census and Karoo Management Survey)

The total area farmed varied by 6% around an average of 7753 km² (1km² = 100 ha) in the period between 1952 and 1993. The variation is probably due to the treatment of cross border farms. The unit of observation in the census is the farming operation, not the farm portion or parent farm, and the 2002 census defines a farming unit as “one or more separate farms, holdings or portions of land whether contiguous or not, provided that they are situated in the same province...”, which difficult to implement especially along the Northern Cape boundary into Sutherland district. In the Karoo Management Survey, 8.55% of the holdings in the Laingsburg sub-panel lies outside of Laingsburg. It was counted as part of the holdings inside the district, for three reasons. Firstly, mismeasurement is likely to be symmetrical across the boundary, secondly the farmers involved all have a Laingsburg address and thirdly and these outside portions would not exist as separate farms. Land is not reported in 2002 or 2007 because of coverage issues from 1993 onwards.

The National Policy on Comprehensive Producer Development Support (also known as the DAFF’s Blended Finance Instrument) wishes to target “smallholders” although the department is prepared to fund medium sized farms and subsistence production as well. A smallholder is defined as a farming operation with annual turnover of R50000 to R5 million. Smallholders are eligible for a development package of up to R3 million over five years if matched by an own contribution of 35%. This implies a minimum overall investment, net of land purchases of R4.6 million, but presumably the package includes the cost of financing land acquisition both as rental contracts and outright purchases as well as livestock purchases which are not listed specifically.

In districts with few land claims, the redistribution target is usually taken as 30% of farmland, regardless of the number of farmers involved. Over time, the number of farmers in Laingsburg have come down sharply. Until 1976 more than 200 farmers or farming units consistently

appeared in the census. Cape Farm Mapper lists 272 parent farms that have been divided into 778 portions with an average size of roughly a thousand hectares each, which implies single property owner-operated production set-ups in that period. By 1993 there were only 156 farming units left and by 2002 the figure had fallen to 98, which implies rising farm sizes. The Karoo Management Survey approached 66 persons of whom forty were successfully retained in the panel over its duration and its associated field notes helped to identify thirty more, mostly lifestyle farmers. Figure 3 presents the current and historical farm size distribution in percentage terms based on area. The 2012 and 2018 data points, from the Laingsburg land register, includes lifestyle farms.

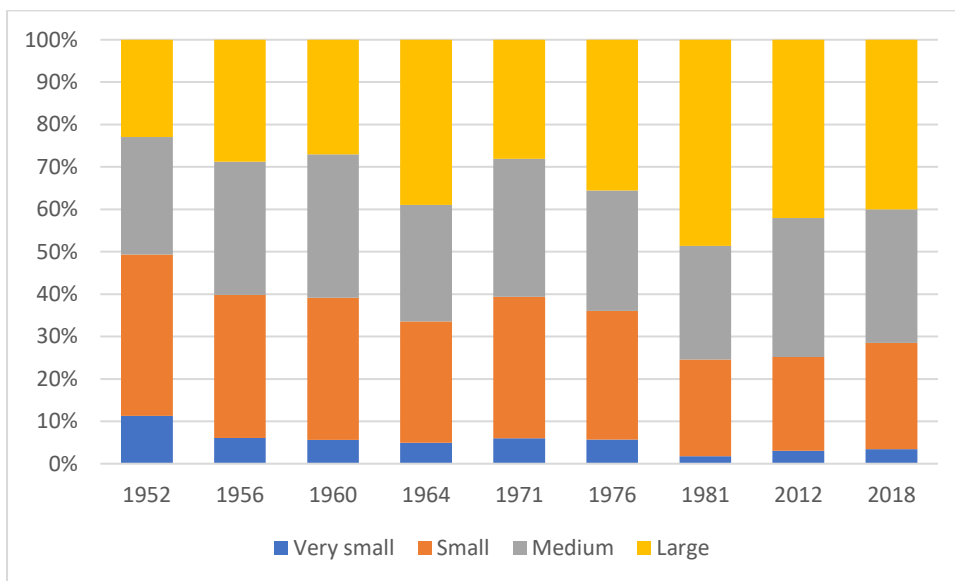


Figure 3: Size composition of Laingsburg's farms based on area covered, 1952-2018

The four size classes are arbitrary but historically consistent. Very small farms are properties of less than 2000 ha. Small farms vary in size between 2000 and 4999 ha. Medium farms fit between 5000 and 9999 ha and large farms are over 10000 ha. Given the change experienced over the last forty years, Laingsburg's farm size distribution has remained remarkably constant. There are few very small farms left (3%). More than 40% of the total farming area is made up of large farms which are all bona fide operations. Medium farms cover a third of the land and consist of three quarters bona fide and one quarter lifestyle units. There are as many lifestyle as bona fide small farms and together this group covers 22% of the district. Of the 46 Laingsburg farmers interviewed by the Karoo Management Survey, thirteen individuals hold a single portion (28%) and ten persons farm on a multi-portion contiguous area (22%) while the remaining 50% occupy several non-adjacent portions, including other districts. The most dispersed farms consist of eight portions in five places or seven portions scattered over six locations, but typically, farmers hold two or three portions in one or two places. More than 90% of this land is owner-operated regardless of farm size.

Table 1 ties financial performance to farm size. It covers four years in constant 2015 prices. Very small farms are excluded because there are too few observations in this category to produce reliable estimates. Small farms turn over R215 thousand per year of which R97

thousand is net farm income. This meagre livelihood, which often forces farmers to take other work, is based on flock of 375 stock sheep and goats kept at a density of 13 ha per stock sheep. More than half of the flock qualified for drought relief support in 2017 and 2018. Medium farms produce a turnover of R492 thousand per year which yields a net farm income of R184 thousand or R24.50 per hectare. Production involves a flock of 702 stock sheep or goats kept on 7466 ha at a density is 12.7 hectares per stock sheep. Their level of drought relief is much lower. Large farms keep 1247 sheep and goats on 17293 ha at a stocking density of 14.8 ha per stock animal. Only 11% of their livestock qualifies for drought relief. Turnover is R797 thousand per year and net farm income is R385 thousand per year or R23.79 per hectare per year. Most large farmers are in the business fulltime.

Table 1: Financial performance of bona fide farms in the Laingsburg subpanel of the Karoo Management Survey, 2012-2015 pooled, in constant 2015 Rand

Characteristic	Units	Small farms	Medium farms	Large farms
Size range	ha	2000 – 5000	5000 – 10000	>10000
Observations	number	43	60	47
Turnover	R1000	215 ± 132	492 ± 271	797 ± 479
Gross margin	R1000	118 ± 106	227 ± 235	479 ± 404
Net farm income	R1000	97 ± 112	184 ± 244	385 ± 377
NFI per ha	R/ha	25.51 ± 30.56	24.50 ± 33.01	23.79 ± 25.50
Flock size	Number	375 ± 163	702 ± 234	1247 ± 525
Farm size	ha	3779 ± 816	7466 ± 1385	17293 ± 7506
Stocking density	SSU /ha	13.0 ± 9.5	12.7 ± 10.9	14.8 ± 4.47
Part-time	Headcount %	9%	8%	2%
Retired	Headcount %	19%	13%	-
Drought relief eligibility	% stock	43%	21%	11%

Although small, medium and large farms are all classified as smallholders by DAFF, size which varies by a factor of four, impacts directly on the kind of livelihood represented by the farm. This is both a challenge and an opportunity, an opportunity because it allows land recipients to choose the level of debt that they are comfortable with and a challenge because it makes planning for redistribution more complicated.

3.2 LAND REGISTER AND TARGET

The land register contains three types of land, bona fide farmland, lifestyle farms and formal protected areas. The Karoo Management Survey formally covered 45% of the district. On the advice of local key informants, the survey excluded 7% of the land as irrelevant to a grazing survey. Field notes gathered during interviews conducted for the management survey added

information on a further 28% of land use and protected areas account for 9%, which adds up to 90% of the district. Protected areas are lost to agriculture. The rest of the land is divided between bona fide and lifestyle farms, where the latter is defined as land held for “non-agricultural aesthetic or recreational purposes” (Reed and Kleynhans, 2009). Bona fide farms can be managed on a full-time or part-time basis but are fully stocked and have their owners present on the farm at least one day per week. Every-one else was considered lifestyle. Some lifestyle farms do have sheep, but we have no systematic data on them, and they were not in the 2002 and 2007 censuses.

Table 2: Land use, in square kilometres, in Laingsburg district, 2012

	Bona fide fulltime	Bona fide part-time	Lifestyle	Protected areas	Total
Cape Nature’s records				709	709
Land register	4299	381	1002		5682
Excluded non-grazing land	63		504		567
Missing fraction	601	53	140		795
Total area per land use type	4963	434	1646	709	7753
% of district	64%	6%	21%	9%	
% of remaining farmland	77%		23%		

The farm register contains 4680 km² of bona fide farms of which 92% is held by full-time operators. On this subset of the land bona fide farms cover 82% of the land. The balance, 1002 km², is held by lifestyle farmers. The two excluded portions, in the *Witteberge* and *Vleiland*, account for 567km². The *Witteberge* section consists of thirteen farms varying in size from 766 to 10148 hectares with a combined area of 504 km². All this land was classified as lifestyle. The settlement at *Vleiland* in the *Swartberg* Mountains comprises of 58 irrigated portions including seventeen of approximately one hectare each and some of up to 600 hectares with a combined area of 63 km². Due to its remoteness, all *Vleiland* farms were classified as bona fide.

SANParks, the national conservation authority, owns no land in the district. The two largest provincial nature reserves are *Anysberg* and *Towerkop*, which forms part of the Greater *Swartberg* Wilderness area that includes *Gamkaskloof*. The farm *Anysberg*, a property of 5197 ha, was purchased in 1936 to protect a locally important water source. In 1986 the farm transferred to the conservation authority who proclaimed a nature reserve. Eight farms with a total area of almost 30000 ha south of the *Swartberg* Mountains were brought under management between 1986 and 1988. Two thirds of this land consisted of three medium sized holdings and the other five were smaller farms. In 2001 to farms of 3822 ha were added to the reserve and in 2012 it expanded by 15924 ha on the Laingsburg side, to bring its Laingsburg portion of *Anysberg* 53921 ha. The reserve also recently expanded into Montagu and Ladismith. Less is known about *Towerkop* Nature Reserve except that it covers an area of 16964 ha on ten parent farms, which brings the total area lost to conservation to 709 km².

The register's proportions of lifestyle and bona fide farms was applied to the 10% missing land, adding an extra 667 km² to bona fide holdings and 141 km² to lifestyle holdings. In total 70% of the district belongs to bona fide farms, 21% is held by lifestyle farmers and 9% has been lost to conservation. The redistribution target is therefore 30% of 7044 km² which comes to 2113 km². See Table 3 for the number of target farms per land use type.

With free access to Cape Farm Mapper, the total cost of compiling the farm register was R3.55 /ha or R355/ km² in research funds. Getting to know the district took five years, although the experience will result in substantial savings if the process is to be repeated for another district and the aim is specifically to produce a land register. The smaller the administrative unit, the easier it will be to work out who the local experts are and therefore it is advisable to do the exercise at the level of the local rather than the district municipality. Lifestyle owners will present difficulty and may require some coercion to participate in the process although Vink and Kirsten (2019) seem to think that lifestyle farmers will be eager to participate in land redistribution.

3.3 THREE REDISTRIBUTION SCENARIOS

Bona fide and lifestyle farms are part of the redistribution plan. All redistributed land is assumed to revert to bona fide sheep farming, due to a lack of local evidence of other viable land uses. Full-time and part-time bona fide farms are pooled. Since the available production data for very small farms is inadequate for planning purposes and their livelihoods are marginal, their share is included with that of small farms. This draws down the category average compared to the data in Table 1 which derives a subset of the land in the register. There no large lifestyle farms in the district at present.

Option 1 proposes that 30% of the remaining farmland in the district is drawn proportionally from existing land use and size classes according to the farm register. Under this scenario the largest target group is large bona fide farms, which are expected to contribute 43% of the land targeted for redistribution, but due to the large individual size, this area only comprises five farming units. The target includes seven medium sized bona fide farms with a combined area of 52,733 ha and eleven small bona fide farms with a combined area of 31,446 ha that represent 25% and 15% respectively of the area to be redistributed. Seven small and two medium lifestyle farms of a combined area of 36,862 complete the redistribution target. According to this scenario there will be 32 beneficiaries whose average farm size will be a fair 6,604 ha.

Table 3: Targets for 30% land redistribution as an area (ha) and in terms of farming units

	Scenario A	Scenario B	Scenario C	Average size
Bona fide small	31446	23425	27017	2909
Bona fide medium	52733	93182	45305	7074
Bona fide large	90276	67249	77559	17299
Lifestyle small	21155	15759	35258	2838
Lifestyle medium	15707	11700	26178	8427

	211,316	211,316	211,316	
Target numbers				
Bona fide small	11	8	9	
Bona fide medium	7	13	6	
Bona fide large	5	5	4	
Lifestyle small	7	6	12	
Lifestyle medium	2	1	3	
Total farms targeted	32	33	34	

Option 2 proposes that very large bona fide farmers are asked to release 30% of their current holdings for redistribution as they can do so without compromising their large-scale status. They will also benefit from marginally higher land productivity as a result of being smaller and as for those properties redistributed under scenario 1 selling the property towards redistribution will release funds for investment outside of agriculture. If just applied to farms of more than 15000 ha, the plan secures 53899 ha or 25.5% of the target, with 157417 ha left over to be distributed as before. In this plan 76% of the target is absorbed by the medium and large bona fide classes. While option 1 targets seven medium and five large farms, option 2 results in the redistribution of thirteen medium sized bona fide properties (including seven newly formed operations) and large farms. All other classes will have to do less redistribution. There will be one more beneficiary than in option 1 and the average size of redistributed land will fall to 6403 ha, which is still reasonable.

Scenario 3 targets the redistribution of half the land currently held in the lifestyle sector and assumes that these properties will be redistributed in whole. This plan will prioritise 61436 ha or 29% of the target and will result in twelve small and three medium sized lifestyle farms being redistributed to black bona fide farmers. The remaining 149880 ha will be taken mainly from large scale bona fide farmers whose contribution will be 77559 ha or 37%. There will be 34 beneficiaries under scenario 3 whose average size will be 6215 ha.

Very little land has been redistributed to date. Just three farms with a total area of 11630 ha are black-owned and /or managed (1.65%). The blended finance instrument also counts subsistence farming towards the redistribution target, which adds another 0.1%. Laingsburg's commonage supports 976 head of livestock on 780 ha at a stocking density of 9.6 ha per large stock unit. The official carrying capacity of the farm is 39 ha per large stock unit, which means that the land is being severely abused by the twenty individuals who have access to this land. No data was available on the distribution of flock sizes, but on average each person should have about 50 sheep and/or goats which less than 15% of a small commercial flock. If more land could be made available for subsistence grazing some commonage farmers might grow their flocks in preparation for buying land under the proposed redistribution programme. For such small flock

sizes suitable land is difficult to identify as it does not make sense to drive 200 km to check on twenty or thirty sheep. Fortunately, the municipality owns a 7000-ha property within ten kilometres of town that would be ideal for subsistence grazing. The combined area would support approximately 1200 stock sheep or goats, which would either allow individual flocks to expand by 23% or there to be 23% more people getting access to subsistence grazing opportunities.

Table 4: A summary of the investment cost and likely return on investment per farm targeted for redistribution, 2015 prices

	Unit	Bona fide			Lifestyle	
		Small	Medium	Large	Small	Medium
Farm size	ha	2909	7074	17299	2838	8427
Stocking density	ha/sp	13.02	12.7	14.8	13.02	12.7
Flock size	#	223	557	1169	218	664
Net farm income	R/ha	25.51	24.32	23.02	25.51	24.32
Turnover	R/ha	57.62	64.29	57.2	57.62	64.29
Breeding stock price	R/ewe	1200	1200	1200	1200	1200
Fence repairs price	R/ha	15.21	15.21	15.21	15.21	15.21
Land price	R/ha	1188	1188	1188	3050	3050
Productive value	3%	850	817	793	850	817
Price as multiple of prod value		1.4	1.5	1.5	3.6	3.7
INVESTMENT						
Land	R mil	3.456	8.403	20.551	8.655	25.704
Fence repairs	R mil	0.044	0.108	0.263	0.043	0.128
Livestock	R mil	0.268	0.668	1.403	0.262	0.796
Stipend (NFI for 4 years)	R mil	0.297	0.688	1.593	0.290	0.820
Total	R mil	4.065	9.867	23.810	9.249	27.448
Maximum grant	R mil	3	3	3	3	3
Investment shortfall	R mil	0.584	5.958	16.947	5.829	21.418
Subsidy level	%	74%	30%	13%	32%	11%
Turnover	R1000	168	455	990	164	542
Net farm income ¹	R1000	74	172	398	72	205

¹ Before interest payments or any cost of living allowance

Table 4 works out the unit cost of redistribution form farm size according to the register, and stocking density, turnover and net farm income according to the Laingsburg sub-panel of the

Karoo Management Survey. Three of the four years covered in the survey had normal rainfall and the fourth was very dry (58% of expected rainfall), and so the expectations set out in the table are realistic to slightly conservative. Breeding stock is assumed to cost R1200 per ewe and repairs to fencing and other farm infrastructure to come to R15.21 per hectare. This figure was obtained from a large-scale Land Care fence refurbishment project in the district (Natrass et al., 2015). For bona fide farms the land price is the constant value actual sales price for properties > 1000 ha recorded in the Elsenburg price data base (Nowers, 2019). For lifestyle farms a spot price for a game fenced farm is used, where the premium covers 75% of the cost of a game fence installed on the property in 2012. This farm has not sold at this price yet. Not all lifestyle farms are game fenced, but many have undergone housing upgrades and fence repairs that will make them more expensive than the going rate for rundown farmland. To calculate the four-year stipend recommended by Vink and Kirsten (2019) was calculated from size specific net farm income. The productive value capitalises net farm income at a real discount rate of 3%.

The total investment required to buy and set up a small scale bona farm for redistribution is R4.065 million per property. This farm will yield an annual turnover of R168 thousand and a net farm income of R 74 thousand in 2015 Rand, which amounts to just over R6000 per month. The figure is before interest and tax. The blended finance instrument indicates a maximum subsidy of R3 million, which leaves a shortfall to be financed of R 584 thousand. The typical small-scale property sourced from the lifestyle sector will be fractionally smaller and yet will cost 2.7 times more on account of more expensive land. It is assumed that when converted back into bona fide farming there will be no difference between the two, which makes it difficult to justify paying the higher price. In fact, a small-scale farm source from the lifestyle sector will cost about the same as a medium sized bona fide farm a 2.8 times higher turnover. With the blended finance instrument proposing a fixed subsidy of R 3 million over five years for farms they classify as smallholders, which includes all of Laingsburg, the effective level of subsidization varies from a generous 74% for the cheapest option to a mere 11% for the most expensive (and not most productive) farm. New recipients will have to borrow money to cover the shortfall, presumably at market related interest rates.

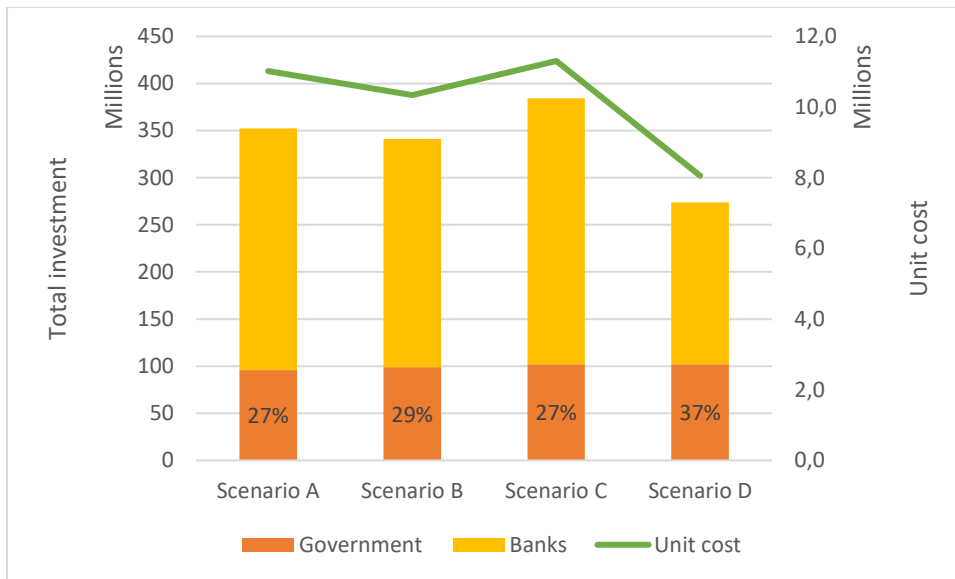


Figure 4: Aggregate investment and unit cost of land redistribution for Laingsburg district in constant 2015 prices

The total cost of redistributing 30% of Laingsburg’s farmland is summarised in Figure 4. A fourth scenario is added whereby the banks refuse to pay inflated prices for lifestyle land. In aggregate there is very little difference between the first three scenarios which will all transfer 30% of the district to 32-34 new holders at a total cost of less than R350 million in 2015 prices. If the banks hold firm on price, the government’s share of the burden rises by more than a third and the unit cost of redistribution falls by more than a quarter under a scenario where the transfer of lifestyle land is prioritised. Converting a large number of lifestyle farms back into bona fide production will create more jobs locally, boost local processing and input supplies and will contribute to regional food security, which looks like a win-win outcome, but unfortunately it will also place a greater burden on the extension service.

Extension needs

The blended finance instrument is quite explicit about the type of extension services that will be available for smallholders such as these and the document envisages that as the beneficiaries of redistribution graduate up through the size ranks, they will pass into the hands of private extension providers coordinated by the commodity value chains. The problem with this plan is that the farming operations of certain of Laingsburg’s “smallholders” are already at a scale where they might need to be handed over to private extension providers, or where private extension providers will have to be co-opted into public-private partnerships. Few of the essential services that new farmers will need are currently available to existing bona fide farmers. Veterinary technicians do move around in the district and Land Care provide certain soil conservation, drought relief and infrastructure upgrade services, but farm plans are no longer developed and implemented, and animal husbandry and rangeland management advice are not available to the current farmers because the extension post is vacant. Not only is there not an adequate service to bona fide farms but the need for this service will expand by between

20-40% depending on the chosen redistribution scenario. It is not clear if the government is prepared to meet the additional demand.

4. CONCLUSION

This study set out to test the best of the current recommendations and plans for rapid land redistribution for a case for which a lot of data exists. The Laingsburg experience shows that it is possible to draw up an adequate land register quite quickly at a very reasonable cost. With a register in hand, planning for redistribution is a trivial exercise provided that some survey data exists to inform key assumptions. Despite its reputation for poor coverage in recent years, it seems as if the 2002 and 2007 accurately depicted sheep farming in this district, which why the obvious source of production data should be the 2019 census. This study also revealed that it is quite important for all land users (even provincial nature reserves and national parks and definitely private nature reserves) to be incorporated in the census as farmland is being converted into non-agricultural uses all the time. Urban edges will present problems that may require primary surveys.

I agree with Vink and Kirsten (2019) that the detail of the redistribution plan must be negotiated locally, although this study showed that the price paid for land has more impact on the outcome than targeting a specific subsector of current land use. Proportional redistribution is also more equitable than any other plan. Those whose land is identified for redistribution should be reminded that being able to sell their land even for a modest price is preferable than to have it expropriated potentially without compensation. In Laingsburg the redistribution process will essentially start from zero, but we all know that the best time to buy land is during a drought, and so now is a good time to get started. More work must be done on willing sellers, but this process can only start once the banks have built a book of credible investors to whom they are prepared to lend at a reasonable interest rate to buy land at market prices. Although there is likely to be some demand from the subsistence grazers that have outgrown their resource, outside investors will be needed to run the large bona fide farms that form part of proportional redistribution.

It is clear that DAFF underestimates how large certain Karoo farms in their smallholder tier will be, and the danger exists that the department will not be able to adequately service the needs of these large operations. The solution is to involve private service providers in public private partnerships and to create additional capacity within Farmer Support and Development.

I do not agree with Vink and Kirsten that the land committee should involve all role players as it must be small enough to respond to opportunities at a moment's notice. This committee should have just three functions 1) it should negotiate with the banks about their book of investors 2) it should appoint and oversee an independent land buyer to negotiate with potential sellers and 3) it should communicate progress and plans with the department of agriculture and industry to ensure that those two parties are activity working towards developing candidates to be vetted by the banks and are taking care of new owners from the moment when they have signed for the land.

If everyone is committed to the process and enters it in good faith, there is no reason from the supply side why two thirds of the target cannot be met by the end of next year.

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**CRITICAL FACTORS INFLUENCING THE EFFECTIVENESS OF FETSA TLALA
FARMER SUPPORT PROGRAMME ON SUBSISTENCE MAIZE PRODUCERS IN
LIMPOPO PROVINCE OF SOUTH AFRICA**

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EXTENSION: TO SERVE AND PROTECT - HOW TO ACHIEVE SUSTAINABLE RURAL DEVELOPMENT

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ABSTRACT

The dearth of success stories around extension projects implemented across South Africa (and Sub-Saharan Africa), even after substantial investment and effort, begs the question: more extension, less adoption, why? What is the role of extension in contributing to rural upliftment, the development of successful farmers, supporting stable protected natural environments and facilitating sustainable economic returns from agriculture? This paper examines the before and after effects of coordinated extension with clear targets, activities and skills development that is aimed at achieving significant rural development for a KwaZulu-Natal community. The purpose is to compare a period of 10 years of uncoordinated extension services with the following 10 years using a targeted structured extension methodology with set measurable outputs, implemented in the same community. Ten years of data in a community which received uncoordinated extension with little support from outside organisations were compared to the results of the following ten years after the implementation of a new, structured extension approach. Extension officers were upskilled, monitored and evaluated on their impact on the development of agriculture and the improvement of livelihoods in the community. There were 224 growers delivering 16 456 tons of sugarcane in 2004. The growth in the agricultural sector over the past decade was compared to the previous ten years and comparisons made for a number of variables which were indicative of the success of the project in terms of adoption, increased agricultural participation and improved production systems. In 2018, there were 704 growers delivering 50 300 tons of sugarcane. The rate and scale of adoption, and increased community confidence in agriculture as a livelihood, is clearly evident in the increased number of growers from 419 in 2013 to 704 in 2018. An extension impact monitoring system and annual work plan was also developed to assist extension officers and their managers to have a clear understanding of roles and responsibilities, as well as being utilised to measure the impact of the extension officers in the area. The agricultural system has become a self-perpetuating one that demonstrates the enormous social, developmental and economic benefits of a sustainable agricultural community.

Keywords: Adoption, Extension effectiveness, Self-perpetuating, Successful

1. INTRODUCTION

The development of appropriate technology and its transfer to farmers are two of the essential enabling conditions to ensure increased agricultural productivity and thus rural development. The complex nature of rural communities, land ownership, socio-economic issues and access to natural resources make it imperative that more effective investment in farmer-centred agricultural research, supported by skilled extension, is needed which is innovative, appropriate and relevant to localised needs and conditions and assists with finding solutions to emerging agricultural problems within rural communities. The dearth of success stories around extension

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projects implemented across South Africa (and Sub-Saharan Africa), even after substantial investment and effort, begs the question: more extension, less adoption, why? What is the role of extension in contributing to rural upliftment, the development of successful farmers, supporting stable protected natural environments, and facilitating sustainable economic returns from agriculture? Continued investment into small-scale, communally-based agricultural projects has been shown to be unsustainable and very few projects have led to viable outcomes and sustainable resource utilisation or directly contributed to job creation or sustained income generation (van Niekerk *et al*, 2009; van Rooyen & Bembridge, 1998).

With specific reference to the South African sugar industry, small sugarcane growers, contribute well below that of modelled yield potential for comparative areas (Cockburn *et al*, 2014). Small growers require an innovative yet practical extension approach since their needs differ from those of commercial growers, particularly in terms of access to finance, information, equipment, weedicides, agronomic knowledge, and production practices. It is paramount that communities identify with the proposed technology and feel safe (in terms of risk to self) when adopting it. So how can extensionists prove this other than by implementing the Demonstration Plot Extension Methodology (DPEM) (Gillespie *et al*, 2009; Gillespie *et al*, 2012; Gillespie & Mitchell, 2006; Gillespie & Mitchell, 2014), where the project is implemented with the full consent and commitment from the farmers and on their own land? This successful approach has upskilled local extension officers and has been fully adopted by the communities involved, leading to a self-sustaining production system. Therefore, this paper explores the outputs from a community for a decade before the introduction of the DPEM with results for ten years after the introduction of DPEM.

2. PURPOSE AND BACKGROUND

While researchers around the world continue to develop solutions to assist in smallholder development, there is also a need to make regional technology adoption and transfer more cost-effective and efficient. The link between research results and the farmer is extension, a complex position which requires communication, scientific, analytical and assessment skills, and an understanding of local social psychology within a community to be able to transfer complex information from research institutes to those who require it on the ground. Extension organisations in developing rural areas need to have clear deliverables and structures, management of both the projects, as well as the activities of the extension personnel so as to increase their effectiveness, capability and service delivery to farmers. When farmers are involved in developing and innovating technologies, they take ownership for success. These technologies must be within the skills and ability of the growers and have continued support until they become sustainable, even if it means some initial subsidy by government.

The purpose of this study was to:

1. Evaluate the effectiveness of DPEM as a project implementation system over a 20 year period (a decade before implementation and a decade after implementation), and
2. Evaluate the effectiveness of the implementing extension officers over the last 20 years of the project.

DPEM is a rigorous and systematic approach to implementation of a project (regardless of enterprise) by following the steps below (Gillespie & Mitchell, 2014):

1. Consultation and buy-in from all role-players.
2. Obtain finance for the project.
3. Selection of a co-operator for the demonstration plot on a suitable site.

4. Establish a programme of work for the growers and extension staff (for technology transfer to the community) following the agronomic cycle of the chosen enterprise.
5. Land assessment and soil classification must be undertaken and then linked to economic viability.
6. Secure suitable seedcane (correct variety, pest and disease-free via the Pest and Disease and Variety Control Committee (P&D&VCC) and confirm availability and price).
7. Technology transfer at a soil conservation practical planning day.
8. Technology transfer at a soil fertility practical information day.
9. Land preparation planning and training day (might include lime application if needed).
10. Planting field day and practical.
11. Weedicide planning and practical training day.
12. Topdressing field day and practical training day.
13. Variety and pest and disease practical training day.
14. Estimating field day and harvesting practical training days.
15. Cane payment (seedcane or mill) and role-players field days.

By incorporating the technical training as a practical process during the implementation of the project, this enables both the growers and the extension officers to learn and reinforce the skills and agronomic steps that will be necessary annually to ensure a good crop. In many instances, extension officers may know the theory, but have never farmed or, for example, calibrated a knapsack or calculated herbicide concentrations for a given area, and thus do not know how to demonstrate these skills in the field. Extension officers also need to have credibility with the growers, and therefore must be able to demonstrate and encourage growers to use good agricultural practices. This starts by being able to do it themselves. With the new entrant extension officers, there is often a gap between theory and practical skills and a lack of experienced mentors is a distinct failure in existing extension development programmes.

Another difficulty for extension managers is monitoring extension performance, namely how to measure their effectiveness in the field. Current personnel evaluation systems tend to consider inputs, for example, budget spent, number of projects implemented, and hectares planted, but seldom measure performance on achieved targets such as number of farmers trained, tons of food produced, income received by a household, and improved livelihoods (e.g. ability to purchase sufficient nutritious food, pay school fees, build a bigger house). The management of extension officers must be re-evaluated in order to improve their effectiveness and efficiency, particularly since the objective of extension is to be accountable for funds spent, provide relevant information and advisory services and training for clients which lead to profitability, productivity and sustainability linked to research innovations, in other words, be results-oriented (Alex, Zijp & Byerlee, 2002).

Over the past 20 years, the Noodsberg small-scale grower sugarcane mill supply community have had continuous extension involvement, but prior to the implementation of the DPEM (1999 to 2008) they were unaware of their soil potential, variety choice, seedcane availability and training in the skills required to manage a crop. There were also social issues such as crop destruction by cattle, incorrect sugarcane burning times, and sugarcane was not seen to be a profitable crop due to the high start-up costs for planting sugarcane (access to finance). The various areas that make up the study area community have similar natural resources in that all eight communities assessed have humic soil forms with depths not shallower than 630 mm, mainly of the Sweetwater, Nomanci, Magwa, Inanda and Kranskop soil forms. The sites fall along the same topographical area on an upland mistbelt crest. The long term mean annual rainfall is 825 mm and the median is 743 mm. All sugarcane is produced under dryland

conditions over a 24 month cycle. Mean monthly maximum temperatures peak at 25⁰ C in February, while the mean monthly minimum drops to 6.4⁰ C. Frost incidence is very low and not severe. No significant differences exist between the various sites in terms of road networks and all sites fall within 50 km of the mill. All farming systems in the area are based on communal tenure. The DPEM plots (from 2008) are mostly two hectares and contain at least two varieties to allow for comparison between varieties. Growers rely almost entirely on contactors to supply equipment and services.

Prior to 2008, extension services were uncoordinated and there was no distinct plan on how to progress the farmers, thus most projects failed. Once the systematic DPEM methodology was developed and implemented in this area (from 2009 onwards), adoption of technologies, yields, area, access to seedcane, and grower and extension competence improved. Included in the methodology are defined training days which reinforce the extension personnel and growers' practical knowledge since practical demonstrations in the field are made alongside and including the farmers.

3. METHODOLOGY

From 1999 to 2008, the area under cane and tons of sugarcane delivered to the mill were assessed for a number of specified sites and compared to the same factors for the decade from 2009 to 2018. This was all accessed from mill records, in other words, these are documented and verified. Comparison was made between the outputs from the decade before implementation with those after DPEM. The figures are represented graphically for ease of reference. All eight communities that made up the mill supply area were added together to give the totals for each parameter used to indicate successful implementation and adoption. Thus, the results are indicative of all areas that supply the Noodsberg Mill. The two main parameters used were tons of sugarcane delivered (yield) and income as indicators of adoption of sugarcane as a crop with its concurrent agronomic technological responsibilities and activities, as a means of achieving better livelihoods. These were the end results of the adoption of all the steps implemented during the setting up of a demonstration plot, including changing to new varieties, using better land preparation techniques, taking soil fertility samples for more accurate fertilizer choice and application, the correct selection and application of weedicides, and better soil conservation practices.

4. RESULTS AND DISCUSSION

4.1 1999-2008: Before DPEM implementation

The number of growers and area under cane from 1999 to 2008 were taken to be indicative of the lack of coordinated extension and very little targeted training around the agronomic cycle of sugarcane production. In addition, no soil classification had been undertaken to assess the land potential of the area as a whole nor had new variety choices been readily offered or made available to these communities. Extension input was haphazard with no clear or defined inputs and role-players were not well coordinated. The graph showing yield (tons delivered) prior to DPEM being implemented (Figure 1) indicates an average of 20 531 tons was delivered per annum over the 10 year period, with an average yield per season of 61 tons/hectare (t/ha).

