DIMENSIONS OF AGRICULTURAL EDUCATIONAL TRAINING IN FORMAL EDUCATION CENTRES: IN THE CASE OF KWAZULU-NATAL, SOUTH AFRICA

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DISSERTATION PRESENTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY SUBMITTED IN THE SCHOOL OF AGRICULTURE, EARTH AND ENVIRONMENTAL SCIENCES, UNIVERSITY OF KWAZULU-NATAL

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ABSTRACT

This study investigated student and teacher attitudes, factors affecting those attitudes and perceptions of students towards different aspects of agricultural education programme processes offered in secondary schools in KwaZulu-Natal, South Africa. It can be used by policy-makers and can also assist the various South African Departments of Education (DoE) and schools to improve classroom administration, curriculum delivery and the provision of teaching facilities and other required support.

The sample population comprised 375 high school agricultural science students and 180 agricultural science teachers. The research was arranged in nested Concurrent Mixed Sampling Designs. A multi-stage, random, purposeful sampling procedure was implemented to select the sample population. The survey was conducted by using a pre-tested structured interview schedule. The survey used structured and unstructured questions appropriate to the study objective. The supplementary qualitative information was collected from both categories of respondents, using an open-ended questionnaire, observation and interviews. The quantitative data was analysed using descriptive statistics, such as frequency, percentage, mean, chi-square and the Tobit Model. The qualitative data was analysed using a spiral content analysis.

With a 97% response rate, the result showed that there was sufficient agricultural lesson coverage in the teaching and learning process, but that there was often no compensation for missed lessons. Other problems include a shortage of teaching materials, trained agricultural science teachers and support for teaching programs. In aggregate, 76.5% of the students and 88% of the teachers have a highly positive attitude towards Agricultural Education and Training (AET). There was, however, a significant difference between the attitude of students in Dedicated, Rural and Urban Schools towards various aspects of AET.

Racial background (African, White and Colored), large family size, discussion about agriculture with other people and family access to farming land, positively and significantly affect students' attitudes towards AET. African students seemed to have the highest positive attitude towards AET, when compared to the White and Coloured students. Coloured students had the least positive attitude towards AET. Generally, the attitude of students positively increased with an increase in their family size. The absence

of family access to farming land, having high school-educated mothers, and a monthly family income of between R500-5000, significantly and negatively influenced students' attitudes towards AET.

Teachers in the age category of 20-29 years have a negative correlation with their attitude towards AET. Teachers in the age category from 30 to 59 years were positively correlated with their attitude towards AET. This means that the attitude of teachers towards AET was positively influenced with an increase in the age of teachers above 30 years. Younger teachers had a more negative attitude than older agricultural science teachers. This suggests that more attention should be focused on motivating and supporting younger teachers to positively influence their attitudes towards AET.

The availability of internet access to teachers negatively influenced their attitudes towards AET. This was attributed to the fact that they are not accessing AET-related information through their respective schools, mainly due to the lack of computer and internet facilities in the schools.

The results showed that a higher percentage of agricultural science high school teachers were offering AET without having an agricultural science qualification and hence, even if they were more satisfied in terms of salary, their attitude towards AET was still negatively influenced. Conversely, teachers' attitudes toward AET were positively influenced by racial background (African, White and Colored), having an Agricultural Science qualification, being satisfied with administrative support, experiencing social value, good human relations and respect in their schools and in the larger community, and the availability of good communication between teachers, students, administrators and support staff in their school's micro-environment. African teachers had a more positive attitude towards AET, compared to the White and Coloured teachers.

These findings, which are based on the empirical data should be used as the basis for improving AET systems aimed at establishing open information-sharing and networking between policy-makers and implementers in order to make timely adjustments, for the limitations that occur. The findings also implied the need to improve the quality of AET offered, by creating awareness among policy-makers and implementers at all levels concerning current attitudes of teachers and students, as well as the factors influencing them. They suggest that consideration should be given to teaching-learning infrastructure,

income-generating agribusiness sources, such as the establishment of small-scale farming, and in-service training programmes for agricultural science teachers.

DEDICATION

To the Almighty God

LIST OF PUBLICATIONS

1.   Paper published in international journals:

1.1.   Chapter 2, published as:

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1.3.   Chapter 4, published as:

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1.4.   Chapter 5, published as:

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2.2.   Chapter 7

The Attitude of High School Agricultural Science Teachers towards Agricultural Education Training, the case of KwaZulu-Natal Province, South Africa.

2.3.   Chapter 8

Agricultural Education and Training in South Africa: A systems perspective.

3.   Conference presentations

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3.2. 29th Annual Conference, Association for International Agricultural and Extension Education. Factors Influencing the Attitude of High School Agricultural Science Students Towards Agricultural Education and Training, the Case of KwaZulu-Natal Province, South Africa. AIAEE conference, Fort Worth, Texas, USA. (19-23 May 2013).

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NOTE

This dissertation presents a compilation of manuscripts, where each chapter is an individual entity and some repetition between chapters, therefore, has been unavoidable.

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CHAPTER ONE

GENERAL INTRODUCTION

1.1   Introduction

Agricultural Education and Training (AET) plays a major role in developing sustainable agricultural industries, by producing a competent workforce (Alam, 2008; McKeown, *et al.,* 2002). Agriculture is a major component of the Africans and South African economies and contributes substantially to the country's economy by creating export earnings, job opportunities and by helping to eradicate poverty (Diao, 2007; Lau., and Louat, *et al.,* 1991; SAGI, 2012; AFF, 2013). Primary agricultural production is South Africa's main source of food, contributes 3% to its Gross Domestic Product (GDP) (Huffman, 2001) and accounts for 7% of formal employment. South Africa's agro-industrial sector represents about 12% of the GDP and 46% of the agricultural production exports. As with other elements of the economy, in order to secure the agricultural sectors, AET has to provide the necessary educated and trained manpower. Agricultural high schools are an early source of an educated workforce for the sector (McKeown, *et al*., 2002).

In South Africa, formal AET starts at secondary school level and is targeted to initiate the process of training professionals in the various fields of agricultural science and technology. It is expected to establish a firm background in preparation for higher AET teaching and learning. Thus, it is evident that the objective of AET in secondary schools is to prepare potential students for further studies in various agricultural education areas of science, engineering and technology, which ultimately produces skilled manpower for the sector (Vandenbosch, 2006).

AET is a continuous process, which coordinates the inputs and outputs of different contributor organizations' to achieve the goal of developing knowledge and skills in the broad discipline of agriculture (Gamoran *et al*., 2006). Teaching and learning is a dynamic between educators' and learners, and that dynamic is affected not only by the environment in which it occurs, but also by the two main participants, teachers and students themselves. Educational processes at high schools that offer agricultural programmes, that form the attitudes of learners and educators toward agriculture and AET, and the factors that affect

those attitudes have a significant effect on AET curriculum implementation. Thus, the identified strengths, weaknesses and gaps in agricultural educational process could be used to generate information to adjust and ultimately improve the AET system at all levels (Dhaliwiwal, 2003; Parsons, 2007; Oladejo *et al*., 2011).

1.2   Attitude

Attitude refers to a tendency to respond positively or negatively towards a certain idea, object, person or situation. An attitude is an organized lasting of beliefs, feelings and behavioural tendencies towards socially significant objects, groups, events or symbols (Hogg and Vaughan 2005). Attitude is a psychological tendency of an individual or group, a favourable or unfavourable tendency to a certain ideas, slogan and thing (Eagly, 1993). Perhaps the most straightforward way of finding out about someone's attitudes would be to ask them. This can be administered through interviews or questionnaires. However, attitudes are related to self-image and social acceptance towards a certain ideas or things. Attitude is the liking or disliking of an object based on what is known about it (Rameela, 2004), which is usually created due to direct exposure to the objects or ideas (Hossain *et al*., 2010). In this study attitude was defined as the degree of positive or negative feeling of students or teachers towards AET. The majority of the youth in South Africa have a negative career image to agriculture (DoA, 2005). However, there is not much literature available on the attitude of agricultural science teachers and students and factors that influence the attitude of teachers and students towards AET. The attitudes of teachers and students, the educational process and role player contribution in the AET process could have a significant effect on students and their school achievement.

1.3   Factors affecting teacher and student attitudes towards AET

Different factors have different effects on the attitude of teachers and students towards AET. To make an adjustment and improvement, it is essential to identify possible factors which could affect agricultural education and training (Chapter 2). It is agreed that five principle factors influence students' attitude towards AET e.g. family, socio-cultural, socio-economic, information variables and situational factors. Many studies have reported that the work environment in a school, such as the behaviour of principals and the nature of communication, plays an important role in shaping teachers' attitudes in a positive way in

the process of effective teaching (Currall, Towler, Judge, and Kohn, 2003; Flores, 2001; Ispir, 2010). The level of knowledge being acquired by students depends, in part, on the level of knowledge and attitude of their teachers (Rezaei *et al*., 2008; Lashgarara, 2011). There is therefore a need to identify the attitude of learners and educators, as well as the possible factors which could affect the attitude of teachers and students positively and negatively and their magnitude.

1.4   Statement of the problem

There is an ever-increasing call for sustainable reforms in agricultural education and training to answer the changing social, economic, political and ecological conditions of Africa (Davies 2005).The global market and sustained high quality agricultural production need agricultural scientific knowledge, based on productive forces (Jung and Thorbecke, 2003). An effective AET system should be responsive to the needs of the sector (DoA, 2005).

However, in South Africa, agriculture as a subject has been removed from the curriculum at primary school level. It is included indirectly through the outcome-based education system. Literature clearly shows that AET at secondary school level, the National Qualification Framework Level 2-4, delivers poorly and failure rates are high (DoE, 2005; Reddy and Ankaiah, 2005). Further, more research indicates that agriculture is seen as the "work" of the poor and the elderly and something that could not be profitable (DoE, 2005).

Despite of higher public investment in education in South Africa, the high failure rate in agricultural science education stands out. In the KwaZulu-Natal province there was an inverse relationship between opening a new high school agricultural science program, the declining agricultural sciences student's matriculation pass and the raising student drop-out rate. This is counter-intuitive. Therefore, assessing different dimensions of AET, such as attitude of teachers and students, factors influencing teacher and student attitudes towards AET and accessing AET processes, could help to identify the causes of this anomaly and facilitate making timely adjustments. The information could be used by policy-makers, implementers and teachers. This could give meaningful revelations on the vast amount of time, effort and resources spent on AET by Formal Education Centres in South Africa.

Given this rationale, this research project was proposed to generate information and develop models that might be used by decision-makers, implementers, teachers, school principals and administrators to improve AET delivery and the achievement of AET students in South Africa.