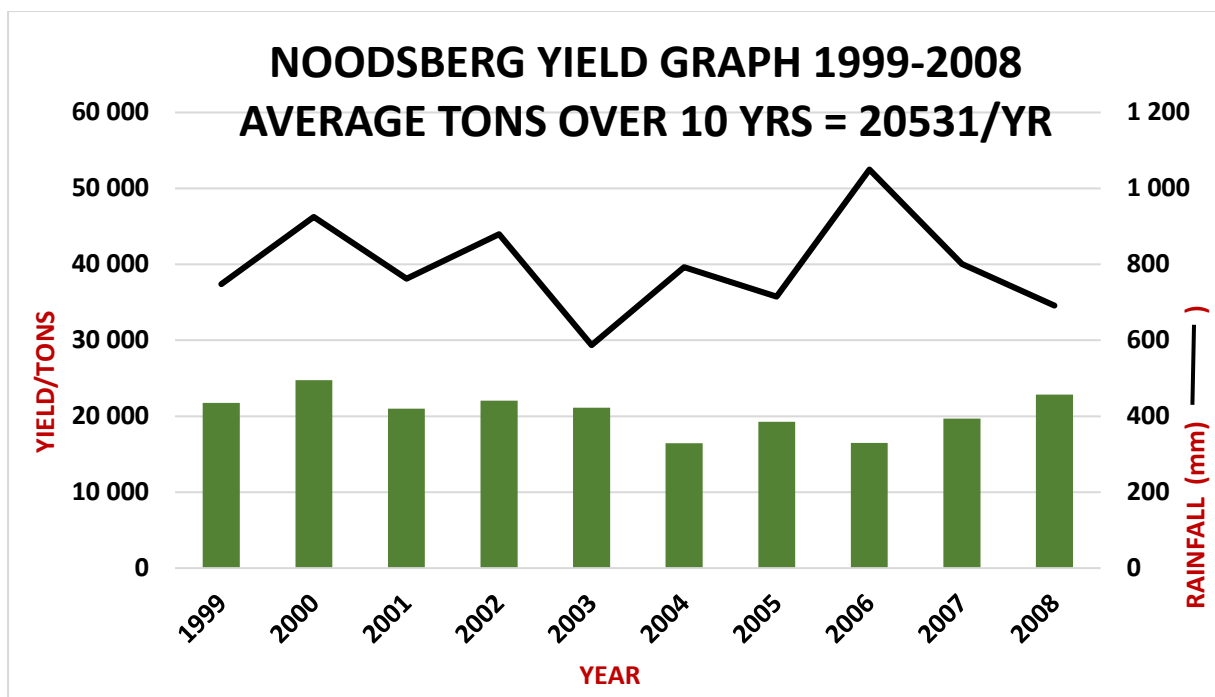


Figure 1: Sugarcane yield (tons) delivered to the mill from the study area between 1999 and 2008

4.2 2009-2018: After DPEM implementation

After the implementation of the DPEM methodology in 2009 to 2018, improved yields from new varieties indicated widespread adoption of new technologies such as the introduction of soil classification for new variety choices, soil sampling, fertility management, weedicides, pest and disease control, and inspections. The two figures clearly show that while rainfall fluctuated from season to season, the variation across the 20 year period was not significant enough to account for the increase in production. The average yields improved from 61 t/ha before DPEM to 74 t/ha after DPEM, an increase of 21%, while the average tons of sugarcane delivered to the mill per year increased from 20 531 tons per year to 35 574 tons per year, an increase of 73% (continuous growth in area planted).

Increased yields post-DPEM (Figure 2) have had a significant and concurrent increase in household income. At today's price per Recoverable Value (RV) of R3808.72 and 12.34% RV, this represents an increase of R5798.00 per hectare due to the adoption of DPEM. Between 1999 and 2008, an average of 343 hectares were harvested per annum and a total of R98.33 million was generated for the community from sugarcane production during this period. Between 2009 and 2018, an average of 514 hectares were harvested per annum, generating a total income of R178.76 million for these communities during this period. The value of DPEM to this community is thus R80.39 million additional revenue over the past 10 years and can be attributed to the correct selection of soil type, new varieties, better agronomic practices, and improved business skills. The extension officers have also been upskilled to the point that they are able to undertake the training with confidence and demonstrate the practical skills required with each new grower group.

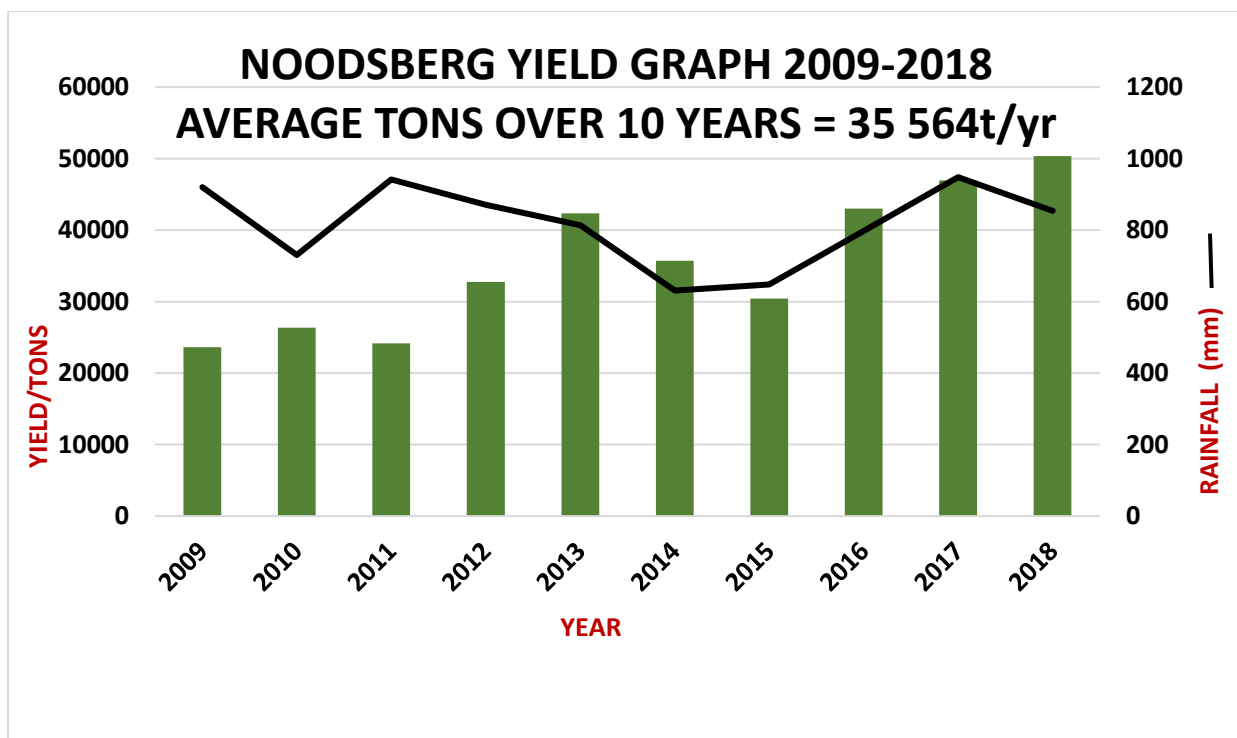


Figure 2: Sugarcane yield (tons) delivered to the mill from the study area between 2009 and 2018

4.3 Effectiveness of extension using DPEM in the study area

The figures above are representative of communities that have been given the opportunity to improve the way in which they were undertaking their agricultural activities through a rigorous, systematic information and training system. There was a concurrent improvement in the skill set of the extension officers involved, which will continue as they provide mentorship to new employees and farmers. The increased area under sugarcane after 2008 is representative of the technology transfer events, creating awareness about sugarcane as a viable cropping option as well as the extensionists' ability to create linkages between role-players. The adoption of sugarcane as the main economic crop is indicative of the level of awareness created through extension, as well as recognition of the link between scientific research, land potential, yield, income and economic opportunity.

Yields achieved in the study area were directly comparable to the adjacent commercial growers due to adoption of good agricultural practices such as pest and disease control, soil sampling, use of appropriate weedicides and fertilizers, choosing suitable varieties, harvesting times, contour planting for erosion control, and reducing the time between cane cutting and delivery to the mill. Variety selection and pest and disease inspections were identified as two of the largest knowledge gaps which the DPEM addressed. These results indicate the enormous opportunity cost of ineffective extension (when the methodology now exists to correct this) for the rural communities who depend on extension staff as their source of support, technology transfer and link to research results, role-players and access to financial support.

4.4 Monitoring and evaluation of extensionists

There is significant responsibility on extension staff to have a clear understanding of their job description, key performance targets and be evaluated fairly as well as monitored by their

managers. Managers should also be aware of under skilled (and thus underperforming) officials, identify these gaps and provide training and mentorship before their actions negatively impact the communities in which they work (Gillespie & Mitchell, 2015). Table 1 shows an annual programme of work as laid out monthly to assist the extension officer with measurable tasks and goals to be monitored and evaluated for performance assessment.

By assessing the extension level of contact with growers and interventions, the area is now receiving training and support with an annualised programme of work (work plan) showing monthly activities and technology transfer events. This study has allowed for the significant improvements in terms of job creation, stability, income, and the growth of an agricultural industry within the community to be quantified as well as the role that an effective extension methodology can play in changing the lives of communities. Extension targets are clear, monthly reports are used as a monitoring tool, and the yields are an indication (other than extreme or unpredictable events, runaway fires, etc.) of whether his/ her work has been effective.

This methodology has created change and spurred development in the area, most notably the following: all role-players are fully committed to the programme, finance for the project is no longer an issue since the mill and the farmers are benefitting financially, and more demonstration plots (which are local seedcane nurseries for the first two crops) are put in place each year to provide a continuous supply of cheaper locally-produced seedcane which is both cheaper and pest and disease-free. A detailed programme of work is followed by the extension personnel and the farmers. All plots have been assessed in terms of slope and soil type and varieties matched to the soils present, soil conservation practices have improved, soil samples submitted for fertility analysis have increased fivefold since DPEM. Planting is done using good agricultural practices and weedicide and topdressing applications are more accurately applied. These are all indicators that both the farmers and the extension support staff have been upskilled and that the DPEM methodology is in fact effective.

5. CONCLUSION

DPEM has been proven to be an effective project implementation system which can be applied to other commodities and in other areas. A decade (1999-2008) where extension efforts were uncoordinated and sugarcane was not seen as a viable enterprise from which to make a living, has cost the communities involved many millions in revenue during that decade. After implementation, the following decade saw massive growth in both area and yields of sugarcane, and spurred social, economic and agricultural development in the area. To avoid the failure of development projects, this type of methodology should become the protocol adopted to ensure new technologies are adopted and extension effectiveness is rigorously evaluated and quantified. The results of this study confirm that the DPEM approach provides a robust model to achieve increased production and extension effectiveness in small-scale grower regions of South Africa.

Table 1: Example of a Programme of work for an Extension officer to implement DPEM

Training and Mentorship Programme (Grading scores: Agenda 2 points; Attendance 3 points; Report 5 points; 12 field days x 10 = 120 points)												
Agricultural Advisor:					Name of demonstration plot:							
	Name of Co-operator	Co-operator's Cell Number	Municipality	Local Area Manager	Area Manager's Cell Number	Local Mill Contact:	P&D Officer Contact:	Demonstration plot soil type	GPS Co-ordinates South	GPS Co-ordinates East	Varieties to be planted	Seedcane obtained from
	January	February	March	April	May	June *start here*	July	August	September	October	November	December
PLANT		Activity: Project proposal/business plan submitted. Establish dates for training days.	Activity: Establish seedcane requirements and payment with role players.		Activity: Demo Plot site selection	1) Soil potential& business skills training day Date:	Activity: Confirm seedcane with P & D & VCC officer	Activity: Volunteer removal Activity: Fencing 2) Soil conservation & farm planning training day Date: 27	Activity: Confirm land prep, Inputs, fertiliser and weedicide 3) Soil sampling results and costing of fertiliser & weedicides Field training day Date:	4) Planting training day Date:	5) Weedicide application training day Date:	6) Top Dressing training day Date:
PLANT	Activity: Check weeds & address issues	7) Pest, Disease and Variety introduction training day Date:	Activity: List of growers to buy seedcane 8) Harvesting and cane quality training day	9) Role Players field day Date:	10) Cane payment training day Date:	11) Estimating training day to confirm yield Date:	12) Field day for seedcane distribution and establish price Date:			Activity: Distributing seedcane	Activity: Inform Stakeholders following year	Activity: Plan for the following year

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FACTORS INFLUENCING LAND REFORM BENEFICIARIES' WILLINGNESS TO PAY FOR EXTENSION SERVICES IN EASTERN CAPE AND KWAZULU-NATAL, SOUTH AFRICA

O. Loki³⁵, M. Mudhara³⁶, Y. Pakela-Jezile³⁷ and T.S. Mkhabela³⁸

ABSTRACT

The study investigated the factors influencing land reform beneficiaries' willingness to pay for extension services. Furthermore, the study determined the extension services for which farmers were willing to pay, and the cost. The study was conducted in seven districts in the Eastern Cape and KwaZulu-Natal provinces. Research activities included a formal survey conducted on a sample of 111 farmers using simple random sampling. Data were collected using a structured questionnaire through interviews and using a semi-structured interview guide for focus group discussions. The study employed Chi-square and T-test analyses to determine the relationship between the socio-economic characteristics of the farmers and their willingness to pay for extension services. The main findings were that 64% of land reform beneficiaries were in favour of privatisation of extension services. Furthermore, 98% of these farmers said they were willing to pay for extension services and indicated the price and type of services preferred. From the results of the probit regression analysis, it was seen that farmers who were likely to pay are those who are younger, with larger land sizes, and who have access to extension services. The study concluded that farmers were in favour of privatisation and were willing to pay for extension services, as they felt this would improve their farm returns.

Keywords: Eastern Cape, Extension services, Land reform, Socio-economic characteristics, Willingness, KwaZulu-Natal

1. INTRODUCTION

The provision of agricultural services to farmers independent of government dates back to the 1980s in South Africa (Koch & Terblanché, 2013). According to Liebenberg (2015), in the past three decades, the republic has seen an exodus of qualified extension personnel from government institutions to set up private consulting companies. This has resulted in the informal existence of a pluralistic extension system that offers services to various farmers across South Africa (Department of Agriculture, Forestry and Fisheries (DAFF), 2014). Such private or pluralistic forms of extension and advisory services are not yet popular or widespread across the country, particularly in the poorest areas (Rivera & Alex, 2004; Zwane, 2016). This is due to a number of reasons such as limited extension radius (coverage), popularity, and most notably, they work on incentives; thus, they only provide extension support to farmers who are able to pay for services (Liebenberg, 2015). The emergence of these sectors has seen the government reduce its investment in agricultural extension services and this has led to many thinking that farmers will eventually transition from free-fee extension service to a fee-based service (Afful & Lategan, 2014; Anderson & Feder, 2004).

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The evidence of success of the private extension services sector has managed to make noticeable contributions in a short space of time within the commercial farmers in South Africa and this has ignited a debate (Liebenberg, 2015). This debate centres on whether it would be feasible to privatise agricultural extension and advisory services in a country where the smallholder sector is the most dominant (Agholor, 2012). For most developing countries, this debate is difficult as there is enough evidence in the literature to suggest against and for privatisation (Rivera & Alex, 2004). A number of studies across the globe have since shed light on the prospects of privatising extension services, but they have been inconclusive.

Some scholars (Labarthe & Laurent, 2013; Oladele, 2008; Uddin & Qijie, 2013; Zwane, 2016) are of the view that if extension services were privatised, there would be a decrease in the fruitless expenditure incurred by the government sector, eradication of the top-down approach, and an increase in the efficiency of the extension service delivered. Further arguments are that if privatisation of extension services are carried out correctly, the returns would be immensely high; examples include the telecommunications and banking sectors (Rivera & Alex, 2004). However, suggestions against privatisation are that it will be limited to a few and relatively financial stable farmers who can afford to pay for services (DAFF, 2014; Hellin, 2012). Another concern is the evidence from literature about the Technical-Entrepreneurial Assistance (ATE) programme of Chile, which in the later years of its existence hit the country's economy (Mwaura, Muwanika & Okoboi, 2010; Rivera, 2001; Schwartz, 1994).

In searching for new delivery systems that will reduce wasteful government expenditure, increase extension efficiency, and cater for farmers' needs, information such as farmers' willingness to pay and which services they are willing to pay for become urgently important (Afful & Lategan, 2014). Furthermore, South African experiences with fee-based services is a practice of commercial farmers' needs to be documented, analysed and disseminated for the better understanding and implementation of commercial prospects for smallholders (Liebenberg, 2015). However, such information is lacking or rather scarce in South Africa. The available literature is on international experiences and there is thus a need for further research on this concept (Gómez, Mueller & Wheeler, 2016). It is against this background that this study was undertaken, so as to provide empirical evidence on smallholder farmers' willingness to pay for extension services. Furthermore, it aimed to probe which extension services farmers in South Africa are willing to pay for and at what price.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The conceptual base for this paper lies on the idea to privatise agricultural extension services, introduce private companies to funding, and delivering extension services to smallholder farmers with the intention to improve their commercialisation prospects. Specifically, it examines the need for smallholder farming to change from free-fee extension to a fee-based advisory service and to a more results-oriented approach that is demand-driven with academic discipline yielding financial rewards to smallholder farmers. According to Ulimwengu and Sanyal (2011), willingness to pay is modeled as a sacrifice of current income in order to sustain or increase agricultural productivity in the future. Therefore, the expenditure function is used to estimate willingness to pay for improvement in the quality of a resource. The minimum expenditure level (e) required to achieve the initial utility level is given by the expenditure function as:

$$e = e(p, EU_0, F_0)$$

Where p is the vector of prices, EU_0 is the current expected utility level, and F_0 is the set of old agricultural services and farm characteristics. This means the amount of money a farmer spends in acquiring improved agricultural innovations is a function of prices, expected utility as well as agricultural services and farm characteristics. It follows that the willingness to pay in order to sustain current level of farm productivity is given by:

$$WTP = e(p, EU_0, F_0) - e(p, EU_0, F_1)$$

Where WTP is the amount at which a farmer feels indifferent between the expected marginal utility under the old set of technologies and the discounted expected marginal utility of the change in future incomes as a result of the new set of agricultural technologies; F_1 is the new set of agricultural services and farm characteristics. The private sector's willingness to commercialise their innovations can be analysed using willingness to accept (WTA) as proxy. WTA measures how much a respondent is willing to accept as compensation for a loss of a good or service. Contingent valuation tends to quantify the value consumers assign to products using a hypothetical purchasing situation in which they have to answer how much money they would be willing to pay (Wegary, 2013).

The study adopted the contingent valuation method (CVM). This technique fits squarely with the objectives and methodology followed in this paper, in that the respondents were asked to state their willingness to pay contingent on the provision of some hypothetical service (Njoko, 2014). For descriptive purposes, let us consider the changes to a consumer (farmer) resulting from a proposed new policy plan (e.g. privatisation of extension services). Let W_i^0 be the status quo of agricultural extension services level of welfare and W_i^1 the privatised extension services. In addition, let $W_i^0 \equiv (y_i^0, P^0)$ and $W_i^1 \equiv (y_i^1, P^1)$ represent the budgets that measure prices (p) and incomes (y) faced by consumer i under the new policy plan. Therefore, the transition from status quo level to post-policy intervention level is simply the difference in the indirect utility given as:

$$v^0(y_i^0, P^0) - v^1(y_i^1, P^1)$$

Consumer i will accept the change caused by privatising extension services if $v^0(y_i^0, P^0) - v^1(y_i^1, P^1) > 0$. However, the consumer will reject the idea of privatisation of extension if $v^0(y_i^0, P^0) - v^1(y_i^1, P^1) < 0$.

The concept of willingness to pay has commonly looked at the utility maximisation of consumers. Relevant literature has shown that it can also be extended to producers, meaning that the producers' profit maximisation decision is subject to a given production function (Munthali, 2013). Agribusiness and various service providers assess the consumers' willingness to pay for a new product or service before production (Wegary, 2013). A farmers' desire to pay for extension services may be borne out of his/ her quest to continually receive proven and relevant information from extension that increases his production and income (Temesgen & Tola, 2015). However, the risk of using hypothetical methods such as CVM is that the respondents (farmers) state a higher value than their true WTP for the services offered to them (Mwaura *et al*, 2010).

3. METHODOLOGY

3.1 Study area and data collection

The study was undertaken in seven districts in the Eastern Cape and KwaZulu-Natal provinces. The seven districts include five from the Eastern Cape (Amathole, Joe Gqabi, Chris Hani, O.R. Tambo, Alfred Nzo) and two from KwaZulu-Natal (Harry Gwala and Umgungundlovu). The reason for the imbalance in the number of districts from each province was due to the remedial provincial programmes organised by the Department of Agriculture in KwaZulu-Natal which forced the farmers to forfeit their participation in the study and the researcher did not have the necessary funds to reschedule. The selection criteria of the district municipalities was aligned to their contribution to the province's total Gross Domestic Product (GDP) (DAFF, 2016). For example, Umgungundlovu is the second largest contributor to the GDP in KwaZulu-Natal after Ethekewini Metropolitan Municipality and houses a significant number of farmers that not only produce for household consumption, but for the markets as well (Statistics South Africa (StatsSA), 2016). Amathole, O.R.Tambo, Chris Hani and Joe Gqabi districts are known to have farmers that produce a significant number of livestock, small stock, and their by-products in South Africa (StatsSA, 2016).

The study employed a quantitative research approach. A list comprising the number and location of smallholder farmers was acquired from the Department of Agriculture, Forestry and Fisheries (DAFF) and the Agricultural Research Council (ARC) in 2017. This permitted the researcher to employ simple random sampling and select 111 land reform beneficiaries. The respondents were randomly selected to avoid biasness and to give the individuals an equal chance of becoming part of the sample. Data were collected using a structured interview schedule and a semi-structured interview guide for focus group discussions.

3.2 Data Analysis

3.2.1 Demographic and socio-economic characteristics

The study employed comparative statistics such as Chi-square and T-test analyses to establish the relationship between the socio-economic characteristics of the respondents and the willingness of smallholder farmers to pay for extension services.

3.2.2 Probit regression

The response variable, farmers' willingness to pay for agricultural extension services, is quantitative in nature. A hypothetical price of R250 per month for extension services was established as a base to investigate whether individual farmers would be willing to pay. The appropriate model is a discrete choice model such as the probit model (Gujarati, 2004). Following Gujarati (2004), to motivate the probability model, the decision of the farmer to pay for extension services or not depends on an unobservable utility index l . This utility index is a latent variable, which is determined by a number of explanatory variables. The index, l_i is expressed as:

$$l_i = \beta_1 + \beta_2 X_i \dots \dots \dots (1)$$

In establishing the relation between the unobservable utility index and the actual decision-making on willingness to pay, a threshold level of the utility index is assumed, say I_i^* .

$$if I_i > I_i^*, l = 1 \dots \dots \dots (2)$$

$$if I_i \leq I_i^*, l = 0 \dots\dots\dots (3)$$

According to Ulimwengu and Sanyal (2011), given the assumption of normality, the probability that I_i^* is less than or equal to I_i can be computed from the standardized normal cumulative density function (CDF) as:

$$P_i = P(Y = 1|X) = P(I_i^* \leq I_i) = P(Z_i \leq \beta_1 + \beta_2 X_i, \dots, \beta_n) = F(\beta_1 + \beta_2 X_1 \dots \beta_n) \dots\dots\dots (4)$$

Where $P(Y = 1|X)$ means the probability that an event occurs given the values of the explanatory variables and where Z_i is the standardized normal value, i.e. ($Z \sim N(0, \sigma^2)$). F is the standard normal CDF (Ulimwengu & Sanyal 2011; Wegary, 2013). Taking the inverse of the CDF gives:

$$I_i = F^{-1}(P_i) = \beta_1 + \beta_2 X_1 \dots \beta_n \dots\dots\dots (5)$$

Where: $WTP_1(Y)$:

Table 1: Relationships between the dependent variable and the explanatory variables

Dependent variable	Measure	
Willingness to pay for extension services	1 = Willingness to pay 0 = Unwilling to pay	
Independent variable	Measure	Expected outcome
Type of farmers	Dummy - Part time = 0 Full time = 1	+
Farmer experience	Continuous - years	-
Age groups	Continuous - years	+
Gender	Dummy - Female = 0, Male = 1	-
Level of education	Categorical - No education = 0, Primary = 1, Secondary = 2, Tertiary = 3	+
Farming enterprise	Categorical Crop farming = 0, Livestock farming = 1, Mixed farming = 2	-
Farming seasons	Dummy - Seasonally = 0, Annually = 1	-
Farming purpose	Categorical - HH Consumption = 0, Selling = 1, Both selling = 2	+
Farming goals	Not Achieved = 0, Yes achieved = 1,	+
Agriculture Income	Continuous - Amount/year	+
Land Ownership	Dummy - Does not own land = 0, Owns Land = 1	+
Land Size	Continuous (Hectares)	+
Land type	Dummy - Communal = 0, Commercial = 1	-
Access to extension	Dummy - Difficult = 0, Easy = 1	-
Extension visit	Categorical - Weekly = 0, Monthly = 1, Quarterly = 2, Annually = 3	+
Response of Ext. officers	Categorical - Instant = 0, Takes time = 1, Neutral = 2, Don't respond = 3	+
Change in farm Practices	Dummy - No change in practices = 0, Change in practices = 1	-
Changes in yield	Dummy - No change in Yield = 0, Change in Yield = 1	+
Privatisation of extension	Dummy - Should not privatise = 0, Should be privatised = 1	+
$Ri + \epsilon_t$ = Error term		

4. RESULTS AND DISCUSSION

4.1 Demographic information of farmers in the study area

The section below looks at the socio-economic characteristics and empirical results of the study, paying specific attention to the willingness to pay for extension services and the services they are willing to pay for. The tables below indicate the frequency and statistical distribution of demographic characteristics, farming activities, access to extension services, and how these were important in explaining the relationship between farmers and their willingness to pay for extension services. The study employed Chi-square and T-test analyses to assess the significance through regression of the dependent variable (WTP) of the relationship between the farmers' willingness to pay and their demographic characteristics.

Table 2: Demographic information of farmers in the study area

	Provinces				Values	Degree of freedom	Chi-Square significance level	
Description	Eastern Cape		KwaZulu-Natal					
Frequency (n=111)	82		29		2.14	1	.143	
WTP: Price \geq 250								
Willing to pay %	65		69					
Unwilling to pay %	35		31					
	Type of farmer							
Description	Full-time farmer		Part-time		1.3	1	.018**	
Frequency (n=111)	100		11					
WTP: Price \geq 250								
Willing to pay %	64		82					
Unwilling to pay %	36		18					
	Age groups (years)							
Description	21-35	36-50	51-65	>66	4.89	3	.095*	
Frequency (n=111)	6	38	42	25				
WTP: Price \geq 250								
Willing to pay %	83	71	69	48				
Unwilling to pay %	17	29	31	52				
	Farming experience (years)							
Description	\leq 10	11-25	26-35	36-45	>46	2.99	3	.559
Frequency (n=111)	35	61	13	2	0			
WTP: Price \geq 250								
Willing to pay %	80	61	54	50	0			
Unwilling to pay %	20	39	46	50	0			
	Gender							
Description	Male		Female		.025	1	.874	
Frequency (n=265)	83		28					
WTP: Price \geq 250								
Willing to pay (%)	70		54					
Unwilling to pay %	30		46					

	Marital status						
Description	Single	Married	Divorced	Widowed			
Frequency (n=265)	18	76	7	10	2.6	3	.456
WTP: Price \geq 250							
Willing to pay (%)	78	63	71	60			
Unwilling to pay %	22	37	29	40			
	Level of education						
Description	No Education	Primary	Secondary	Tertiary			
Frequency	4	22	54	31	2.22	3	.013**
WTP: Price \geq 250							
Willing to pay %	50	55	69	71			
Unwilling to pay %	50	45	31	29			

Note: *** = $p < 0.001$; ** = $p < 0.05$; * = $p < 0.1$

Source: Field survey, 2018

As indicated in Table 2, age of the farmers (divided into groups) was found to be statistically significant in relation to the willingness to pay for extension services. Furthermore, among the age groups, farmers between the ages of 36 and 50 (63%), as well as between 51 and 65 (55%) years had the capacity and were willing to pay for extension services compared to their counterparts (> 66 years). Education was found to be statistically significant in relation to the willingness to pay as more farmers who had secondary and tertiary levels of education were willing to pay than illiterate counterparts were. The findings are similar to Bester's (2008) findings with regards to farmers being able to be flexible and open to new ideas.

4.2. Agricultural income and land size

Agricultural income is an important indicator; it gives information on the viability or lack of it in the agricultural sector (DAFF, 2016). Agricultural income refers to the total income (cash or in kind) earned from agricultural products sold and other income (StatsSA, 2016).

Table 3: Agricultural income and land size in the study area

Explanatory variables	WTP: Price (hypothetical) = R250		T-test for equality of means Sig
	Yes = $P \geq R250$	No = $P \leq R249$	
Total agriculture income (R)	733155.03	607293.68	.023**
Land Size (ha)	670.48	409.60	.036**

Note: *** = $p < 0.001$; ** = $p < 0.05$; * = $p < 0.1$

Source: Field survey, 2018

The average agricultural income of farmers who were willing to pay is higher than that for farmers who were not willing to pay. The difference is statistically significant at 5%, presumably owing to the fact that the variance of income for each subgroup is quite high. The same goes for the comparison of average land size; the average land size of farmers who are willing to pay was higher than that for farmers who were not willing to pay, and the difference was significant at 5%. The mean amount generated in the study area was approximately R733 155.03.

4.3 Farming characteristics

Each individual farm has its own specific characteristics, which arise from variations in resource endowments and family circumstances. The household, its resources, and the resource flows and interactions at this individual farm level are together referred to as farm activities. The study employed a Chi-square test to assess the relationship between farming activities and farmers' willingness to pay for extension in the study area.

Table 4: Farmer activities

	Farming enterprises			Values	Degree of freedom	Chi-Square significance
Description	Crop farming	Livestock farming	Mixed farming			
Frequency (n=111)	7	29	75			
WTP: Price \geq 250				2.32	2	.090*
Willing to pay (%)	71	59	32			
Unwilling to pay (%)	29	41	68			
	Farming season					
Description	Seasonally	Annually	Both	.511	2	.775
Frequency (n=111)	9	72	30			
WTP: Price \geq 250						
Willing to pay (%)	44	69	63			
Unwilling to pay (%)	56	31	37			
	Farming reasons					
Description	HH Cons	Selling	Both sell & Cons			
Frequency (n=111)	1	33	77	1.24	2	.538
WTP: Price \geq 250						
Willing to pay (%)	100	76	61			
Unwilling to pay (%)	0	24	39			
	Achieving farming goals					
Description	Yes	No		4.97	1	.026**
Frequency (n=111)	89	22				
WTP: Price \geq 250						
Willing to pay (%)	66	64				
Unwilling to pay (%)	34	36				
	Land ownership					
Description	Yes	No		4.74	1	.491
Frequency (n=111)	49	62				
WTP: Price \geq 250						
Willing to pay (%)	63	68				
Unwilling to pay (%)	37	32				

Note: *** = $p < 0.001$; ** = $p < 0.05$; * = $p < 0.1$

Source: field survey, 2018

As represented in Table 4, farming enterprises, which were comprised of crop, livestock and mixed farming, were found to be statistically significant at 5% in relation to the willingness to pay. Similarly, farming goals were statistically significant at 5% to the willingness to pay. The assumption is that the farmers understand the value of fee for services concept and that paying for services would improve the quality of extension received and subsequently help improve yield returns and achieve farming goals (Njoko, 2014).

4.4 Extension services in the study area

In South Africa, agricultural extension services are the most common forms of public sector support for knowledge diffusion and learning. The concept of extension services sector involves agricultural experts, who teach improved methods of farming in both livestock and cropping enterprises, demonstrate innovations, organise farmer meetings and markets (Schwartz, 1994). Smallholder farmers are the primary beneficiaries.

Table 5: Access to extension services

	Access to extension services		Values	Degree of freedom	Chi-Square significance
Description	Yes	No			
Frequency (n=111)	110	1	.145	1	.608
WTP: Price \geq 250					
Willing to pay (%)	66	0			
Unwilling to pay (%)	34	100			
How is the access to extension services?					
Description	Easy	Difficult	.145	1	.099*
Frequency (n=111)	81	29			
WTP: Price \geq 250					
Willing to pay (%)	67	66			
Unwilling to pay (%)	33	34			
Any changes in farm practices?					
Description	Yes	No	1.85	1	.947
Frequency (n=111)	92	19			
WTP: Price \geq 250					
Willing to pay (%)	68	53			
Unwilling to pay (%)	32	47			
Any difference in yield/ production outcome?					
Description	Yes	No	.488	1	.860
Frequency (n=111)	91	20			
WTP: Price \geq 250					
Willing to pay (%)	68	55			
Unwilling to pay (%)	32	46			
Should extension be privatised?					
Description	Yes	No	71.66	1	.001***
Frequency (n=111)	64	47			

WTP: Price \geq 250	98	79			
Willing to pay (%)	2	21			
Unwilling to pay (%)					

Note: *** = $p < 0.001$; ** = $p < 0.05$; * = $p < 0.1$

Source: field survey, 2018

Table 5 presents results on farmers' access to extension services. The majority (67%) of farmers who had access to extension services indicated that it was easy to contact extension officials whenever they needed technical assistance and this was statistically significant at 5% to the willingness to pay. Furthermore, privatisation of extension services was statistically significant at 1% to the willingness to pay for extension services. This indicates that farmers foresee the benefits of pay for extension services, which include technical efficiency, and extension officials who are profit orientated. The findings are similar to those made by Zwane (2016) that the reason/s farmers are willing to pay for private extension is that they come with a host of benefits such as greater operational efficiency, cost-effectiveness, as well as accountability of extension officers to perform and produce results.

4.5 Extension services farmers are willing to pay for

In its simplest form and definition, willingness to pay is the measure of the maximum amount of money a consumer/ farmer is willing to give by obtaining goods or services of a good quality (Bello & Salau, 2009). Table 6 shows the different services farmers are willing to pay for and the amounts. As alluded earlier, information and empirical evidence on farmer's willingness to pay, which extension services they are willing to pay for, and at what price is scanty in South Africa. Table 6 indicates which services farmers in the Eastern Cape and KwaZulu-Natal provinces are willing to pay for and at what price. Using T-test analysis, the results are shown below.

Table 6: Extension services and the mean amount farmers are willing to pay for

Explanatory variable	Mean (R/ Per-Month)	T-test for equality of means Sig
Maximum amount willing to pay for extension services	618.89	.005***
Maximum amount willing to pay for visitation period	481.07	.004***
Maximum amount willing to pay for production skills	414.37	.164
Maximum amount willing to pay for marketing skills	445.51	.001***
Maximum amount willing to pay for risk management	391.12	.145
Maximum amount willing to pay for disease manage	425.71	.468
Maximum amount willing to pay for crop and livestock management	429.39	.021**
Maximum amount willing to pay for fertilizer and vaccine application	352.86	.623
Maximum amount willing to pay for record keeping	390.65	.056*
Maximum amount willing to pay for individual training and visits	418.52	.085*
Maximum amount willing to pay for group training and visits	425.52	.051**
Maximum amount willing to pay for mass media as source information	391.43	.951

Maximum amount willing to pay for facilitation as a teaching method	299.47	.159
Maximum amount willing to pay for demonstrations as a teaching method	488.03	.003***

Note: *** = $p < 0.001$; ** = $p < 0.05$; * = $p < 0.1$

Source: Field survey, 2018

As demonstrated in Table 6, after establishing willingness to pay, farmers indicated the price and type of services for which they were willing to pay. On average, farmers in the study area were willing to pay R618.89 per month (pm) for extension services in crop and animal husbandry. For visitation periods, farmers were willing to pay an average fee of R481.07 pm for extension officers who visits them on a monthly basis. Farmers also preferred an extension officer who would visit them and communicate technologies to them in groups (R425.52 pm) and individually (R418.52 pm). Furthermore, farmers preferred demonstrations as the main method to deliver agriculture technologies and they were willing to pay an average amount of R488.03 pm.

Employing the T-test on Table 6, farmers felt that some services were urgent (highly significant) to their farming and they were willing to pay for them. These services included marketing (R445.51 pm) as well as crops and livestock management (R429.39 pm).

4.6 Empirical results of the probit model

Table 7 shows the results from the probit regression model that was run to investigate the factors that influence land reform beneficiaries' willingness to pay for extension services. Willingness to pay was used as a dependent variable, which was a dummy variable where 1 represented the farmers who were willing to pay for extension and 0 for farmers who were not willing to pay for extension services. The results are presented in Table 7.

Table 7: Factors influencing farmers' willingness to pay for extension services

Willingness to pay for extension services	Coefficient	Robust Std. Err.	Z	P>z
Farmer type	.8631117	.3049947	2.83	0.005**
Farmer experience	.1033147	.1489763	0.69	0.488
Age groups	-.3108833	.1403793	-2.21	0.027*
Gender	-.1685664	.2412904	-0.70	0.485
Marital status	-.0456795	.1329028	-0.34	0.731
Level of education	-.0542694	.1253966	-0.43	0.665
Farming enterprise	.0714885	.1895641	0.38	0.706
Farming season	.5076662	.2130887	2.38	0.017*
Farming goals	-.3275927	.2010245	-1.63	0.103
Farm goals achieved	.6158427	.2502532	2.46	0.014*
Agric income	-1512e-07	1.00e-07	-3.12	0.002***
Land ownership	-.0666157	.2194024	-0.30	0.761
Land size	.0010292	.0002869	3.59	0.001***
Land type	-.1163733	.2434998	-0.48	0.633
Access to extension	.4742006	.2385187	1.99	0.047*
Extension visit	.1273775	.1187857	1.07	0.284

Response of extension officers	-.3085125	.1116263	-2.76	0.006**
Change in farm practices	-1.058301	.4030892	-2.63	0.009**
Changes in yield	.4745995	.3665985	1.29	0.195
Privatisation of extension	2.444119	.2447612	9.99	0.001***
Constant	-.2189632	1.006589	-0.22	0.828

Source: Field survey, 2018

From the 19 variables fitted in the probit logistic model, 10 variables had a significant influence on identifying the characteristics associated with the willingness to pay for extension services. Farmer type, age, farming seasons, goals, agricultural income, land size, type, access to extension services, response of extension to farmer needs, change in farmers' practices, and privatisation had a significant influence on the willingness of farmers to pay. The Pseudo R2 suggests that the model is reasonably powerful and that the results could be used with confidence.

In general, the coefficients of the probit regression cannot be interpreted from the initial output, thus the need to interpret the marginal effects of the regressors (Greene, 2000). That is to say, how much the (conditional) probability of the outcome variable changes when there is a change in the value of variables, holding all other variable constant at some values. This is different from the linear regression case where a direct interpretation can be estimated for the coefficients (Gujarati, 2004). This is because, with linear regression, the regression coefficients (output) are the marginal effects, whereas in the probit regression, there is an additional step of computing required to get the marginal effects (Greene, 2000). This is the notion of marginal effects measure and is shown in Table 8.

Table 8: Marginal effects of the probit regression model

Willingness to pay for extension services	dy/dx	Std. Err.	Z	P>z
Farmer type	0.333643	.1095	3.05	0.002***
Farmer experience	0.0402112	.05795	0.69	0.488
Age groups	-0.1209992	.05472	-2.21	0.027**
Gender	0.0649615	.09206	-0.71	0.480
Marital status	-0.017779	.05169	-0.34	0.731
Level of education	-0.0211222	.04883	-0.43	0.665
Farming systems	0.0278241	.07374	0.38	0.706
Farming season	0.1975893	.08365	2.36	0.018**
Farming goals	-0.1275027	.07864	-1.62	0.105
Farm goals achieved	-0.2406287	.09606	2.51	0.012**
Agric income	-0.1002e-07	.00000	-3.13	0.002***
Land ownership	-0.025941	.08544	-0.30	0.761
Land size	0.0004006	.00011	3.62	0.001***
Land type	-0.0453624	.09478	-0.48	0.632
Access to extension	0.1845641	.0927	1.99	0.046*
Extension visit	.0495767	.04623	1.07	0.284
Response of extension officers	-0.1200764	-.04351	-2.76	0.006**
Change in farm practices	-0.3586407	.11108	-3.23	0.001***
Changes in yield	0.1847193	.14278	1.29	0.196

Privatisation of extension	0.7634686	.04755	16.06	0.001***
* dy/dx is for discrete change of dummy variable from 0 to 1				

4.6.1 Farmer age and farm experience

Farmers in this survey were either full-time or part-time farmers. According to Table 8, being a farmer, either full-time or part-time, was significant at 1% to the willingness to pay, and if a farmer decides to move from part-time to full-time farming, their willingness to pay for extension services increases by 0.33 unit (33%). This may be motivated by an increase in his farm income, access to larger farming land, funding, or retrenchment from their everyday occupation (Mniki, 2009).

Table 8 also indicated that the age groups in which farmers were categorised was significant at 5% to the willingness and the coefficient was negative suggesting that the relationship was inversely proportional. This means that when a farmer moves out of a younger age group to an older one, their willingness to pay for services decrease by 31% (-0.31 units). This may be a result of the farmer believing that with increasing age and time in farming, the farmer has adequate expertise and therefore does not require advisory services (Alemu, 2012). This may also explain why farming experience was not significant, since the higher the experience of the farmer, the less likely they are willing to learn something new or change their farming methods, for example, pay to receive services. Moreover, education was also found to be insignificant. It could be proposed that the higher the educational level of farmers, the more they are not willing to pay because they feel they can acquire information on their own (Sikwela, 2013).

4.6.2 Farming season, goals, agricultural income and land size

As represented in Table 8, farmers in this survey practiced farming either seasonally or annually, the significance level to the willingness to pay was at 5%, and the coefficient was positive. This means there was a positive relationship between the willingness to pay and farming seasons such as the probability of a farmer moving from an annual to a seasonal farmer associated with willingness to pay increases by 19%. Achieving farming goals were significant at 5% and the coefficient was negative. The means that the probability of achieving farming goals associated with farmers' willingness to pay for services decreases by 24% (-0.24 units). This implies that if a farmer achieves one set goal (short, medium and long-term goal) their willingness to pay more for that extension service decreases.

Agricultural income was significant at 1% to the willingness to pay for extension services, however, the coefficient was negative. This indicates that the marginal effect on probability of $y = 1$ associated agricultural income increased by 100%. This means that farmers who made a profit from their produce were no longer willing to pay for extension services. This may be as a result of the farmer not feeling the need to pay more after an increase in his income as this may reduce his anticipated profit. Furthermore, land size was significant at a 1% level and the coefficient was positive. This implies that the relationship between land size and farmers' willingness to pay was directly proportional and the marginal effect on the probability of $y = 1$ associated with land size increases by 0.04%. In other words, this means an increase of one hectare in land size increases the willingness to pay by 0.04 units/ price.

4.6.3 Access to extension, response change in farming practices and privatisation

Individual farmers were asked how their extension services are and the relationship between these two role players was found to be positive and significant (Table 8). Access to extension services, whenever you need them, was significant at 5% to the willingness to pay and the coefficient were positive. The relationship is positive, and this indicates that that the expected difference in the probability of $y = 1$ associated with access to extension to pay for extension increases by 18%. This means that if access to extension services is easy, farmers' willingness to pay for services increases by 18%. This is because if extension officials are easily accessible, they can help farmers deal with their farming challenges quickly, especially in cases of emergency (Afful & Lategan, 2014; Labarthe & Laurent, 2013).

The time taken by extension officials to respond to farmers was significant at 5% to the willingness to pay for extension services. However, the coefficient was negative which indicates that the expected difference in the probability of $y = 1$ associated with the response of extension services decreases by 18%. This means that the relationship between the response of extension officials to farmers' queries was found to be inversely proportional. The farmers' willingness to pay decreased presumably since farmers do not entirely trust the response of extension officers or if they will get the help they need (Umhlaba Rural Services, 2006).

As represented in Table 8, change in farm practices were found to be significant at 1% and the coefficient was negative in relation to the willingness to pay for extensions services. Changes in farm practices/ methodologies had an inversely proportional relationship to the willingness to pay and the expected difference in probability of $y = 1$ decrease was 35%. The reason or this may be due to the fact that the farmers do not see the need to pay more when they have learned a new skill set.

Farmers were in favour of privatisation of extension and as shown in Table 8, the relationship between privatisation and farmers' willingness to pay was highly significant at 1%. Farmers argued that if extension were to be privatised, they would pay for those services provided by private companies (Hellin, 2012). The relationship between privatisation and willingness to pay was positive and it stated a change in extension supplier (from public to private) increases the probability of a farmer to pay by 76% (0.76 units). The reasons for this are found in literature and the argument is that if extension services were privatised, they would cut down the fruitless expenditure championed by the government sector, get rid of the top-down approach, and increase efficiency which improves the quality of extension services provided (Labarthe & Laurent, 2013; Uddin & Qijie, 2013)

5. CONCLUSION AND RECOMMENDATIONS

The study was inspired by the lack of reliable and detailed empirical data on smallholder farmers' willingness to pay for extension services, and types of services they are willing to pay for. The scarcity of this information has derailed the commercialisation prospects of smallholder farmers in the Eastern Cape and KwaZulu-Natal provinces in South Africa. The study concluded that farmers were in favour of privatisation as they felt it would improve their farm returns. Inevitably, the idea of privatising extension services meant that farmers had the capacity and were willing to pay. Furthermore, farmers preferred an extension officer who would visit them monthly and communicate technologies to them as a group and through demonstrations. Results of the survey further indicated that farmers needed assistance on the most included marketing, livestock management, and record keeping. From the results of the

probit regression, it became evident that farmers who were likely to pay appeared to be those who practiced farming on a full-time basis, who are younger, with large farm size (land), who had access to extension, and who saw changes in their farming practises.

Based on the findings, the following recommendations are put forward:

- The study established that age, land size and easy access to extension services are key farmer attributes influencing the willingness to pay for the services. For successful intervention, any extension services provider should take note of such characteristics, as farmers who exhibit such traits will appreciate the services. Farmers with such characteristics should act as innovators upon which others could learn from.
- For land reform beneficiaries who receive grants for farming from the government, an immediate but slow introduction of a fee-based extension services should be embarked upon.
- The study established that land was one of the significant factors with willingness to pay for extension services, therefore efforts leading to giving land reform farmers' title deeds and full ownership of the land they farm on is ideal for privatisation.
- The study also investigated the extension services/ technologies that farmers were willing to pay for. However, further research in this area needs to be undertaken as information is still scarce.
- Introducing fee-based extension services or private companies in a space dominated by the public sector and smallholder farmers who have been receiving extension services for free need to be monitored and treated with care.
- International experiences on privatisation of extension services and information on the experiences of commercial farmers in South Africa who practice fee-based services need to be documented and disseminated for public understanding and implementation.

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FARMERS' PERCEPTIONS OF LIVESTOCK HUSBANDRY AND RANGELAND MANAGEMENT PRACTICES IN TWO COMMUNAL COASTAL AREAS OF THE EASTERN CAPE PROVINCE, SOUTH AFRICA

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ABSTRACT

This study assessed indigenous knowledge and farmer perceptions of livestock performance, rangeland condition and indigenous feed resource management in two communal coastal areas of the Eastern Cape Province, South Africa. A total of 50 farmers from each communal area (Dyamdyam and Machibi) were interviewed using a structured questionnaire to determine farmer's perceptions. The respondent included both female and male farmers who owned livestock. About 82 % and 74 % of households at Machibi and Dyamdyam, respectively, were male-headed. The average population of livestock species at Dyamdyam was cattle (6.0), goats (3.1) and sheep (1.2), whereas at Machibi it was cattle (8.9), goats (5.8) and sheep (1.0). Cattle and sheep are primarily raised for sale and food, while goats are primarily raised for traditional purposes such as circumcision. The primary challenges faced by farmers to raise their livestock include stock theft followed by feed shortage and animal diseases. All the respondents reported that they practice continuous grazing due to the absence of fence on their rangelands. In both villages rangelands are primarily used for grazing followed by the collection of wood and grass for building, fire and medicines. About 30 % and 32 % of the respondents at Dyamdyam and Machibi respectively, perceived that their rangelands were in poor conditions. Communal farmers do not control their livestock movements due to vandalised fences in their rangelands. Therefore, it can be concluded communal rangelands are continuous grazed due to the absence of fence.

Keywords: Grazing, fencing, household respondents, livelihood, poor conditions, villages.

1. INTRODUCTION

In South Africa, rural areas are mainly populated by small scale farmers who raise livestock on common land and practice crop farming for consumption and sale on local markets (Wessels *et al.*, 2004). Communal rangelands provide natural resources that support the multiple livelihood strategies of the resource poor rural people (Peden, 2005). Several communal farmers in Africa use their indigenous knowledge and perceptions to make decisions on livestock farming and grazing land management. This local knowledge has allowed them to keep livestock under challenging biophysical environments, which are highly variable in space and time, and with little support as well as modern farming technologies (Angasa and Oba, 2010). Local knowledge and perceptions of communal farmers may vary from place to place and also from individual to individual within the same location.

Many scientists worldwide have recently recognised the indigenous knowledge and perceptions of communal farmers regarding their livestock husbandry and rangeland management (Solomon *et al.*, 2007; Kgosikoma *et al.*, 2012; Ghorbani *et al.*, 2013), while others have ignored and disapproved (Abate *et al.*, 2010). As a result, many development projects in Africa that are trying to improve the communal rangeland condition and livestock

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production have failed (Abate *et al.*, 2010). Twyman *et al.* (2004) reported that combination of indigenous and scientific knowledge can bring more useful evaluation of environmental changes and its implication for local land users. Some South African communal herders have indigenous knowledge and skills that can be used in developing the livestock production by sustainably using and managing the rangeland resources (Allsopp *et al.*, 2007). It is an advantage to acquire the perceptions of communal farmers related to rangeland conditions and livestock management because many communal farmers are able to classify the grass species that are more palatable and less palatable to livestock (Gemedo-Dalle *et al.*, 2006; O'Farrell *et al.*, 2007; Kgosikoma *et al.*, 2012).

In an attempt to improve livestock production and achieve ecological stability in communal rangelands, an investigation of farmers' indigenous knowledge and perceptions about their livestock husbandry and rangelands management practices is significant (Brown and Havstad, 2004). Therefore, the objective of this study was to evaluate the farmers' perceptions of livestock husbandry and rangeland management practices in two communal coastal areas (Dyamdyam and Machibi) of the Eastern Cape Province, South Africa.

2. MATERIALS AND METHODS

2.1. Description of study areas

The study was conducted in two communal grazing lands namely Dyamdyam and Machibi located in the coastal areas of the Eastern Cape, South Africa. These communities are beneficiaries of the Nguni Cattle project. In 2004, the University of Fort Hare in collaboration with Industrial Development Corporation (IDC) and the Eastern Cape Department of Agriculture Agencies initiated the Nguni cattle development project (Musemwa *et al.*, 2008). The objective of the project is re-introducing the Nguni cattle in communal areas (Mapiye *et al.*, 2007). The Nguni cattle development project operates in a pay it forward system" in which the project selects communal areas and supply them with two bulls and ten heifers which are then passed to second community after five years (Musemwa *et al.*, 2008).

Machibi is located at the coordinates of 33° 00.088''S and 027° 27.605''E and an elevation ranging from 362–364 m above sea level. It has a semi-arid climate and receives average annual rainfall of 700–800 mm, with most rainfall occurring during summer (November to January). Temperature ranges from 20 °C–26 °C in summer and in winter it ranges from 9 °C– 12 °C (Buffalo City Metropolitan Municipality (BCMM), 2007). The soil is fine textured and dominated by sandy soil that has low moisture holding capacity and high tendency of getting waterlogged after heavy rainfall. Machibi falls under the Thorn-veld savanna biome. The dominant grass species are *Themeda Triandra*, *Sporobolus Africanus*, *Cynodol dactylon* and *Eragrostis plana*. The common woody species are *Acacia Karoo* and *Scutia Myrtina* (Mucina and Rhutherford, 2006).

Dyamdyam is located at the coordinates of 33° 12.611''S and 027° 13.918''E and an altitude that range from 62–64 m above sea level. It has a humid climate and receives mean annually rainfall of 800–1000 mm, with most rainfall occurring during summer (November to January). The temperature ranges from 20 °C – 24 °C in summer and in winter 8 °C –10 °C (Acocks, 1988; World Atlas, 2012). The soil is fine texture and predominated by sandy soil with low moisture retention capacity. The common grass species are *Themeda Triandra*, *Sporobolus Africanus*, *Eragrostis Plana*, *Tristachya leacothrix* and *Elulia vilosa*. The dominated woody

species are *Diospyros Cyciodis* and *Acacia Karoo* (Buffalo City Metropolitan Municipality (BCMM), 2011).

2.2. Selection of Farmers

A total of 50 households who kept the livestock species were randomly selected from each communal area. These included both female and male farmers. Prior to the selection of households, a meeting was held with the Chairman of each community to introduce the purposes of the study. These two villages were selected because they are the beneficiaries of the Nguni Cattle Project and communal farmers complained about poor performance of Nguni Cattle.

2.3. Data collection

Household respondents were interviewed using structured questionnaires consisting of open-ended and closed questions. Closed questions in the current study were defined as a multiple response questions where the household respondents could make more than one choice. Open-ended questions were added in this study to inspire free and spontaneous answers from interviewees. Therefore, when the respondents answering such questions were not limited to choices encoded by the designer of questionnaire and they explained their own facts and opinions. Each farmer was interviewed individually in the homestead. The questionnaire was structured into three sections-: (1) Demography, (2) Livestock role and husbandry and (3) Rangeland condition and management. Interviews were conducted in Xhosa language by trained enumerator. The study protocols were approved by Govan Mbeki Research and Development Centre (GMRDC) in accordance with University of Fort Hare and Ethical Committee.

2.4. Statistical analyses

The data pertaining to farmer's perceptions and demographics were analysed using the SPSS statistical software program (SPSS, 2011). For ranked data Friedman's Chi-square test was employed (Steel and Torrie, 1980). When Friedman's test showed significant variation, a set of sign test for multiple comparisons of means were made. For other data, descriptive statistics such as frequencies, means, standard deviations and percentage were used where applicable.

3. RESULTS

3.1. Demographic information

About 82 % and 74 % of the households at Machibi and Dyamdyam, respectively were male headed. The majority of the respondents at Dyamdyam (56 %) and Machibi (68 %) were married. Most of the interviewed communal farmers at Dyamdyam (66 %) and Machibi (70 %) were above 50 years of age (Table 3.1). Mean households size at Dyamdyam was (2.1), whereas at Machibi it was (3). About 50 % and 42 % of household respondents at Dyamdyam and Machibi respectively were not employed (Figure 3.1). They mainly relied on social grants followed by pension and small businesses (Figure 3.1). Most of the respondents at Dyamdyam (74 %) and Machibi (64 %) attended the primary education and only 6 % of farmers at Dyamdyam and 2 % at Machibi attended tertiary education (Figure 3.1).

Table 1: Age distribution (%) of respondents at Dyamdyam and Machibi communal areas (respondents, n= 50 per village)

	Dyamdyam	Machibi
<i>Age distribution (years)</i>		
<30	6	4
30-40	8	12
40-50	20	14
>50	66	70

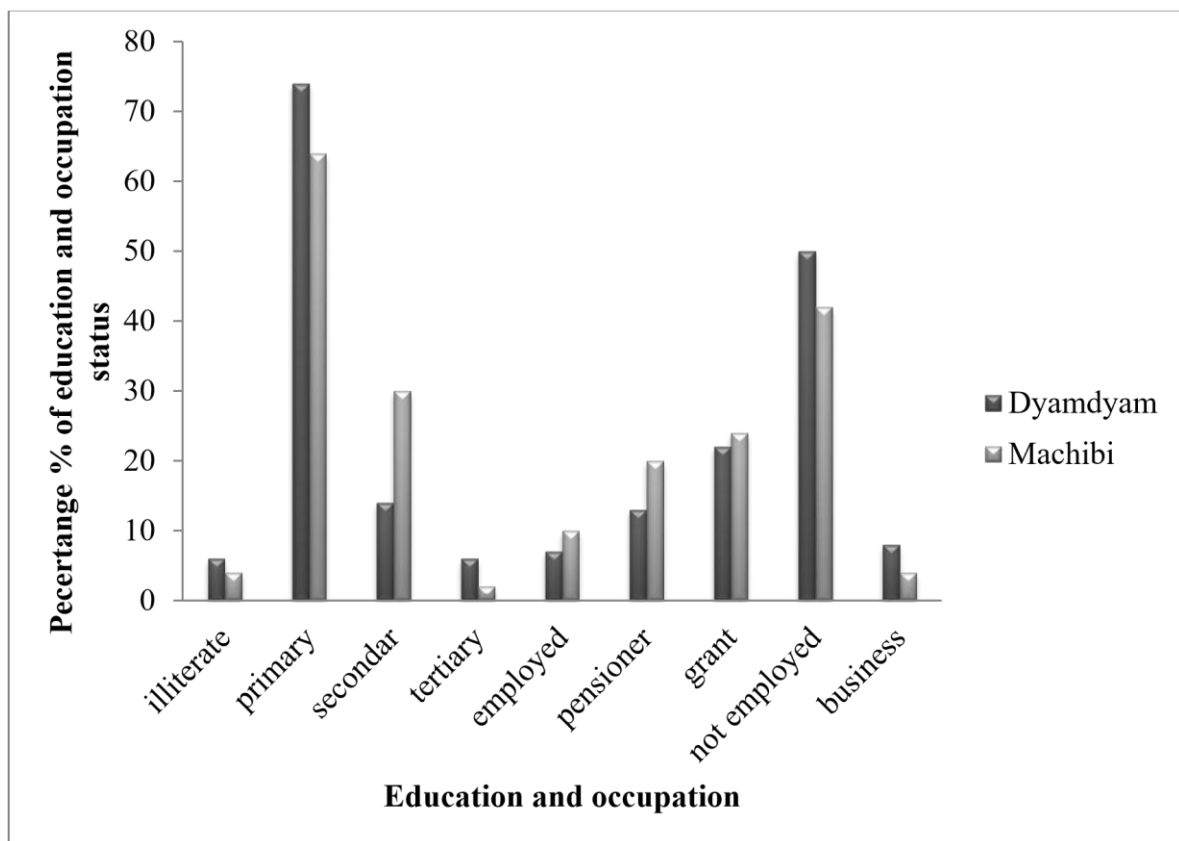


Figure 1: Education and occupation status of communal farmers at Dyamdyam and Machibi areas

3.2. Livestock population and trend

The mean population of livestock species at Dyamdyam was cattle (6.0), goats (3.1) and sheep (1.2), whereas at Machibi it was cattle (8.9), goats (5.8) and sheep (1.0) (Table 3.2). There was a significant ($P < 0.05$) difference in mean numbers of cattle and goats kept between the study areas, being higher at Machibi than Dyamdyam. Most household respondents at Dyamdyam (64 %) and Machibi (70 %) kept non-descript cattle breed, while 24 % and 16 % kept Nguni

cattle, respectively. About 78 % and 86 % of respondents at Dyamdyam and Machibi respectively perceived a declining trend of cattle population over the past ten years. Similarly, household respondents at Machibi (82 %) and Dyamdyam (52 %) observed the decreasing trend of sheep population over the past ten years. However, about 38 % and 37 % of respondents at Dyamdyam and Machibi respectively, perceived an increasing trend of goats population over the past ten years.

Table 2: Livestock population (mean \pm SE) at Dyamdyam and Machibi (respondents, n= 50 per village)

	Dyamdyam	Machibi
<i>Cattle population</i>		
Bulls	0.3 ^a \pm 0.1	0.2 ^a \pm 0.1
Heifers	2.2 ^a \pm 0.5	1.3 ^b \pm 0.3
Cows	1.9 ^b \pm 0.4	3.7 ^a \pm 0.9
Calves	0.8 ^b \pm 0.3	1.7 ^a \pm 0.4
Oxen	0.8 ^b \pm 0.4	1.5 ^a \pm 0.3
Total	6.0 ^b \pm 1.6	8.6 ^a \pm 1.6
<i>Sheep population</i>		
Rams	0.2 ^a \pm 0.1	0.3 ^a \pm 0.2
Ewes	0.6 ^a \pm 0.3	0.6 ^a \pm 0.2
Castrated rams	0.3 ^a \pm 0.1	0.2 ^a \pm 0.1
Lambs	0.2 ^a \pm 0.1	0.1 ^a \pm 0.1
Total	1.2 ^a \pm 0.6	1.1 ^a \pm 0.5
<i>Goats population</i>		
Does	1.6 ^b \pm 0.7	3.1 ^a \pm 0.6
Bucks	0.2 ^a \pm 0.1	0.3 ^a \pm 0.1

Kids	0.6 ^b ± 0.2	1.8 ^a ± 0.4
Castrated Bucks	0.6 ^b ± 0.2	0.8 ^a ± 0.2
Total	3.1 ^b ± 1.1	5.8 ^a ± 1.1

^{ab}Means with different superscript within the same row are significantly different (P< 0.05)

3.3. Purposes of keeping livestock

As ranked by the interviewed farmers in both communities, cattle are primarily raise for sale, traditional purposes (circumcision and wedding) and *lobola*. Secondly, they raise their cattle for food and traction (Table 3.3). Interviewed communal famers at Dyamdyam and Machibi keep goats primarily for traditional ceremonies such as circumcision followed by sale, food and *lobola* (Table3.3). In both communities the principal reason for raising sheep is for sale followed by food, *lobola* and traditional ceremonies (circumcision and wedding).

Table 3: Relative importance (mean rank ± SE) for keeping livestock in Dyamdyam and Machibi (respondents, n= 50 per village)

Purposes	Dyamdyam			Machibi		
	Sheep	Goats	Cattle	Sheep	Goats	Cattle
Sale	1.5 ^a ± 0.1	1.7 ^a ± 0.2	1.4 ^a ± 0.1	1.7 ^a ± 0.1	1.9 ^a ± 0.2	1.3 ^a ± 0.2
Food	2.2 ^b ± 0.2	3.3 ^c ± 0.3	3.8 ^c ± 0.5	2.3 ^b ± 0.3	3.5 ^c ± 0.3	3.8 ^c ± 0.6
<i>Lobola</i>	3.1 ^c ± 0.4	2.4 ^b ± 0.3	2.7 ^b ± 0.8	2.4 ^b ± 0.3	2.5 ^b ± 0.3	3.0 ^c ± 0.4
Traditional ceremonies	3.2 ^c ± 0.3	2.6 ^b ± 0.3	3.7 ^c ± 0.6	3.5 ^c ± 0.3	2.1 ^b ± 0.3	2.4 ^b ± 0.4
Traction			4.7 ^d ± 0.8			5.7 ^d ± 0.5

^{abc}Means with different superscript within the same column are significantly different (P< 0.05). Purpose that has low mean value is more important and is given the first letter. (1= most important, 5= least important).

3.4. Challenges faced by communal farmers in rearing their livestock

Communal farmers are faced with various challenges in rearing their livestock. Household respondents at Dyamdyam reported that, the primary challenges faced by farmers in raising their cattle and sheep are feed shortage and stock theft followed by animal diseases. Drought is ranked third while predators and water scarcity were ranked the least (Table 3.4). In the same village, their view of challenges in raising goats is differently ranked with animal diseases and

stock theft ranked as the primary challenges (Table 3.4). The respondents at Machibi reported that the primary challenges faced in raising their sheep are stock theft, feed shortage and animal diseases followed by predators, water scarcity and drought. For raising goats, stock theft is still the major challenge followed by animal diseases and predators. For raising cattle, stock theft, feed shortage and animal diseases were regarded as the primary challenges (Table 3.4). About 62 % of respondents at Dyamdyam and 68 % at Machibi reported that their livestock have poor performance in terms of production and reproduction with only 12 % and 16 % indicated that, their livestock have a good performance, respectively.

Table 4: Challenges of raising livestock (mean rank \pm SE) as perceived by communal farmers at Dyamdyam and Machibi (respondents, n= 50 per village)

<i>Challenges</i>	Dyamdyam			Machibi		
	Sheep	Goats	Cattle	Sheep	Goats	Cattle
Feed shortage	2.5 ^a \pm 0.5	3.4 ^a \pm 0.9	1.9 ^a \pm 0.3	3.1 ^b \pm 0.8	4.1 ^c \pm 1.1	3.1 ^c \pm 0.8
Water scarcity	4.5 ^d \pm 0.7	4.4 ^b \pm 0.8	4.7 ^c \pm 0.7	4.2 ^c \pm 0.5	4.3 ^c \pm 0.5	4.2 ^d \pm 0.5
Drought	3.9 ^c \pm 0.7	3.7 ^a \pm 0.7	3.8 ^b \pm 0.7	4.9 ^c \pm 0.6	4.1 ^c \pm 0.6	4.3 ^d \pm 0.6
Predators	4.1 ^d \pm 0.8	3.2 ^a \pm 0.6	4.1 ^c \pm 0.8	4.2 ^c \pm 0.8	3.2 ^b \pm 0.7	4.2 ^d \pm 0.8
Animal diseases	3.2 ^b \pm 0.7	3.1 ^a \pm 0.7	3.3 ^b \pm 0.8	3.0 ^b \pm 0.8	3.1 ^b \pm 0.7	2.2 ^a \pm 0.8
Stock theft	2.6 ^a \pm 0.5	4.1 ^b \pm 0.8	3.2 ^b \pm 0.7	2.1 ^a \pm 0.4	2.3 ^a \pm 0.4	2.1 ^a \pm 0.4

^{abc}Means with different superscript within the same column are significantly different ($P < 0.05$). The lower the rank of a challenge, the greater is its importance and is given the first letter. (1= most important, 6= least important).

3.5. Feed supplementation

About 14 % of the respondents at Dyamdyam and 28 % at Machibi reported that they offer supplementary feed to their livestock, whereas 86 % and 74 % respectively did not offer their livestock with supplementary feed. All the farmers at Dyamdyam and Machibi indicated that they give feed supplements to their livestock in the winter season (May to July). Household respondents at Dyamdyam (8 %) and Machibi (12 %) used lucerne and lick to supplement their livestock, whereas only 2 % and 3 % use maize stalk respectively. All the respondents at Dyamdyam and Machibi indicated that their livestock obtained water from dams and rivers.

3.6. Uses of communal rangelands

Respondents from both villages showed slight differences in terms of their perceptions of the uses of rangeland. At Dyamdyam respondents reported that rangelands are used primary for grazing and collection of woods and grass for building and fire, whereas at Machibi, the respondents considered grazing as the most important use (Table 3.5). The majority of

respondents at Dyamdyam (62 %) and Machibi (66 %) indicated that their livestock start grazing near the homesteads. About 54 % of household respondents at Dyamdyam and 64 % at Machibi reported that their livestock spend most of the time grazing near to the homesteads. They agreed that the reason livestock spend most of time grazing near the homestead is because it is easily reached by the animals and distribution of drinking areas. The majority of respondents in both villages reported that water drinking areas are mostly found near the homestead. Most household respondents at Dyamdyam (98 %) and Machibi (96 %) reported that, their livestock spend about 9 hours on rangelands. In addition, they further stated that, they keep mixed livestock species on their grazing lands.

Table 5: Uses of communal rangelands (mean ranked \pm SE) at Dyamdyam and Machibi (respondents, n= 50 per village)

	Dyamdyam	Machibi
<i>Uses of rangelands</i>		
Grazing	2.2 ^a \pm 0.1	1.4 ^a \pm 0.1
Fire wood	3.2 ^b \pm 0.1	2.1 ^b \pm 0.1
Building	2.4 ^a \pm 0.1	2.9 ^b \pm 0.1
Medicine	3.1 ^b \pm 0.1	3.2 ^c \pm 0.1

^{abc}Means with different superscript within the same column are significantly different ($P < 0.05$).

(1= most important, 4= least important).

3.7. Farmers' perceptions of rangeland condition and rangeland management

About 54 % of household respondents at Dyamdyam and 30 % at Machibi indicated that they do not know the current condition of the rangelands. About 30 % of the interviewed farmers at Dyamdyam and 32% at Machibi reported that their rangelands are in poor condition whereas 0 % and 2 % reported that their rangelands are in good condition respectively (Figure 3.2). All respondents from both villages indicated that they practice continuous grazing system. They explained that they used continuous grazing due to the absence of fence and camping system on their rangelands. Household respondents at Dyamdyam (20 %) and Machibi (14 %) perceived that the current state of their rangelands is caused by overgrazing followed by the lack of rainfall, whereas the rest do not know the driving factors to current state of rangeland condition.

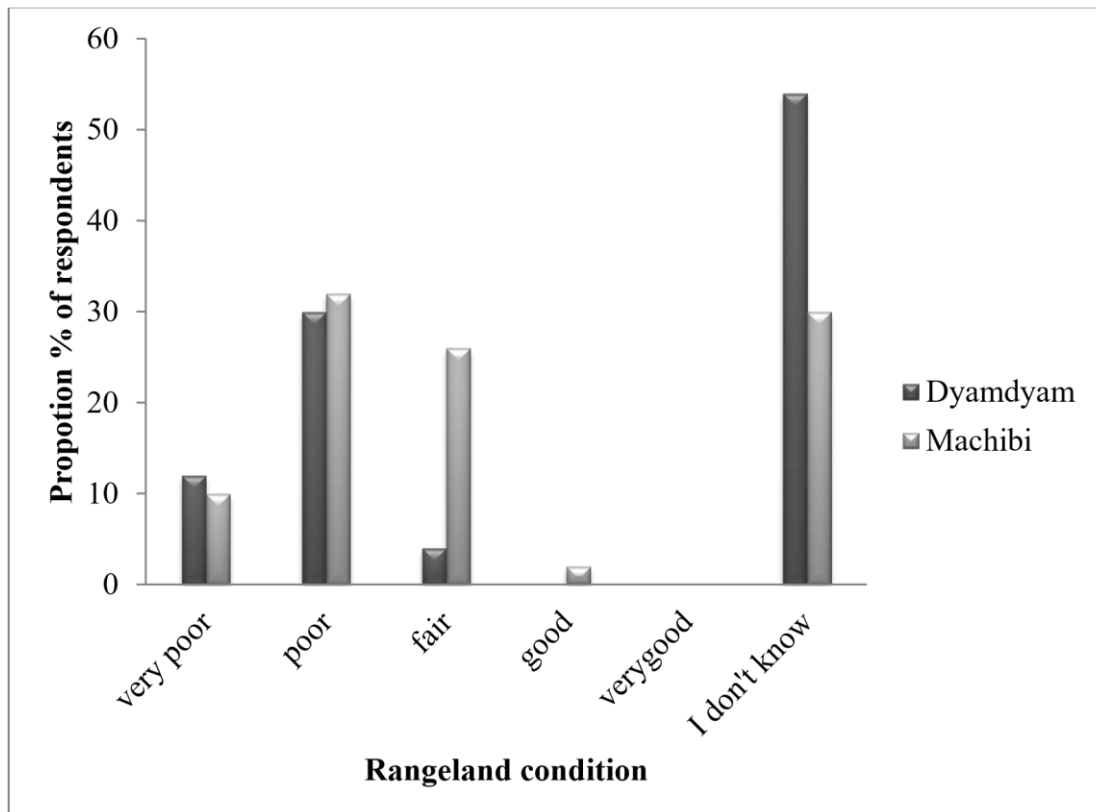


Figure 2: Proportion (%) of household respondents who perceived different state of the current rangeland condition at Machibi and Dyamdyam

4. DISCUSSION

4.1. Household demography

The current study revealed that the majority of household respondents were above 50 years of age. Similar results were reported by Mapiye *et al.* (2009) in communal areas of the Eastern Cape Province of South Africa. This indicates a lack of commitment and interest in agriculture among the youth in communal areas of the Eastern Cape Province of South Africa. This also showed that farming in communal areas is mostly practiced by elderly people. These results are further supported by Rumosa-Gwaza (2009), Lesoli (2011) and Gwelo (2012) who reported that youth in communal areas of the Eastern Cape showed a lack of interest and participation in livestock farming. Indeed, from the different point of the involvement of youth in farming may result in an increase in food insecurity because of limited farming experience (Mbata, 2001). According to Lesoli (2011) less involvement in agriculture by rural youth is associated to the failure of the transfer of indigenous knowledge from the elders to the youth. On the other hand, Hofferth (2003) reported that the age of the household head is a vital driving factor in agricultural productivity as it determines farming experience. The higher the age of the farmer, the more the productivity because of more experience developed from farming (Joubert and Simalanga, 2004).