1.5   Research Questions

The main research question of this study is: How should AET at level 2-4 be designed to meaningfully contribute to the advancement of the agricultural sector in South Africa? The specific questions are as follows:

- What is the current status of the Agricultural Education program process at high school (Level 2-4)?

- What is the attitude of teachers and students towards AET at high school (Level 2-4)?

- What are the factors affecting the attitude of teachers and student's towards Agricultural Educational Training at high school (Level 2-4)? and

1.6   Objectives

This thesis aims to investigate dimensions of AET in the formal educational sector in South Africa. It explores educational processes, teacher and student attitudes toward AET, factors affecting those attitudes and an appropriate educational model. The specific objectives of the study are to:

- Establish the strengths and weaknesses of the current AET programmes offered at KwaZulu-Natal (KZN) high schools;

- Determine the attitude toward AET among high school agricultural science students and teachers;

- Determine what is required to foster and maintain a positive attitude toward AET among high school agricultural science students and teachers; and

- Develop the proper agricultural educational process model for effective agricultural education system implementation at high school level.

1.7   The study area

The study area, KwaZulu-Natal (KZN) province, is one of the nine provinces of South Africa. The KwaZulu-Natal province was specifically selected for this study since there is an inverse relationship between increasing numbers of new agricultural schools opening and declining Grade 12 matriculation results, as well as increasing student drop-out rates in AET (Chapter 2). The province is located in the eastern part of South Africa.

1.8   Scope and limitations of the study

The study was conducted only in KwaZulu-Natal, South Africa. The study was restricted to investigating the dimensions of AET in the formal educational sector in the KwaZulu-Natal province, South Africa. While the specific data cannot be generalized to other provinces or situations, it can nevertheless raise the much-needed awareness about the range of issues that affect the success of AET and its high school students.

The study focuses on selected high schools that offered agricultural sciences and, more specifically, on agricultural science teachers, students and educational processes in those schools. The study investigated the AET process, as well as the attitude and factors affecting the attitudes of teachers and students towards AET. The study did not question the agricultural science curriculum, which was taken as relevant and appropriate. Thus, the study does not offer any insights into the curriculum, but only into specific aspects relevant to the delivery of AET and the environment in which that takes place. The research was limited by resources, budget, and time.

1.9   Structure of the Thesis

In addition to this the introduction and the general discussion and conclusion chapters, the thesis is comprised of nine chapters, which address these objectives. Chapters 2-8 are written as journal articles. Of these, Chapters 2, 3, 4 and 5 have been published and included without alteration, except for the formatting of the references, to make them consistent throughout the thesis. Chapters 6 and 7 have been submitted for publication. The chapters are set out as follows:

Chapter 2 is a review of literature assessing Agricultural Education Training in South Africa and focusing on sub-Saharan Africa, factors which affect the attitude of students

and teachers towards their performance and teaching. This chapter was published and sets out the theoretical framework for the study.

Chapter 3 is the first of the five chapters which discuss the findings. The paper discusses student perceptions of different aspects of the agricultural education programme processes that have been offered in secondary schools by the formal educational sector in the province of KwaZulu-Natal, classroom administration, curriculum delivery and teaching aids, teaching infrastructure and academic support. The study is the first of its kind. It was accepted for publication in 2013 in the Journal of Agricultural Education and Extension.

Chapter 4 discusses the attitude of students towards AET in the formal educational sector in South Africa at selected high schools in KwaZulu-Natal. This study was published and is the first of its kind.

Chapter 5 follows on the findings of Chapter 4. It discusses the factors affecting student attitudes. Among the factors explored were social, economic and cultural factors, as well as the situational factors in the teaching and learning process. This paper has been submitted to the South African Journal of Education and is awaiting results of the review. This study was published and is the first of its kind.

Chapter 6 presents the findings of the study regarding the attitude of agricultural science teachers toward AET. This study was done at the same schools selected for researching student attitudes. It has been submitted..

Chapter 7 follows Chapter 6 and discusses the factors influencing teacher attitudes about AET. It covers age, racial background, qualifications and area of specialization, teaching experience, access to resources, job and salary satisfaction, as well as school administration. It has been submitted.

Chapter 8 consolidates the findings and discusses them more broadly. It provides final conclusions and makes recommendations for improving the achievement of students studying agricultural science at high school and the success of the high schools and the teachers offering the AET programme. Based on the data and discussion presented in earlier chapters, Chapter 8 proposes a model for improving the AET educational process. This model suggests a direction, relationship and flow of communication and information in the process of implementing the educational process that will strengthen the offering of AET at high school level.

Due to the fact that some chapters have been written for publication, there will unavoidably be some repetition of information, particularly the research design and methods.

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CHAPTER TWO

A REVIEW OF AGRICULTURAL EDUCATION AND TRAINING IN SOUTH AFRICA

Abstract

Agricultural Educational Training is vital for economic development and food self-sufficiency, poverty alleviation and environmental protection. This review assesses the Agricultural Education Training in South Africa and focuses on sub-Saharan Africa, including factors which affect the attitude of students and teachers towards their performance and teaching. Literature shows that the teaching and research system in agricultural sciences and technology requires an emphasis on executing the phases in more coordinated ways. This will then lead to a responsive and coordinated system that recognizes the existing reality and need in the field. Respectively significant role has been played to solve the problem associated with Agricultural Education Training access barriers by opening new agricultural schools with the incompatible increased dropouts. However, very limited analytical research has been conducted in the area of agricultural sciences education in sub-Saharan countries, including South Africa. It is recommended that it is essential to identify the existing Agricultural Education Training problems by considering both teaching and learning processes, as well as the attitude of students and educators towards Agricultural Education Training, in order to produce efficient and capable professionals for the agricultural production and processing systems.

Key words: Agricultural Educational Training, Factors affecting performance, Sub-Saharan Africa, South Africa.

2.1   Introduction

South Africa has one of the highest rates of public investment in education in the world. About 5.3% of gross-domestic product (GDP) and 20% of total state expenditure is being spent on education (Burger, 2011). Agriculture in South Africa agriculture is also considered a key engine for economic growth, sustainable development and food self-sufficiency. In the new political era in South Africa, faster economic growth and development are encouraged by newly-developed policies on land use and land ownership. In order to, address the political, social, economic and environmental conditions in South Africa, improvements in Agricultural Educational Training (AET) were required (DoE, 2008). Policy argues that agricultural productivity can be improved though AET, research and outreach. Further, improved agricultural knowledge and competence are required, not only to improve primary agricultural production, but also for the processing and marketing of the produce and for the successful implementation of agricultural policies in the country (Sundstøl, 2004).

AET thus plays a major role in agricultural development. It is concerned with the provision and maintenance of sound education and training to support environmentally and economically sustainable agriculture (DoE, 2005). At present, a variety of statutory, non-statutory and private institutions provide AET in South Africa (DoE, 2005).

South African AET policy indicates that the objective of AET is to play a main role by providing a strong background to produce efficient farmers, researchers, educators, extension staff, agri-business professionals and others who are needed to achieve sustainable agricultural development in South Africa. In secondary schools, the objective of agricultural education is to provide a background for further studies in various agricultural disciplines in science, engineering and technology (Vandenbosch, 2006). AET at the post-secondary education level is important for advancing agricultural productivity and the processes that move agriculture from farm-gate to markets (Rivera, 2008). In this advanced world, the future success and achievement of students in science depends on their successful completion of the secondary school education (Alam and Farid, 2011). It is proposed that three key factors leading to successful completion are the implementation (teaching and learning) process, the attitude of the participants (e.g. learners and educators) and the AET curriculum secondary school, leading to tertiary level education, each of which need to be assessed in the context of local and global development in agricultural sciences.

Globalization and international competition are creating a great change in agricultural curricula worldwide (DoE, 2005). Furthermore, teaching and learning are dynamic processes that regularly need adjusting to meet changing needs and opportunities in the area (Creemers and Kyriakides, 2009). Therefore, AET will need to steer carefully designed curricula that will meet the demands at home and the opportunities abroad (DoE, 2005). However, one of the major challenges to deliver relevant support to agricultural rural development is the challenge to reshaping the AET curricula content in the country (Worth, 2006).

This review of literature presents four key themes. It introduces concepts of education and training, followed by a discussion of the concept of agricultural education and training in sub-Saharan Africa, which leads to a brief discussion of the concept of agricultural sciences in South Africa. The paper then discusses the historical perspectives of AET in South Africa, which is followed by an exploration of factors affecting teachers' attitudes towards AET and factors affecting students' performance in AET.

2.2 The concept of education and training

Education is one of the basic needs and is fundamental for the growth and development of human beings in both developed and developing countries. Education incorporates the goals of training and explains why certain information is required. By nature it is a longer-term process (Anderson, 1997). Education give emphasis to the scientific foundation of the material presented. Both training and education induce learning, a process that modifies knowledge and behavior through teaching and experience (Niosh, 1999).

Training is communication intended for the purpose of developing skills, modifying behavior, and increasing competence of a defined population and focuses exclusively on what needs to be known (Niosh, 1999). The major difference between education and training is their purpose and process. The purpose of education is gaining knowledge and developing intelligence in a basic sense, while the purpose of training is to gain specific skills. Education transfers the basic knowledge and information to learners in order to create ability to generalize and learn by comparison (Subedi, 2004). Education provides less emphasis on improving skills and more emphasis on improving knowledge. On the other hand, the purpose of training is to use the acquired basic knowledge and develop

specific skills based on the specific requirement. Training involves the implementation of the acquired knowledge, skill and attitude into practice in a given work environment (Subedi, 2004). Also, in its process, training also has specific guidelines and textbooks for specialized purposes, but education has more general guidelines to conduct the process. Practically, the ultimate goal of training and education will not be achievable without the transfer of the acquired knowledge, skill and attitude into practice (Subedi, 2004).

2.3 The Concept of Agricultural Sciences in South Africa

Agricultural science is the study of the relationship between soils, plants and animals in the production and processing of food, fibre, fuel and any other agricultural commodities that have an economic, aesthetic or cultural value (SAQA, 2003). It is an integrated science that combines the knowledge and skills from physical life, social and earth sciences, engineering, mathematics and economics (SAQA, 2003).

Agricultural science aims at developing the skills of investigating and analysing sustainable agricultural practices, indigenous agricultural knowledge and historical development and interrelated issues in agriculture (SAQA, 2003).

Oberle and Keeney (1990) submit that "agricultural science is a complex and a multi-disciplinary field that represents the vital link between human socioeconomic systems and the natural environment." Thus, the South African education authority argues that the competencies should be developed within the context of the following knowledge areas: soil science, plant science, animal science, agricultural economics, basic chemistry, basic biological concepts, sustainable natural resource utilisation and management of the environment (SAQA, 2003). In addition to these competencies, agricultural sciences and technology should also address social and economic justice issues, such as food security and risk management (DoE, 2008).

Similarly, at high school formal AET levels, agricultural science focuses on the relationships among soils, plants and animals to produce and process food, fibre, fuel and other agricultural products that are valued in society. Agricultural education and training enables students to obtain the required knowledge, skills and values and to learn their appropriate application in the process of production and processing. In South Africa, agricultural education and training is meant to be learned in the context of promoting sustainable agriculture (DoE, 2008). In general, at high school formal education levels,

agricultural sciences consist of plant science (nutrition, reproduction and propagation, breeding, protection and classification), soil science (components, forming, characteristics, organic matter, chemical and colloidal characteristics, classification and soil microbiology), animal science (nutrition, reproduction and propagation, breeding, protection and classification), agricultural economics, basic chemistry and biology, sustainable natural resource use and management of the environment (DoE, 2008). Therefore, AET is a vast and interrelated discipline. It is important to develop the required skilled manpower for sustainable development and food security in the country. Knowledge and skill creation is the basis for sustainable development in local and regional level in the continent.

2.4   AET in sub-Saharan Africa

AET in sub-Saharan Africa is slow to adapt to new patterns of demand. It also lacks proper mechanisms for identifying emerging needs, as well as for reforming curricula to meet the demands of growing modern agricultural activity in the region (Wallace, 1997). In sub-Saharan Africa, different AET and research approaches were applied by different colonial regimes. AET in sub-Saharan Africa has also suffered due to inadequate and uncoordinated resources, both in terms of human resources and physical infrastructures (Spielman *et al*., 2008).

Many developing countries adopted integrated systems of teaching, research and extension from developed countries. In sub-Saharan countries, formal pre- and post-secondary AET can be traced to the colonial system. Many post-colonial African countries borrowed western AET systems or models, rather than developing their own, based on the existing demand and responding to local and global development contexts.

The borrowed western AET systems do not address the agricultural problems in the regions (Spielman *et al.,* 2008). These adopted systems are not integrated with the existing needs and reality. They are unable to accomplish significant socio-economic changes among the rural society for effective sustainable development and poverty reduction (Betru and Hamdar., 1997).

In many African countries, even after independence, their AET systems have changed little (Spielman *et al*., 2008). In the region, AET systems are weak, out-dated, under-funded, disconnected from the realities of modern globalization trends and at the

point of disaster (Rivera, 2008). In addition, in many African countries there is the common failure to ensure wide participation in the curriculum process and a lack of appropriate adaptation, which is responsive to the ongoing change all over the world (Wallace, 1997). It is as though Sub-Saharan African AET is trapped, using an inflexible AET system, which not only is not of African origin, and thereby devoid of the African context, but it has been neglected in terms of reform and in terms of effectively positioning African agriculture in the world economy.

AET curricula in sub-Saharan Africa have been formulated without analysis of the systematic training needs analysis. These curricula were unresponsive to socio-economic, technological, physical and environmental changes in the rural sector and were inappropriate for the existing situation. The degree of accepted change has been insufficient to meet the true needs of the situation (Wallace *et al.*, 1996). There has also been an urgent need for broad reviews of AET and the identification of which processes should be seen as a prerequisite for both policy and curriculum reform. The curriculum needs to be constantly adjusting to the changing realities of the socio-economic development. However, in reality, few AET organizations in sub-Saharan Africa have changed significantly since their establishment. They have been in deep crises because most of them have been sluggish and unwilling to change (Wallace, 1997). There are, of course, notable exceptions in selected countries and disciplines. Zimbabwe's agricultural extension educational programme was found to be one of the most progressive in Africa (Murwira *et al.* 2001) the Sawasaka initiative in various universities in sub-Saharan Africa (Chapman and Tripp, 2003). Curriculum needs to be constantly adjusting.

However, there is an ever-increasing a call for sustainable reform in AET that attempts to answer the existing changes in social, economic, political and ecological conditions of the region (Spielman *et al.*, 2008). On the other hand, there is a need for training based on the existing increasing demand for trained human power in agricultural sciences in Africa. But on this count, AET has suffered a lack of knowledge with regards to the training need of its targeted groups and labour market, both locally and globally. AET policies, curricula, teaching methods, management styles and structures need to be kept relevant to the needs and expectations of its audience. It should be more market-oriented and need-based, in order to survive with success (Wallace, 1997). However, AET systems in the region remain attached to the teaching and research approaches that are organised along a linear vision of science (Spielman *et al.,* 2008). All over Africa policy-

makers and implementers also continue to adhere to a linear model, even after years of failure in situations where it does not apply (Roling, 2009).

Similarly, many studies have revealed that a number of problems exist around donor support for AET. Funding for agricultural research, extension and education in developing countries are the most neglected components of the past decade of the World Bank research-extension-education investments (Rivera, 2008).

Another problem associated with agricultural education in the region is related to the level of integration with regard to communication in the system. In sub-Saharan Africa, there is weak communication between all implementing agencies and various institutions. Furthermore, in most African countries in the region there is no coherent policy framework for AET (Wallace, 1997). Teaching and research systems in Sub-Saharan Africa lack coordination between agricultural educational training organisations and individuals, as well as linkages between themselves and other related organizations, both internal and external to the systems (Spielman *et al.*, 2008). An AET system needs wisdom to make good use of peer reviews, broad consultation and constant monitoring in order to ensure making timely, need-based decisions and right implementation (Wallace, 1997), hence the need for.effective coordination and consultation.

AET systems in the region also continue to struggle with inadequate communications facilities, limited human resources for teaching and research, poor incentives for teaching and research staff and limited funding constraints that hinder teaching and research in the region (Spielman *et al*., 2008). In most parts of Sub-Saharan Africa, staff development for AET is an area of weakness, and in some cases, may be totally lacking (Wallace, 1997).

Continent-wide, the development of human capital now constitutes a major limitation in Africa's agricultural development and thus, greater attention should be paid to building institutional capacity at post-secondary level, delivering relevant technical and professional education and training for the agricultural sector and strengthening the efficient production of suitable manpower for the sector (Rivera, 2008). The future success of the students at post-secondary level depends on their successful completion of the secondary school education (Alam and Farid, 2011). The objective of agricultural education in secondary schools is to provide a background for further studies in various agricultural education areas of science (including agriculture), engineering and technology to create an appropriate mind-set for the prospective candidate entering at post-secondary level

(Vandenbosch, 2006). Therefore, it would be fruitful if research identified appropriate AET curricula based on a systematic training need analysis reflecting the local, regional and global contexts.

Throughout Africa, agriculture has been influenced by globalization, trade liberalization and a rapid advancement of technologies, population growth and urbanization (Vandenbosch, 2006). Together, agricultural education and training at secondary- and at post-secondary levels are crucial to the production of the skilled manpower for an effective development and implementation of scientific knowledge and to solve the existing agricultural knowledge and skills gap by producing skilled and competent people to help address the rural socio-economic development of the region (Vandenbosch, 2006).

Sub-Saharan Africa's AET systems are ineffective and fail to fit the existing real situation of the agricultural sector and people in the regional context. This situation exists in many African countries, including South Africa. It is evident that to address this situation requires detailed research. In particular, research is needed for the identification of existing AET needs in the local, regional and global contexts. Such research could help Sub-Saharan Africa develop appropriate AET and research systems that are relevant to the existing reality in the region.

2.5   The historical perspective of AET in South Africa

The AET in South Africa can be categorized into two historical perspectives, namely, AET before 1994 and AET during the democratic era after 1994. The literature review on AET before 1994 will be presented first which will be followed by the review on the AET after 1994.

2.5.1   AET before 1994 in South Africa

Before 1994, AET was designed and introduced after the passing of the Bantu Education Act No. 47 of 1953 (DoA, 2005). This legislation stretched the gaps in educational opportunities within South Africa by applying separate curricula based on racial groups (DoA, 2005). Therefore, under the then Bantu Education Act, students were trained in Agriculture as a subject, combined with other non-scientific subjects such as

History, Biology, Geography and Biblical studies. There was not much emphasis given to Mathematics and Science during teaching of Agricultural Sciences (DoA, 2005).

Ostensibly, education offered under so-called Bantu Education was said to be especially modified to the 'needs' of indigenous cultures and to the rural context of the Bantustans. This gave Bantu Education an air of legitimacy and appropriateness. Thus, it could be expressed that Bantu Education was appropriate separate education for the development of Africans in their own rural area, if it really meant to consider the role of indigenous knowledge. However, the reality was far from the reflected ideas which were described in the policy (Morrow and King, 1998). In the country, white and black schools had very different educational experiences under apartheid. There was the unequal allocation of resources and opportunities to the various racially or geographically defined sections of the systems, over and above the differences imposed by varieties of education curricula, based on their colour (Morrow and King, 1998).

In the 1980s the then ruling National Party supposedly made dramatic reforms in the style and reality of educational policy for Africans through a variety of moves which were captured by changing the title of the 'Department of Bantu Education' to the 'Department of Education and Training' (Morrow and King, 1998). However, the policy was openly aimed at keeping anyone who was not white in an inferior position in the job market and keeping them from other related opportunities (Morrow and King, 1998).

Because of the negative impact of Bantu Education Act, AET became inaccessible to those from black communities (Didiza, 2005). At that stage, educators were known to have a sufficient knowledge of the theory of agricultural sciences, but with limited practical knowledge in agriculture at the tertiary level. The challenge associated with the inadequately trained agricultural sciences educators with more theory and little practice, still remains to be one of the important factors that need attention. This specific problem is widespread in the schools throughout in the country (Didiza, 2005). The absence of well-trained manpower in agricultural science education and weak institutions has been the main problem for the development of South Africa's communities (African Development Forum (ADF), 1999).

2.5.2   AET after 1994 in South Africa: the democratic era

After 1994, new AET policies, programmes, strategies and governance structures were established (Didiza, 2005). In 1995, the South African government started to develop and revise a new curriculum for the primary and secondary school system (the General Education Band) to fulfil the required level of performance for the new South Africa and the needs in the 21st Century (DOE, 2008). In 2005, the new agricultural sciences curriculum (the General Education Band) was developed. This curriculum created the foundation for the development of the Revised National Curriculum Statement for General Education and Training (Grades 1-9) and the National Curriculum Statement for Grades 10-12 (DOE, 2008). The strategy was developed as part of South Africa's Reconstruction and Development Programme (DOE, 2008).

The process of developing the National AET strategy started in 2002 and was completed in 2005. The AET strategy is mainly focused on the provision and maintenance of sound education and training to support an environmentally and economically sustainable agriculture in South Africa (DoA, 2007).

The National AET Strategy was launched with the aim of addressing the needs of the country's economic development and improvement of agricultural production through quality AET, balancing local, regional and global needs and contexts. The implementation of the AET strategy was supported by the establishment of a National AET Forum (NAETF) (DoA, 2007).