The majority of respondents participated in this study were married. According to Mphale *et al.* (2002), married communal farmers are able to reduce food insecurity in their families because they can work together to expand crop and livestock farming. The mean household size reported in this study was small and slightly similar to other studies reported in the same province but in different communal areas (Chimonyo *et al.*, 1999; Mapiye *et al.*, 2009).

However, it was relatively low compared to the mean household size reported by Solomon *et al.* (2007) in Ethiopia. According to Paddy (2003), large household size tends to put pressure on the consumption of livestock products within the household. However, Hayes *et al.* (1997) suggested that large household size could provide enough farm labour to expand household livestock and crop farming. In addition, availability of labour within a household plays a vital role in determining the number of livestock to be held per household (Snyman *et al.*, 2008).

The educational status of household respondents showed that most communal farmers did not go beyond primary education. The poor status of education in communal areas could be attributed to the shortage of schools in rural areas of South Africa. This is a common occurrence in many rural areas of South Africa for historical reasons. The poor level of education may negatively affect agricultural productivity in communal areas (Mapaye *et al.*, 2007), because access to information with regard to good management skills for livestock, rangelands and crop farming depend on the level of literacy. This is supported by Kabirizi *et al.* (2009) who reported that, well-educated communal farmers have a better opportunity to manage their livestock and crops. They can acquire information for livestock, crops and rangeland management from new technologies rather than the poor educated communal farmers. This is further supported by Nyangito (1986) adoption of new technology to improve agricultural practices in rural areas depends on the educational status of the farmers. In addition, communal farmers need to combine indigenous skills and educational skills and approaches in order to improve their rangelands and livestock production. This view is supported by Twyman *et al.* (2004) that the combination of indigenous and educational knowledge can bring more useful evaluation of environmental changes and its implication in rangelands and livestock production. In summary, improved educational level of communal farmers can speed up the adoption of new skills and proven and recommended farming practices to increase livestock and crop production in communal areas (King and Bembridge, 1988).

This study also showed that many household respondents at Dyamdyam and Machibi were not employed, they mainly relied on social grants followed by pensions, livestock sale and small businesses for their livelihood. Many studies conducted in rural areas of South Africa reported similar results (Condill, 2005; Dovie *et al.*, 2006). According to South African Statistics (2001), the Eastern Cape has the highest level of unemployment in the whole country. Therefore, expanding livestock production and crop farming could reduce food insecurity a point from creating employment opportunities in communal areas of the Eastern Cape Province, South Africa.

4.2. Livestock population trend and its importance

Respondents perceived a declining trend in cattle and sheep population over the past ten decades and increasing trend in goats population over the past ten years. This declining trend may be due to an increase of feed shortage and animal diseases, whereas the increase of goats is associated with the increase of woody plants on communal rangelands (Smit, 2004). The total mean population of cattle and sheep reported in this study was higher than the results reported by Gwelo (2012) in the same province but in different villages. However, the total mean cattle population recorded in this study was lower than the values reported by Mapiye *et al.* (2009) and Mngomezulu (2010) in the same province, but in different villages and by Shackleton *et al.* (2005) in different province. In addition, the total mean population of goats found in this study was relatively lower than the total mean population reported by Mapiye *et al.* (2009) and Gwelo (2012) in the Eastern Cape Province of South Africa. The majority of household respondents in this study raise non-descript cattle breeds. The reason for raising non-

descript breeds might be due to a lack of breeding practices in communal areas. In most cases, this is due to a lack of knowledge and existing conditions such as infrastructure and land tenure rights within the communal farming system (Montshwe, 2006).

In terms of livestock structure, heifers and cows have the largest mean population at Dyamdyam and Machibi, respectively. Higher mean population of heifers and cows in study areas may be due to the fact that communal farmers prefer to hold cows and heifers for milk production and breeding purposes. The mean population of cows and heifers reported in this study was relatively higher than the mean population reported by Gwelo (2012) in the same province but in different villages. The mean population of bulls reported in the current study was very low. This could be attributed to the fact that communal farmers castrate their male animals, slaughter for traditional ceremonies such as wedding and circumcision, and make them docile for traction (Dovie *et al.*, 2006). In addition, communal farmers prefer selling the oxen to generate income. Similar results were reported by Musemwa *et al.* (2007) in communal areas of the Eastern Cape Province of South Africa. In the present study, ewes and does have the largest mean population. This may be due to the fact that communal farmers slaughter the castrated rams and bucks for meat consumption, sale and traditional ceremonies (Katjiuna and Ward, 2007). The mean population of ewes and does found in this study was slightly higher than the values reported by Gwelo (2012) in the same province.

Communal farmers at Dyamdyam and Machibi raise livestock for different purposes. They raise cattle primarily for sale, food (meat and milk) and traditional ceremonies (circumcision, wedding and pacification of ancestors) and *lobola*. In this study traction was regarded as the least important reason for raising cattle. These findings agree with the studies of Musemwa *et al.* (2010) and Mngomezulu (2010) in South Africa and Solomon *et al.* (2007) in southern Ethiopia. Interviewees in this study reported that sheep and goats were primarily raised for cash generation, food, and traditional purposes (circumcision and wedding) and *lobola*. Similar results were reported by Katjiuna and Ward (2007) and Dovie *et al.* (2006) in southern Africa and by Nthakheni (2006) in the Limpopo Province of South Africa.

4.3. Challenges faced by communal farmers in raising their livestock

Communal farmers were faced with various challenges in raising their livestock. Feed shortage, stock theft, animal disease and predators in this study were cited as the main challenges faced by communal farmers to raise their livestock. These findings agree with many studies conducted in communal production system of Africa (Solomon *et al.*, 2007; Mapiye *et al.*, 2009; Mngomezulu, 2010 and Gwelo, 2012). However, communal farmers regarded feed shortage as the least challenge faced in raising their goats. This may be due to the fact that communal rangelands have a relatively high density of woody species, therefore the browser species such as goats may not be affected by feed shortage (Katjiuna and Ward, 2007). Drought and water scarcity were regarded as the least challenges faced by communal farmers in raising their livestock. This might be due to the fact that both study areas are found in coastal areas where the rainfall is high and there is less risk associated to drought and water scarcity.

Furthermore, household respondents at both villages perceived that feed shortage is worsened by reduction of available grazing land areas and rangelands degradation. These findings strongly agree with the findings reported by Mngomezulu (2010) in the same province and contrary to the report of Retzer (2006) in Sahelian. Other reasons comprise of population pressure, increase in livestock numbers and bush encroachment (Gemedo-Dalle *et al.*, 2006; Solomon *et al.*, 2007). According to Mapiye *et al.* (2009), the lack of adequate skill for

livestock and rangelands management results in feed shortage, stock theft and animal health problems. In the current study, poor performance of livestock in terms production and reproduction due to lack of adequate feed is reported. These results are corresponding with the study of Mengistu (2012) in Ethiopia who reported that feed shortage causes a loss of body weight, less milk production and poor fertility in livestock. In addition, household respondents further suggested that the provision of management skills for rangelands and livestock, supplementary feed, kraals and fencing the rangelands would assist to reduce feed shortage, animal diseases, predators and stock theft. These plans pointed out by the household respondents to reduce these challenges are similar with plans used by communal farmers in Ethiopia (Abule, 2003).

4.4. Feed supplementation and rangeland condition

In the current study, many communal farmers at Dyamdyam and Machibi did not provide supplemental feed to their livestock and they depend on natural rangeland in order to feed their animals during the year round. Similar results were reported by Solomon *et al.* (2007) in Ethiopia. Communal farmers who offered supplements to their livestock indicated that they supplement during the dry season (May to July) due to the lack of feed during this season and they use lucerne, licks and maize stalk. In addition, all the respondents in this study indicated that, they experience shortage of feed during the dry season (winter). The shortage of feed during the dry season might be due to the lack of rainfall and cold temperatures. This view is supported by MacDowell (1992), it is rare to have enough feed and meets the entire minerals required by the livestock during the dry season (winter) due to the weather conditions.

The majority of respondents in this study do not know their rangeland condition. This might be due to a lack of adequate training and educating skills in communal farmers about their rangeland management and conditions. The minority of interviewed communal farmers reported that their rangelands are in poor condition and this is caused by overgrazing, the lack of rainfall and human activities. Many studies reported that some communal farmers in rural areas of Africa believe that the condition of their rangeland is poor whereas others rate their rangelands to be in good condition (Ward *et al.*, 2000; Abule *et al.*, 2005). Similarly, Palmer *et al.* (1997) found that about 0.5 million ha of the Eastern Cape rangelands was in good condition and 2.6 million ha in poor condition. All the interviewees in the present study reported that they practice continuous grazing system due to the absence of fence and camping system in their rangelands. Similar results were reported by Shackleton (1993) in the eastern Transvaal Lowveld. In addition, Ward *et al.* (2000) further stated that grazing areas in several communal rangelands of Namibia are not sub-divided into camps for effective utilization of rangeland. This does not permit for recovery of vegetation after grazing because the control of animals is not easy (Arnalds and Backerson, 2003).

4.5. Uses of communal rangelands

In the present study, communal rangelands are primarily used for grazing followed by the collection of wood and grass for building, fire and medicine. This is because extensive natural rangelands are the primary source of forage for poor resource livestock farmers in communal areas (Solomon *et al.*, 2007). These results are strongly agreed with the report of Homewood (2004) in communal production of Africa. In addition, Dovie *et al.* (2007) further stated that over 90 % of resource poor rural households in the southern Africa depend on the natural rangeland resources for food, income and other services. According to de Oliveira *et al.* (2003), communal rangeland provides services such as timber, pharmaceuticals, human food, animal

feed and fresh water. Communal farmers in this study reported that their livestock spend most of time grazing near the homestead since it is easily reached by the animals and the distribution of drinking areas. Similar results were reported by Lesoli (2008) in the same province but in different villages.

5. CONCLUSION

The present study revealed that livestock plays a vital role in the livelihood of poor resource farmers at Dyamdyam and Machibi by generating income and provision of food. However, it is constrained primarily by feed shortage, stock thefts and animal disease. Many communal farmers did not offer their livestock with supplementary feed and they depended on natural rangelands for feed throughout the year. Therefore, there is a need for intervention to identify other sources of fodder that can be used by resource limited farmers during the dry seasons. In addition, all the household respondents indicated that, they practice continuous grazing system due to vandalised fence on their rangelands. Thus in turn leads to over utilisation of communal rangelands. Therefore, fencing and application of appropriate grazing system in communal grazing area is highly recommended.

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LAND REFORM, LAND CARE, DEVELOPMENT AGENCIES AND EXTENSION SERVICES: OVERLOOKED INCOMPATIBILITY AMONGST CRITICAL PROGRAMMES/PROJECTS: A CASE STUDY OF UKHAHLAMBA FARM, UNDERBERG AREA, KWAZULU NATAL

N. Dumakude and S. Hadebe

THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

WHAT CAUSES YIELD DECLINE IN SUGARCANE LAND REFORM FARMS?

P.M. Ngcobo⁴⁰ and S. Mkhwanazi⁴¹

INTRODUCTION

The research was conducted in the KwaDukuza Local Office under ILembe District Municipality in 2018. Land reform beneficiaries in the sugar industry were interviewed to find out as to what causes yield decline on their farms. The case study was done by interviewing two members from ten Land Reform projects. The main objective for this study is to find out what causes yield decline in sugarcane Land Reform farms. The farms were producing on average 60 tons per hectare before transfer or sale but, after transfer, the farms are now yielding 44 tons per hectare over the past two years (2016/17 & 2017/18). This is a 16 tons decrease per hectare which is worth millions of Rands that is lost by the industry and the communities at large. Participatory Rural Appraisal provided a selection of tools. For this study, method for data collection used was; the focus group discussions and semi-structured interviews.

PURPOSE

Within the sugar industry, claims over cane land lodged since the programme's inception in 1994, have been settled, and continue to be settled. However, more and more diverse challenges and mixed realities are being experienced after land restoration, it is evident that the post-transfer aspects of land restitution can no longer be under-estimated. Hence a combined effort is needed to ensure that the restitution beneficiaries not only benefit from their newly restored rights at the point of transfer, but that the transferred commercial farms are successfully managed, in order to contribute to improving their present livelihoods, and for the sustainability of the sugar industry.

In order to achieve high yields, there are best management practices that should be followed when growing sugarcane. Sugarcane production starts with establishing the soil potential by classifying the soil type on which the plot is to be planted, since this will not only ensure the site is suitable for the crop, but also dictate the selection of varieties, fertilizers and lime as well as herbicides and estimated yields that could be realised. This step *cannot* be omitted since an error of judgement at this stage will lead to significant financial losses over the remaining term of the crop.

The revenue that sugarcane farming has over the years is not sufficient enough to keep up with the farming input costs that keep rising (Thomson, 2010). This has caused many farmers to face financial pressure. In any business, costs can only be minimized to a certain point. This is done before diminishing returns on investment are received. Focus should not only be on costs alone but there is a need to increase yield and cane quality. This is because the payment system

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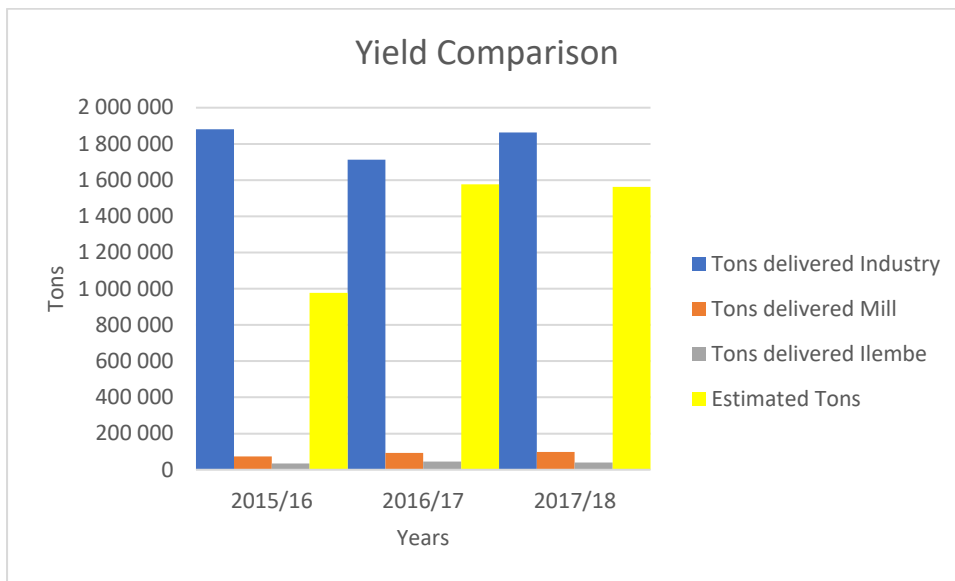
within the South African sugar industry favours good sugarcane quality combined with tonnage (tonsRV). It is also advisable that this yield and quality increase is done without any compromise to the quality of soil. When sugarcane yields are increased, the requirements of supplying sufficient sugarcane to the mill will be met since enough sugarcane will be produced. According to the South African Sugar Association website (South African Sugar Association, 2015) over the period, 2001/02 to 2012/13, total area under sugarcane in South Africa declined from 431 771 hectares to 379 870 hectares. Area harvested also decline from 325 704 hectares in 2001/02 season to 257 095 hectares in the 2012/13 season. When sugarcane yields decrease on average, and sugarcane supply areas continue to decrease, there may be more marginal areas and virgin land that is planted to sugarcane in the prospect. The environmental consequences would be negative. The sugar mills face a challenge of being closed when they cannot source enough sugarcane to remain economically viable.

METHOD

Semi-structured type of questioning was used and the following critical questions were asked. Answers to the following questions have a direct impact either adversely or positively on transportation of sugarcane from field to the mill. The questions were asked in both IsiZulu and English. Participants had to respond on the following questions; mechanism used to move cane from the field to the mill, control mechanisms employed to avoid unnecessary time delays, reasons for delays in getting sugarcane to the mill and mitigation measures thereof. The questionnaires also focused on fiscal constraints and analysis of the participants in relation to sugarcane farming and operations. These included sources funding/income, provisions for emergencies, timeframes for processing of payments. The critical and required skills were looked at. This has an empirical role in the thriving of the sugarcane farming sector, specifically for enhancement of yield. The qualifications of the work force were also looked at, necessity for the required skills. Finally, a training program and required training were asked of.

Majority of the participants (8), wanted to fill in the questionnaires at the comfort of their own homes. The participants were given the questionnaires and they filled them in their own homes. As previously mentioned that the questionnaires were both in IsiZulu and English, some participants gave answers in English on an IsiZulu questionnaire and vice versa.

RESULTS & FINDINGS



Appendix 1: Yield Comparison in Industry, Mill & Ilembe

The overall land reform growers' industry picture in blue depicts a yield decline over the three year period. In the 2015/16 season, growers were getting an average tonnage of 60t/ha but in the 2017/18 they got 44t/ha of cane. The tonnage of cane delivered in a mill basis (orange) depicts that there is an increase in yield but the tons delivered at the Ilembe District Municipality (grey) depicts low yields. Further from this, individual grower records show that the yield has decreased over the years. The tons delivered for the industry are more than the estimated tons. This means that growers are having a challenge with doing cane estimates to prepare for the harvesting season. The estimated tonnage should be closer to reality (tons delivered) as much as possible because that has an adverse effect on price of sugarcane. The price of sugarcane for a season is determined through the estimates given and if growers estimate less than what they will deliver, the price of selling cane goes up since low tons are expected but goes down when the final figures are derived. If the growers estimate a higher tonnage than what they will deliver, the price will be low (supply and demand) but when they do not deliver the estimated tons, the sugar industry then has to import sugar to cover the shortfall made by the growers for not delivering the estimated tons. This is because all the sugar sales for the season are done before the season commences (forward selling).

Structural issues:

1. there is a long chain of command within the beneficiaries, committee dominated by illiterate members.
2. infighting amongst community members.
3. lack of youth involvement within projects, transfer of farms just before mill closing time.
4. financial pressure; beneficiaries depend on sugarcane income. Diversification is encourage so that this gap can be bridged.

FARM Management issues:

1. Inability to do cane yield estimates, farm budgets and staff allocation
2. Burning of fields more than what the mill allocated

DISCUSSION

The predecessors had most of the infrastructure needed to run a farm. This means that it was easy for them to plan their activities before time. The land reform beneficiaries come to the farm with nothing and are expected to perform at the same level as their predecessors. This poses a threat because of lack of infrastructure to undertake the duties of their farms.

The land reform beneficiaries have a long chain of command that makes it difficult for instant decisions to be taken. This then leads to a delay in executing important tasks on time. The predecessors only had one or two people making decisions on the farm operations, this helped them to make decisions quicker on how to manage the farm.

The land reform beneficiaries are dependent on government for grants to run their farms and be able to compete in the industry with rising input costs. The timing of transfers when they happen also cause a challenge within the land reform beneficiaries. Most of these farms are transferred when the mill is about to close and there is no cane that can be sent into the mill for the next four months or so. The land reform beneficiaries then end up not ratooning their fields which lead to yield decline. This is because no fertilizer is applied and weeds are not controlled due to lack of funds.

Committee being dominated by illiterate members means that the project is vulnerable to misinformation and manipulation by input suppliers. The committee ends up buying wrong or expensive inputs for use in their farms. Lack of youth involvement within the projects leads to a lack of succession plan. This causes the project to be dependent on older generation that work no further than 10 years in a project. For a sugarcane farm to be productive, transfer should be done before the mill opens so that the community can have funds available for ratoon maintenance for the new crop. Most transfers occurred just before mills close. This made the farm not to have any funds to prepare for the next season and end up not being farmed properly. These challenges then cause infighting amongst community members as those that are not close to the project feel that there is mismanagement of funds. Community members then end up burning the sugarcane or put in cattle to feed on the sugarcane.

The yield decline in sugarcane production is caused by many factors. An influence diagram (Appendix 2) depicting these many factors when looking at yield lost at harvesting of sugarcane is an example of this. This is just an example of yield loss and it was used through systems thinking to show yield loss since most farmers lose yield at this stage. The yield loss at harvesting is influenced poor contractor performance which is influenced by cane cutters striking and this is influenced by cane left on the field not being cut. Cane delays influence cane left standing on the field and cane left standing on the field in turn influences cane delays

and cane rejection. Cane delays and cane rejection both influence each other since delayed cane stands a good chance of being rejected in the mill for poor quality, cane rejection causes cane delays since the cane is not crushed in the stipulated time. Yield is then lost during this stage since the cane loses weight and sugar that will benefit the farmer. Stumps left on the field influences yield loss at harvesting and strike of cane cutters. This is because the high sugar content is concentrated at the bottom of the cane stalk. The stumps left on the field also influence disease presence since pests like Eldana use it as a point of entry to affect the new crop. Strike of cane cutters influences improper stacking which influences cane spillage by the trailer and trucks. Farmers lose that cane since the tractors and other machinery drive on top of it. Driving on top of the cane influences bell loading and yield loss at harvesting. This is because the loading of cane will slow since there is less cane to load and that causes yield to be lost during the harvesting stage.

CONCLUSION

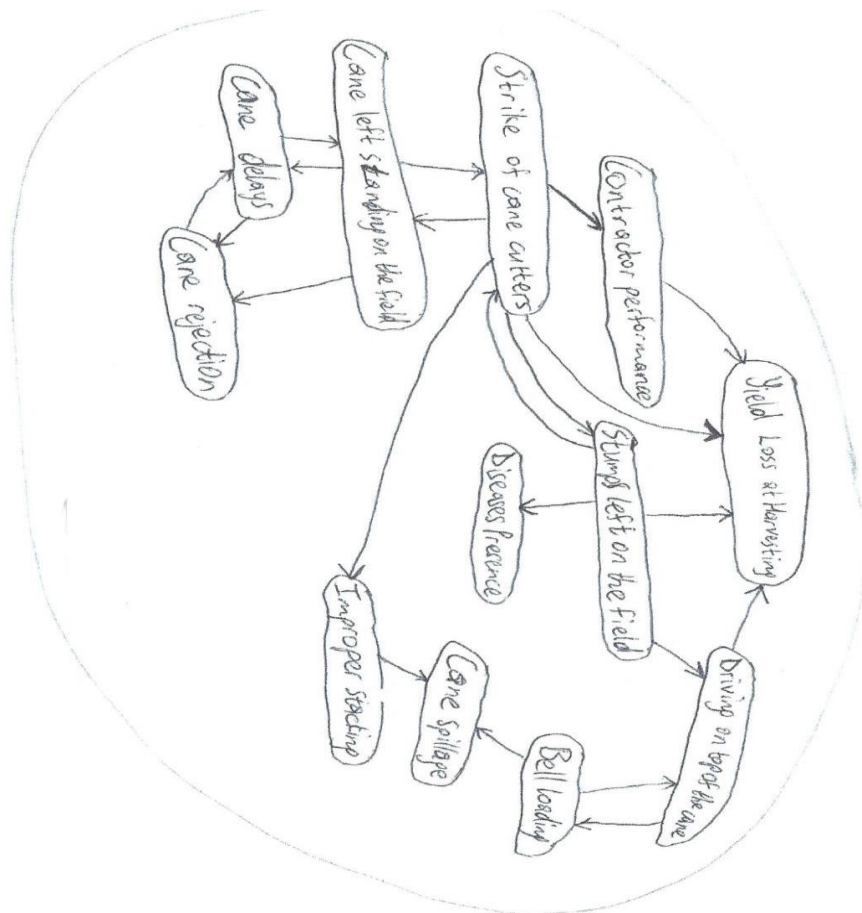
Globally, yield decline has been something that has been researched on and the factors that contribute to yield decline are mentioned. These factors (inadequate root penetration into the subsoil, soil that is maintained in a too wet condition and unacceptable levels of root pathogens) cause yield decline since they are not visible above the soil surface (Sumner, 2011). In learning from the global perspective of sugarcane yield decline, the study looked at how Land Reform beneficiaries farm. Yield decline analysis by Hess, *et al.* (2016) focused on Sub-Saharan Africa (SSA), stated that this is a critical region for continued expansion because of its high production potential, low cost of production and closeness, and access, to markets in Europe. This analysis shows that sugarcane production is, in general, neither clearly good nor bad, viable nor unviable. Even though there is a vast area for potential production, the transferred farms are yielding below the full potential. This is because institutional capacity is not prioritized. This causes the beneficiaries to lose interest in farming and therefore farms become abandoned. With the current South African government pushing for expropriation without compensation, it is important to first deal with the issues of transferred farms. This is done so that the same mistakes are not repeated in future transfers. Despite threats experienced from climate change and imminent changes in the trade relationship with the European Union, agricultural development policies are driving national and international interest and investment in sugarcane in SSA, with expansion likely to play an important role in sustainable development in the region.

In summary, yield decline is not caused by a single factor but many factors play a role which leads to the decline in yield.

Definition of terms:

- Focus group: A collective of farmers that have been farming for more than 5 years in transferred farms
- Yield: It is the tonnage produced/achieved at the end of a growing season.
- Ratoon management (ratooning): It is the application of herbicides and fertilizer in a field for the improvement of yield.

- Land reform farmers/beneficiaries: A group of people that acquired land through government after being possessed during the apartheid era.
- Predecessors: Farmers that sold land to government for the benefit of black farmers.
- Dispersion: It is the separation of the clay particles from the aggregates when the soil is wet.
- Salinity: It is the accumulation of salts in the soil.



An Influence Diagram of Yield Loss at Harvesting

Patrick M. Nyobu: 216085515
 19 October 2018

Appendix 2: An Influence Diagram on Yield Loss at Harvesting

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FIFTH SESSION

ASSESSING SOCIO-ECONOMIC FACTORS INFLUENCING WOOL PRODUCTION IN KOLOMANA VILLAGES OF EASTERN CAPE, SOUTH AFRICA

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ABSTRACT

Despite considerable investment by government and non-governmental organisations (NGOs) to support wool production amongst farmers in parts of the Eastern Cape Province, the sub-sector continues to feature low production and productivity while the small-scale farmers continue to wallow in poverty. There is therefore genuine interest to gain a deeper understanding of the reasons for this situation and identify elements for a strategy to remedy the situation. This study looks specifically at socio-economic constraints/factors affecting wool production in the rural Kolomana area. A structured questionnaire was used to collect information on demographic parameters and socio-economic factors affecting wool production in Kolomana villages of the Eastern Cape Province in South Africa. Descriptive statistics were generated using the Statistical Package for Social Sciences (SPSS, version 20). Observed major infrastructural constraints to sheep farmers in Kolomana were shortage of shearing sheds, dip tanks, fences and re-fencing of camps and technical resources such as availability of animal health technicians. A linear regression model was used to test how independent variables relate or affect the dependent variables, which were defined in value and quantitative terms. Age of the household head, marital status of household head, number of sheep owned by households, division of rangeland into camps, state of fencing on rangeland, visits by animal health technicians, and availability of colostrum to lambs were found to be influential. Without doubt, removing constraints faced by rural wool sheep farmers and implementing correct managerial practices when necessary could improve efficiency in wool production for the rural poor. Thus, the study seeks to acknowledge different practices that rural farmers employ in sheep production, which includes but is not limited to indigenous knowledge used to enhance maximum wool production.

Keywords: Linear regression model, Rural wool farmers, Smallholders, Socio-economic factors, wool production

1. INTRODUCTION

Sheep are important to farmers in many economies. They provide milk (and its derivative products such as cheese and butter), wool, sheep skin (used for making clothes, footwear and rugs), and meat. The contribution of sheep to the economies of many countries in Southern Africa has however declined in the last decades (Bot *et al*, 2004; Lupton *et al*, 2007). South Africa produces mainly apparel wool (Bot *et al*, 2004; Lupton *et al*, 2007). The South African wool clip is predominantly a Merino clip, but coarse and coloured types are also produced and

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marketed on a limited scale. Historically, wool produced in the neighbouring states of Namibia and Lesotho was considered part of South African production and has always been sold in South Africa (Department of Agriculture, Forestry and Fisheries (DAFF), 2010).

South Africa is also rich in mutton production and mutton sheep such as South African mutton merino is mostly found in the semi-arid areas of the Northern Cape, Western Cape, Free State and Mpumalanga provinces (Grootfontein, 2014). The most popular mutton breed in South Africa, which is locally developed, hardy and highly reproductive is a Dorper. Limited numbers of indigenous fat-tailed sheep and Karakul sheep are still found (Agriculture and Land Affairs, 2007). Mutton contribution in the growth rate of Southern Africa economies was 3% per annum in 1960-1970 and 1.4% per annum in 1970-1980 (Tangermann & Krostitz, 1982). Sheep possess an exceptional ability to convert a wide variety of non-competitive feedstuffs (forage and crop residues) into high quality meat and fibre products for human use (Agriculture and Land Affairs, 2007). They are efficient converters of forage to meat and fibre and are capable of producing good carcasses from forage alone (Umberger, 1996).

Sheep feed on a forage that is found freely on the rangelands and convert it to meat and fibre. Sheep mostly eat grass, clover, and other pasture plants. They especially love forbs (a broad-leaf plant other than grass); it is usually their first choice of food in a pasture. Therefore, sheep produce high income generating products (meat and fibre) using low cost vegetation found on the rangelands. Sheep also contribute to income through its wool while it is still alive. This makes them choice elements of poverty reduction strategies especially for previously disadvantaged groups unable to raise the critical mass of capital to invest in income generating activities (DAFF, 2010). South Africa is ranked number five after Australia, New Zealand, Uruguay and Argentina amongst wool exporting countries (DAFF, 2010).

Over half of the sheep in South Africa are fine-woolled Merinos. Other breeds used include the locally developed Afrino, a woolled mutton breed adapted to arid conditions, the South African Mutton Merino, the Dohne and the Merino Landrace. The Eastern Cape is well known for its wool production and good quality wool that farmers produce every year. The sheep breed with the highest wool production per head in South Africa is the South African Merino (Safari, Fogarty & Gilmour, 2005).

The other high producing breeds are the dual purpose Merino breeds, of which the Dohne Merino, the South African Mutton Merino, the Afrino and the Lettele are the most popular (Safari *et al*, 2005). Dual-purpose breeds are bred with the specific aim of maximising wool and mutton income, since they have a better body conformation than the Merino, but produce slightly less wool per kilogram of body weight (Bot *et al*, 2004). The gross value of production for wool is dependent on the quantity produced and prices received by producers. Average Merino fleece weights vary from 4 kg to 5 kg per year in the semi-arid regions, to up to 8 kg per year from sheep grazing on cultivated pastures. DAFF (2010) stated that the gross value of wool production started to increase in 2000 to 2002 until a decline was experienced in 2003 to 2005. Between 2006 and 2007, the gross value of wool production increased until a decline in 2009. In 2007, the gross value of wool production reached a peak at approximately R1.3 million and the lowest attained was in 2000 at approximately R600 000. The recorded gross value of wool sold at first point of sale for the season 2009/10 came to R1 505 million, compared to R1 154 million in 2008/09 – an increase of 30.5%. In South Africa, wool production increased by 0.8% from 47.9 million kg in 2008/09 to 48.3 million kg in 2009/10, mainly because of improved production conditions in most areas (DAFF, 2010). Marked dramatic improvements in productivity and quality of wool are possible and are already experienced in other parts of

the country where improvement programmes are put into place. For example, de Lange *et al* (2004) reported that pilot programmes under cooperation arrangements between the National Wool Growers Association (NWGA) and the Department of Agriculture, with the active engagement of communal developing farmers, led to an increase in the annual income from R15 per sheep per annum to more than R65.

The NWGA is running a scheme to improve the quality of wool sheep in underdeveloped areas. The project is aimed to produce good quality and environmentally adapted sheep in these areas through the use of improved technology such as artificial insemination and embryo transfer. The improved ewes and rams will provide a sufficiently large infusion of appropriately high quality animals into the communal areas that will catalyse production practices and catapult rural wool production and income levels ten times (de Lange *et al*, 2004). These quality wool sheep are distributed to farmers by NWGA through the exchange system, where a farmer will take an old sheep to NWGA and get a good quality ram to improve his/ her flock. One of the requirements for the success of the project is proper veld and flock management systems (de Lange *et al*, 2004).

The emergent and traditional stock-keepers in particular in the rural areas of South Africa are faced with problems or constraints in increasing their production and productivity and thus their incomes from wool is alarming. The principal constraints are technical in nature, especially genetic (stock quality) improvement, better herd and health management (to increase reproduction and reduce mortality rates), and improvements in shearing, grading and sorting standards as well as the fenced camps. However, most of the technical solutions are known and capable of being addressed (Bot *et al*, 2004). There are more than 27 000 wool producers (mostly Merino) in South Africa producing a total of just over 100 million kg of wool. Commercial growers are producing more than 80% of the entire wool clip. The average production per sheep is roughly 4,5 kg. The number of annual slaughtering comprises about one-third of the total sheep population giving a meat yield of just over 6 kg per sheep (Grootfontein Agricultural Development Institute (GADI), 2012).

Over 70% of the resource poor rural farmers in the Eastern Cape Province of South Africa reside in the harsh agro-ecological zones where cropping is unsuitable and therefore, they rely on livestock for their livelihoods (Bester *et al*, 2003). Wool sheep contributes to subsistence farming and enhances the sustainability of smallholder farming systems. Although sheep provide diverse functions to farmers in Africa, their productivity is generally low. There are various factors that reduce wool production (Abeyratne, 2001). This led to the introduction of several initiatives by the government and NWGA such as the Ram Project which is introducing superior rams to wool farming communities in the former Transkei and Ciskei regions. These constraints have a negative impact on wool production. Therefore, there is a need to carry out a study at Kolomana villages in the Nkonkobe Local Municipality and Amathole District Municipality of the Eastern Cape to determine constraints faced by rural wool farmers and management practices being used.