In May 2009, the National Department of Education had been split into two ministries: Basic Education and Training and Higher Education and Training. Each ministry is responsible for its level of education across the country as a whole, while each of the nine provinces in the country has its own Education Department responsible for the actual delivery of the national curriculum from Grade R to Grade 12 (Burger, 2011). The Ministry of Basic Education and Training is responsible for basic adult education and primary and secondary education. The Ministry of Higher Education and Training is responsible for tertiary education up to doctorate level, including post high-school technical and vocational training (DoE, 2011).

The National AET Strategy identified limitations and challenges faced by AET in still newly democratic South Africa. These included fragmentation and lack of co-ordination, poor and inconsistent quality control, ineffective and non-responsive education

and training systems, poor access to AET, negative career image and a shortage of critical skills (DoE, 2005). The AET Strategy sets out an agenda to address these issues and to achieve the vision of "accessible, responsive, quality agricultural education and training for agriculture and rural development" (DoE, 2005).

Consequently, corresponding to other Sub-Saharan countries, it is evident that a detailed curriculum needs further assessment, in order to develop an appropriate curriculum that is well-suited to South Africa as a united whole. However, this curriculum should also be based on the local, the regional and the global context, considering the South Africa's place in the world. Such research should be conducted at regular intervals to communicate with each other regarding the exact need and reality of the situation as it changes with the world trends. It is then also necessary to continuously evaluate and improve the existing curriculum, based on the outcomes of the research. Concerning agricultural education, an essential part of the research would be to assess the factors that affect the quality of AET and its ability to produce the required skilled manpower in the region. Moreover, the quality of education is usually determined by the curriculum and the education systems that could be well created by research, based on the existing realities and needs of the implementing country.

In many Sub-Saharan African countries, including South Africa, AET systems have changed little after their independence. They were weak, outdated, under-funded and at a point of disaster. They remain disconnected from and do not prepare African agricultural learners for, the realities of contemporary local and regional contexts or globalization trends (Rivera, 2008). They keep Africa's agricultural sector at a distinct disadvantage.

To change this, a curriculum must be continuously assessed and evaluated through research. This will meet the ever-increasing call for sustainable reforms in AET that answer to the changing social, economic, political and ecological conditions of the region (Spielman *et al.*, 2008). Therefore, it is important to investigate the existing gaps in AET and its compatibility with the existing realities. In particular, there is a need to strengthen post-secondary level AET by assessing the existing research on the provision of AET in the formal secondary educational sector.

2.5.3   AET in Formal Education in South Africa

Formal education is associated with formal schools. It is described as the hierarchically structured, prearranged, chronologically graded education system, running from primary school through to university (Coombs, 1974). In addition to general academic studies, it includes a variety of specialized programmes and institutions for full-time technical and professional training (Coombs, 1974).

South Africa has a single National Education System, which is organised and managed largely on the basis of nine provincial sub-systems. The National Department of Education is responsible for educational matters that cannot be regulated effectively by provincial legislation, and for those matters that need to be coordinated in terms of norms and standards at a national level. Hence, the National Department of Education prepares government policy on education and training for the country as a whole (DoA, 2007).

The number of agricultural science schools was increased in South Africa between 2008-2010. In addition to the decreasing trends in the number of student enrolments in AET .in AET during these years, the students' performance in agricultural science also seemed to be declining (Naido, 2011). This indicates that the problem is beyond merely making AET accessible by investing in physical facilities. Furthermore, AET at Levels 2-4 of South Africa's National Qualification Framework (NQF) (i.e. secondary school level) delivers poorly and failure rates are known to be high. At primary school level, agriculture as a subject has been removed from the curriculum, although it could be included indirectly through the Outcomes-Based Education (OBE) system. Agriculture also has a negative image as a career choice in the eyes of youth in the country, which affects the whole of South Africa's AET programme (DoE, 2005).

2.5.4   A framework for research-based reform of South African AET at secondary-school level

The aforegoing review of literature identifies some of the key issues facing AET in Sub-Saharan Africa, including South Africa. It suggests that, in order to overcome the existing AET gaps, one important element is to answer the following question: How should AET at NQF levels 2-4 be designed to contribute meaningfully to the advancement of the agricultural sector in South Africa in the context of the realities discussed earlier?

This will require research that assesses various dimensions of AET in a formal educational sector in South Africa. Such research can generate information that can be used for further analytical study, which could contribute to strengthening the agricultural sector in the country by means of quality AET that can meet internal and external demand and create opportunities locally, regionally and globally. A significant part of the research would include identifying the existing gaps and factors affecting the attitude and the knowledge of students towards AET.

2.6   Factors Affecting Students' Performance in AET

It is submitted that five principle factors influence the AET process and students' achievements. These are individual, family, socio-cultural, socio-economic and situational factors.

2.6.1   Individual factors

In the school environment the individual factors, such as student competence in the medium of an instructional language, study effort, the number of lectures missed and the student's age, are the most determining factors in a students' educational success and performance and which, if addressed, can have a positive effect on students' achievements (Harb and El-Shaaraw, 2006; Clabaugh and Rozycki, 1990). Research revealed that hard work, previous schooling, discipline and self-motivation are factors that can explain differences in grades or academic performance (Harb and El-Shaarawi, 2006: Clabaugh and Rozycki, 1990). Similarly, Tay (1994) explained that student capacity and effort have a positive effect on a student's performance in the school. These confirm that individual factors have a positive intervention on student performance and achievement. The identification and control of these factors has a positive effect on the students' success in school.

2.6.2   Family factors

Parents are the major role-players in academic achievement (Alam and Farid 2011). In the teaching and learning process, family factors influence student success and school achievement. Parental expectation and aspiration, home environment and parental

involvement in their children's education, such as creating a conducive home environment and the consistent provision of assistance in their studies are the main factors that could affect student achievement in their studies (Christenson *et al.*, 1992). Kloosterman (1999) studied the effects of a home environment on a learners' socio-emotional and cognitive development. The author clearly showed that the family and school environment plays an important role in a learner's socio-emotional and cognitive development. Emotional support, family values, such as respect, a strong maternal role and the legacy and maintenance of the home language were identified as the most essential family factors (Kloosterman, 1999). Marks (2006) reported that both family size and family type have an effect on a student's academic achievement. Students from large, single-parent and re-constituted families were found to be grouped in the academically weaker categories in the school. The study also clearly showed that single-parent and reconstituted families had negative effects on student performance. These empirical studies show that family factors can and do affect student achievement. AET programmes need to be conscious of this reality and should be designed to help students overcome any negatively influencing family factors.

2.6.3 Socio-cultural factors

The socio-cultural factors have major implications for schools and student achievement. Socio-cultural factors that contribute to quality agricultural education implementation are student mobility and racial background (Cooper and Centre, 1998). These are social class, discriminatory language and ethnicity (Emmitt *et al.*, 2003). Jegede and Okebukola (1989) reported that socio-cultural factors such as goal structure, the African world-view and societal expectation, have significant effects on student achievement in science subjects. Furthermore, Otsuka (2004) explained that student achievement varies based on their different ethnic background. Students from different ethnics have cultural differences in values, beliefs and practices. Racial differences cause for the formation of a difference in cultural values and attitudes towards education.

2.6.4 Socio-economic factors

Socio-economic factors are related indirectly to a child's academic achievement through parental belief, income and behaviour (Davis-Kean, 2005). Socio-economic status

is estimated as an arrangement of factors including income, level of education and occupation (Boskey, 2009). Based on Davis-Kean's (2005) finding, there are three indicators that characterize the socio-economic status and structures of a family. These indicators are parental education, parental income and family size. Furthermore, much empirical evidence shows that parental education; children's education and earnings are strongly related to each other (Arias *et al.*, 2004). Vandenbosch (2006) showed that a learner' family socio-economic status and home learning environment have a noticeable effect on a learners' education. Similarly, Davis-Kean (2005) identified that parental education and family income can explain differences in grades or performance of the students in school (Harb and El-Shaarawi, 2006). On the other hand, parent education and family income determine the living conditions of a student. Another factor that could contribute to differences in grades and academic performance of the students is how crowded the household is. The more the crowded the household, the poorer a student's performance (Harb and El-Shaarawi, 2006; Omar *et al*., 2002).

2.6.5   Situational factors in the teaching and learning process

The school environment such as safe school environment, flexible grouping and provision of language support for those learners were found to have effects on their academic achievement. Moreover, a positive school culture, including shared vision, an orderly climate and positive reinforcement, plays a crucial role in academic achievements in the teaching and learning process (Teddlie and Reynolds, 2000; 2001; Teddlie and Sammons, 2010). Killian and Baker (2006) suggested that an improvement in situational conditions in the school, namely, increased support from school administration and the reduction of student discipline problems in the school, would improve student achievement. Moreover, the research results show that a lack of enforced policies and weak administration are the main sources of student stress in the school environment. Similarly, a lack of connection between administration support and student discipline also creates stress in the school. Higher stress leads to poorer performance (Killian and Baker, 2006).

Creemers and Kyriakides (2009) reported that the development of comprehensive school policies for teaching has stronger beneficial effects in schools where the quality of teaching at classroom level remains low. Schools and educational systems that are able to

identify their weaknesses in the teaching and learning process and develop a policy to address the teaching and learning environment of the school, are able to improve the performance of classroom and thereby the performance of the student (Creemers and Kyriakides, 2009).

The within-school factors that contribute to high quality implementation require the creation of a supportive culture for institutional change. This can be achieved by overcoming the resistance of a minority of teachers to these changes, motivating a devotion to implement the structures of a program, creating a strong school-site facilitator, teachers devoting themselves to an increased workload and to securing the availability of program materials (Cooper and Center, 1998).

A good match between a students' learning style and an instructors' teaching style will have a positive effect on a students' performance in the teaching and learning process (Clabaugh and Rozycki, 1990). However, different organizational structures in the school such as a library, different organised educational clubs and mini-media, may influence the socialization of students in the ways which may undermine as well as support educational goals. The school is a complex organization, which means that it is where decision makers, educators, learners, parents, public education supporters interact and work in harmony, in order to enhance educational success as well as individual student academic achievement (Clabaugh and Rozycki, 1990).

2.7   Factors Affecting teachers Performance in AET

The agricultural education community across the world consider creating understanding about the central role of agriculture, food, fibre, and natural resource systems. This can be achieved through strategic planning for agricultural education, which in turn, calls for a rich supply of highly motivated, well-educated agricultural science teachers in the system to produce agricultural experts (Lashgarara, 2011). In the teaching and learning process, teachers and parents are the major role-players for the success of the system (Alam and Farid, 2011). Teacher's attitude towards teaching has an effect on their performance in the school and students success. Teachers are significant role-players in shaping students' attitudes and achievements in their study (Erawan, 2010). In addition, to this, teachers have greater satisfaction when they believe that they can make a positive impact on their students' academic achievements (Hoy and Miskel, 2001). Therefore,

agricultural science teachers are the main source and facilitators of agricultural science knowledge transfer in the schools. In this respect, however, the level of knowledge being acquired by students depends, in part, on the level of knowledge and attitude of their teachers (Rezaei *et al.*, 2008b; Lashgarara, 2011).

In the school environment, teachers are the major role-players in the attributed teaching and learning process for an effective implementation of AET (Rezaei *et al.*, 2008)**.** In teaching, job satisfaction is the attitude of a person reflecting the degree to which his/her important need is stratified by his/her job in relation to positive and negative contributing factors. In a teaching occupation, different factors influence teachers' job satisfaction, their attitude towards teaching agricultural science and their relationships with students. These factors include student number, daily class time, practical schadual time, level of education, previous job experience, realistic expectations of teachers by society, burn-out levels, student-teacher ratio, the work environment and the emotional conditions of agricultural teachers. Currall *et al.* (2005) reported that school academic performance is correlates positively with a teacher's pay satisfaction, it correlates negatively with the average teacher's intention to give up.

Agricultural education teacher job satisfaction had been increased due to student numbers thought each year, daily class time and the level of education (Rezaei *et al.*, 2008). Insefficient practical teaching program and inapproprate teachers student ratio in the classroom had a negative and significant relationship with an agricultural teacher's job satisfaction. Similarly, Bennett (2001) and Rezaei *et al.* (2008) describe that a level of education and class time per day were postively related to the job satisfaction of agricultural teachers. On the other hand, Iverson *et al.* (2004) revealed that an agricultural teacher's with previous agricultural occupation experience brought higher job satisfaction in teaching agricultural sciences. However, the absence of society's genuine outlooks of teachers had a negative impact on agricultural teachers' job satisfaction.

The work environment in schools, such as the behaviour of principals, and the nature of communication within a school and pay satisfaction, plays an important role in shaping teachers' attitudes in a positive way in the process of effective teaching (Flores, 2001; Currall *et al.*, 2005). Likewise, Ispir (2010) argues that there is a significant relationship between teachers' attitudes towards the teaching profession and the burn-out levels of teachers.

Croom and Moore (2003) reported that there was no significant relationship between student misbehavior and teacher burnout. The authors also indicated that teachers have a high degree of satisfaction from their successful contribution to their students and the community. Similarly, Croom and Moore (2003) reported that agricultural teachers, in most cases, experience moderate levels of emotional tiredness, low levels of changing their behavior in relationships with students, colleagues and others, as well as a high degree of personal accomplishment in their work. An agriculture teacher's gender, academic degree, field preparation method and annual contract length do not influence teachers' responses much on each of the sub-scales such as the size of the school, the type of community and the size of the Agricultural Education Department. The age and years of teaching experience of the agriculture teacher is related to emotional dissociative disorder, where there is loss of contact, followed by feelings of unreality and strangeness. However, personal emotion scores were found to be significantly influenced by age and years of experience (Croom and Moore, 2003).

2.8   Summary and recommendation

The AET is one of the most important elements for the development and achievement of the agricultural sector. It is believed that colonial and apartheid rule had a negative impact on AET in Sub-Saharan Africa and South Africa, respectively. Sub-Saharan Africa adopted integrated systems of teaching, research and extension systems from developing countries. These systems are unable to fit and solve the existing problems and needs. Furthermore, limited funds, poor communication and weak linkages between implementing agencies have impacted on the success of AET systems in the region. AET curricula are unresponsive to the existing and changing needs and realities of the content and globally. Before 1994 in South Africa, the education was racially segregated and unresponsive to the needs and aspirations of the majority and their future progress. After 1994, a significant effort has been made to remove access barriers to AET, by investing in AET. Further, the South African agricultural science curriculum in the General Education Band was revised, apparently to reduce the gaps in the system and to broaden access. In parallel, a new AET strategy was developed to address broader aspects of the whole AET system. Despite these advancements, South African AET (as a system) and students studying the curricula (particularly at the secondary level) are not faring well. There is actually an inverse relationship between agricultural science student numbers and the

newly-opened agricultural schools in the country. AET continues to struggle to deliver the quality professionals so urgently needed by South Africa's agricultural sector.

In the midst of this, literature clearly shows that different factors are responsible for the success of a students' performance in AET. However, further studies are required to identify factors affecting the quality of AET as a system and process. It is vital to evaluate the knowledge, attitude and AET process dimensions in a formal educational sector, to clearly understand the problems. This will give meaningful answers and basic information to address the shortcomings in the sector.

The review indicates that it is important to strengthen the bases of AET processes by encouraging and investing in research. This could help to identify problems and fill the existing gap by providing innovative solutions that will help in the processes of designing and implementing an AET policy. Moreover, this could also significantly contribute towards sustainable agricultural development and food security through quality agricultural education and training.

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CHAPTER THREE

STUDENT PERCEPTIONS OF AGRICULTURAL EDUCATION PROGRAMME PROCESSES AT SELECTED HIGH SCHOOLS IN KWAZULU-NATAL PROVINCE, SOUTH AFRICA

Abstract

Purpose: This study investigated student perceptions of different aspects of Agricultural Education and Training (AET) programme processes that have been offered in secondary schools by the formal educational sector in the province of KwaZulu-Natal, South Africa. The study sought to identify the existing shortcomings in the implementation of the Agricultural Education curriculum by gathering important information and by considering three different types of agricultural science schools. The intention was to inform education policy-makers, program organizers and teachers at all levels and thereby to assist them in the identification of those areas in which improvements can be made.

Design/methodology/approach: A sample population of 375 pupils was selected from high schools in the province of KwaZulu-Natal, South Africa. The research was arranged in nested concurrent mixed sampling designs. The response rate for this sample was 97%. The survey was conducted by using a pre-tested and structured interview schedule.

Findings: The results showed that, there was sufficient Agricultural Science lesson coverage, there were sufficient notes for each lesson and sufficient time to cover the agricultural textbooks within the allocated teaching times during the teaching and learning process. However, problems do exist, namely, wasted uncovered class lessons, inadequate teaching aids and materials and a shortage of trained Agricultural Science teachers. The majority of Agricultural Science students indicated the unavailability of sufficient infrastructure and support.

Practical implications: It is recommended that the responsible bodies should give serious consideration to the improvement of teaching aids and teacher training within the

system. Throughout the system, thoughtful consideration should be given for the teacher-student-teaching-learning infrastructure.

Originality/Value: The article presents the actual data collected from the province. Analysing the educational processes and taking appropriate action could help to solve the existing teaching and learning problems in the system.

Key words: Teaching, Student, Classroom administration, Agricultural Education and Training, Educational process, Secondary school.

3.1 Introduction

Education is a source of skilled manpower and timely innovative solutions for existing economic and political needs on the African continent (Sundstøl, 2004; Vandenbosch, 2006). Within the broader sphere of education, Agricultural Education and Training (AET) plays a major role in human capacity building for the development of the agricultural sector, in order to achieve sustainable development and food self-sufficiency (Birhanu, 2010). This is particularly important in the face of the increasing demands placed on African agriculture, calling for innovative food production and processing. Thus, AET is vital to attain a high level of agricultural productivity and for making skilled manpower available, which are both required for the proper functioning of agricultural systems (Ray, 2010). To meet these demands, agriculture needs trained manpower, using research-based AET programmers. There is scant published research on AET in South Africa and Africa, particularly curriculum development and delivery.

3.2 Purpose and Objectives

A study was undertaken to investigate various factors affecting the design, implementation and delivery of AET at high school level in South Africa, with particular reference to the KwaZulu-Natal province. This paper presents the perceptions of students studying agriculture in twelve selected high schools. The objectives were: 1) to gain insight into the reasons for the poor performance of high school students studying AET; and 2) to identify areas to be addressed to improve curriculum delivery and student performance.

3.3   Conceptual Framework

In high school, the objective of agricultural education is to provide background knowledge in agriculture to learners to, prepare them for further studies in various agricultural disciplines (Vandenbosch, 2006). The success and achievement of students in post-secondary agricultural education depends on the successful completion of their secondary school education. Learners' access to post-secondary education is dependent on the strength and quality of the high school curriculum and its implementation processes (Adelman, 1999).

Educational systems in the teaching and learning process require the coordinated participation of students and teachers to meet their educational objectives (Ilenloh *et al* 2012). In school systems and environments, learners, educators and school organizations should be working together towards an effective teaching and learning process. This harmonization can improve a student's achievement and a school's pedagogical outcome (Opdenakker and Damme, 2001). The educational process, especially the organization of schools towards the implementation of a designed curriculum, can have a significant effect on these outcomes. A school's climate is dictated by the effectiveness of the communication that is being exercised in the school (Owens and Valesky, 1995) and this influences a school's teaching and learning process (Owens and Valesky, 1995).

Research also indicates that there is a positive relationship between a variety of inputs in schools (i.e. availability of teaching aids, trained teachers, competent school administration, an enabling school environment and a student' levels of achievement (Opdenakker and Damme, 2001). Adequate investment in school educational processes and resources leads to significant increases in student achievement. Similarly, school structure and various features of school processes have an effect on student achievement in secondary schools. There are also important relationships within the school's composition, such as the principal's leadership and the organizational culture of the school, or the quality of teaching and the experiences within the classroom and school processes in secondary education (Opdenakker and Damme, 2001).

 Effective school accountability for aspects of the teaching process and student results can also improve the scores of students and the score discrepancy among students (Hanushek and Raymond, 2004). This indicates that it is vital to continually evaluate both the teaching and learning processes and the implemented curriculum, in order to modify

and update it according to the developmental needs in the global or local context (Kumar and Kashyap, 2012). Therefore, the evaluation and assessment of educational processes at high school could help systems correct and adjust themselves according to current developmental needs.

Prior to 1994, South Africa employed a policy of segregated education, based on the racial background of learners. Since 1994, there have been intensive investigations to develop new educational policies and legislation, which have now been implemented (Lomofsky and Lazarus, 2001). Currently, South Africa has one of the highest rates of public investment in education in the world. About 5.3% of its Gross Domestic Product (GDP) and 20% of total state expenditure is being spent on education, although the budget primarily comprises salaries. Despite its considerable budget, there are huge variations between school results in science subjects within the South African education system (Taylor, 2008), which, will lead to variations in student results, within and among schools. Within South African AET, student performance in high school level agriculture is generally poor. Research shows a decline in successful Grade 12 matriculation results, as well as an increasing student dropout rate from AET (Chapter 2). This is compounded by a generally negative view of agriculture as a career choice (NDA, 2003).