1.1 Problem statement

Kolomana sheep farmers have large numbers of different wool sheep breeds such as Merino and Dohne Merino, availability of suitable vegetation for feeding their sheep, availability of clean water for the stock to drink, veterinary services, as well as the undivided support from the Eastern Cape government structures such as extension services from the provincial Department of Rural Development and Agrarian Reform (DRDAR), previously known as the

Department of Agriculture and Land Affairs. The National Wool Growers Association (NWGA) and the Agricultural Research Council (ARC) collaborated in 1996 to establish and provide an advisory service to the woolgrowers in the former Transkei and Ciskei areas to improve the quality of life of rural sheep farmers.

Under the scheme, sheep farmers exchange old sheep for superior ram to improve the quality of their breeding stock. Kolomana sheep farmers have benefited from the project. Even though these farmers have been supported over the years and are still being supported, the quality of their wool is still poor; producers still suffer low incomes and poverty remains high. Both the DRDAR and the NWGA are concerned about this state of affairs.

Over the years, several studies have been undertaken to explore the reasons for this situation as a basis for designing optimal solutions. However, these studies have focused on general animal production questions, trying to find out which types of livestock were suitable to be reared in Kolomana. Cattle, sheep and goat were the livestock that have received the most attention. Studies on wool production constraints, opportunities and management practices have either been rare or never been carried out. Types of sheep which are mostly reared in Kolomana are Merino and Dohne Merino, which are the wool breeds. Ideally, these farmers are supposed to produce good quality wool. In the view of experienced white farmers in the area, it is contrary to common sense that wool production would be as severely constrained among these farmers as is the case at present.

These views were again very strongly expressed during the rural sheep farmers mini flock show held in September, 2010 in Kolomana and again in September, 2011 by the DRDAR and NWGA in trying to motivate farmers to take wool production seriously. It is also true that neighbouring farms (white-owned) have consistently produced good quality wool when compared to what the local farmers produce. It is for this reason that the present research is designed to assess the management practices such as feeding, breeding, lambing and health issues that are employed or practised in seven villages of Kolomana. More specifically, the study aims to describe the sheep production system in the study area, assess opportunities and constraints for wool sheep producers in Kolomana, assess availability of resources such as feed, water and grazing land, determine infrastructure needed for wool sheep production such as fencing, dip tanks and shearing sheds in Kolomana, as well as to identify the sheep management practices (feeding, health issues, breeding and lambing) that are being employed in Kolomana and how they influence the performance of the wool sheep production systems.

2. LITERATURE REVIEW

This section reviews the literature on economic and social importance of livestock production in rural development and poverty alleviation.

2.1 Livestock production - The tool for rural development and poverty alleviation

Ngqulana (2017) states that livestock plays an important role in poverty reduction in rural areas, however, it is also opposed by a number of constraints which exist globally and locally. These constraints are the obstacles to the development of livestock production and for it to be able to reach a level where the people in rural areas are able to reap the benefits of keeping livestock.

Livestock production accounts for about one-fourth of the total food produced by households rearing livestock in the Eastern Highlands of Ethiopia. These results lead one to hypothesise

that if livestock are so critical in the densely populated Eastern Highlands with small land holdings, their contribution might be even greater in the Central and Western Highlands of Ethiopia where population density is lower and the average land and livestock holding per farm is larger (van Averbek & Khosa, 2007). Ainslie (2002) found that the number of livestock marketed from the small-scale sector of the Eastern Cape Province is well under 10% of the total herd. Jooste (1996) states that this is low compared to the commercial sector that ranges between 23% and 25% of the total herd. Jordaan (2012) states that small stock does play a valuable role in all rural communities because of their low cost, which makes accumulating herds easier for the poorer groups. Their small size means that they are easily disposed of when slaughtered and they can be easily marketed to meet minor cash demands.

Ainslie (2002) stated that communal area livestock production contributes insignificantly to formal agricultural output and confined to the eastern and northern parts of the country. However, herd sizes vary considerably between and within regions and livestock. Ownership is skewed with a small number of people owning large herds and the majority owning few animals or none at all. Stock numbers tend to be less evenly distributed in communal than in commercial areas. There is a tendency for high concentrations of people and livestock near to access roads, towns, infrastructures (schools, clinics, supply stores), and permanent water. Portions of the landscape that are inaccessible or far from permanent water remain underutilised. The areas designated as homelands were caught up in an age-old tradition of communal livestock farming among Africans in which there were very poorly defined individual rights with respect to access to grazing resources, except for national or tribal boundaries. This led to problems such as landlessness and little available land, which were in fact unavoidable (Bayer, Alcock & Gilles, 2004).

2.2 Economic importance of livestock production in rural development and poverty alleviation

In the Eastern Cape Province of South Africa, the communal grazing areas occur mostly in the former homeland areas such as Transkei and Ciskei which constitute about 25% of the surface area but are carrying high livestock numbers. These areas carry about 1.7 million out of 2.3 million cattle, 2.9 million sheep out of 7.3 million, and 2 million goats out of the 2.7 million in the Province (Food and Agriculture Organization (FAO), 2001). These figures are an equivalent of more than 60% of the cattle and 70% of the goat populations of the entire province (Ainslie, 2002). The combined livestock sector contributes about 75% of total agricultural output (National Department of Agriculture, 2009).

Comparison between crop and livestock incomes reveals that while livestock accounted for 49% of total net income, crop production contributed a mere 6%. Within the livestock sector, cattle contributed the highest (33%). Nevertheless, the contribution of small ruminants is substantial, amounting to 15%. This exceeds the contribution from crops by 58%.

This finding provides enough evidence for the smallholder farmers to reallocate some resources from crop production to small ruminant production if only they view profitability and efficient utilisation of resources as their main goals. Smallholder farmers in the area should, therefore, exploit the potential benefits of small ruminant production to increase their household income by allocating more resources to its improvement. Furthermore, policy makers, researchers and farmers should be made aware of the economic viability of small ruminant production in the country and elsewhere in Africa.

According to Hendricks and Fraser (2003), about 65% of all the cattle in the province are held in the former Ciskei and Transkei and this in itself illustrates the importance of the cattle for very reserve dwellers. Livestock contributes about 70% of gross agricultural income in the province as a whole (NWGA, 2008). There is an overwhelming catalogue of evidence about the skew distribution of cattle holding and ownership in the former reserves with fewer households owning large herds and the majority holding smaller herds.

Hendricks and Fraser (2003) argue that conventional wisdom has merely repeated the view that cattle holdings in the reserves are manifestly irrational, that low off-take has led to overgrazing and land erosion with little attention to animal health. From an economic point of view, the large cattle holdings in the communal areas is rational if the objectives of keeping the cattle are taken into account. If the cattle are seen as a symbol of status or wealth, the owners are being perfectly rational by maximising their wealth by increasing the number of cattle they own.

Livestock produce food (e.g. meat, milk) and non-food commodities (e.g. hides, wool), and provide draught power and manure for food and cash crop production, thereby helping to generate income for livestock owners and their employees. Since livestock grow in number and in individual size, they also constitute a form of profitable investment/ savings which can be drawn on in time of need. In good years, savings invested in livestock can earn considerably higher rates of return than those obtainable from money deposited in interest-earning bank accounts. However, in times of drought or disease, such savings can be swiftly wiped out.

According to Eastern Cape Business (ECB), the Eastern Cape Province provides approximately a quarter of South Africa's milk, and the industry is further expanding as producers tend to favour high-rainfall coastal areas such as the Eastern Cape. The province's farmers mostly sell raw milk to three major processors, namely Parmalat, Clover and Dairy Belle. With the growth of the dairy subsector in recent years, a few independent processors have emerged. Small-scale dairy farming presents an opportunity to develop the industry in the former homeland areas. The livestock subsector accounts for about 5% of the total gross domestic product (GDP) in sub-Saharan Africa. Its contribution to the GDP excludes draught power and manure. In South Africa, the livestock sector contributes up to 49% of agricultural output (van Niekert, 2012).

3. METHODOLOGY

3.1 Area of study

This study has been conducted in the eight villages of Kolomana, namely Phathikhala, Dunedin, Ngqikana, Cairns, Votyiwe, Marais, Edika, and Grafton. Kolomana is located in the Raymond Mhlaba Local Municipality, which is situated in the Winterland of the Eastern Cape under the jurisdiction of the Amathole District. It is approximately 200 km from Port Elizabeth. It is the largest municipality of the six in the district, making up a third of its geographical area (Raymond Mhlaba Local Municipality, 2019).

Raymond Mhlaba Local Municipality has a landscape that has a character of a flat, regular topography. The northern part of the municipality is structured by high mountain ranges, having the highest peak being the Hogsback Region, which has a height level of 1700 m – 2000 m above sea level. Towards the southern region, the topography starts to have a relatively flat surface and evens out, having some of the southern parts with the heights of less than 200 m above sea level. The topography has influenced the distribution of human activities in the area,

with most of the settlements occurring at heights of 200 m – 400 m above sea level (Raymond Mhlaba Local Municipality, 2019).

Ortmann (2005) states that people in rural areas rely on poorly developed road networks for connecting with the surrounding towns and cities. The poor road conditions of Kolomana prevent development in the area in terms of job opportunity creations. Ortmann (2005) further insisted that the main occupation held by rural residents is skilled agricultural (farming) workers. This means that rural households of Kolomana are capable of producing their own food by combining indigenous knowledge and skills they have acquired.

3.2 Data collection

There are eight villages in Kolomana and each village has approximately 11 to 23 families or households. All these villages are represented in the study. A total of 100 structured questionnaires were administered to wool sheep farmers in all of the eight villages..

Both primary and secondary data were used in this study. Primary data were collected using interviewer administered questionnaires which included household characteristics such as demographic questions (age, sex, education, marital status, family size, and employment status), availability and characteristics of resources or infrastructure found in the area (dip tanks and materials, shearing facilities, fencing), and sheep management practices that are taking place in Kolomana.

The questionnaires were interviewer administered to alleviate the problem of misinterpretations or misunderstandings of words or questions by respondents. The respondents were presented with a series of questions that they responded directly to on the questionnaire form itself with the aid of an interviewer. This questionnaire method of data collection is much quicker in terms of saving time. The interviewer read questions to respondents and recorded their answers on the questionnaire.

The advantage of this data collection method is that an interviewer was in a position to probe for more information from respondents. These questionnaires could also ensure that all questions had been considered and respondents did not omit difficult questions. By having the questionnaires administered by the interviewer, it also meant that information could be obtained from respondents who could neither read nor write (Levy & Lemeshow, 2013).

The questionnaire consisted of both open-ended and closed-ended questions. Open-ended questions allowed respondents to express their views freely, but these types of questions were minimised for easy data analysis as well as to focus on issues relating to the research. Most of the questions were structured as closed-ended questions for the benefit of obtaining information from respondents without consuming much of their time as well as for easy coding of responses. Secondary data were collected from published and unpublished documents. It was collected from books, articles, journals and the internet.

3.3 Data analysis

For the purpose of this study, the unit of analysis was rural households of Kolomana locations and for each household, the head of the household was interviewed. The study has used tables, graphs and descriptive statistics (frequency and percentages) to analyse data. Descriptive statistics are brief descriptive coefficients that summarise a given data set, which can be either

a representation of the entire population or a sample of a population (Investopedia, 2018). They provide simple summaries about the sample and the demographic measures of the households and household heads. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data (Emathzone, 2011).

A linear regression model was used to predict direct relationships between a vast array of sheep management practices as well as the characteristics of household heads and the total income generated from wool sales. It is therefore possible to fit a simple linear model of the form:

$$Y = f(x_1, x_2, \dots, x_n) \dots\dots\dots(1)$$

Where:

Y is the dependent variable representing total income that has been generated from the sales of wool, while the x 's are the explanatory variables representing age of the household head, marital status of the household head, number of sheep owned by each household, visits by animal health technicians, division of range land into camps, state of fencing on range land, gender of household head, household size, access to arable land, production of feed for sheep, availability of technicians when needed, season to join ewes with rams, keeping of sheep on range land, and the availability of first milk to lambs. These explanatory variables were used to determine the relationship between them and the dependent variable.

Following convention, the model can be specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots\dots\dots \beta_n X_n + \mu_i \dots\dots\dots(2)$$

Where:

- β_0 = the intercept or constant term,
- $\beta_1, \beta_2, \dots, \beta_n$ = slope or regression coefficient,
- X_1, X_2, \dots, X_n = explanatory or independent variables, and
- μ_i = error or disturbance term.

The model was estimated to identify factors affecting the total income generated from the sales of wool. As previously mentioned, the explanatory variables are used to determine their effect on the dependent variable.

If the signs of their coefficients are positive, this implies a positive relationship between the dependent and explanatory variables, meaning that the dependent variable is influenced by such explanatory variables. If the signs of their coefficients are negative, this implies that they are not influential to the dependent variable.

The synthesis of qualitative data has also been done to fully cater for valuable information from key informant interviews and individual perceptions. Quantitative data was analysed using a combination of Microsoft Excel and the Statistical Package for Social Scientists (SPSS, version 20).

4. RESULTS AND DISCUSSION

In this section, the demographic characteristics of the household heads are presented. These include gender, age, educational level, marital status, size of the household, and occupational

information of the household head. Makhura (2001) stated that these aspects are important because the main household activities are coordinated by the household head and the head's decisions are most likely to be influenced by such demographic aspects. In addition, this section presents information on the number of sheep owned by each household head, visits by extension and animal health officials for technical advice, and availability of first milk (colostrum) to lambs. The information mentioned above is presented in tables and graphs below. Only factors or variables that are positively influential to the dependent variable are presented in this section.

Table 1: Summary statistics of the household demographic (continuous) variables

Variable	Minimum	Maximum	Mean
Age	31	89	59.01
Household size	3	11	6.08

Source: Field survey, 2012

Table 1 displays the personal information of the household. Demographics that are in the table include the age of the household head and household size and are referred to as continuous variables. The minimum and maximum statistics are shown in Table 1 and the minimum age is 31 while the maximum age is 89. The mean age of the households is 59.01 and household size is 6.08.

Table 2: Summary statistics of the household demographic and socio-economic situation (categorical) variables

Variable	Category	Frequency	Percentage
Gender	Male	59	59.0
	Female	41	41.0
Marital status	Single	10	10.0
	Married	57	57.0
	Divorced	3	3.0
	Widowed	30	30.0
Employment status	Employed	26	26.0
	Unemployed	34	34.0
	Pensioner	40	40.0
Educational level	No education	17	17.0
	Primary	38	38.0
	Secondary	41	41.0
	Tertiary	4	4.0

Source: Field survey, 2012

Table 2 shows the household demographic frequencies. These household head demographic variables include gender, marital status, educational level and employment status of the household head and are referred to as categorical variables.

Table 3: Distribution of households by sheep numbers

Number of sheep	Frequency	Percent
1-49	66	66.0
50-99	25	25.0
100-149	3	3.0

150-199	4	4.0
200-249	0	0
250-299	0	0
300-349	1	1.0
350-399	1	1.0

Source: Field survey, 2012

The majority (66%) of farmers or households in the survey own less than 49 sheep as shown in Table 3. The total number of households in the survey who were found to own between 100 and 149 sheep were only three, while those who owned between 150 and 199 sheep were only four. Those households that were found to have large numbers of sheep between 300 and 349, as well as between 350 and 399 were only two. As portrayed in Table 2, several households were headed by pensioners (40%) or were unemployed (34%). These households depend on their sheep for survival. They generate income by producing wool and selling the sheep itself in times of hardship.

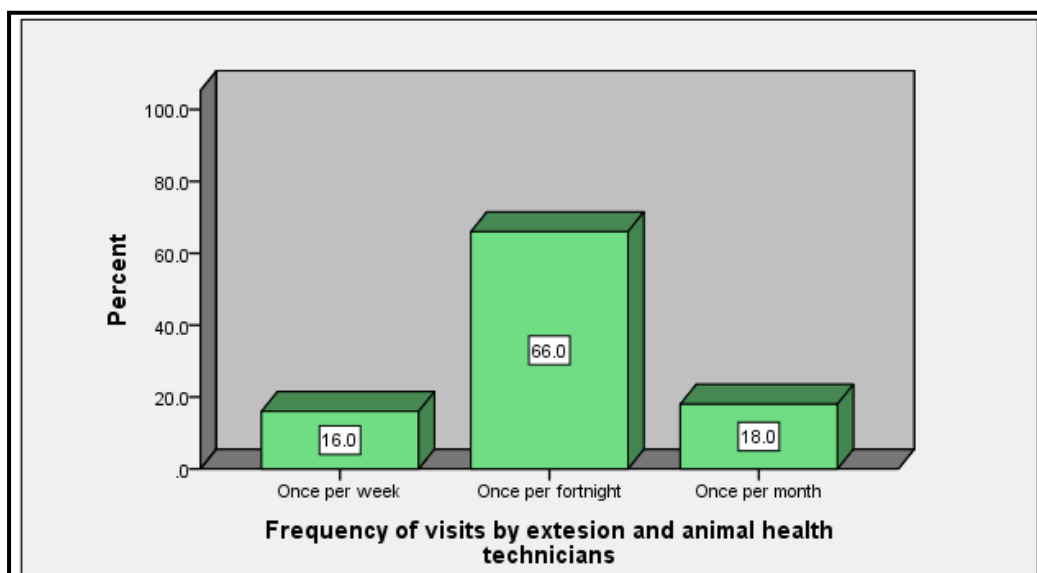


Figure 1: Distribution of households by visits of animal health and extension technicians
Source: Field survey, 2012

In Figure 1, it is indicated that 66% of the surveyed households stated that extension and animal health technicians visit once every two weeks, while 18% stated that they visit once a month and 16% stated that they visit once a week. Figure 1 also shows that the technicians do visit these farmers, but such visits are not enough for these farmers. They need proper visits in order for them to be productive and sustainable.

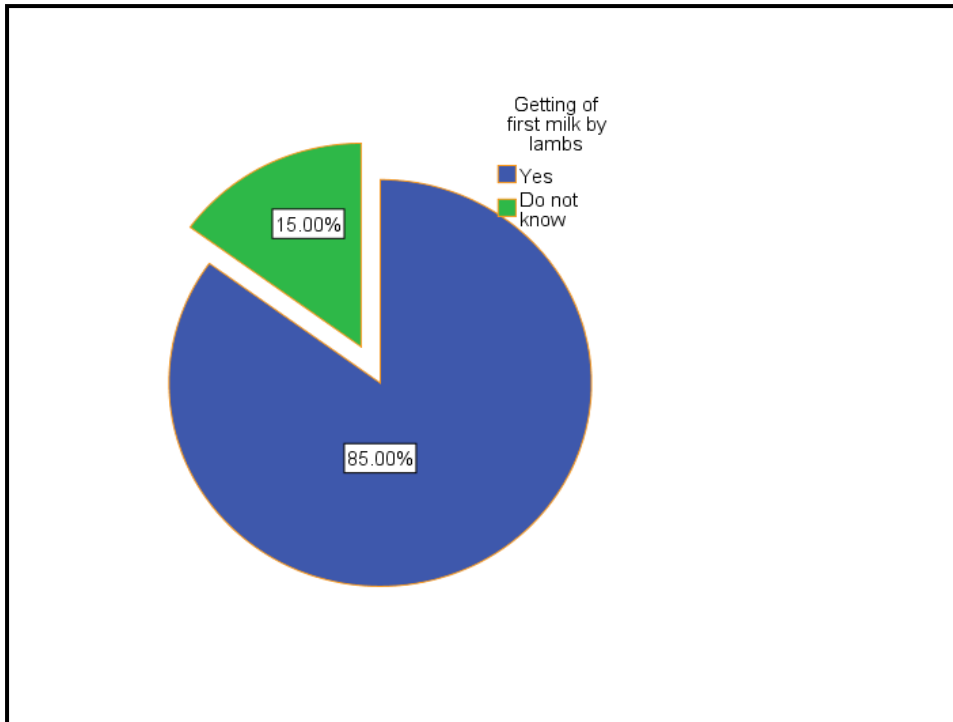


Figure 2: Distribution of households by availability of first milk for lambs
 Source: Field survey, 2012

Figure 2 indicates that 85% of households who participated in the study indicated that their lambs do get the first milk, which means they are present when the ewes lamb. The other 15% of households indicated that they do not know if their lambs do get the first milk after birth.

4.1 Inferential results

A General Linear Regression Model (GLM) was used to analyse the effect of household head characteristics and the sheep management practices variables in influencing the total income generated from wool sales. In statistics, the generalised linear model is a flexible generalisation of ordinary linear regression that allows for response variables that have error distribution models other than a normal distribution. The GLM generalises linear regression by allowing the linear model to be related to the response variable via a link function and by allowing the magnitude of the variance of each measurement to be a function of its predicted value. The farmer’s goal of obtaining higher income, which is the dependent variable in the model, is assumed to be influenced by many factors. It is assumed that if the farmer’s goal is to get a higher income from the wool production, he or she needs to apply proper sheep management practices in his or her farm. However, if such a farmer does not do that, his or her goal will never be realised. Wool production does not begin in the shearing shed during the shearing season. It starts from making sure that the farm itself is in a proper and suitable condition for keeping the animals and to apply proper management practices in the whole farm.

Multiple variables were therefore regressed to determine their influence on the income. The independent variables include gender of household head, age of household head, household size, marital status of household head, number of sheep household head owns, access to arable land, production of feed, visits by animal health and extension technicians, availability of animal health and extension technicians when needed, division of range land into camps, state of fencing, season to join ewes with rams, availability of first milk to lambs, and keeping of

sheep on open camps. Table 4 shows the results of the model where the independent variables were tested to determine how influential they are to income (dependent variable in this study) generated from wool sales. Some independent variables were found to be influential and the findings are indicated in Table 4. The overall results show that the model for the study is highly adequate and a good fit as the R Square value is 0.947 and is higher than the Adjusted R Square value which is 0.938.

Table: 4: Factors affecting income generated from wool sales

Variable	Coefficient (B)	t-Value	Significance
(Constant)		-0.777	0.439
Gender of household head	0.033	1.204	0.232
Age of household head	0.133	3.307	0.001***
Marital status of household head	-0.099	-2.675	0.009***
Household size	-0.044	-1.405	0.164
Number of sheep owned by household	0.994	37.276	0.000***
Access to arable land	0.044	1.409	0.163
Production of feed for sheep	0.042	1.446	0.152
Visits by animal health technicians	0.119	3.650	0.000***
Availability of technicians when needed	-0.031	-1.046	0.299
Range land division into camps	-0.057	-1.873	0.065*
State of range land fence	-0.087	-2.704	0.008***
Season to join ewes with rams	-0.042	-1.341	0.183
Availability of first milk to lambs	0.066	2.231	0.028**
Keeping of sheep on the range land	0.019	.692	0.491
Model summary	R Square = 0.947; Adjusted R Square = 0.938; F Change = 108.297; Durbin-Watson = 1.703		

Note: * = Significant at 10% level; ** = Significant at 5% level; *** = Significant at 1% level.

Table 4 presents the results of the major factors influencing the income generated from sales of wool produced. These factors are the marital status of the household head, age of the household head, number of sheep owned by the household, visits by animal health technicians, division of range land into camps, state of fencing on range land, and availability of first milk to lambs. For the purposes of this study, the discussion will be focusing on the variables that are significant.

4.1.1 Age of the household head

At a 1% significance level, age of the household head has been found to be significant in influencing the income. It has a positive relationship with income as it has a positive β value (0.133). Age of the household head is found to be influential in income generated from wool production. It is assumed that the older the person participating in agricultural activity, the better the output to be realised. The reason for this is the assumption that the older people have more experience in farming activities than younger people. However, young people are indeed needed in agricultural activities as the older people are no longer able to participate in agricultural activities, especially wool production in this case, as it requires more physical labour in terms of handling sheep during the shearing process.

4.1.2 Marital status of the household head

Table 4 shows that at a 1% significance level, marital status of the household head is significant. The β value of -0.099 for marital status of the household indicates that there is a negative relationship with income. This implies that income is not influenced by marital status of the household head.

4.1.3 Number of sheep owned by household

At a 1% significance level, the number of sheep owned by the household is highly influential to income generated from the sales of wool. With a β value of 0.994, the number of sheep owned by the household has a positive relationship with income. This implies that numbers of sheep owned by the household is influential to income. Wool that is sold is from the sheep that are shorn by farmers. Therefore, numbers of sheep owned are crucial in generating income because if a farmer owns a large number of sheep, he or she will eventually obtain a maximum amount of wool which will bring in higher income.

4.1.4 Visits by animal health technicians

It is shown in Table 4 that visits by animal health technicians are very important and has an impact on income. At a 1% significance level and at β value of 0.119, visits by animal health technicians has a positive relationship with income. This implies that visits by animal health technicians are highly influential to income. These technicians are important to farmers, especially wool farmers in this case, as they advise them on prevailing diseases and medicines to prevent or cure such diseases. Healthier sheep provide good quality wool that yield higher incomes.

4.1.5 Division of range land into camps

Table 4 indicates that the division of range land into camps has a 10% significance level at β value of -0.057. This implies that the division of range land into camps has a negative relationship with income and it does not influence income. Income can be generated without division of range land into camps. However, proper sheep management practices need to be well implemented for range land to be divided into camps. This will ease the process of feeding, mating and lambing, as those ewes which are about to lamb need to be separated from the whole flock of the farm. In addition, division of range land helps to rest certain camps so as to allow them to grow enough grass for the sheep not to starve in winter season when vegetation becomes poor.

4.1.6 State of fencing on range land

At a 1% significance level and at β value of -0.087, state of fencing on range land has a negative relationship with income. This implies that state of fencing on range land does not affect income. Income is not influenced by state of fence on range land, it can be generated whether there is fence or not.

4.1.7 Availability of first milk to lambs

At a 5% significance level and at β value 0.066, availability of first milk to lambs has a positive relationship with income. This implies that availability of first milk to lambs is influential to

income that is generated from the sale of wool. If the lambs do not get the first milk from ewes after birth, they are at risk of easily contracting diseases and starving. Once the lambs contract diseases or starve, they are at risk of dying. Decreasing sheep numbers means that the quantity of wool is also going to decrease and that will lead to decreased incomes.

5. CONCLUSION AND RECOMMENDATIONS

Studies show that small-scale farmers and rural households of South Africa have the potential to contribute to growth in rural areas and to reduce poverty as well as income disparity. Wool farmers have not yet reaped the full benefits from the potential of new technology because of employment of improper sheep management practices and illiteracy in rural areas. It is suggested that there is a need for smallholder farmers to increase adoption of improved techniques of production for them to gain improved farming production. However, it has been observed that smallholder farmers are still restricted by a number of institutional arrangements, technical factors and other factors.

With regards to sheep management practices, some farmers in rural areas still use the old traditional techniques (keeping large numbers of sheep for bragging rights, do not dip, do not vaccinate, and dose using indigenous plant medicines) of production in terms of keeping their sheep. They do understand that sheep production is very important as a medium of income generation. They only consider their sheep as a tool for generating income, but they fail to understand that the same sheep they use to generate income has to be well managed for it to continue generating income for them. Some farmers were found not to dip, vaccinate and dose their sheep until the arrival of animal health technicians to do it for them.

The farmers claim that they do not have access to facilities such as dip tanks and shearing sheds in their communities, and the medicines are expensive, therefore, the government should provide it for them. In order for farmers to stop thinking that their farming is for the government or they do it for government, the government should provide by capacitating farmers through trainings, where the training will focus in certain areas of the prevailing problem and stop implementing the top down approach where they assume and decide on the needs of the farmers without consulting the farmers or extension officers who are the ones who understand the needs of the farmers. Another pressing problem is the lack of fencing. Rangelands are not fenced, or the fencing is broken. Livestock production cannot do well if the rangeland is not properly fenced because management will be poor.

Farmers should organise themselves to form commodity groups or cooperatives. This will facilitate the process of securing funds from financial institutions or organisations. Farmers must be encouraged to be independent. They must not depend on government for the sustainability of their farming business. These were the key elements the researcher found pressing regardless of what the farmers indicated in the study.

The study focused on demographic characteristics of the household head, sheep management practices, as well as opportunities and constraints that the farmers face in terms of sheep or wool production in Kolomana. Further research is required to assess the change brought by the introduction of the improved rams to farmers through the ram exchange scheme by NWGA.

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**CAN AGRICULTURAL LAND REFORM BUSINESSES BE SUCCESSFUL? A
WESTERN CAPE CASE STUDY**

Aries, J

**THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS
PRODUCED.**

FARMING HOUSEHOLD'S LIVELIHOOD STRATEGIES IN NDABAKAZI VILLAGE, EASTERN CAPE: WHAT ARE THE IMPLICATIONS TO EXTENSION SERVICES?

S. Zantsi⁴⁵ and B. Bester

ABSTRACT

Using a retrospective and circumspective approach, this paper looks at how livelihood strategies have changed during pre and post-democratic eras in rural former Transkei of the Eastern Cape, and identifies present livelihood strategies in Ndabakazi. The focus of the research was Ndabakazi, a cluster of rural villages in the former Transkei. A survey of 80 household heads was conducted using semi-structured questionnaires, complemented by focus group discussions. The findings show that farming and wage labour have been declining over time as major sources of income, while social grants have become increasingly important. Field crop cultivation has been completely abandoned and garden cultivation is declining. The overall findings show that livelihood strategies have continued to change from land based livelihoods to non-farm and later non-labour. The paper argues the importance of understanding a farm household in the perspective of household economics theory and to incorporate the diverse portfolio of livelihood strategies in farming households into the extension advisory service in order to render relevant and appropriate service.

Keywords: Cultivation, Farming rural, Livelihood, Strategies

1. INTRODUCTION

1.1 Background: Change of rural livelihood over time

In the late 1990s, it was noticed that rural livelihoods across sub-Saharan Africa were changing, in particular by becoming more diversified (Barret, Reardon & Webb, 2001; Ellis, 1998). As such, it was reported that up to 60% of rural African households derive most of their income from non-farm sources (Bryceson, 2000). This was against the general known view that rural households derive most of their livelihood from farming.

In South Africa, the livelihoods of black South Africans started to change since the contact of the colonists with the natives between 1778 and 1878 (Ncapayi, 2013). This involved land dispossession and eventually turning the Africans into wage labour (Bundy, 1979). However, Africans continued to depend on land-based livelihoods, although increasingly combined with wage labour. In the Transkei, which was one of the 'Homelands' in South Africa and the largest in terms of surface area (4 426 338 ha) (Pollock, 1969), this was noticed by declining maize yields in the 1930s which was and still is the major staple crop in the area (Bembridge, 1984; Gilimani, 2005). For example, between 1920 and 1930, Africans in the Transkei produced 640 million pounds of maize per annum. However, this fell to 490 million pounds between 1931 and 1939 (Simkins, 1981).

This decline in agricultural production amongst Africans was also noticed by the Tomlinson Commission in the 1930s. It found that most rural households in the Transkei could not support themselves solely by farming (Redding, 1993). On the one hand, agricultural production was

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declining. In this regard, Bembridge (1984) highlighted how maize production in the Transkei has declined throughout the decades. For example, over the period of 1918 to 1980, maize yields in the Transkei dropped by 52%. On the other hand, non-farm and non-labour such as social grants sources of income had been increasingly becoming an important source of household income⁴⁶. In the late 1950s, the state's old age grants had also been increasingly becoming an important source of income for Africans (Lund, 1993). In 1958, 60% of the state funds allocated for old age pension went to Africans (van der Berg, 1997). However, the amount paid per beneficiary was very little for Africans compared to whites which was below the minimum wage. In 1993, this figure had risen to 80% in women and 77% in men (Lund, 1993).

This continued throughout the decades with Africans combining wage labour with farming (Redding, 1993). In the late 1990s, this trend was becoming worse with the economic recession in the mining industry which saw much male-migrant labour from Transkei retrenched, bearing in mind that this was the largest employer of Transkei⁴⁷ male labour (Manona, 1999; Murray, 1995). This was the same period the country was approaching the new democracy.

In the post-apartheid era, in many rural areas of the former Transkei, it can be observed that cultivation of arable fields to a great extent has declined over the years while reliance on small backyard garden cultivation has become the only form of arable cultivation (Andrew & Fox, 2004; Connor & Mtwana, 2018; McAllister, 2000). In line with the decline in farming activities, Transkei households continued relying on non-farm sources of income in the early 2000s. For example, Perret *et al* (2000) reported that in Transkei, 53% of households depended on pensions and welfare grants for survival, while only 8% relied mainly on farming income. At a national level in general, rural households, like their urban counterparts, mainly depend on the market for their food due to their inability to produce sufficient food for subsistence (Baiphethi & Jacobs, 2009).

1.2 Research problem

The transition to the democratically elected government in South Africa has brought major changes in agrarian policies, mostly directed to black smallholder farmers (Manona, 2005). Among the policies and support was the commercialisation programmes such as the Massive Food Production Programme and food security policies such as the Siyazondla Food Security Programme. The first sought to bring all the uncultivated arable fields into production of high quality and quantity maize to supply the Eastern Cape Province, while at the same time creating emerging black commercial farmers. However, there is inadequate evidence for its success (Fischer & Hajdu, 2015; Hajdu *et al*, 2012). In addition, there were other policies which sought to provide basic services to the rural communities. Overall, these policies have brought positive changes in the quality of life of the majority of rural households. However, unemployment and abandonment of arable fields continue to be a challenge in rural South Africa (Aliber, 2017; De la Hey & Beinart, 2017; Shackleton & Luckert, 2015; Statistics South Africa (StatsSA), 2016). Tracking changes in livelihood strategies is one way of examining the impact of these changes. While several studies have given explanations of why arable land cultivation and declining contribution of agriculture to rural livelihoods, little attention has been paid to how

⁴⁶ In Transkei, in the 1980s, the share of social grant to the rural household income was 17.2% (Moll, 1984), while in the late 1990s, it hiked to 40% (Perret *et al*, 2000).

⁴⁷ This is now the former Transkei after 1994. All homelands were incorporated into the nine provinces of South Africa.

this behaviour of farming households implies to agricultural extensionists, especially with a view of the household economics theory.

1.3 Justification

Why is the study of livelihood strategies important and how is it useful? It is useful because it provides critical information concerning the goals, choices and activities which matter to local communities, thus contributing to better planning and decision making by policy makers (Walker, Mitchell & Wismer, 2001). Furthermore, it helps to identify important historical changes which have affected households as well as providing a clear indication of how households have responded or adapted to these changes.

Moreover, it allows development practitioners to take a closer look at how people interact with resources and institutions to construct a way of life. In this respect, many of the state's rural development initiatives have seen limited success, which Kleinbooi (2013) attributed to lack of knowledge on how rural households cope with everyday challenges such as poverty and food insecurity. Hajdu *et al* (2012) also argued about the approach to policies intended for rural households which are based on incorrect assumptions and top-down approach resulting in unintended results.

Understanding how farming rural households combine livelihood strategies and the contribution of farming is important for agricultural extensionists in numerous ways. For example, such understanding could improve the planning of advisory service, and aid in providing relevant and appropriate advice to farming households.

1.4 Objectives and structure

It is against this background that this study seeks to track the changes in rural household livelihood strategies. The objectives of this paper are threefold. The first is to describe how livelihood in rural parts of Ndabakazi, particularly the former Transkei, have changed over time. The second is to discuss the importance and the rationale of understanding the household economics theory in improving agricultural extension. The third objective is to identify livelihood strategies in Ndabakazi villages related to those of other rural Transkei to track the change over time.

2. HOUSEHOLD ECONOMICS THEORY AND ITS IMPLICATION TO AGRICULTURAL EXTENSION

The household economics theory is a branch of neoclassical economics (Mattila-Wiro, 1999). It originates from a combination of work from different scholars. The most notable contributors include Becker (1965) in his seminal work 'A theory of the allocation of time', Muth (1966) in 'Household production and consumer demand functions', Chayanov (1966) in 'The theory of peasant economy', and Lancaster (1966) in 'Change and innovation in technology of consumption'. These scholars viewed the household from the developed world perspective. Later on, Low (1986) and Ellis (1998) provided perspectives from the developing and under-developed worlds.