The question thus arises as to what the current status is of AET processes at secondary school level and what is contributing to the current state of affairs. Further, how should AET be designed and delivered at secondary school level to contribute meaningfully to the advancement of the agricultural sector in South Africa? This requires knowing and analyzing these educational processes, which will provide a research base to formulate appropriate action to address the identified problems and thereby improve pass rates and reduce result variations among students and high schools. This, in turn, should then also improve student interest in and access to post-secondary AET education, thereby contributing to the improved production of skilled manpower in the system.

3.4   Research Methodology

This was conducted at selected dedicated, rural and urban high schools offering agricultural sciences in the KwaZulu-Natal Province, South Africa. It investigates and analyses student perceptions of three key AET processes: classroom administration, curriculum delivery and teaching infrastructure and support. This study is based on the

earlier work, which is presented in Chapter 2, which suggests that efficient educational processes could contribute to student academic achievement and that the student achievement in schools could be determined by the effectiveness of teaching and learning processes, as well as the availability of infrastructure and facilities.

The study area, The KwaZulu-Natal Province, is one of South Africa's nine provinces. In this province, inverse relationships were observed between the number of newly-opened agricultural secondary schools and the number of successful Grade 12 matriculation results. The data clearly shows that although the number of newly-established agricultural secondary schools increased, there was still a decline in successful Grade 12 matriculation results, as well as an increase in the student dropout rate from AET (Chapter 2). Hence, the province was purposely selected, based on the actual trends observed. KwaZulu-Natal is located along the southeastern coast of South Africa. It is one of the most agriculturally diverse and active provinces (DAEA, 2013). The province had 69,552 agricultural science students in Grade 10-12 levels in 2012 (personal communication, Provincial Department of Education).

This study used Nested Concurrent Mixed Sampling Design (NCMSD), were quantitative and qualitative data were collected almost concurrently, but were the qualitative sample was employed as a subset (i.e. a nested relation) of the quantitative sample (Johnson and Christensen, 2012). Due to the homogeneity and the nature of the sample, equal school numbers and sample sizes were determined, for comparative purposes. In South Africa, including KwaZulu-Natal, a number of schools specialize in providing an AET curriculum within the standard matriculation framework. In this study, these are referred to as dedicated agricultural schools. There are also several rural and urban high schools that offer agricultural science subjects. Based on this reality, twelve high schools offering AET were purposely selected. Multi-stage random and purposeful sampling (Johnson and Christensen, 2012) were used to select 375 students from the twelve schools to represent the 69,552 students in the province registered for agricultural subjects in 2012. The data were collected in the presence of the researcher. The response rate of this sample was 97%.

This study was carried out in two stages, using qualitative and quantitative data collection methods to obtain the perceptions of the student respondents. Primary and secondary data were also gathered and analysed for the purposes of the study. Quantitative data were collected from the student respondents, using a pre-tested structured interview

schedule, following the procedure described by Johnson and Christensen (2012), to check its validity and consistency and to make refinements. The qualitative data were collected from the respondents, using small group interviews with an open-ended questionnaire containing structured and unstructured questions, which was in accordance with the objectives of the study. The quantitative data was analysed, using descriptive statistics, such as percentage and chi- square. The qualitative data was analysed, using a spiral content analysis.

3.5   Results and Discussion

A total number of 375 agricultural sciences secondary school learners participated in this study. The respondent population consisted of 70.7% (265) male and 29.3% (110) female students. Responses were organized around three key themes: classroom administration, curriculum delivery and teaching infrastructure and support.

5.5.1 Classroom Administration

Table 3.1 displays the students' responses to questions related to classroom administration processes in dedicated urban and rural agricultural science secondary schools. Classroom administration was framed by the appointment of class representatives, formal discipline for undisciplined student action, meetings between classes and school representatives and class attendance registration.

The results show that class representation, class attendance registration and discipline for undisciplined student action varies significantly ($P \leq 0.01$ and $P \leq 0.05$) in the different type of school. Urban schools more frequently use student representatives and discipline students for undisciplined behavior. Dedicated agricultural schools are marginally more diligent in tracking class attendance, but they also scored generally high in all areas of classroom administration, indicating on the whole that they tend to have more stable classroom administration.

The study found that, at least to some degree, all the schools implement discipline exercises to discipline students wherever it is found to be necessary, but that there is significantly more continuous follow-up of discipline and relevant corrective action exercised in the urban schools than in the sampled rural and dedicated agricultural schools.

The respondents from urban schools indicated that their schools have serious disciplinary measures and according to them, having these measures compelled them to follow school rules and behave according to school expectations. Moreover, it is clear from the qualitative data obtained, that this not only helped the students to respect the school procedure, but it also had a positive and significant impact on a students' attendance and attention to their lessons. Having disciplined students in the school is shown to facilitate an effective teaching and learning environment.

Table 3.1: Student responses to classroom administration processes

Variable	Response	DAS (%)	US (%)	RS (%)	X^2
Class representatives	Yes	82.4	92.8	83.2	$7.0^{(s2)}$
	No	17.6	7.2	16.8	
Discipline for undisciplined student action	Yes	68.0	80.8	73.6	$5.5^{(s1)}$
	No	32.0	19.2	26.4	
School meetings between class representatives and school administrators	Yes	63.2	64.8	56.8	$1.9^{(ns)}$
	No	36.8	35.2	43.2	
Class attendance registration	Yes	58.4	52.8	44.0	$5.3^{(s1)}$
	No	41.6	47.2	56.0	

ns: non-significant; s1: significant at $P \leq 0.01$; s2: significant at $P < 0.05$. DAS: Dedicated agricultural school; US: Urban school offering AET; RS: Rural school offering AET

Schools that have discipline for undisciplined student actions encourage self-discipline and self-responsibility among the students. In the school environment having disciplined and well-mannered students could have a significant influence on effective curriculum implementation and on student achievement. Self-disciplined students contribute towards an optimally functional teaching and learning school environment. Having disciplinary consequences for undisciplined action could also increase students' sense of responsibility and self-discipline. Furthermore, broad support for positive behavior and corrective action for student ill conduct in schools could have a positive effect on student absenteeism and on their achievement in general (Luiselli *et al*., 2002). Corrective school practice, including proper detention and other positive or negative reinforcement for certain behavior, positively influences student character, which in turn, fosters positive behavior, student satisfaction and an improved perception of the school's safety (Horner *et al*., 2005; Tobin and Sugai, 1999). This could help to support positive

feelings, values and attitudes of both students and staff. A school's learning climate should be sufficiently well-ordered, to create an effective teaching and learning environment. Better quality school climates are partly the product of an improved school environment, including school connectedness and student satisfaction and conduct (Loukas *et al.*, 2006). Positive teaching and learning environments have a positive effect on better student academic achievement and higher levels of student self-confidence (Ma, 2002; MacNeil *et al.*, 2009).

The respondents in each type of school indicated that their schools have student class representatives. However, while, use of this mechanism for meetings between representatives and school administrators was reported by 63.2%, 64.8% and 56.8% of the respondents in dedicated, urban and rural schools, respectively a significant percentage of the respondents indicated that such meetings do not occur. This is important, because such communication facilitates an information-sharing culture between school administrators and students. It also helps school administrators to monitor, assess and improve the effectiveness of teaching and learning processes.

On the other hand, the rural agricultural science schools student respondents indicated that they do not have a built-in system of student representation that can report and assist in solving the existing problems. These students indicated that support is needed for their economic, psychological and other problems arising during their high school years. During the qualitative data collection, it was observed that the learners seek relevant solutions from those who have knowledge, information and resources to provide possible resolutions. Therefore, establishing the conditions for the existence of functional class representatives, the improvement of classroom attendance, necessary disciplinary action and professional advice, could promote changes for better academic achievement. As shown in Table 3.1, 58.4% and 52.8% of the students in the dedicated and urban agricultural schools respectively indicated that their schools have class registration to check absenteeism in each lesson. This varies significantly ($P \leq 0.1$) in the rural schools, were 56% of the students indicated that class registration is not taken during lessons.

The absence of class registration of attendance in the schools could encourage absenteeism, which will negatively impact on student performance (Hidsyat *et al.*, 2012), which implies that keeping a record of attendance and using it to curb absenteeism should positively improve student performance. Hidsyat *et al.* (2012) established that low performing students do not give sufficient consideration to the importance of attentive

class follow up, when compared to high performing students who tend to avoid absenteeism (Hidsyat *et al*., 2012). Similarly, Wyatt (1992) explained that absenteeism is positively related to disliking the class.

Urban high schools that offer agricultural science subjects have good classroom administration. However, the results presented in this study showed that the rural agricultural schools require more effort to improve the information-sharing culture between school administrators and students. Similarly, class registration needs to be introduced and has to improve in all the rural, urban and also in dedicated agricultural science schools. In the teaching and learning processes, having efficient classroom administration has a significant effect on effective agricultural science curriculum implementation and student achievement.

3.5.2 Curriculum delivery

Table 3.2 shows the students' responses to variables connected to curriculum delivery. The results show there is no significant difference among the schools in terms of lesson coverage and that all of the schools do provide comprehensive coverage of the curriculum through the year and provide notes for lessons, the latter directly and positively affecting student understanding and achievement (Kumar and Kashyap, 2012).

However, Table 3.2 also shows that availability of agricultural teachers, compensation for uncovered lessons by teachers and sufficiency of time to cover textbooks, are significantly ($P \leq 0.1$) and ($P \leq 0.05$) affected by the type of school. Unexpectedly, dedicated agricultural schools suffer the greatest shortage of agricultural teachers, followed, by the rural schools, which is not unexpected. While all of the schools surveyed appear to struggle to compensate for missed lessons, rural schools appear to struggle the most.

While all three types of schools appear to provide sufficient time to cover textbook material, respondents from the urban schools demonstrate that their schools are significantly better in this regard. Further, while the students indicated that the curriculum is covered, the fact that a significant percentage of the students at the dedicated and rural schools indicated that sufficient time is not given to cover it, suggests that a significant number of students would struggle to keep up in those schools. This would have repercussions on student performance and potentially on the learning environment as a whole, reinforcing the negative impact.

Table 3.2: Student responses to curriculum delivery

Variables	Response	DAS (%)	US (%)	RS (%)	χ^2
Comprehensive annual agricultural lesson coverage	Yes	81.6	77.6	84.8	2.1[ns]
	No	18.4	22.4	15.2	
Missed lesson compensation	Yes	36.0	48.8	28.0	11.7[s2]
	No	64.0	51.2	72.0	
Shortage of agriculture teachers	Yes	67.2	25.6	62.4	51.9[s1]
	No	32.8	74.4	37.6	
Sufficient teaching time to cover textbook material	Yes	55.2	80.0	54.4	22.8[s1]
	No	44.8	20.0	45.6	
Notes received for each lesson	Yes	73.6	73.6	75.2	0.1[ns]
	No	26.4	26.4	24.8	

ns: non-significant; s1: significant at $P \leq 0.01$; s2 significant at $P \leq 0.05$;

DAS: Dedicated agricultural school; US: Urban school offering AET; RS: Rural school offering AET

This is borne out by the post-survey interviews with students, which that there were scenarios where the agricultural science topics remained uncovered during the stipulated time frame for the year, also noted that there were no proper compensation classes for the lessons lost because of teacher absenteeism, which students attributed to personal and administrative reasons. The learners felt that their educators are usually subject to stress in their efforts to cover the year's subject content within the time allocated. The students viewed this as making the subject tedious and demanding, which confirms Logan and Skamp's findings (2008) that not compensating for time lost in the teaching schedules in a systematic and planned way, could negatively affect the students' perceptions and passion towards a subject.

These curriculum delivery factors with which the schools struggle, all contribute to the learning environment that influences student performance. Logan and Skamp (2008) and Hedjazi and Omidi (2008) confirm that, the instruction approach of educators and the classroom environment in the teaching and learning process all have an effect on student attitudes and interest in science lessons, which can significantly impact on their achievement in secondary education. Moreover, a positive attitude and determination on the part of students could lead to the success in the agricultural sector (Méndez, 2011; Talbert and Larke, 1995).

As shown in Table 3.2, 67.2% and 62.4%, respectively, of dedicated and rural school agricultural science students indicated that there are shortages of agricultural science teachers in the schools. Curriculum delivery is obviously dependent on the availability of quality teachers and their efforts, and these affect student achievement. Student achievement is also influenced by the areas of qualification and experience of teachers that are assigned to each class (Sanders and Rivers, 1996). While most students indicated that the annual curriculum is covered, a significant proportion indicated that it is not covered and/or it is rushed. Overloaded and stressful schedules, untrained teachers and absenteeism among teachers, all raise issues of quality assurance, both in terms of delivery and the students' attentiveness to the subject matter during the course of the academic year.

To achieve the objectives of teaching agricultural science in high schools, that is, to ensure students succeed in their studies, it is necessary to have adequate teachers in the school teaching system, the required qualifications. Both technical and human aspects should be considered, to provide the possibility of improvement and achievement in the teaching and learning process (Kumar and Kashyap, 2012), because both human and non-human resources are vital to support and implement effective teaching and learning. The findings of this part of the study indicate that, while the perception of the majority of the students is that the curriculum is delivered adequately, a significant percentage highlight some of the more important weaknesses, in particular the lack of qualified agricultural science teachers at dedicated agricultural schools and rural schools, inadequate arrangements to cover missed lectures (particularly at dedicated and rural schools), and the lack of time allocated to covering the annual curriculum.

3.5.3 Teaching infrastructure and support

Table 3.3 displays students' responses to questions related to the infrastructure and support for the teaching and learning process in offering AET at the selected high schools. The result reveals that all Internet access, access to computers, practical lessons, library facilities, availability of agricultural science books in the library, and the supply of agricultural student textbooks are significantly ($P \leq 0.1$ and $P \leq 0.05$) and differently affected by the type of school.

Table 3.3: Student response to teaching infrastructure and support

Variable	Responses	DAS (%)	US (%)	RS (%)	χ^2
Access to a computer	Yes	65.6	84.8	41.6	50.8[s2]
	No	34.4	15.2	58.4	
Internet access	Yes	52.0	72.0	34.4	35.5[s2]
	No	48.0	28.0	65.6	
Farm or field for practical lessons	Yes	94.4	57.6	50.4	63.4[s2]
	No	5.6	42.4	49.6	
A library in school	Yes	57.6	88.8	21.6	114.7[s2]
	No	42.4	11.2	78.4	
Agricultural science books in library	Yes	47.2	72.8	27.2	52.3[s2]
	No	52.8	27.2	72.8	
Given agricultural student textbooks by school	Yes	92.0	76.8	85.6	11.3[s1]
	No	8.0	23.2	14.4	
Well-equipped school laboratories for experimentation	Yes	11.2	40.8	7.2	53.2[s2]
	No	88.8	59.2	92.8	

ns: non-significant; s1 significant at $P \leq 0.05$; s2: significant at $P \leq 0.01$

DAS: Dedicated agricultural school; US: Urban school offering AET; RS: Rural school offering AET

3.5.3.1 Internet and computers

As can be seen from Table 3.3, 52.0% and 72.0%, respectively, of the students in dedicated and urban schools indicated that they have Internet access. However, about 65.6% of students in rural agricultural science high schools responded that they do not have Internet access. These differences are significant at $P \leq 0.01$ levels of significance. A similar pattern emerges regarding access to computers: the majority of the urban and dedicated high school students have access to computers, whereas the majority of students at rural schools do not. Moreover, some of the students in these rural high schools indicated that they have no experience in the use of information technology and are not accessing additional literature and information about agricultural sciences beyond classroom and textbook learning. Learning to access information – especially electronic information, is an important part of the teaching-learning process. Lack of access negatively affects knowledge transfer and the acquisition of skills in the teaching and learning process. Such access facilitates effective class and individual learning and helps learners by motivating and presenting materials systematically. The learners can use the medium of learning again and again, they need information (Kumar and Kashyap, 2012), supports an attitude of continuous life-long learning.

3.5.3.2 Facilities for practical lessons

There is significant difference among the three types of schools with respect to facilities for practical lessons. As shown in Table 3.3, 94.4%, 57.6% and 50.4% of dedicated, urban and rural agricultural schools, respectively, have a farm or field for practical lessons. This indicates that there are still some schools that do not have a farm or field for practical lessons. Consequently, this implies that some work needs to be done to standardize the availability of these basic facilities for practical lessons in schools. In general, these percentages show the variation between the schools, with respect to accessibility to farms or fields for practical agricultural science lessons. Not unexpectedly, the dedicated agricultural schools more consistently have a farm or field available for practical lessons.

3.5.3.3 Libraries and books

The majority of urban 88.8% and dedicated 57.6% school students indicated that they have libraries in their respective schools. Although a statistically higher percentage of schools appear to have a library, it is evident from the results that a few urban schools still have no library access. Lack of libraries and books appeared to be more prevalent in dedicated schools, when compared to urban schools. Likewise, the majority of students, 78.4%, of rural agricultural schools, indicated that they are without library facilities (Table 3.3). In this case, there was a significant difference between frequencies and percentages of students in the three schools. The variations between schools were found to be statistically significant at (P ≤ 0.01) levels (Table 3.3). Libraries and the access to information they represent, are critical to student performance. These, together with Internet access, are issues that appear to be lacking in a number of schools, particularly rural schools.

Similarly, 72.8% of urban school students indicated that they have sufficient agricultural science books in their school libraries, while 72.8% of rural and 52.8% of students in the dedicated agricultural schools indicated that they do not have sufficient agricultural science books in their school libraries. The variations between schools were found to be statistically significant at (P ≤ 0.01) levels (Table 3.3). However, the majority of dedicated, urban and rural school students indicated that they were given agricultural student text books by their respective schools. In the teaching and learning process, printed media, such as books and newsletters, training guides, hand-outs, worksheets and exercises,

are a more effective means of communicating the subject matter, than the traditional oral communication (Kumar and Kashyap, 2012). Thus, students who are in schools that provide textbooks and other relevant teaching materials benefit more and achieve better in their studies.

3.5.3.4 Laboratories

The majority (88%) of students, in dedicated, 59.2% in urban and 92.8% in rural agricultural science schools, indicated that they do not have well-equipped laboratories for agricultural Science related experimentation in their schools. The variations between schools were significant at ($P \leq 0.01$) levels, as shown in Table 3.3. In summary, the majority of respondents felt that there was a shortage of libraries, laboratories and spaces for practical agricultural education. They felt that laboratories and libraries, together with fully functioning agricultural fields, are needed, so that theoretical agricultural concepts learned in the classroom, can be augmented with practical knowledge and experience exercised in the field. Some of the students explained further that laboratories and farms should also be appropriately supplied with at least basic farming facilities and equipment that are related to the courses offered at their schools. Without these, labs and fields con not help them learn to apply theoretical lessons in a practical 'real world' setting. Given that the majority of the participating students' families do not have access to farming land, their school is the only resource, where theoretical and practical knowledge and skills can be learned together. During qualitative data collection and small group discussions the majority of students indicated that visiting commercial and/or small-scale farms and small-scale food processing industries could be important in widening their outlook about AET outside their classroom.

Agricultural education is an applied science in which the acquisition of skills is very crucial. It is argued that being practically skilled is considered the most desirable quality to consider in the teaching of agriculture (Kumar and Kashyap, 2012). It is especially important to follow a methodology of the presentation of theory, combined with experiential learning where students learn by doing. In short, theoretical lessons need to be complemented by practice (Kumar and Kashyap, 2012). Engaging in such practical learning will deliver manpower that provides innovative problem solving capacity (Parsons, 2007).

Further, in the process of developing practical learning, Kumar and Kashyap (2012) argue that practical learning should not be too rigid or fixed, but should rather be experimental in nature. The utilization of improvised instructional materials in the schools' teaching and learning process promotes and enhances effective teaching and learning (Oladejo *et al.*, 2011).

In related discussions with students, the majority of students linked practical learning to off-campus field trips. They indicated that visiting commercial and small-scale farms and small-scale food processing industries could be important to widen their outlook about AET outside the classroom.

Therefore, having facilities for practical agricultural education will significantly improve student understanding and help the students visualize their learning, make abstract concepts concrete, and thereby support retention and understanding much more effectively than verbal teaching alone (Kumar and Kashyap, 2012). Conversely, shortages of teaching infrastructure and support negatively affect student learning and school achievements (Dhaliwiwal, 2003). In this study, as shown in Table 3.3, agricultural science in rural schools in particular, suffers from a shortage of teaching infrastructure and support. Improving access to these should facilitate and significantly strengthen teaching and improve student learning.

3.5.4 Pooled Data of Educational Process in AET

Table 3.4 displays pooled students' responses to questions related to classroom administration processes, teachers' approaches in the classroom process and teaching aids for agricultural education in formal educational sectors. The result reveals that there is a significant (P ≤ 0.1) difference in the percentage of the respondents to the educational process in AET offered by the formal educational sector.

As is indicated in Table 3.4, 81.0% of the students felt that their teachers were properly covering the entire agricultural annual lessons, based on the master lesson plan and 74.1% of the students indicated that they received notes from their subject teachers. However, 62.4% of the students indicated that they did not receive classes to compensate for missed lessons – often apparently due to teacher absence. The absence of compensatory classes for uncovered lessons could create a burden on the normal class schedule, and in particular to students who are struggling to keep pace with the work. Students are left to

bear the burden of learning missed lessons on their own, which would negatively impact on their performance.