The main purpose of the theory is to understand the complex structure of the household resource allocation, behaviour and decision making in coping with resource scarcity (Mattila-Wiro, 1999). The theory views the household as a single economic unit which uses market

goods as inputs to produce household goods in order to maximise household utility (Muth, 1966). The other important feature of the household recognised in this theory is that a household is not static, there are distinct stages within the development of the household better, known as Household Development Cycle (HDC), and as such, resource availability changes within these stages (Fortes, 1970).

Furthermore, the theory acknowledges that time is the most important resource of the household and it can be substituted for money in the form of wage employment. In addition, household members have different opportunity cost in wage labour and the members with lower opportunity cost in wage labour are left to do farming, and these include less educated and the elderly. In contrast, those with high opportunity cost in the wage labour, for example educated and young members, are sent for wage labour (Low, 1986).

How is this theory relevant to agricultural extension and why it is important to understand? Low (1988) argued that while the objective of development practitioners, including agricultural extensionists, is to improve yields, while the farm households' objective is to maximise welfare/utility. Therefore, it would seem like agricultural extensionists are interested in only one component of farm households, improving farming skills/methods and in turn production.

However, with this approach, they are likely to miss the point. There is a need to understand the whole household behaviour, resource allocation and decision making in order to render relevant and appropriate advisory services. For example, the resource availability differs in relation to the stage of the household in the HDC, therefore, understanding the farm household by extensionists can enhance the kind of advisory service rendered. Furthermore, the drivers of change in livelihood strategies can be categorised into endogenous and exogenous (Zantsi, 2016). The first results from internal factors within the household such the stage of the household in the household development cycle, aging of household head, and death of household head or bread winner.

These factors influence how the household combines livelihood strategies to cope with these changes, therefore understanding the farm household is important for extensionists in providing relevant advisory services (Zantsi, 2016). While Christoplos (2010) as well as Davis and Terblanche (2016) support the view that agricultural extension should encourage the creation of more livelihood opportunities as a measure of risk reduction and increasing income, the household economics approach has not been widely adopted in agricultural extension research.

3. METHODOLOGY

This study was conducted in Ndabakazi villages in Butterworth in the Eastern Cape's former Transkei area to gather data on income sources, demographic information and farming activities. Within Ndabakazi, which is a complex of six villages, four villages, namely Ejojweni, Lengeni, Komkulu and Mziteni were chosen. Ndabakazi is located 10 km from Butterworth in the direction of East London. In September 2014, a sample of 80 respondents were randomly selected and interviewed for this research. This sample was equally divided amongst the four villages as 20 respondents were selected from each village.

Semi-structured questionnaires were used to collect information from household heads using the local language, IsiXhosa, to enhance the understanding of the respondents. Focus group discussions were also used to supplement the information obtained from the household survey. The groups each consisted of eight household heads as smaller groups are easier to manage and

everyone has a chance to engage in the discussion. This was done by combining respondents from two villages, Komkhulu and Ejojweni. Household heads over the age of 50 years, both females and males, were selected through the help of the headmen for the group discussion.

Studies of this nature which seek to track change over time usually require time series data (Murray, 2002). However, the challenge of data on rural household production is the major challenge in South Africa (Binswanger-Mkhize, 2014). Hence, we used past data from other former Transkei rural households and compared them with the one from Ndabakazi to overlook the change of livelihood strategies before and after the democratically elected government. This approach is a combination of circumspective and retrospective approaches. Murray (2002) supports the combination of these approaches for evaluating the changes in livelihood strategies. The circumspective approach looks at livelihood strategies at the present moment, while the retrospective approach seeks to identify change prior to and post-democratic era.

The study mainly employs descriptive statistics as a major analytic technique. This encompasses the use of averages, minimums, maximums, standard deviations, range, frequency counts, percentages and charts. The descriptive analysis has been widely used in similar studies such (McDermott, 2006; Perret, 2000), hence, it was deemed appropriate for this study given the nature of our data.

4. RESULTS AND DISCUSSION

4.1 Demographic information

It is important to understand the farm household structure including demographic information. This is important since the decision of farm activities is influenced by the demographic feature of the household head and household structure as argued by Modiselle *et al* (2005) who emphasised this importance to agricultural extension.

Table 3: Age distribution

Age category	Village				Total	%
	Ejojweni	Komkhulu	Lengeni	Mziteni		
30-39	0	0	1	2	3	40.0%
40-49	3	3	4	4	14	17.4%
50-59	3	4	5	3	15	18.6%
≥60	4	13	10	11	48	60.0%
N	20	20	20	20	80	100%

Findings from the present study show that many household heads in Ndabakazi were pensioners, in other words, persons over the age of 60. In all four villages, many respondents fell into the 60+ age group followed by the middle category which is between the ages of 50 and 59 as well as between 40 and 49 (Table 1). The household heads' gender distribution was dominated by females (63%). Furthermore, almost half (48%) of the respondents were widows, while 40% were married and the remainder were single or divorced. The average size of the household in Ndabakazi households is five persons per household and ranged from one to eight persons. These results are typical in many rural parts of South Africa, especially for subsistence farming households and resemble those in the Household Community Survey (StatSA, 2016).

4.2 Land holding

Findings from Ndabakazi show that every household has at least access to land both for arable crop production and shared grazing land. These findings are in line with those reported by Perret *et al* (2000) on a provincial level. She claimed that 85% of rural households in the Eastern Cape have access to arable land, while 75% have access to shared grazing land. All the surveyed households in Ndabakazi have at least access to land as shown in Figure 1.

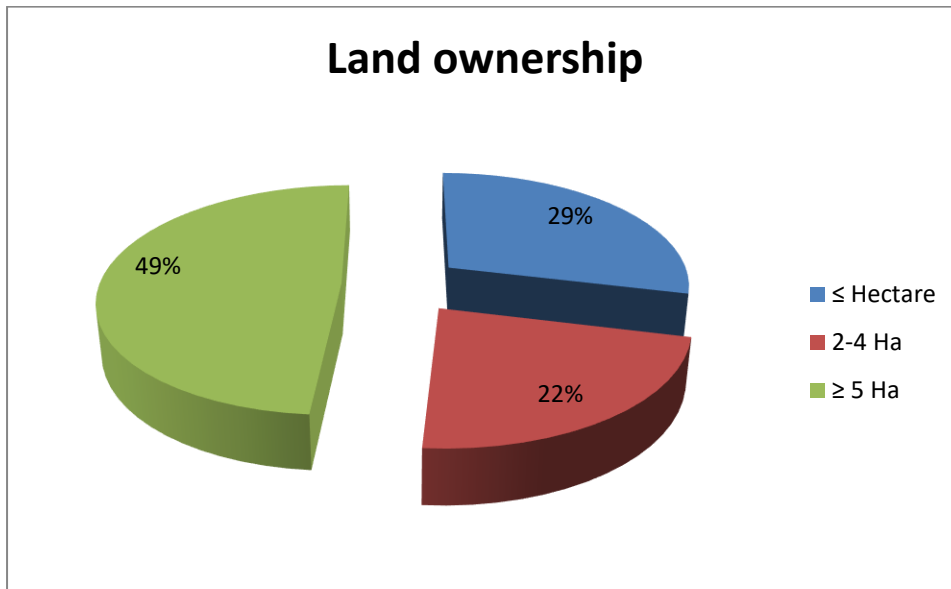


Figure 1: Land access and distribution

4.3 Agricultural production

4.3.1 Crop production

Despite that the majority of respondents (49%) own more than five hectares, not even a single respondent claimed to be cultivating a field. The fields in all the villages, except for Mziteni, are fenced and it has been quite some time since they had been fenced early in the last decade. In other villages, the fence is starting to rot. In terms of garden cultivation, a large proportion (71%) of respondents cultivate gardens adjacent to their homestead. These results corroborate what the existing literature says in that rural households have not completely abandoned crop production; they have rather left field cultivation and focused on garden cultivation (Andrew & Fox, 2004). Connor and Mtwana (2018), who based their study in three areas, two in Transkei and the other in Ciskei, also found that field cultivation has been left for gardens. This suggests that this trend has cut across the Eastern Cape. However, garden cultivation is also declining in some parts of the Eastern Cape as in Ndabakazi (Shackleton & Luckert, 2015).

Maize is the most produced crop in Ndabakazi. All the respondents who claim to be producing in their gardens planted maize in the previous production season. This is in line with what Bembridge (1984) found in 1979 in the Qumbu, Emgwe and Qamata rural areas in Transkei. Perret *et al* (2000) also found the same result in Tsomo, Mount Fletcher and Nyandeni in the Transkei. Later on, Gilimani (2005) also reached the same conclusion. Rural households in Ndabakazi produce an average of 150 kg of maize per year. This is equivalent to three 50 kg bags of maize. The most producing household produced 10×50 kg, while some who produce

in small gardens yield only 25 kg of maize. These were the approximate quantities harvested in the 2014 production season. These may not be the exact quantities due to the nature of production in households as stated by McAllister (2000). As such, farming rural households do not formally keep records of production, however, they relate their produce in 50 kg bags and buckets. Although these figures also exclude green maize, they are far too low for a 0.5-2 ha farm.

4.3.2 Reasons for abandoning field cultivation

When asked why respondents do not cultivate their fields, a variety of reasons were cited. These include the distance from the homestead to the fields. This makes crops prone to livestock damage as the fields are near the grazing land separated by fences. Furthermore, in weeding periods, it is not easy to reach the fields. As a result, they receive lower yields since the crops are not thoroughly and completely weeded. Shackleton and Luckert (2015) also found the same reasons in Gatyana and Leyssaton in the Eastern Cape. Another common reason given was the expensiveness of tractors, which cost R350⁴⁸ per hour in a field when the owner still has to hire planting services and labour for weeding. It was also mentioned that production costs are just too high for field crop production. If the homestead does not have cattle or a large family to work on the field, they have to hire everything, further limiting the turnover.

An additional reason for abandoning field production was the uneven distribution and uncertainty of rainfall. It was cited that rain falls in one month every week in such a way that they do not get a chance to prepare land and then it stops for a while. Furthermore, the occurrence of drought was mentioned to be occurring frequently. Respondents noticed the change of climate, even in temperatures. Most respondents also mentioned a lack of energy as they are older women, mentioning their health issues that they are not like their parents who were healthy throughout their lifespan.

They also mentioned the unwillingness of their children to invest in farming. Many respondents claimed that 'they do not send money for production nor do they buy livestock'. This was also noticed by Kepe and Tessaro (2014) where they found that those who are able to secure jobs in rural areas prefer to buy cars than investing in farming. Aliber (2017) also found that rural households in the former homelands spend more on hardware material for building their homesteads.

The flight of more active labour was also cited. Laziness and a lack of interest in farming was highlighted in the group discussion, particularly with regards to the younger generation. Youth are investing in fancy lifestyles, buying luxury furniture and building expensive houses. It has also been revealed that youth are very reluctant to stay in rural areas, especially those that are educated.

In summary, there are complex reasons for why people have stopped cultivating large fields and these reasons differ between households and some are interrelated. There are very few households headed by younger people or the economically active group. This can be linked to high unemployment rates. Furthermore, a lack of interest in farming among the youth was observed from the focus group discussions and that farming is failing to attract young people as an income generating activity that one may rely on. Hull (2014) also shared similar findings in one former homeland in KwaZulu-Natal, where there is a large pull of labour available,

⁴⁸ 2014 Rand value when the data was collected; this might have risen now.

especially young people who still live with their parents, but are not interested in household agricultural activities, even in the face of limited employment opportunities.

4.3.3 Livestock production

The main livestock kept by households in Ndabakazi includes goats (46%) and poultry (64%). The most commonly kept stock is indigenous free range chickens (64%), followed by goats (46%), pigs (38%), cattle (36%), and sheep (29%). In Komkhulu village, none of the respondents owned sheep. The widespread farming of chickens may be due to their easy accessibility as they are relatively cheap and the lending is more common in chickens than in any other livestock types. Most of the households claimed that fewer households own livestock now as compared to the past. The average household livestock holdings are presented in Table 2.

Chickens and small stock (goats and sheep) seemed to be more compared to cattle. With sheep having an average of 16.25, goats 10, and cattle 5. The small number of cattle holding also has an effect on crop production as cattle are used to plough the land and for planting. As a result, it was mentioned that very few households use draft power to till the land. With the high cost of production that was previously highlighted, the use of draft power animals can reduce the cost of production making subsistence production worthwhile and increasing food supply. In this respect, animals such as horses and donkeys who have longer lifespan and adapt well in drought and to diseases can play a vital role. Extension services provided by the state should prioritise animal traction for subsistence farmers.

Furthermore, 11% of the households kept none of the mentioned stock types. They pointed out a number of reasons for this. These include the cost of keeping livestock, namely that vaccines are expensive, diseases are prominent, and it is difficult to succeed without them in keeping stock. Another reason pointed out regards livestock herders. Boys attend school now on a regular basis, and in other households that are headed by women, there may be no boys. This means there will be no one to look after stock. The cost of hiring a shepherd/ herder is quite high, ranging between R1000 and R1500. Also emphasised was the loss of Ubuntu amongst the community and working together where a child is raised by a community in such a way that a neighbour's child can be asked to do something, as it used to be in the past.

Table 2: Livestock distribution in Ndabakazi

Village	Cattle				Range
	Average	Standard Deviation	Minimum	Maximum	
Ejojweni	6	5.66	1	9	8
Komkhulu	3	2.33	2	4	2
Lengeni	6	4.94	1	15	14
Mziteni	5	4.89	1	15	14
		Sheep			
Ejojweni	16	11.66	2	38	36
Komkhulu	0	-	0	0	0
Lengeni	26	34.09	8	109	101
Mziteni	23	10.31	17	30	13
		Goats			
Ejojweni	10	9.8	2	21	19

Komkhulu	11	8.94	3	25	22
Lengeni	16	14.81	1	36	35
Mziteni	3	4.79	3	14	11
			Pigs		
Ejojweni	3	3.5	2	7	5
Komkhulu	3	2.64	1	9	8
Lengeni	3	1.98	1	7	6
Mziteni	3	2.50	2	3	1
			Chickens		
Ejojweni	5	7	1	18	17
Komkhulu	1	7.38	3	25	22
Lengeni	15	7.33	2	26	24
Mziteni	14	6.02	5	21	16

4.4 Income sources in Ndabakazi

4.4.1 Main income source

Rural households in South Africa, as a way of coping with risk and uncertainty of food prices, rainfall and diseases, rely on a portfolio of income sources.

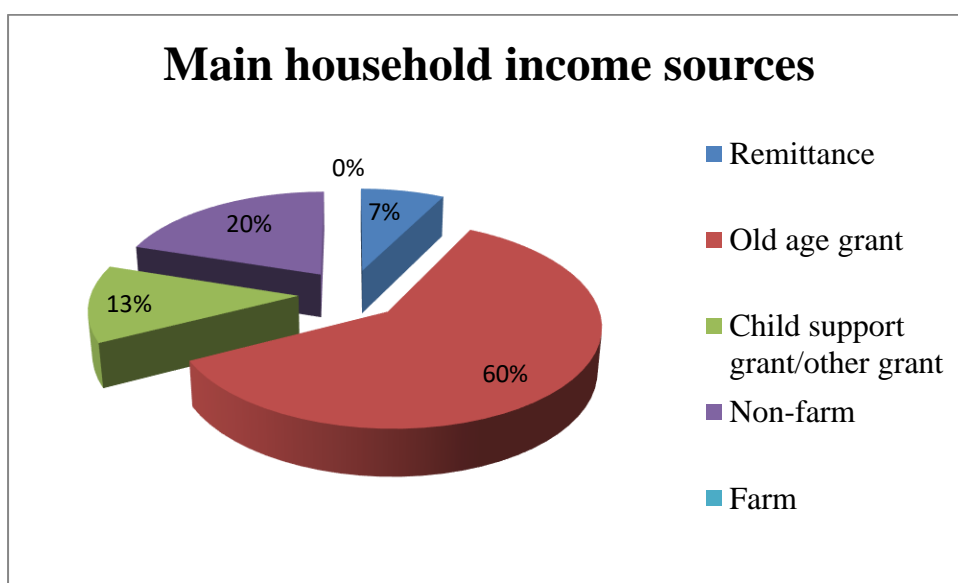


Figure2: Main livelihood activities

Figure 2 presents the main sources of income for households in Ndabakazi. The main livelihood strategies were identified based on the activity that contributes the most to the household income. Social grants are the main source of income in Ndabakazi. Old age grants were the dominant livelihood strategies followed by non-farm income, child support grants and other forms of social grants, except for old age grants, remittances and farm income. The larger proportion of old age grants as a main source of income can be justified by the age of the respondents. The non-farm sources of income include government employment such as educators, police officers, and nurses. Self-employment and petty trading are also part of this category. Child support grants accounted for 13%. There were very few respondents (7%) who depended mainly on remittances. No respondents claimed to be dependent mainly on farming activities, hence the 0% as shown in Figure 2.

These results paint a picture that farm households in Ndabakazi, as is the case in most rural parts of South Africa, are headed by pensioners, with farming contributing very little to household income as argued by Baiphethi and Jacobs (2009). This also links with the HDC in that towards the aging of the parental group, resources become scarce and farming activities decline. Furthermore, Low (1986) ascribed the decline of food production in rural farm households to the fact that farming is left for the elderly, mostly women, since the young members have comparative advantages in wage labour in the cities. Moreover, the majority of households are headed by females who have other household chores other than farming. This may be taken to imply that they have less time for farming, hence the little contribution of farming as a livelihood activity.

While many development policies (e.g. Food Security Policy, Land Reform, etc.) are designed with the assumption that since rural households have at least land available to them and there are very limited opportunities for non-farm employment, they will or should be focusing on farming. Unfortunately, that does not seem to be happening successfully, partly because farm households strive to maximise welfare/ utility and therefore will always choose activities which maximise utility at less efforts as Low (1986) argued.

4.4.2 Combination of income sources

It is rare to find households depending solely on one income source (Barret *et al*, 2001; Manona, 1999; Shackleton & Luckert, 2015). Figure 3 depicts the combination of livelihood strategies pursued by households in Ndabakazi.

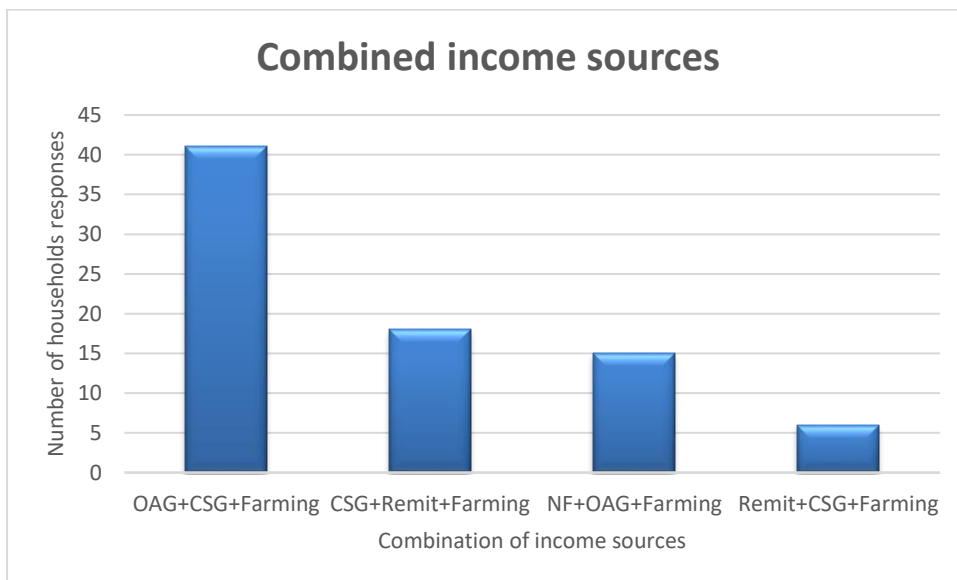


Figure 3: Combined income sources

Note: OAG = Old Age Grant, CSG = Child Support Grant, NF = Non-farm income

When grouping the main three contributing activities to household livelihoods, Old Age Grants (OAG), Child Support Grants (CSG), and farming were the most combined activities by most households (Figure 3). This finding corroborates with that of Perret *et al* (2000) in Xume, Tsomo, and Mount Fletcher, which are also Transkei rural areas. Following this group was the child support grant plus remittances and farming. Remittances plus child support grants and farming were the least combined activities as there were only a few respondents who receive

remittances on a regular basis. Farming has been the smallest contributor in all the combinations.

This suggests that the households of Ndabakazi depend mainly on a combination of social grants and farming activities. This finding is in line with those of Shackleton and Luckert (2015) and contradict those of McDermott (2006) in Sehlabethe Lesotho and Richtersveld in the Northern Cape Province that rural households have not changed from relying on farming, but rather there is a change in relative importance of the farming activities.

5. SYNTHESIS AND CONCLUSION

This paper sought to achieve the following three objectives. The first was to describe how livelihood strategies have changed in pre and post-democratic eras in rural Transkei. Secondly, to identify livelihood strategies of Ndabakazi rural households and observe the change in relation to the change described in Transkei. The third objective was to discuss the importance and the rationale of understanding the Household Economics Theory in improving agricultural extension.

Farming as a source of income in rural Transkei has been declining throughout the decades. In the 1980s, evidence from Qumbu shows that it contributed only 8% to household income. While in the late 1990s, evidence from the whole of the Eastern Cape Province showed that it had declined to 4%. Current findings from Ndabakazi show that the figure has fallen to less than 1%. Wage labour contribution to household income has also been declining; in the 1980s its share was 41, 4%, while in the late 1990s it had fallen to 26%. The current findings from Ndabakazi show that it has further fallen to 20%. This can be attributed to high unemployment rates which, from the 1996 census and central statistics as cited by Perret *et al* (2000), was 48, 5%. Recent reports from Statistics South Africa also show a high unemployment rate of 28, 5% in the Eastern Cape, while in Mquma Local Municipality where the study areas are, it is 44, 2% according to the 2011 census.

In contrast, social grants have become a significant rural income source in the Transkei. In the 1980s, the share of social grants to the rural household income was 17,2%, while in the late 1990s, it hiked to 40%. Current findings from Ndabakazi shows that social grant income accounts for more than 70% of rural household income now. It has also been observed that investment of the households have changed over time from investing in livestock to a fancy lifestyle of modern houses and furniture driven by the younger generation.

In conclusion, livelihood strategies in rural Transkei have continued to change from land-based to non-farm and later to non-labour since the contact of Africans with the colonists up to the democratically elected government. Social grants, mainly old age grants and child support grants are the major sources of income in rural Transkei and in Ndabakazi villages. Although there have been a number of support programmes implemented with limited success in the rural areas of the former Transkei such as the Comprehensive Agricultural Support Programme, the Siyazondla Food Security Programme, and the Massive Food Production Programme, there is still high unemployment (Fischer & Hajdu, 2015; Kubheka, 2015; Nilsson, 2008; StatsSA, 2016). Rural households continue to move away from the land-based livelihood. The Household Economics Theory provides a good lens in understanding farm households' behaviour, resource allocation and decision making, and this is important for agricultural extensionists in providing relevant and effective advisory services.

6. IMPLICATIONS FOR AGRICULTURAL EXTENSION

Results from this case study confirm the ongoing declining contribution of farming as an income source and income diversification in rural farming households. This implies that agricultural extension advisory services should incorporate the goals of farming rural households and caution against being biased towards encouraging and focusing solely on improving farming practices, but also encourage an effective combination of livelihood that would improve the welfare of farming households. This can be achieved through a holistic farm household economic perspective and understanding of the goals of farming households. Among other objectives, the objective of agricultural extensionists should be to strive to help farm households through advisory services on how to combine their livelihood activities to maximise utility, given certain farm household characteristics.

ACKNOWLEDGEMENTS

The authors would like to thank the financial assistance of the Levenstain Family Bursary Trust and the Govern Mbeki Research and Development Centre in data collection. The authors would also like to thank reviewers for their insightful comments and suggestions.

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THE IMPACT OF LAND REDISTRIBUTION ON AGRICULTURAL LAND PRODUCTION: A CASE STUDY OF THE MZIMVUBU VALLEY FARMS

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THIS ADDRESS WAS NOT AVAILABLE AT THE TIME THE PROCEEDINGS WAS PRODUCED.

THE NEW ROLE OF EXTENSION ADVISORY SERVICES IN ACCELERATED LAND REFORM PROGRAM/PROJECT WITH REFERENCE TO CONDUCTING A SOCIO-ECONOMIC SURVEY: MASAKONA COMMUNAL PROPERTY ASSOCIATION IN MAKHADO MUNICIPALITY, VEMBE DISTRICT OF LIMPOPO PROVINCE.

E. Zwane⁴⁹

ABSTRACT

Masakona is one of the Village situated in Makhado Local Municipality and it falls in Vhembe district which is situated in Limpopo province. Limpopo is one of the provinces of South Africa. Different types of land reform, have been instituted in South Africa. However, progress has not been impressing. Agricultural practitioners have often been ignored in assisting communities to develop a bankable project. It is proposed that extension practitioners, could positively contribute towards the development of bankable business plans should they be provided with the necessary tools of support in terms of enabling them to conduct baseline surveys of the socio economic status of land reform owners and beneficiaries. This paper therefore present the findings of a baseline conducted in Masakona Communal Property Association. Both quantitative and qualitative methodology were used. Data was collected through 67 questionnaires which is 20 % of the total population of 326, of the beneficiaries constituting a sample of 65 respondents. The sample was captured and analysed through an excel and SPSS programme. The study found that 72% are above 48 years of age, 57% were females, 49 % were married ,75 % have primary education ,99 % have no tertiary agricultural education, 92 % considered themselves poor, 93% do not participate in the subsistence farming, 85% are not gainfully employed, 97 % never benefited from the CPA. Based on the findings the following are recommended: providing bursary to the youth and young people or the children of the beneficiaries, providing skill of the beneficiaries, and other creative ways of caring the most vulnerable households. The implication is that advisory services should be capacitated to conduct baseline as their new role prior resuscitation of bankable plans for CPAs.

Keywords: Socio economic, land reform, role of agricultural extension

1. INTRODUCTION

The history and the development of land restitution in South Africa was instituted by the Mandela Government in 1994 (Hall,2010). It has been difficult to operate land reform prior the development of the white paper on land policy of 1997 which formed the basis of further acts and legislations related to land issues (White paper on Land Policy of 1997). The white paper provided different subprograms and one of such programme which is linked to land restitution was called the Settlement for Land Acquisition Grant (SLAG) (White Paper on land Policy, 1997). Masakona village is situated in Makhado Local Municipality and it is in Vhembe district which is in Limpopo Province. Limpopo is one of the nine provinces of South Africa. Many countries have adopted land reform programmes in order to make a difference in the well-being of their citizens. This is also true in South Africa where different types of land reform programmes were conceived and implemented (Department of Land Reform and Rural

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Development, 1997). The objective of the study was fourfold namely: (i) to determine the status of household demography of the CPA (ii) to determine the extent of participation of land reform beneficiaries in the affairs of the CPA and to establish the perceptions and expectation of beneficiaries of the CPA in Masakona.

2. LAND RESTITUTION IN LIMPOPO PROVINCE

A number of research has been conducted in Limpopo and elsewhere in the country focusing on the sub programme of land restitution (Lahiff, et al. 2008; Hall, 2010 and Didiza, 2000). The aim of this subprogram was to bring justice to people whose land was taken from them by force through government legislations such as land Native act of 1913 and other subsequent acts. Land restitution has been instituted in South Africa, given a cut off period from 1913 until December 1998. However, progress has not been impressive and this was acknowledged (Land claims Commission Annual Report 2014: 7, Lyne, undated, Williams, et al 2015).

Land restitution in Limpopo took a turn when the Department of Agriculture and Environment by then took an initiative under the former MEC, Mr Aron Motsoaledi to second a group of twelve extension advisors to the Land claims commission in 1997 to assist in fast tracking the process. The process was however halted in 2009 due to some logistics. There are a number of restituted projects in Limpopo whose productivity are somewhat not satisfactorily and they include the following: Masakona, Tshitwani, Gillimberg, Ravele, Ratombo, Tshakhuma and Tshivhazwaulu.

3. PROBLEM STATEMENT OF STUDY

Agricultural practitioners have often been ignored in assisting communities to develop a bankable business plans of restitution projects. Baseline study is always regarded as a waste of time and resources. The consequences of this is that restitution projects are not operational except those who have partnerships. This paper seeks to present the findings of a study based on baseline survey of Masakona Communal Property Association which is situated in Makhado municipality in Vhembe district. The writers considered that the problem of the study was that land reform is often oversimplified, believing that slow progress is caused by lack of funding without considering other needs coming from socio economics and demographics of land reform beneficiaries.

4. RESEARCH METHODOLOGY

The point of entry to the project was through the mentor of the project whose name is not disclosed in the paper for confidentiality purposes. Masakona CPA, consist of members drawn from the following villages: Khaphamali; Maneledzi; Makovha; Linyenye; Ha- Murovhi; Furautuwe; Tree-Stands; Thondo, Masakona-New Stand; Tsamahatsi, Maphangule; Rambuluwani and Vhalinawe. Employees samples were from: Khaphamali.; Linyenye; Ha-Murovhi; Masakona New-Stand; Thondo; Thiofhi; Tsamahatsi; Vhalinavho; Manashi and Thondo from different headmen. The CPA is trading under Sharp Move Trading 150 (Pty) Ltd, located at plot B24,3 Paul smith in Levubu. The research population had 326 beneficiaries and 104 employees from various Territorial Councils in the Vhembe District. The sample was based on a 20 % of the total population which amounted to 65 respondents. The sample was randomly selected. A questionnaire was developed by the two researchers and it was administered during October and November of 2018.

Prior to the interview, the researchers explained the objective of the survey and the questionnaire was clarified and members were informed that they were free to participate or not to participate if they choose to do so. However, they did not object and all participated in the study. Data was captured and analysed through computer excel and the Statistical Package for Social Sciences (SPSS). The results were categorized and are presented in Tables. Some of the observation during the interview are included in this paper.

5. FINDINGS AND DISCUSSIONS

The themes that emerged fall into the following broad categories: household demographics, household characteristics, participation in affairs of the CPA, economic impact and food security and perceptions and expectations. The details are reported in the next section, beginning with the demographic information in item 4.1

5.1 Demography of Masakona communal property association

The first objective of the study was to determine the status of household demography of the CPA.

5.1.1 Age of respondents

The age of respondents was categorised into 4 age ranges. The findings of the survey are presented in Table1.

Table 1: Age of respondents

Age range	Frequency	percentage
Below 20 years	0	0 %
21-60	1	1%
41-60 years	18	27 %
Above 60	48	72 %
Total	67	100

Source: own study 2019

After interviewing 67 participants of households, the outcomes on ages ranged from 20 years to above 60 years. It was found that those within this age range were 72%, between 41-60 years were 27%, between 21-40 years were 1% and below 20 years were 0%. The mean average age of respondents was 64 years and 5 months. Majority of the interviewees were old people and conversant with their household's dynamics. A similar finding was revealed by (Kwabena et al.2011). On the other hand, the 14 employees interviewed ages ranged between 41-60 is 57%, between 21-40 is 43%, between 20 years is 0% and above 60 years is 0%.

5.1.2 Gender

The gender of households of the respondents is indicated in Table 2.

Table 2 Gender of respondents

Gender	Frequency	Percentage %
Female	38	57
Male	29	43
Total	67	100

The gender of male participants in the survey was 43% and the female's participants was 57%. The implication of the findings is that there are more female at the project as compared to males. Females stood a chance of building the CPA due to their multitask capability.

5.1.3 Number of adults in the household

The total number of adults in the households were found to be as follows: the household with 1 adult was 3%, 2 adults was 9%, 3 adults was 16%, 4 adults was 17%, 5 adults is 29% and adults more than 6 was 26%. It was found that it is only 26 % of the house holds that have 6 adults, this was similar to other findings (Urban Econo, 2005). This may imply that if these households were all working could contribute to the welfare of the households when comparing it with those with few adults.

5.1.4 Number of children in the household

The total number of children in percentages in the households are: 1 child was 4%, 2 children was 11%, 3 children was 14%, 4 children was 17% and more than 4 children was 54%. A similar finding was found by other researchers (Kwabena et al. 2011, Urban Econo, 2005).

5.1.5 Head of household

The majority of households are headed by adult males 55%, adult females 43% and child male 2%. The trend is changing as one can notice that there are more females heading households although they are not yet at 50 %. There was a debate that male headed household display order in the family unlike when it was headed by a female member of the household, although there was no scientific basis to confirm this statement. Experience shows that this depend on the discipline of a parent irrespective of the gender.

5.1.6 Marital status

The marital status of the respondents is as follows: 49 % are married, 34 % are window, 15% single, 2% separated and 0% divorced. The marital status of the respondents was found reasonable.

5.1.7 Educational level

The respondents level of education is reflected in Table 3.

Table 3: Educational level

Level of education	Frequency	Percentage %
Primary school	50	75
Matric/Grade 12	12	18
Post matric	3	4

University degree	2	3
Total	67	100

The majority of the households had an opportunity of attending school as alluded by 96% irrespective of the level of educational level attained which indicated that 75% attained primary education as the highest form of education. Furthermore 62 % of the households indicated that they have acquired some form of education. This is appreciated that many can read and write which makes it easier for them to read developmental news.

5.1.8 Language proficiency

The majority (52%) of households' members can speak, understand and/ or write languages other than Tshivenda. Forty-eight percent could only speak Tshivenda 78% can speak English. In each household at least 1 or more languages out of the 11 can be used with proficiency. Communication was not posing any challenge especially that the community of Masakona were living peacefully with the Vatsonga people prior to the introduction of ethnicity which led to apartheid.

5.1.9 Agricultural qualification

The majority of members of the households (99%) had no tertiary agricultural education which was detrimental to their restored land because only 1% possessed agricultural qualification. It would have been expected that more would have been trained in agriculture.

5.1.10 Employment of respondents in Masakona

The majority of members of the households (85%) are not actively and gainfully employed. The reason advanced was that the majority said they solely relied on social grants and partly supplemented by the child grants. A similar finding was revealed in other villages of Vhembe (Kwabena, et al 2011). Furthermore, household members indicated that none worked in an occupation which brought income in the last 12 months. However, 15 % of respondents said they were employed in the following institutions; education, security, farming and hospitality industries.

5.2 Characteristics of the household

5.2.1 Housing of respondents

In terms of housing, there were mostly bricks houses with corrugated ions, few grass rondavel houses, few houses with bricks and tiles and lastly 38 % RDP houses. Each household had at least a roof. A similar study was confirmed in other villages of Vhembe district (Thabeda, undated).

5.2.2 Occupation of households

As far as the occupation of the household members is concerned, it was reported that 44%, have retired, 11 % were still working, 9% were farmers, 9 % were livestock breeders, 9 % were merchants, 9%, were teachers, 6 % were civil servants and 3% was a craftsman. The main income sources of family were from child grants at 44 %, social grants at 38%,(Urban Econo,

2005), salaries at 8%, pensioners 4%, dependence from kids 3%, crop sales 2%, and animal sales at 1%. Most of the households in the project area do not have viable sources of income due to the high incidence of unemployment.

5.2.3 Household Income

On average, the monthly income per household was on the range of R1 001- R2 000 equating to 69%. Subsequently, the majority 92% of the respondents considered themselves poor.

5.2.4 Subsistence farming

Subsistence production is vital for the survival of the households in the rural areas (Williams et al. 2015), unfortunately 93% were found not practising any form of subsistence production. However only 7 % of the households reported that they were practising subsistence farming. The reasons why only few were practising subsistence farming could be due to climate change where rains do not come as expected. The few households practising subsistence farming proved that where mitigation factors are taken care of, it can yield better results, for example, it was revealed that the value of one subsistence production per production circle ranged from R300 – R550 amongst 4 of them and one made R10 000,00. All participants 100% pointed out that there was no income realized from non-farm activities by members of the household. This situation is serious in terms of fighting poverty.

5.2.5 Monthly expenditure

The monthly expenditure of the respondents was investigated and the finding is in Table 4.

Table: 4 household expenditure

Gender	Frequency	Percentage %
R0- R1 000	57	85%
R1 001-R2 000	4	6%
R2 001- R3 000	4	6%
R3 001- R4 000	2	3%
Total	67	100

Monthly expenses on household's goods and groceries showed different trends, the majority of households were spending very little amount for their survival.

5.2.6 Health expenditure cost

As far as the cost of annual health expenditures is concerned, it is reported that 59 households use clinic confirmed by 8%, 3 households use between R5 000-R 8 000, this amount to 4% and the remaining used R50- R500 which was confirmed by 8% of respondents, and this was used for transport to hospitals. Due to the high unemployment rate, most villagers cannot afford to have met the Health expenditures cost annually in their households; they rely on local clinics and hospitals. It is important that health care services should be accessible to all citizens of the country.

5.3 Participation of land reform beneficiaries in the affairs of the CPA

The second objective of the study was to determine the extent of participation of land reform beneficiaries in the affairs of the CPA. One way of creating ownership is to involve the participants.

5.3.1 Deriving benefits from the projects

The majority of respondents, 97% indicated that they never benefitted financially from the project and only 3% benefitted from employment by the project. This finding seem to be serious and may derail the good intension of the project. Project Management team will need to intervene to correct the situation.

5.3.2 Participating in election of office bearer

Majority of sampled participants (96%) indicated that they participated in electing a new committee of the CPA which means they were on board with the affairs of the project. This is strengthened by the fact that they got feedback constantly from elected committee and held regular meetings with elected CPA Leadership as pointed by 91% of the respondents. Moreover 69% indicated that they were not supplied with yearly financial statements of the project. The reasons for not being provided with such benefits was indicated by more than 50% of the participants, 69% indicated that such information bypassed them may be because they were not the heads of household. The total employees of the project were 104 of which 71% were beneficiaries and the remaining 29% were non-beneficiaries. It was important that the survey included non-beneficiaries in order to bring balance in the discussion.

5.3.3 Job opportunities

The majority of participants (87%) indicated that the available job opportunities were advertised to the beneficiaries beforehand. But none of the remaining 13% indicated how did they wish the project to benefit them in terms of employment.

5.4 Expectation of beneficiaries to the CPA

The fourth objective of the study was to establish the expectations of beneficiaries of the CPA. Despite the challenges experienced in the project the beneficiaries were expecting a number of issues to be taken care of by the project and the CPA in particular. It is a sure case that rural areas are faced with a number of challenges such as job creation and an improvement in their living standard. This factor was reiterated by the respondents who indicated that since the acquisition of Masakona land restitution project, 46 % of the respondents indicated that their living standard and status has not changed whereas 40 % of the respondents viewed themselves worse off.

The reasons advanced by the respondents against the poor living status offered by the CPA included lack of service which is attained by beneficiaries, no contributions obtained, and poor management in the leadership of previous CPA and the Board of directors. (It should be noted that their term of office is not the same i.e. CPA is for 3 years and Board of Directors is 5 years, which complicates the smooth running of the project).

5.5 Perceptions of participants to the CPA

The third objective of the study was to establish the perceptions of beneficiaries to the CPA. According to the Cambridge English Dictionary, perception refers to the way in which something is regarded, understood or interpreted. Or it can also mean a belief or opinion often held by many people and based on how things seem to be. Perception is important because it is a physiological process through which everything is interpreted and understood. Participants were asked to indicate their perceptions about the land reform and they have indicated four most important problems with regard to their development, and these are as follow: Water was indicated as a major crisis in the above villages.

It was pointed out that water is either unavailable or shortage in their respective villages and 58% of the respondents confirmed this state of affairs. Poor infrastructure was cited as the challenge in the rural areas such as roads which in some cases were neither existing nor properly looked after, or in poor conditions having dongas for example. Forty-seven percent of the respondents agreed that there was poor infrastructure. This finding implied that improvement in infrastructure would improve the standard of living of respondents.

Other challenges mentioned in rural societies and livelihood include the effects of HIV/AIDS, crime/theft in the villages, chronic diseases, beer halls and teenage pregnancy. Respondents perceived the issues mentioned above as negative in promoting rural development. They perceived beneficiaries that they were still suffering. The reasons advanced were that nothing were obtained, unemployment was rife, not enough resources to develop the project, no disbursements to claimants in kind, board members were uncooperative and lastly the switching of ESKOM electricity due to non-payments were seen to be not good for the project. The majority of the respondents perceived the creation of jobs by the CPA as one of the objective unfortunately were disappointed by non-delivery of this item by the CPA.

5.6 Economic impact and food security

When land restitution was designed there were four expected impact to achieve namely to facilitate access to land by victims of racially-motivated land dispossessions that took place under the previous government, yes this has been achieved because the Masakona community have received their land back. The second impact is poverty alleviation through sustainable development on restored land as well as improved livelihoods (Kleinbooi, 2010). This impact is not fully achieved (Williams et al. 2015). This is the impact which the community has to pursue based on this baseline study. The third objective was to foster the rights of vulnerable groups, in terms of ownership and participation in economic activities. This is not fully achieved. The fourth impact is to foster national reconciliation and stability (Department of Rural Development of Rural development, 2019).

In most rural areas there are elderly people who have reached an age where they can be employed, they usually leave the rural places and go to urban centres to access employment opportunities. Once they have sufficiently worked in urban areas, they develop a desire to return to their rural roots upon retirement. This means that rural populations will mostly consist of the young and old vulnerable populations who cannot make a meaningful contribution to rural development. This population mainly consists of government grant recipients in the form of child support grant and the old age grant.

5.6.1 Impact of social grants

It is noteworthy that in the sample, participants are recipients of the Social grants and child grants were in majority, very few obtain pensions and salaries. Few beneficiaries of the grants depended on the kids grant. Indications from the samples were that within the household very few households had members that were earning a decent or living wage, except that they were recipients of either social or child grants. The majority of respondents indicated that they have earned an amount of R1740.00 in the form of social grants.

As pointed out, majority of households 91% do not own any piece of land for subsistence food production. The few 9% who own piece of land for subsistence food production, its size ranges from 70m x 40m to half a hectare. The majority of 97% of any member of the household have no knowledge of agricultural production. The few gained such knowledge through experiential training and or through Short course. The knowledge was gained in the period between 15-20 years. The training on short courses ranged from 1 week to 1 month and the experiential duration ranged from 15- 20 years. The training was on a variety of activities on Subtropical production practices.

6. ROLE OF THE EXTENSION ADVISORS IN RESTITUTION PROJECTS

This aspect was not part of the questionnaire however, at the end gathering the data of this study, the researchers saw a gap which a solution is being proposed in this section. Based on the experience of our contact with Masakona CPA, it was not clear from the discussion about the role that extension advisors could play in participating in the drafting of the bankable business plans. It should be noted that drawing business plan is the competency of someone with agribusiness knowledge, especially someone who has specialized in agricultural economics or economics to guide the process (Kwabena, et al. 2011).

However, our experience is that such professionals are hard to come by in public extension, if ever they are there in most cases are few and have difficulties in rounding the projects as expected. Our suggestion is that this services are so important in moving the dormant land restitution projects to the next stages of development. if this service is left to the private sector of which it is capable it could be too costly. A new role can be considered in which the extension advisors could be capacitated in this area.

7. CONCLUSION AND RECOMMENDATIONS

The purpose of the restitution programme was to provide equitable redress to victims of racially motivated land dispossession, in line with the provisions of the Restitution of Land Rights Act, 1994 (Act No. 22 of 1994 and it derives its mandate from the 1996 Constitution of South Africa especially section 5(7) (Department of Rural development of Rural development, 2019). The objective of restitution for the Masakona community was achieved hence the formation of the Communal Property Association, however, in terms of the five categories of the identified themes. This section summarizes and gives recommendations based on the findings of the study. The following are the conclusions and recommendation based on the study findings.

7.1 Conclusions

The conclusion is presented in terms of the study objectives. The first objective is concerned with the demography of respondents.

7.1.1 Demography of the study

Majority of the interviewees were old people and conversant with their household's dynamics. The majority of the participants were females. Only 56 % of the households had 6 adults in the homestead, 4 % of the households had 4 children, 54% of the households were headed by adult males. Forty-nine percent of the respondents were married, 75% of them had a primary education, 78% could speak English besides Tshivenda. Only one out of 67 had a qualification in agriculture, whereas 85 % of the respondents were not actively or gainfully employed.

7.1.2 Characteristics of the respondents

Each household had roof over their heads with 38 % had Reconstruction and Development Programme (RDP) houses, 44% had retired, 44% derived income from child grants while 38% from social grants. Sixty-nine percent received income from a range of R 1000.00 - R2000.00 and these respondents considered themselves poor. Ninety –three percent of the respondents not practising subsistence farming, 85 % spent money from this range R1.00- R1000.00. Fifty-nine households from 67 used clinic for health services and could spent R50.00 – R500 for transport.

7.1.3 Participation of land reform beneficiaries in the CPA affairs

Ninety-seven percent of the respondents confirmed that they never benefited from the CPA, but 97% indicated that they did participate in the affairs of the CPA, such as the election of the new committee, 87 % confirmed that job opportunities were advertised to them as beneficiaries of the CPA.

7.1.4 Expectation and perceptions of respondents to the CPA

Forty –six percent of the respondents expected the project to improve their living standard, 58% have indicated that their living standard has not improved, Water was cited as a challenge for domestic use, 47% agreed that infrastructure was poor such as roads, HIV/AIDS, and early pregnancy were perceived as negative for rural development. Non-delivery was also perceived as not good by the respondents.

7.2 Recommendations

The following recommendations are made based on the aspects of the study namely economic impact and food security and the role of the extension advisors.

7.2.1 Economic impact and food security

As far as the expected impact on food security is concerned, the CPA has not delivered in terms of this expectation. It is recommended that the project should come up with:

- the strategy to achieve this objective. Such strategy should allow beneficiaries to participate meaningfully in the economic activity of the project of the CPA.
- Beneficiaries be encouraged to participate in the affairs of the CPA

7.2.2 New role of extension advisors

Since extension advisors do not play any role in crafting of the business plan in restitution project while they have such a potential to make a meaningful contribution, it is recommended that:

- The role of the extension advisors should include developing a bankable business plans for the restitution projects
- That a selected few extension advisors based on their potential be capacitated in terms of the relevant skills needed to have a viable project.

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SIXTH SESSION

PROMOTION OF SUSTAINABLE AGRICULTURE BY MPUMALANGA AGRICULTURAL EXTENSION SERVICES: PERSPECTIVE OF PUBLIC EXTENSION PRACTITIONERS

R.H. Khwidzhili⁵⁰ & S. Worth⁵¹

ABSTRACT

The ever growing population of the world compels most farmers to resort in farming practices that are unsustainable. This is particularly factual in Mpumalanga province, South Africa, where there is a lack of support towards promoting sustainable agriculture. This study evaluates the role of public agricultural extension in promoting sustainable agriculture in Mpumalanga province. The role of public agricultural extension is evaluated against the framework of the five pillars of sustainable agriculture. The study evaluates the context of dominant agricultural extension approaches used in Mpumalanga province. Data was collected through semi structured interviews with 68 respondents, comprising of various extension practitioners in all seventeen districts in Mpumalanga province. The study provides an analytical emphasis on the premise that the assessment of farmers' livelihoods will assist extension practitioners to customise their interventions based on farmers' needs. The study further evaluates extension practitioners' knowledge of the concept of sustainable agriculture. The support provided to extension practitioners in promoting sustainable agriculture was also appraised. Table 1 in this paper presents consolidated responses on extension practitioners' knowledge of the five pillars of sustainable agriculture. Extension practitioners provided their suggestions on what measures could be taken to promote sustainable agriculture in Mpumalanga province. Drawing from the conclusions of this study, it is evident that there is a need for frameworks and support for extension practitioners in sustainable agricultural practices.

Keywords: Mpumalanga province, extension practitioners, sustainable agriculture, five pillars, natural environment

INTRODUCTION

About sixty percent of the land in Mpumalanga province is used for agricultural purposes. Mpumalanga is one of the nine provinces in South Africa. The name Mpumalanga means east or literally the place where the sun rises. Mpumalanga lies in the central eastern area of South Africa and shares its border with two African countries, Mozambique and the Kingdom of eSwatini (Swaziland). The province also shares borders with other South African provinces which include Limpopo to the north, Gauteng to the west, the Free State to the south west and Kwa-Zulu Natal to the south. The province is divided into the three district municipalities of Ehlanzeni, Nkangala and Gert Sibande.

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The province is further sub-divided into seventeen local municipalities which are Albert Luthuli, Depalising, Goven Mbeki, Lekwa, Mkhondo, Msukalikwa, Pixley ka Seme, Delmas, Dr. JS Moroka, Emalaheni, Highlands, Steve Tshwete, Thembisile Hani, Bushbuckridge, Nkomazi, Thaba Chweu and Mbombela.

The study was conducted in Mpumalanga province. In each of the seventeen local municipalities, four extension practitioners were interviewed for total of 68 practitioners throughout the province. A number of farmers were also interviewed throughout Mpumalanga in order to triangulate the validity of data collected from extension practitioners. The study provides a perspective of some common extension approaches that are used in Mpumalanga province. This study outlines the imperative for considering farmers' livelihood prior to providing extension services. The argument for considering livelihoods is based on the premise that farmers' attitudes differ- in terms of their well-being related to income, education, experience, and other determining baselines.

Some respondents were quoted from audio recordings or questionnaire. The study assessed the respondents' knowledge regarding the concept of sustainable agriculture. It came somewhat clear that their knowledge was primarily based on the three pillars of sustainable agriculture social, environmental and economic viability (Tey, *et al*, 2012: 379-396) instead of the total five pillared framework (Khwidzhili & Worth, 2016).

The study gives a perspective of the respondents' attitudes and practice towards promoting sustainable agriculture in Mpumalanga province, as well as the support they receive towards this end. Table 1 provides consolidated responses of the respondents towards the five pillars of sustainable agriculture. The imperial perspectives of farmers towards sustainable agricultural practices were also highlighted. Finally, initiatives for promoting sustainable agriculture in Mpumalanga were also outlined. The study concluded by providing philosophical conclusion and recommendations based on the results of this study.

OBJECTIVES AND PURPOSE OF THE STUDY

This study evaluated the promotion of sustainable agriculture by Mpumalanga public agricultural extension practitioners. It evaluated whether or not current agricultural extension services are aligned to the five pillars of sustainable agriculture. The study evaluates the degree to which extension practitioners get support towards promoting sustainable agricultural practices in Mpumalanga province. The study also highlighted the reaction of farmers towards sustainable agriculture. The study draws from public agricultural extension on what could be initiated to promote sustainable agriculture in Mpumalanga province. The purpose of the study also compliments the main objective which was to determine how and through what means public extension could promote sustainable agriculture through five pillars of sustainability.

METHODS

Data was collected through semi-structured questionnaires with sixty-eight public agricultural extension practitioners in Mpumalanga province. Mpumalanga province consists of seventeen municipalities. In each municipality four extension practitioners were purposively selected to take part in this study. The researcher arranged with extension managers of all seventeen municipalities for the purpose of collecting data.

According to Cohen (2007), purposive sampling allows for selecting rich information from

respondents with specific characteristics relevant to the objectives of the research. Purposive sampling will enable the researcher to select a case which demonstrates some characteristics or processes of which the researcher is interested (Cohen *et al*, 2007:254). The selection considered gender, age, experience and qualification of the respondents. The study adopted a basic qualitative approach. The research drew its methods from the interpretive paradigm which focuses on relevant experiences and interpretation, (Nieuwenhuis, 2007:50).

The study also used convenience sampling which allowed for the selection of respondents from the relatively homogenous population that were available and willing to participate at the time of data gathering (Saunders, Lewis & Thornhill, 2007). During collection of data most information was saturated. (Glaser & Strauss, 1967) This did not stop the research from collecting further information for the purpose of final triangulation. Triangulation technique was used to determine points of similarities and variations in qualitative data collection from participants through questionnaires, interviews and related literature review to improve the credibility of findings and interpretations.

Data was collected between July 2017 and July 2018. The respondents were informed about the purpose of the study and requested to sign a consent of participation. Respondents were not required to sign the form. The respondents were given a questionnaire with enough space for them to explore their understanding. After completing the questionnaire, the respondents were interviewed using supplementary questions to get their insight and clarity on their initial responses. Notes were taken during each interview and all discussions were recorded for further review triangulation. Participants were given more time to respond to interviews in order to validate more details.

The researcher held an advantage, having served as a member of an adjudication panel for the best extension practitioners Mpumalanga province. Similar questions related to sustainable agriculture were asked during the adjudication. The interactions were recorded and notes were also taken during a panel of adjudication. The researcher was also able to access all power-point presentations from extension practitioners. The researcher was also able to access the final consolidated report from all the fellow adjudicators. Finally, various relevant documents and existing literature. were used to relate the outcome of the study (Downe-Wamboldt, 1992; Hsieh & Shannon, 2005).

RESULTS/ FINDINGS

This section presents the results of sixty-eight respondents who were interviewed. The analyses also included documents, journal articles and other related information on sustainable agriculture in order to triangulate and give insight of the data.

Agricultural extension approaches

This paper identifies some common extension approaches that are used in Mpumalanga province. Extension practitioners use these approaches to convey information to farmers. The farm visit or face to face interaction and system approach are the most commonly used extension approached in Mpumalanga Province. Some respondents indicated that they prefer farmer to farmer approach. Farmer to farmer approach involves farmers assisting one another through the help of extension practitioners. Farmers are likely to learn from each other's experiences. Some respondents indicated that it is unethical to disclose farmers' information without their consent. System approach extension recognizes the farmers work within certain systems, meaning that apart from agricultural activities, farmers have internal and external

forces the influences their decision making.

This paper also revealed that majority of extension practitioners use participatory approach which recognizes that farmers are part of decision making. In order to facilitate a successful participatory approach, the following platform should be organized; workshops, meetings, awareness, campaigns and trainings. Other information includes information and farmers' days. Another successful approach involves grouping farmers according to their commodities. A Commodity group approach involves farmers who produce similar products. A good example is that of maize farmers; they relate to each other as they experience similar challenges and success about maize production.

Some extension practitioners prefer to organize farmers according to farming categories. Farmers are categorized according to their scope of production such as subsistence, small scale or commercial. The need drive in approach is determined by farmers who require specific support from extension practitioners. Another approach that extension uses is the farmers' forum association where all stakeholders meet quarterly to evaluate the challenges and achievements of their projects. The study also reveals that extension practitioners make use of agricultural development committees at a ward level in order to share relevant information with farmers.

A majority of practitioners still have a preference on bottom -up extension approach in which farmers identify their problems and seek advice from extension services. The top-down approach, a traditional transfer of technology which dictates that farmers are only recipients of technology from extension practitioners, is fading away as most practitioners avoid using this approach. Some extension practitioners are engaged with home or community project approaches. In this method, practitioners consult with the traditional authorities and organize meetings with this category of farmers.

As a result of the growing digital platforms, some extension practitioners prefer to utilize cellular phones for direct calls, SMSs and WhatsApp to the farmers. A few extension practitioners create group chats amongst the farmers in order to exchange information and challenges affecting their farming enterprise.

Assessing farmers' livelihood

This paper evaluates the degree to which extension practitioners consider farmers' livelihoods when providing extension services. All respondents indicated that they do consider farmers' livelihoods. The concept of livelihoods comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shock, maintain or enhance its capabilities and assets, while not undermining the natural resource base (Chambers, 1994; Glew *et al*, 1995; DFID, 2000; Heller, 2003; Misturelli & Heffernan, 2008). Practitioners indicated that the farmers they served were diverse in terms of their wellbeing related to income, education and experiences and other baselines.

Extension practitioners highlighted that livelihoods assessments assist them to identify farmer's needs and the extension services they require. They declared that livelihoods assessments also assist them to ensure that they operate from the perspective of the farmer. They also indicated that farmers are located in different areas and that this tends to direct the way they think and do things. However, individual characteristics also affect the adoption of sustainable agricultural practices, such as level of income, education and age (Cary, Webb & Barr, 2001). The following statements were said by some respondents:

"Categorizing farmers according to their livelihood assist with planning of extension programs. Livelihood goes hand in hand with the bottom-up extension approach which promotes that farmers should identify their challenges and look for advice from extension services. Farmers feel happy when they are involved in every step of their projects"

"That is the first thing I consider before assisting farmers, I do situation analysis. I ask for farmer's background and current situation regarding their families. I also prefer to do the actual farm visit to understand what support will be best suited for individual farmer"

Some respondents indicated that the department's limited resources should be channelled to the most vulnerable farmers in order to improve their livelihoods. On the other hand, they also argue that assessing livelihoods will assist the department to draft budgets reflecting farmers' needs in order to improve farmers' livelihoods. They emphasized details to be collected as part of livelihoods include, but are not limited to, farmers' background, their age and the language they speak. Other extension practitioners pointed out that livelihoods assessments assist farmers when drafting business plans and accompanying budgets to present to the department for approval. They also indicated that the rate of adoption in extension services or innovations differs depending on farmers' livelihoods.

Extension practitioners indicated that consideration of livelihoods helps them evaluate whether they are achieving their goals and objectives. Livelihoods assessment assists the department to allocate resources according to farmer's needs. Practitioners will therefore develop a database for allocation of inputs such as seeds, fertilizers and mechanization amongst others. A database on livelihoods assessment is a detailed questionnaire which contains farmers' information. The practitioners highlighted that farmers are content when their livelihoods are considered as resources will be allocated according to their farming categories. The challenge is that some farmers tend to provide incorrect information about their livelihoods especially relating to financial statements. When a farmer's livelihoods are improved their farms tend to be sustainable due to positive contributions.

"It is advisable to include farmers when making decisions. Livelihood assessments assist us as extension practitioners to render an extension service that is relevant in accordance with specific commodity. I organize meetings, farmers' days and also invite farmers who already succeeded in farming."

Knowledge of sustainable agriculture

This section reflects on public extension practitioners' knowledge in Mpumalanga province towards their knowledge of sustainable agriculture. This section explores the definition of sustainable agriculture as well as how extension practitioners acquired such knowledge. The respondents indicated that sustainable agriculture involves focusing on farming practices where farmers are taking care of the natural environment (Altieri, 1996; Hobbs *et al*, 2008; Martin & Sauerborn, 2013). In this way, the land is protected from degradation and avoids pollution of the atmosphere. This is further supported by Mokoto (2014) who argued that water, soil, atmosphere, animals and plantation are the most affected natural resources. The respondents emphasized that they always advise farmers to use animal manure as compared to inorganic fertilizers.

The integration of crops and livestock is reported to be an important factor towards improving soil fertility. This is particularly important when planting crops which improves soil fertility

like legumes (Iiyama *et al*, 2007). Variety of crops in one area can also improve soil control from different pests and diseases (Gautam & Andersen (2016). There is a strong sentiment amongst most extension practitioners that crop rotation is closely linked to sustainable agriculture. The following statements also reflect on extension practitioners' views on sustainable agriculture:

"Sustainable agriculture involves farming in sustainable way considering ecosystem and the environment. Such farming practices should provide and protect human health, environment and animal welfare."

"To me sustainable agriculture is all about meeting societal food needs and also use methods reserve the ability of future generation to meet their needs e.g. maintaining soil health, minimum water use, lower pollution levels, economic profitability and social equity"

"Sustainable agriculture encourages farm productivities that will produce good return for an extended period using similar resources and without depleting the natural environment. It should protect human health and also improves soil microbial activities"

The respondents pointed out that sustainable agriculture recognizes the practice of Integrated Pest Management (IPM). IPM promotes the use of different methods for controlling pests (Blackshaw *et al*, 2001; Caamal-Maldonado *et al*, 2001; Inderjit, 2001). If farmers alternate different methods of controlling pests, it will avoid the frequency of solely depending on chemical pesticides and herbicides (Letourneau, 1998; Nicholls, *et al*, 2001; Letourneau & Bothwell, 2008; Shennan, 2008). They further indicated that chemicals may harm beneficial species and pollute the natural environment.

Other respondents maintain that minimum tillage is part of sustainable agriculture. The practice of minimum tillage has least effect on soil compaction and erosion. Higher proportion of soil water retention can be achieved if farmers practice minimum tillage (Karlen *et al*, 1998 Abid & Lal, 2008). The respondents also indicated that rotational grazing is part of sustainable agriculture. Rotational grazing prevents animals from overgrazing. Overgrazing may lead to shortage of vegetation or pastures for animals in the future. Overgrazing may also lead to soil erosion (Khwidzhili & Worth, 2016).

This paper also highlights on how the respondents acquired their knowledge for sustainable agriculture. Most of them indicated that they attended a workshop on sustainable agriculture organized by the land care section within Mpumalanga Department of Agriculture, Land and Environmental Affairs. Some knowledge was acquired through reading journal articles and documents on sustainable agriculture. Few respondents have indicated they have a master's degree in sustainable agriculture acquired from universities. The majority of the respondents possess four year degrees in agriculture while some have relevant diplomas from agricultural colleges and universities of technology. Some respondents attended workshops on climate change and climate smart agriculture organized by the department.

This paper also reveals that other respondents attended conferences, seminars, symposia and other training on sustainable agriculture. The Agricultural Development Committee (ADC) is also a platform where different stakeholders share their experience on sustainable agriculture. The stakeholders are composed of various members depending on the location of the ADC. In most cases the stakeholders include various government departments, municipalities, research institutes, communities and representatives of traditional leaders. Sustainable agriculture

should emerge as a result of individual or collective intelligence to maintain the long term productivity of the natural resources on which they depend (Sriskandarajah, 1991; Pretty 1995; Rolling 1994).

The knowledge of respondents on the concept of sustainable agriculture is summarized by a table below

Table 1: Understanding pillars of sustainable agriculture

Adapted from Khwidzhili & Worth (2017)

	Understanding pillars of sustainable agriculture by respondents (Indicators of sustainable agricultural practices)
Pillar 1 Maintaining and increasing biological productivity	<ul style="list-style-type: none"> Implementation of conservation or organic farming. Farmers should avoid soil degradation and disturbance to the ecosystem. Natural vegetation should be protected to avoid soil erosion. Crop rotation and rotational grazing should be encouraged. Some portion of the farm should be rested (fallowing). Encourage minimum or zero tillage. Uncontaminated water should be used for irrigation. Farmers should limit or avoid the use chemicals such as pesticides, fungicides, inorganic fertilizers and herbicides. Promote the use of animal of kraal manure. Mulching and making compost heap. Chemicals pollute ground water. Farmers should be encouraged to plant green manure to improve soil fertility. Avoid movement of heavy machines (soil compaction). Promote microbial activity (encourage earthworms, micro- fauna and flora). Planting should be against contour lines to prevent soil erosion.
Pillar 2 Decreasing the level of the risk to ensure larger security	<ul style="list-style-type: none"> Planting date for farmers no longer predictable as a result of climate change. Theft in farms. Natural disasters and man- made farmers. Financial risk associated with high cost of chemicals and other farm inputs. Market risk associated with competition amongst farmers in relation to quality farm produce. Planting crops that are adaptable to local conditions. Choosing resistance or adaptable cultivars. Planting of certified seeds. Continuous training of both extension and farmers. Linking farmers with formal markets, logistical support, and agro-processing and other market hubs. Post-harvest risk (storage and handling). Conservation farming. Planting in controlled environment (considers both plastic and shade tunnels). Farmers should have insurances for their farm and produces. Farmers should guard against diseases outbreak for animals. Labour unrest (strikes) and pickets. Farmers should have proper fences in their farms.
Pillar 3 Protecting the quality of natural resources	<ul style="list-style-type: none"> Rain water harvesting. Training is required for administration and safe keeping of agricultural chemicals. Farmers should be encouraged to use irrigation systems that save water. Farmers should avoid spraying of chemicals which pollute the atmosphere. Climate smart agriculture. Biological control of pest. Protection of beneficial insects such as bees and ladybirds. Intercropping with repellents or herbs to avoid the use of pesticides. Integrated pest management. Chemicals pollutes rivers and dams (pose danger on aquatic life).
Pillar 4 Ensuring agricultural production is economical viable	<ul style="list-style-type: none"> Farmers produce for commercial purpose. Farmers should know budgeting processes and planning (clear understanding of all financial statements). Price of farm inputs and inflation. Production should be above break-even -point. Efficient record keeping. Good profit without harming the natural environment. Farmers should make money (profit) from farming practices. Farmers should be encouraged to invest their profit. Increased production in farms.
Pillar 5 Ensuring agricultural production is socially acceptable	<ul style="list-style-type: none"> Farmers produce for own consumption. Farmers avoid the production of genetically modified organisms. Farmers should produce products that are acceptable by consumers (Products should not have health issues). Farmers should form cooperatives and relevant forums.

Promoting sustainable agriculture

The respondents were asked on which role public agricultural extension could play in promoting sustainable agriculture.

They indicated that farmers should be trained in conservation farming. In conservation farming the soil is less disturbed by tractors. Farmers should be encouraged to produce products that are accepted to the market. Farmers should be taught using practical demonstration rather than theories. The respondents indicated that farmers should be encouraged to use environmentally friendly inputs such as inorganic fertilizers and other chemicals; this assertion is confirmed by (Shah, Ganji & Coutrousbis, 2017). The innovation should first be tested or researched and thereafter be shared with farmers. Other respondents proposed for coordinated resource management. Coordinated of agricultural resources will help facilitate farmers to use inputs that are not harmful to the natural environment (Manale *et al*, 2009; FAO, 2014; Krall, 2015).

Extension practitioners should organize workshops and awareness committees on sustainable agriculture. Farmers should be encouraged to form partnership with other farmers in order to discuss and share expertise of sustainable agricultural practices. Cary *et al* (2001) argued that sustainable agricultural practices differ with the environment as there is no specific practice for all users. They indicated that there should be introduction of farmers' training centres in the province (Mpumalanga). The respondents proposed that participatory and bottom-up extension approaches should be emphasized, as these approaches make farmers part of problem solving and decision making.

The respondents were further asked if they would encourage other extension practitioners to promote sustainable agriculture. These were their responses:

All respondents indicated they will encourage sustainable agricultural practices to prevent further degradation of the natural environment. Farmers are likely to adopt agricultural advice if they know such innovation has worked for other farmers. There is no single extension approach that will suit all occasions. This means that extension approaches should be used alternately depending on categories of farmers. Some various views about promotion of sustainable agriculture are:

"Yes, I encourage others to promote sustainable agriculture because agriculture depends on scarce natural resources such as water, soil and the ecosystem. Therefore, it is critical that all agricultural producers should practice sustainable agriculture".

"Yes, because this is for the benefit of farmers who are poor and living in rural areas. These farmers can't afford food without farming. Farming helps them produce food and generate income. Extension should assist farmers produce more wood without harm to the natural environment"

"Yes, we must remember that we are not only doing for farmers but also for the future generation of farmers. Farmers should take care of the natural environment and not forgetting that farmers should still get good return from their produce".

"Definitely since extension officers have high influence towards farmers. Farmers will be able to move from conventional to conservation agriculture. In conservation agriculture farmers will save water and practice minimum tillage".

Supporting extension practitioners towards sustainable agriculture

Respondents were asked on what kind of support they will require from their managers to promote sustainable agriculture:

Most respondents highlighted that they require regular training and workshops on sustainable agriculture. They pointed out that managers approve both weekly and monthly itineraries so that they can attend farm visit, workshops and campaigns. There should be intervention from the national Department of Agriculture Forestry and Fisheries and the Agricultural Research Council (ARC). Some respondents indicated they still need a formal training in institution of higher learning such as Technical Vocational Education Training (TVET) colleges, colleges of agriculture, universities and universities of technologies.

"I require more training, workshops, exposure, farm visit and even more. This can assist our farmers and extension services to understand and contribute towards sustainable agriculture. Trainings can also help extension practitioners understand some risk that affects farmers. Extension service will help disseminate information and mitigation of risk and disasters".

Most respondents indicated that they receive no support from their manager in order to support sustainable agriculture. They suggested that information from other districts should be shared amongst officials. The support will assist the respondents in relaying information to farmers. Most extension practitioners have subsidy cars or government vehicles that they use when providing extension services. Other tools include cellular phones, laptops, extension apps (applications) and extension suite online that assist them in providing extension services to farmers. The respondents also reveal that most extension managers visit projects in order to monitor if the respondents are providing service to farmers.

"My manager gives me contact for different stakeholders so that we share information on sustainable agriculture".

"The manager is responsible for both production and administrative policies. This makes it difficult to focus on sustainable agriculture. The support given is general and not specific to sustainable agriculture"

"No support I get from my manager except that she travels a lot to claim fuel from the department and not monitor work done. Extension manager often spoil farmers by giving production inputs instead of farmers buying inputs for themselves".

Reaction of farmers towards sustainable agriculture

In response to the pressure for food production to meet the demand of the ever-growing world population, many farmers have resorted to use farming practice that increase agricultural production without considering the potential harm to the natural environment (Khwidzhili & Worth, 2017). Respondents were asked the following question:

What is the reaction of farmers as you advise them about the importance of sustainable agriculture?

Farmers are positive about sustainable agricultural practices in response to zero tillage method. In zero tillage less soil is disturbed by machinery. The respondents indicated that farmers are willing to reduce their stocking order to avoid overgrazing. Overgrazing exposes soil to erosion. There is some resistance by farmers who perceive sustainable agricultural practices as unprofitable. Farmers are comfortable to use irrigation systems that save water and other practices such as water harvesting. Farmers replace chemical fertilizers with animal manure.

"Most smallholder farmers have challenges with access to market. The engagement that I always have with farmers is on compliance to good practice (sustainable agriculture). The compliance helps with market access certification. The reaction of farmers is always positive because sustainable agricultural practices help in accessing markets".

This paper noted that most commercial farmers are money driven and therefore it is difficult for them to practice sustainable agriculture. However, there is an indication that shows that farmers are gradually moving towards adopting sustainable agricultural practices. This is as a result that farmers have noticed continuous decline of the natural resources. In most circumstances they are interested in increasing yield without considering the natural environment. Farmer requires more land for agricultural purpose in order to farm for markets. Even though awareness of sustainable agricultural practices to farmers may be available, some farmers are reported to not adopt these practices even when they are aware of them (Rodriguez *et al.*, 2009).

"Farmers responded very well on taking care of natural resource because we do advise them, that if they don't protect it, they will lose their treasure. This can be witness when we are visiting their farms. Farmers have made gabions to prevent soil erosion. They also construct some waterways and build earth dams to store water. Other farmers bought some water tanks to store water and also use drip irrigation systems to prevent waste of water".

A study by Alonge & Martin (1995) argued about different barriers which influence the level of adoption by farmers. Among these barriers are human behaviour and their perception toward the sustainable agriculture as well as resources means to adopt the practices.

Initiatives for promoting sustainable agriculture in Mpumalanga province

Respondents were asked on what measures should be in place to promote sustainable agriculture in Mpumalanga province:

The Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) should partner with relevant stakeholders to create awareness on sustainable agriculture. Most respondents indicated that more trainings, workshops and dialogues should be organized to promote sustainable agriculture. It is imperative that workshops on sustainable agriculture be prioritized in order to improve the knowledge on the subject. Knowledge on sustainable agriculture is important in compliance with market access certification such as South African Good Agricultural Practice (SAGAP). The lack of knowledge among the extension practitioners is that they do not receive any training in the service they provide. They also neglect the research findings, which carry the scientific findings of the sustainable agriculture (Agunga 1995). Lack of information by the change agents can also affect the distribution of practices to the farmers.

Some respondents indicated that institutions of higher learning especially the University of Mpumalanga should introduce formal and short courses on sustainable agriculture. In support of institutions of higher learning, sustainable agricultural practices should be initiated in the foundation education system. The respondents indicated that there should be a departmental grant dedicated to farmers who are already practicing sustainable agriculture. This will encourage many small holder farmers to engage in sustainable agricultural practices. Farmers should be provided with resources that promote sustainable agricultural practices.

"There should be adequate provision of budget available to purchase no till implements especially for small holder farmers. On-farm training and demonstration should be emphasized. Pezukwemkhono and other departmental programs should be designed to promote sustainable agricultural practices."

Most respondents proposed that there should be forums that are targeting farmer who are practicing sustainable agriculture. They proposed that the department should formalized forums for relevant stakeholders that will meet to promote and share ideas on sustainable agricultural practices. Departmental programs of mechanization should support or prioritize implements that promote sustainable agricultural practices at a farm level.

CONCLUSION AND RECOMMENDATIONS

The study found that extension practitioners in Mpumalanga are not aware of the five pillars of sustainable agriculture. However, the responses suggest that they fully understand the three common pillars of sustainability --economic, social, and environmental viability. There is a need to define all the five pillars of sustainability in their totality. Table 1 presents consolidated responses of all sixty-eight respondents. The subdivision on the five pillars of sustainable agriculture in Table 1 was categorized by the researcher and not by individual respondents. The researcher had to classify the sustainability indicators in Table 1 according to five pillared framework. The study reveals that there are no framework or guideline documents supporting sustainable agriculture in Mpumalanga province. This might be a result that South Africa does not have an inclusive policy on sustainable agricultural practices (Khwidzhili & Worth, 2017).

The study shows that the extension practitioners in Mpumalanga are aware of the concept of sustainable livelihood and that it is imperative to consider and understand farmers background prior providing extension services. The study also discovered that the promotion of sustainable agricultural practices is dependent on the knowledge of individual extension practitioners. This is dictated by the level of education and experience on the concept of sustainable agriculture. There are no clear benchmarks or targets in place towards promotion of sustainable agricultural practices in Mpumalanga province.

The study further reveals that there is formal support towards promoting sustainable agriculture. There is a conflicting argument amongst farmers who support sustainable agriculture and those against the concept. Most farmers prefer to take care of their natural resources in order to conserve it for future generation. The latter argument is based on that sustainable agricultural practices are not practically income orient. There is a need for training of extension practitioners on the five pillared framework of sustainability. There is also a need to establish a sub-directorate that will focus of sustainable agriculture in Mpumalanga. Finally, potential studies should be conducted to further categorize sustainable agricultural practices according to five pillars in sustainable agriculture.

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THE IMPACT OF LAND REDISTRIBUTION ON RURAL HOUSEHOLD'S FOOD SECURITY: A CASE STUDY OF BALA LOCATION IN FLAGSTAFF, EASTERN CAPE

S. Nombiba

ABSTRACT

Land redistribution is no longer a concern in commercial farming only but also on communal land. This study focuses on investigating the impact of land redistribution on rural households' food security and this was a case study of Bala location in Flagstaff Eastern Cape. The Department of Rural Development and Agrarian Reform in the Eastern Cape Province has come with an initiative of funding agricultural projects through food security programme and the main requirement is a farmer to have land. This programme aims to improve the livelihoods of rural households. Bala location was dominated with high unemployment rate and most households depend on social grants as their main source of income. This study evaluated the contribution of land redistribution through food security programme on rural households' food security. Data was collected in three groups, the focus group, personal interviews and the official from the Department of Rural Development and Agrarian Reform. Data collection for the household survey enabled the respondents to answer the questionnaire in their comforts of their homes. Focus group discussion selected a neutral safe place which is the project site and the official insisted to be interviewed in the comforts of his offices. The data was analysed using descriptive statistics and SWOT analysis. Unemployment was among the key findings. But interviews with participants suggests that if the project can be expanded and receive comprehensive funding more job opportunities can be created. Dietary diversification and food access are other benefits from the project. It is recommended that further studies on determining the contribution of land redistribution on households' livelihood assets must be conducted.

Keywords: Land redistribution, Food Security, Rural households

1. INTRODUCTION AND BACKGROUND

Agricultural projects required potential land in order for them to be functional. In rural areas most of land with potential for agriculture is underutilised. There are no clear policies that are dealing with land redistribution in communal land. The farmers that are willing to utilise the land depends from tribal authorities. The Department of Rural Development and Agrarian Reform in the Eastern Cape Province has come with an initiative of funding agricultural projects through food security programme and land is the main requirement. Land redistribution has an impact on food security.

Food security is widely debated globally; it is one of supreme importance to millions of people (Broun, 1992). Food security is a situation where people at all times have physical, economic and social access to enough, safe, and nutritious food that meets their dietary needs and socially acceptable food for an active healthy life (FAO 2002). Food security is interwoven in all developmental programmes. It is often assumed that agriculture which is about production directly translates to food security. However, food security encompasses and extends to a full range of factors such as access to food, food safety, hygiene and sanitation, nutrition, sustainable livelihoods, food preferences and socio-cultural dynamics (Australian AID, 2011).

In South Africa the right to access to food is embedded in section 26 and 27 of the constitutional law of 1996. It states that every South African citizen has the right to access to sufficient food, clean water and sanitation (du, Toit, 2011). The state is there mandated by the constitution to ensure that this constitutional right is adhered to (Integrated Food Security Strategy, 2000).

The state can fulfil this law through the expected outcomes of integrated food security strategy which include the following: Greater ownership of productive assets and participation in the economy by food insured. Increased effectiveness and profitability of farming operations and rural enterprise that are owned by half of the food insured. Increased levels of nutrition and food safety among food insecure. Greater participation of the food insecure, in the social security system, prevention and mitigation of food emergencies. Greater availability of reliable, accurate and timely analysis, information and communication on the food insecure and the impact of food security improvement interventions; Enhanced levels of public private society common understanding and participation in agreed food security improvement intervention. Lastly improved levels of governance, integration, coordination, financial and administration management of food security improvement interventions in all spheres of government (Integrated Food Security Strategy, 2000)

The literature report that most of the government programmes failed. Failure of the government programmes can be caused by the policies promoting agricultural development and food security (Bird, 2003). Policies related to food security fails to reach their objectives. These include lack of capacity within government, lack of intra and inter agency coordination over food security policy. Also the lack of attention to budgetary implications of policies at the formulation stage and a failure to address the necessary institutional transformation and policy sequencing (Bird, 2003). Programme failure is also caused by poor or lack of project management skills.

1.2 Problem statement

Poverty is one of the main causes of food insecurity; in South African, Provinces such as the Eastern Cape, Limpopo, Mpumalanga and KwaZulu-Natal. To combat food insecurity in these provinces, the government has implemented food security programmes. However, the extent to which these food security programmes are effective in addressing food insecurity has hardly been studied. In the Eastern Cape the food security programme is implemented by the Department of Rural Development (Integrated Food Security Strategy, 2000). For the department of rural development to be able to implement these programmes land is the key requirement.

1.3 Main objective

To investigate the impact of the land redistribution through food security programme on rural households.

1.4 Specific objectives

- a) To determine the contribution of the food security programme to rural households.
- b) To assess the food access of rural households who beneficiaries if the food security programme.
- c) To determine the strengths, weaknesses. Opportunities and threats (SWOT) of the food security programme.

2. METHODOLOGY

2.1 Description of study area

The study carried out in Flagstaff under Ingquza-Hill Local Municipality at Bala location (Mtshini co-op) in the Eastern Cape Province. Ingquza-Hill Municipality is one of the five local municipalities within O.R Tambo District municipality of the Eastern Cape Province. The area is about 15 km from town and it is a rural area. The level of education in that area is low. The employment is also a problem most people depends on social grants. There are soils with high potential for both livestock and crop production.

2.2 Sampling technique and sampling size

A total number of fifty four participants were participated in this study. Focus group discussions were conducted. One focus group was for the members of the project and the other respondents in the other group were non-members. Nine were the beneficiaries of the funded project by the department of rural development and agrarian reform. Other forty in other focus group was non-members of the project.

Interviews were held with extension officers and community development workers.

2.3 Focus group discussion (FGD)

Focus group discussion was used as the most effective method of data collection for this study because of its ability to collectively generate views of many different people at once. Focus group of nine members was used, which includes the committee structure of project executive and two community leaders. Hundred percent of the executive were female representatives.

2.4 Department of Rural development and Agrarian Reform official

Official responsible for the location where this research took place was also interviewed by the researcher. There was an in-depth communication with the official hence the questionnaire did not just recorded answers only but also reasons. Semi-structured questionnaire was used as a data collection instrument.

2.5 Household survey

Questionnaire with sixteen variables were administered in 30 households containing project members who benefited from Siyazondla and non-project members who did not benefit from Siyazondla to spot if there is any difference in the two groups. A simple questionnaire with guiding questions was designed and used during interviews. The questionnaire was written in English and then the researcher translated to the local language of the respondents. The interviews took about 20 minutes each. The questionnaire is attached in the Appendixes.

2.6 Data collection

Data was collected in three groups, the focus group, personal interviews and the official from the Department of Rural Development and Agrarian Reform. Data collection for the household survey enabled the respondents to answer the questionnaire in their comforts of their homes. Focus group discussion selected a neutral safe place which is the project site and the official insisted to be interviewed in the comforts of her offices.

2.7 Materials and methods for data collection

Semi-structured questionnaire was formulated with both closed and open ended questions to collect data from respondents; one questionnaire per respondent was made available. The answers to the questions were recorded by ticking in a box next to each possible answer where necessary. Enough space was provided for answers that needed an explanation. Semi-structured interviews were selected because they allow for one to one interactions between the researcher and the participants.

2.8 Data analysis

Data collected was encoded in Microsoft excel and transferred to the software computer system called Statistical Package for Social Sciences (SPSS), version 21 of the year 2013. Quantitative data analysis technique was used, meaning that questions were analysed using descriptive statistical methods to formulate tables, graphs and pie charts.

3. RESULTS AND DISCUSSION

This study was conducted to investigate the impact of land redistribution through food security programme to rural household food security at Bala location in Flagstaff. This study was essential to address the problem statement; the problem statement says that poverty is one of the main courses of food insecurity. To combat food insecurity government has implemented food security programmes. However, the extent to which these food security programmes are effective in addressing food insecurity has hardly been studied. The broad research of the study seeks to investigate the impact of the land redistribution through food security programme on rural households. The specific research objectives are to determine the contribution of the food security programme to rural households. To assess the food access of rural households who benefited to the food security programme. To determine the strengths, weakness, opportunities and threats (SWOT) of the food security programmes. The study assessed the responses of household representatives who are the member of food security programme and non-members. More information about the contribution of food security project was gathered through focus group discussions and interviews with extension offices and Community Development Workers. The data analysis is presented in tables below:

Tables below show crosstabs using chi-square tests to check the significance between two factors.

Table 1: Household demographics

Household participation status	Gender		Total	Test
	Female	Male		
Participants	3	6	9	0.026
	33.3	66.7	100	
Non-participants	29	11	40	0.002
	72.5	27.5	100	
Total	32	17	49	
	65.3	34.7	100	

Household participation status	Marital status			Total	Test
	Single	Married	Widowed		

Participants	9	0	0	9		
	100	0.0	0.0	100		
Non-participants	14	22	4	40		
	35	55	10	100		
Total	23	22	4	49		
	46.9	44.9	8.2	100		
Household participation status	Formal education level				Total	Test
	None	Primary	Secondary	Tertiary		0.162
Participants	0	3	6	0	9	
	0.0	33.3	66.7	0.0	100	
Non-participants	8	14	13	5	40	
	20	35	32.5	12.5	100	
Total	8	17	19	5	49	
	16.3	34.7	38.8	10.2	100	
Household participation status	Employment				Total	Test
	No	Yes				0.741
Participants	7	2	9			
	77.8	22.2	100			
Non-participants	33	7	40			
	82.5	17.5	100			
Total	40	9	49			
	81.6	18.4	100			
Household participation status	Main source of income				Total	Test
	None	Social grant	Pension	Salary		0.001
participants	7	0	0	2	9	
	78.8	0.0	0.0	22.2	100	
Non-participants	2	17	14	7	40	
	50	42.5	35	17.5	100	
Total	9	17	14	9	49	
	18.4	34.7	28.6	18.4	100	
Household participation status	Household monthly income				Total	Test
	Less than R500	R500-R800	R800-R1500	More than R1500		0.002
	0					

Participants	0	4	3	2	9
	0.0	44.4	33.3	22.2	100
Non- participants	3	1	29	7	40
	7.5	2.5	72.5	17.5	100
Total	3	5	32	9	49
	6.1	10.2	65.3	18.4	100

Source: Survey data (2014)

Notes: The significance level in the test is 0.05 any numbers above that show no significance.

Gender and household participation status

The literature says women are more involve in agriculture than man, but in this case the project is dominated by man about 66.7% of the project members are man. But about 72.5% respondents that were non-participants of the project were females

Marital status and participation status

All the project beneficiaries are single this means that to participate in a project does not have anything to do with marital status

Formal education level and participation status

Most of the respondents have primary and secondary education and they are involved in agriculture because it is their primary source of income.

Employment status and participation status

As stated earlier in chapter one that Bala location is dominated by unemployment. About 81.6% of the respondents are unemployed. Most of them they practice agriculture to supplement their small income.

Household main source of income and participation status

As the level of employment is to low most people of that area depends on social grants as their main source of income. In the literature review it was stated that the evidence shows that social grants have played a huge role in improving household food security since 2001, but an improvement in employment creation is very important.

Household monthly income and participation status

As the rate of unemployment is too high and most people depends on social grants for their household income, about 65% of respondents their monthly income ranges between R800 and R1500.

3.1 Effect of the project on participants

The table below shows the effect of the project on household food security of the participants and non-participants

Table 2: Household food security

Household participation status	Household food security positive change		Total	Test
	No	Yes		
Participants	0 (0.0)	9 (100)	9 (100)	0.059

Non-participants	12 (30)	28 (70)	40 (100)			
Total	12 (24.5)	37 (75.5)	49 (100)			
Household participation status	Acquire food			Total	Test	
	Buy from shop	Grow own food	From the project			
Participants	1 (11.1)	7 (77.8)	1 (11.1)	9 (100)	0.058	
Non-participants	21 (52.5)	18 (45.0)	1 (2.5)	40 (100)		
Total	22 (44.9)	25 (51.0)	2 (4.1)	49 (100)		
Household participation status	Household income positive change			Total	Test	
	No	Yes				
Participants	0 (0.0)	9 (100)	9 (100)		0.001	
Non-participants	26 (65)	14 (35)	40 (100)			
Total	26 (53.1)	23 (46.9)	49 (100)			
Household participation status	Dietary diversification			Total	Test	
	No	Yes				
Participants	0 (0.0)	9 (100)	9 (100)		0.046	
Non-participants	13 (32.5)	27 (67.5)	40 (100)			
Total	13 (26.5)	36 (73.5)	49 (100)			
Household participation status	Current food security status			Total	Test	
	Moderate	Good	Very good			
Participants	0 (0.0)	5 (55.6)	4 (44.4)	9 (100)	0.002	
Non-participants	21 (52.5)	16 (40.0)	3 (7.5)	40 (100)		
Total	21 (42.9)	21 (42.9)	7 (14.3)	49 (100)		
Household participation status	Benefits of the project				Total	Test
	Farming skills	Job opportunities	Fresh vegetables	None		
Participants	5 (55.6)	4 (44.4)	0 (0.0)	0 (0.0)	9 (100)	0.005
Non-participants	5 (12.5)	11 (27.5)	14 (35)	10 (25)	40 (100)	
Total	10 (20.4)	15 (30.6)	14 (28.6)	10 (20.4)	49 (100)	

Household food security positive change and participation status

All project participants have seen the improvement in their household food security after their project was funded. Also about 70% respondents who are non-participants of the project have seen the change in their household food security. This change it's because of the easy access of vegetables and the jobs created by the project.

Acquire food and participation status

About 77.8% of the project members most of food they consume come from their own hands they grow it. Non-participants 52% of them buy food from shops but about 45% of non-members grow their own food for their households.

Change in household income and participation status

All participants of the project have seen a change in their household income because of the project. They do not spend a lot of money on food. Only 35% non-participants of a project have seen a change in their household income.

Dietary diversification and participation status

All project members have seen a change in their dietary diversification because of different varieties of vegetables they grown. Also about 67.5 non-participants of the project also saw a change in dietary diversification because they buy their vegetables from the project.

Food security status and participation status

Most of the beneficiaries responded that their food security status has been improved because food is available in their project, easily accessible at all times and nutritious. Also the non-participants of the project shown that their food security status has been improved since the project was funded.

Benefits of project and participation status

The most benefits from the project for project members are farming skills and job opportunities. Non-members also get job opportunities but less than the beneficiaries. They have the access to fresh vegetables

Figures and tables below show analysis results using frequencies

Figure below shows that, out of 49 respondents 16% have never go to school, 35% have primary education, 39 % secondary education and only 10% with tertiary education. This shows that most people where the study was obtained have secondary education so they have the ability to learn.

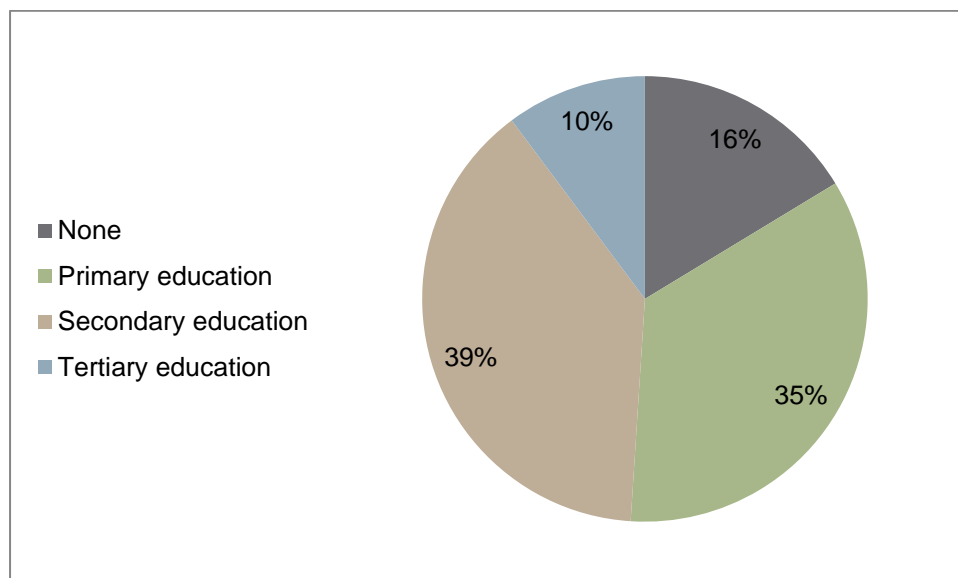


Figure 1: Formal education levels

Figure below shows that this area is dominated by unemployment as only 18% people are employed and 82%, of the respondents is unemployed out of the 49 respondents.

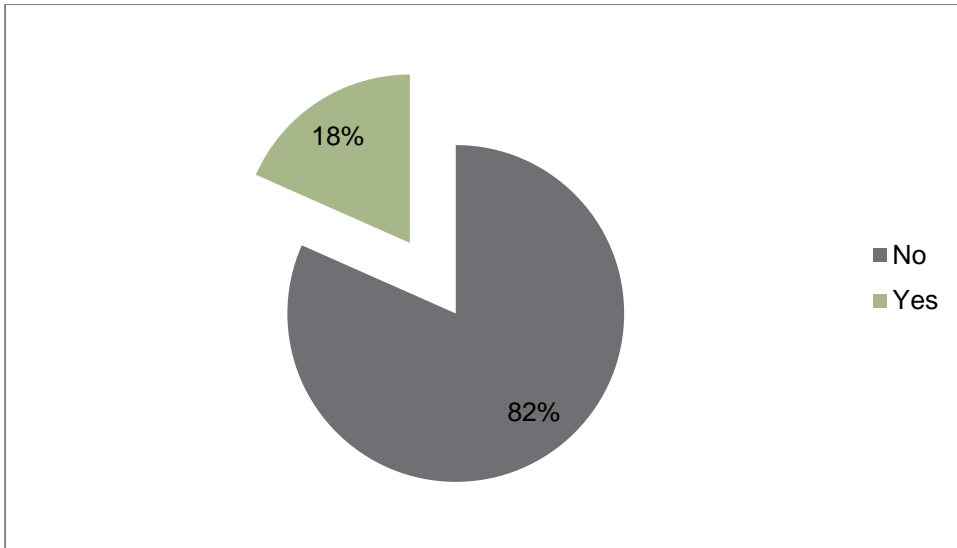


Figure 2: Employment status

Figure below shows that 16.7% do not have any source of income, 31.5% depends on social grants, and 25.9% depends on pension and only 16.7% receiving salaries/wages



Figure 3: Main source of household income

Table below show that only 6.1% of the households with less than R500 monthly income, 10.2% of the household monthly income is between R500 – R800, 65.3% is between R800- R1500 and 18.4% with household monthly income more than R1500

Table 3: Household monthly income

Monthly Income	Frequency	Valid Percent
Less than R500	3	6.1
R500 - R800	5	10.2
R800 - R1500	32	65.3
R1500 or more	9	18.4
Total	49	100.0

Figure below show that out of 49 respondents 53% have seen the positive change in their household income after the introduction of food security programme and 47% does not see any change in their households' income

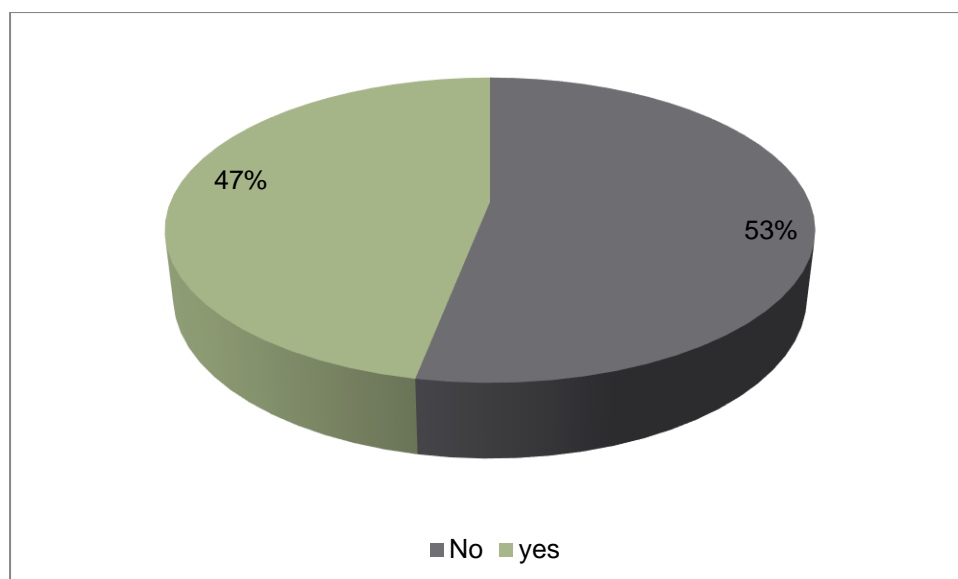


Figure 4: Positive change in household income after food security programme has been introduced

Table below show 73.5% of the respondents have seen a change dietary diversification after the food security programme has been introduced and 26.5% of the respondents does not see any change out of 49 respondents

Table 4: Dietary diversification change after the food security project has been introduced

	Frequency	Valid Percent
No Change	13	26.5
Change	36	73.5
Total	49	100.0

Figure below show that out of 49 respondents 68.% have seen positive change in the households' food security because of project funded under food security programme and 22% does not see any change in their household food security.

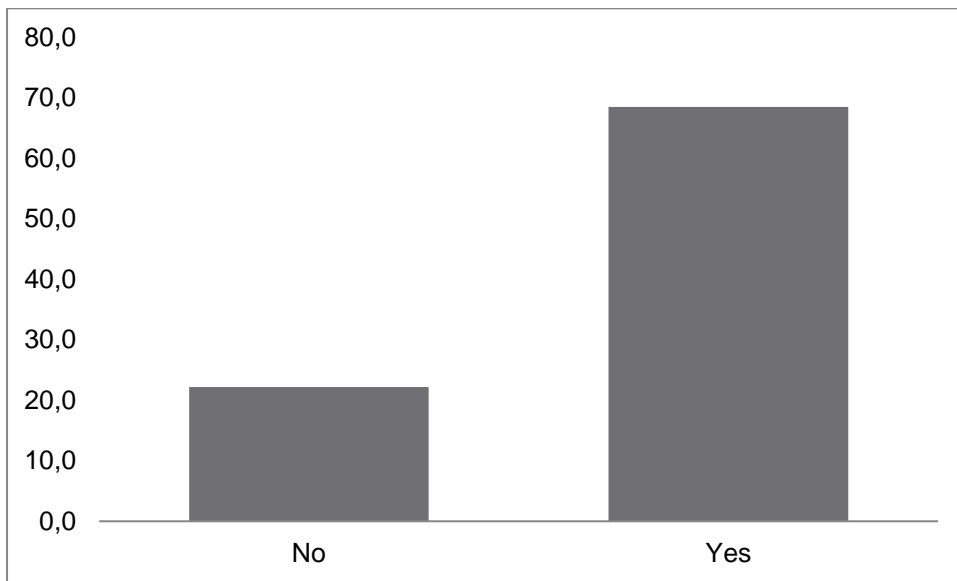


Figure 5: Positive change in household food security because of the project

Figure below show that in terms of the current food security status of the rural households at Bala 43% of the respondents said their current food security status is moderate, 43% viewed their food security as good and only 14% have responded that their food security status is very good out of 49 respondents.

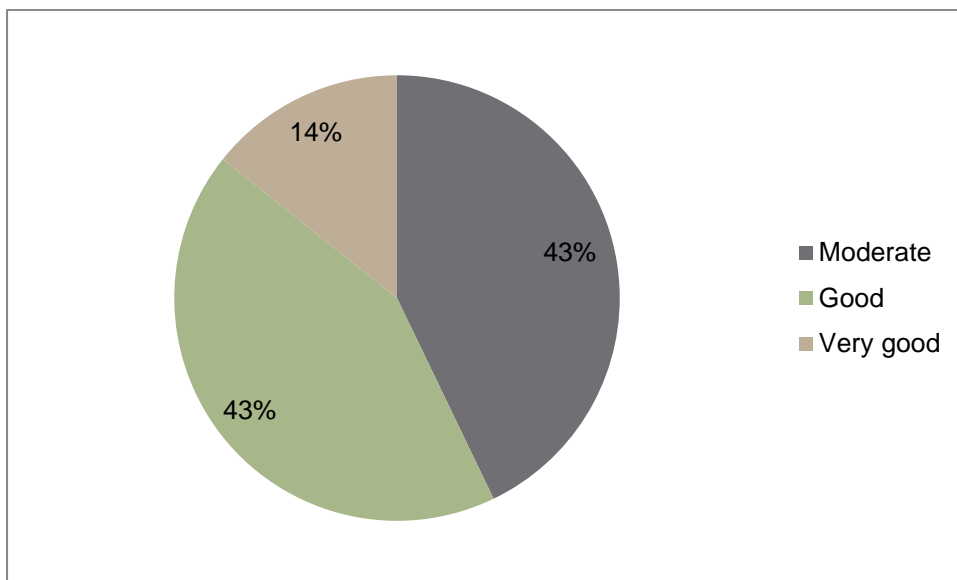


Figure 6: Current food security status of household

Table below show that out of 49 respondents 20.4% have obtain farming skills from the project, 30.6 have got job opportunities, 28.6 have benefited by getting fresh vegetables from the project and 20.45% does not see any benefit from the project.

Table 5: Benefits form the project

Benefits	Frequency	Valid Percent
Farming skills	10	20.4
Job opportunities	15	30.6
Fresh vegetables	14	28.6
None	10	20.4
Total	49	100.0

Figure below show that 49% of the respondents have household members that are employed by the project and 51% of the respondents do not have any members of the households that are employed by the project.

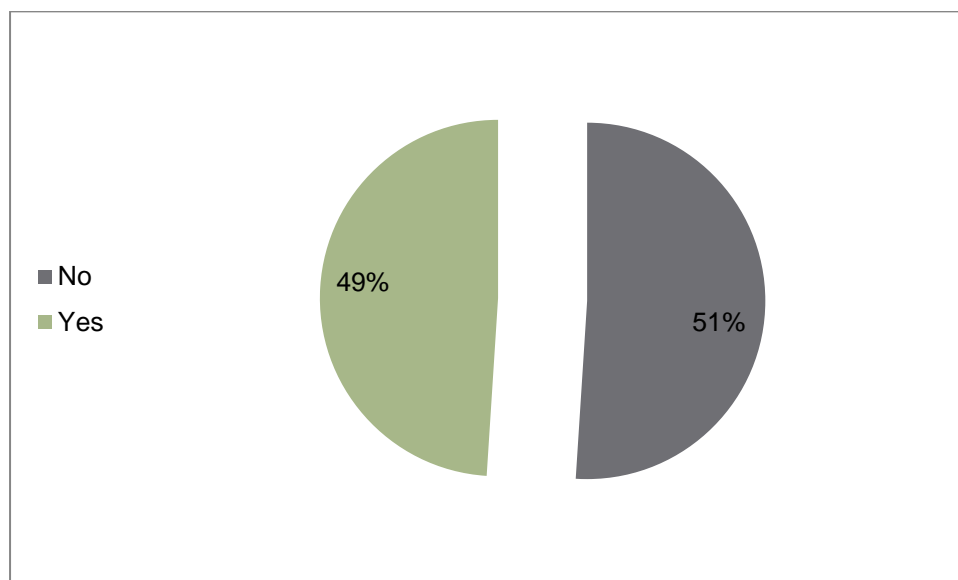


Figure 7: Member of the household employed by the project

As per findings from the survey, out of 49 respondents it was stated that the highest education level is secondary with 39%. As it was stated in the introduction of this study this area is rural dominated by the highest level of unemployment that 82% from the respondents. Most people depends on social grants as it is 31,5% in the graph shown before. Their household monthly is about 65.3% ranges between R800-R1500 as most people depend on social grants. About 47% of the respondents have seen a change in their household income because of the project, the say some members of the households get jobs from the project they also get vegetable with a reasonable. In terms of the dietary diversification 73% of respondents said it has improved because the buy fresh varieties of vegetable cheaper without any transport cost. Because of cheaper vegetable with no transport costs about 75% of the respondents have said their household food security has been changed. The project also contributed to the with job opportunities, local market, farming skills. Focus groups stress that this project donate with vegetable for funerals in poor households.

During the in-depth interview with government official, in trying to respond to questionnaire, the official mentioned that food security programme is the good government initiative that has put a lot of impact in agriculture and the communities. Extension officers are playing their part in every way however government authorities are the one giving rise and difficulties in the functioning of this programme. Budget allocations are never enough for the smooth running of the programme ending up in the programme functioning not according to the policy. The officials stated that government assists the project with inputs, implements and fencing. The main objective of the grant to the project is to alleviate poverty, to create jobs and to capacitate farmers with farming skills. In terms of the food security status of the members and non-members it has been improve. Programme has impact it creates job opportunities, people are getting fresh vegetables. Government also provide capacitation to members through trainings, monitoring is done by the extension officers. Table below shows SWOT analysis results of food security programme, these are response from the interviews with extension officers.

Table 6: SWOT analysis of food security programme

Strengths	Weakness
<ul style="list-style-type: none"> ➤ Grant or funding – food security programme is implemented with a free funding from government. ➤ Capacitation – beneficiaries get capacitated with skills ➤ Extension services – extension services are provided free of charge. Extension officers provided technical support and regular visits. 	<ul style="list-style-type: none"> ➤ Delay in funding – application for funding take too long before it became successful. ➤ Long procurement processes – buying of inputs and implements takes a long time because of procurement procedures.
Opportunities	Threats
<ul style="list-style-type: none"> ➤ Trainings – farmers get trained in different production skill and business management ➤ Human development – members of the projects get introduced to new farming methods 	<ul style="list-style-type: none"> ➤ Ever changing of policies – frequent changing of policies delays the implementation of project. ➤ Climate change – an anticipated change of climate disturb the production plan ➤ Theft – produce get stolen by other people

4. CONCLUSION

Several factors indicate that food security programme has the impact to rural households through the use of land that was redistributed to agricultural project. These factors include dietary diversification, jobs created by the project and easy access of vegetables. The other important output from respondents is that project donates vegetable for funeral in poor rural households; it also provides farming skills to the community members. Food security of the households has improved because they spend less money in vegetable although there are individuals that do not see any change in their household food security. The rate of house breaking is all reduced because the majority of youth is involved in the project. Although the youth get job from the project they also use the skills they obtain to produce their own crops. Respondents have suggested that the government must put more money and expand the project so that it can create more jobs. They also suggested that more land must be given to the people that are willing to utilise it.

5. RECOMMENDATIONS

Human capacitation is the best tool that plays a minimal role in the sustainability of the project, therefore skills development is highly recommended. It is recommended that proper advocacy coupled with skilled personnel with good training and knowledge can be able to yield good implementation of food security policies to the people that they are designed for. It is highly recommended that as other food security indicators were out of the scope further research is encouraged on determining the impact of the food security programme on household livelihood assets. Households should learn to grow their own food in their backyard gardens to avoid spending less money they receive from government grants. Government should increase the budget for food security programmes and should stick in the policy in place in their implementation. Administrative tasks should also be reduced in Extension officers and government should employ administrative officers to deal with such issues to aid in the visibility of extension officers in communities. Clear land redistribution policies or regulation for rural communal land must be updated or be on place.

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CASE STUDY COMPETITION

Dr J.W. Swanepoel and Mr M. Anthony

MIND THE GAP - STRENGTHENING RURAL ECONOMIES BY BRIDGING THE DIVIDE – AGRI SECTOR

General Rules

- Create a proposal presentation on Power Point.
- Presentations should not take longer than 12 minutes. You will be timed – Penalties for longer presentations will be given.
- All the team members must participate in the presentation.
- After the presentation the panel of judges will ask a few questions and you will be scored.

Assignment

Identify a challenge experienced in any part or parts of an agricultural value chain (of your choice) of rural communities.

Develop a SMART (use the acronym) solution that will help strengthening the rural economy surrounding the agricultural community in this rural setting.

Indicate how you as a team would be involved in the roll-out of the solution.

The Business model canvas can be used as guide for your proposal.

Solutions must be cost effective and include innovative ideas.

The purpose of your proposal is to acquire funding to implement the plan, thus Standard Bank will be listening to your proposals and rate you on the bankability and sustainability of your idea...

Winners of the case study competition: Western Cape