Table 3.4: The aggregated student responses to the teaching and learning processes in agricultural schools

Educational process	Yes (%)	No (%)
Curriculum Delivery		
Comprehensive annual agricultural lesson coverage	81.3	18.7
Missed lesson compensation	37.6	62.4
Shortage of agriculture teachers	51.7	48.3
Sufficient teaching time to cover textbook material	63.2	36.8
Notes received for each lesson	74.1	25.9
Teaching Infrastructure and Support		
Internet access	52.8	47.2
Farm or field for practical lessons	67.5	32.5
Library in school	56.0	44.0
Sufficient agricultural science books in library	49.1	50.9
Well-equipped school laboratory for agricultural science related experimentation	19.7	80.3
Given agricultural student textbooks by school	84.8	15.2
Classroom Administration		
Class representative	86.1	13.9
School meetings between class representatives and administrators about the learning process	61.6	38.4
Class attendance register	51.7	48.0
Detention for undisciplined student action	73.6	26.4

The aggregated data presented in Table 3.4 shows that the students studying agricultural science have the textbooks required (84.8%), while just over half of the students have access to libraries (56.0%) and the Internet (52.8%). However, just over half (50.9%) of the students do not have access to relevant books in their libraries. An even larger majority of the students, (80.3%) do not have access to well-equipped laboratories for Agricultural Science related experimentation. This clearly highlights that the lack of appropriate laboratories and shortages of sufficient agriculture related textbooks in libraries are key factors in all the schools, which could be contributing to poor student performance and which thus require urgent attention.

The students articulated that they need improvement in their schools in practical education, access to agricultural support books and library facilities. The students suggested that their school should supply more reading books and Internet access to create more opportunities for reading and exploring new scientific knowledge that exists in the

literature on agricultural education. They suggested correlating theoretical knowledge with practical knowledge, it would be useful to visit commercial farms to witness the practical application of modern scientific agricultural knowledge in a real-world setting.

Finally, added to this range of concerns, the respondents also observed that their schools used a one-way instruction system, which means the teaching and learning process is more dependent on the transfer of knowledge from educators to the learners. However, the learners articulated that the availability of a farm or field for practical instruction, laboratories, libraries and relevant books could encourage self-learning and study. Consequently, these facilities could inspire students to develop their own ideas and contribute to the learning and teaching process, promoting a multiple way of learning, rather than the traditional teacher-centred approach.

AET is a practical discipline in which the gaining of practical skills is very crucial. It is vital to combine practical learning with theory. Logan and Skamp (2008) and Hedjazi and Omidi (2008) explained that the educators' instructional approach in the teaching and learning process has an effect on students' perceptions towards science lessons. Usually, students are averse to excessive note-taking, the absence of student-centred practical work, few opportunities for independent exploration and implemented pedagogy. In secondary schools the agricultural science teaching and learning processes should not centre on listing facts. It could be more effective if the process integrated theoretical teaching with practical lessons. This could help the students to become critical and capable of exploring, judging and using theory for real and powerful purposes, through practical application of theory.

Classroom administration is another factor that can affect student performance. Table 3.4 shows that the vast majority of the students (86.1%) indicated that there is a class representative system. A smaller majority (61.6%) indicated that there is regular communication between the student representatives and school administrators, casting some doubt on the effectiveness of the system.

While the majority of students (73.6%) indicate that corrective action is taken against undisciplined students, nearly half of the students (48.3%) responded that there was no class registration in their school, implying there is no corrective action for absenteeism. Absenteeism, which could be encouraged by the lack of class registration, has significantly negative effects on the student achievement. Introducing effective measures to control and

minimize student absenteeism, may significantly contribute to and could possibly increase the students' school achievement (Dhaliwiwal 2003).

Overall, the results showed that agricultural science students study and learn in environments that are not wholly conducive to good achievement. There is a clear shortage of teaching infrastructure and support, as well as out-of-class learning materials, including most notably, access to the Internet and laboratories. There is no compensation for missed agricultural science classes, a shortage of agricultural science teachers and no class registration in the schools. This is particularly true in rural secondary schools offering agricultural science. These findings, which clearly indicate shortcomings in the teacher-student relationship and in the teaching-learning environment, suggest that these factors contribute significantly to the poor academic achievement of students studying agricultural science. In the broader context, this study implies that, in order to improve the effectiveness of AET delivery, it is necessary to understand the perception of students towards classroom administration, curriculum delivery, infrastructure and support.

3.6 Conclusion

The study shows that urban secondary schools are slightly better in classroom administration, when compared to the dedicated and rural secondary schools. Urban secondary schools had the highest percentage of students who responded favourably to the existence of class representatives and disciplinary measures for undisciplined students, when compared to the percentage of respondents in dedicated and rural secondary schools. Hence, the dedicated and rural secondary schools need to work on the implementation of classroom administration, while it is evident from the results that the dedicated secondary schools are performing slightly better, compared to the rural secondary schools. A high percentage of student respondents in rural secondary schools indicated that there is no class attendance registration, compared to that in urban and dedicated secondary schools. Overall, it is evident from the results that all dedicated, urban and rural secondary schools are experiencing a low level of class registration.

When the student responses to curriculum delivery were investigated, urban secondary schools showed they have sufficient teaching time to cover agricultural science textbook materials, compared to the dedicated and rural secondary schools. There was less focus on compensating for missed lessons in the rural, dedicated and urban secondary

schools. Similarly, it is evident from the results that there is a shortage of agricultural science teachers in rural and dedicated secondary schools.

With respect to the availability of agricultural science teaching infrastructure and support in the studied secondary schools, a farm or field for practical lessons and agricultural textbooks, were more available in the dedicated agricultural science schools, compared to the urban and rural secondary schools. Overall, the results indicated that the urban secondary schools have relatively good teaching infrastructure and support, such as Internet access, libraries and textbooks and access to computers, when compared to the dedicated and the rural secondary schools. However, there is a shortage of well-equipped laboratories in the rural, dedicated and urban secondary schools. Likewise, rural secondary schools need to improve on teaching infrastructure and support. Overall, students' responses to the teaching and learning process was found to be favourable, except that class attendance registration needs due consideration. In summary, the study showed that there is a need to improve the teaching and infrastructure support in agricultural science high schools.

3.7   Recommendations

Based on the findings of this study, it is recommended that action should be taken to establish libraries, laboratories, fields for practical lessons and computer and Internet access to all agricultural science schools. School administrators should take action against absenteeism and design systems to strengthen control mechanisms towards this end. Major consideration should be given to the training of agricultural teachers in the system, through short and long-term training. Action should be taken to compensate for missed lessons. As a precursor to this, a thorough inventory should be taken at every school offering agricultural science, to determine the *de facto* situation in individual schools with regard to class administration, curriculum offering and teaching infrastructure and support.

Special and urgent attention needs to be given to agricultural science students in rural schools, who are particularly at risk, in order to enhance their academic progress in agricultural science by improving the basic inputs for teaching and learning.

Finally, it is essential to examine the attitudes of agricultural science students and agricultural science teachers towards AET and the possible factors influencing their attitudes.

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CHAPTER FOUR

ATTITUDE OF STUDENTS IN THE FORMAL EDUCATIONAL SECTOR TOWARDS AGRICULTURAL EDUCATION AND TRAINING IN SOUTH AFRICA

Abstract

The purpose of this study was to determine the attitude of students towards Agricultural Education and Training (AET). The sample population of the study was 375 high school agricultural science students in the KwaZulu-Natal province, South Africa. A five-point Likert-type scale was used. Cronbach's alpha coefficient was found to be 0.8, which indicated the internal consistency of the scale. Over 90% of students had a positive perception towards farming, agricultural education, high school agricultural knowledge impartation and the importance of practical lessons, but responded negatively ($P \leq 0.001$) to the delivery process, especially regarding agricultural sessions. A higher percentage (75%) of the respondents showed that they were acquiring agricultural knowledge to target the public institutions. The majority of students had a highly favourable attitude towards AET. There was a significant ($P \leq 0.001$) attitude score difference between the perception of dedicated, urban and rural schools students' towards AET. The provision of fields for practical experience, laboratories and libraries to facilitate the learning is also recommended. The responsible body should focus on the impartation of the agri-business concept, in order to create awareness in learners about the potential of agriculture for job creation.

Keywords: Agricultural Science. Attitude. Learner. High School. South Africa

4.1   Introduction

Agricultural Education and Training (AET) plays a major role in agricultural development and is concerned with the provision and maintenance of quality education and training to support environmentally and economically appropriate and sustainable agriculture (DoA, 2005; Pingali, 2007; Mutambara *et al*., 2013). It is obvious that agricultural productivity can be improved though AET research and outreach. Thus, sufficient and relevant agricultural knowledge and competence is required, not only to improve farming systems and technologies, but also for the processing and marketing of produce and the implementation of good agricultural policies in the country (Bawden, 1992; Sundstøl, 2004).

Primary education, together with other enabling factors contributes significantly to increasing the productivity of agriculture (Lockheed *et al*., 1980; Cabraal *et al*., 2005). At present, Agricultural Science as a subject in South Africa has been excluded from the primary school curriculum, but is included indirectly through other sciences that are in the curriculum (DOE, 2008). In secondary schools, the objective of AET is to provide the required background for further studies in various agricultural education areas of science, engineering and technology (Vandenbosch, 2006, Ozge and Omer, 2012). Conversely, AET at post-secondary levels of education is important for advancing agricultural productivity and the processes that move agricultural produce from farm-gate to markets, thereby sharpening the competitive edge of the agriculture sector in the country (Rezaei *et al*., 2008, Shenaifi, 2013).

The successful completion of high school education is the basis for the students' future achievements in education, their careers and their lives (Lashgarara, 2011). This will be accomplished if the system assesses the implementation process, the attitude of the participants on delivery and curriculum of AET at secondary schools and up to tertiary levels of education, the context of local and current global development in agricultural sciences. Teaching and learning are the dynamic processes, which regularly need adjusting, to meet the rapidly changing needs and opportunities in a given area (Creemers and Kyriakides, 2009; McGrath, 2012).

Research in other regions showed that the majority of agricultural science students had a positive attitude towards AET, but their positive interest towards agriculture science depends on their experience of agriculture (Dyer *et al*., 1996; Osborne and Dyer, 2000).

Students also believed that high school Agriculture Science plays a key role, in the students' progress to tertiary level of study and this in turn helps them to develop a positive attitude towards agriculture as a career (Dyer *et al.*, 1996; Osborne and Dyer, 2000). Student willingness to pursue agriculture as a career depends on student attitudes towards agricultural education and science (Ilenloh *et al.*, 2012; Radhakrishna *et al.*, 2003). Some recent work has indicated that a student' decisions to pursue agriculture as a field of study or career, and their involvement and success therein, may be predictable by investigating the student's attitude towards AET (Bassey *et al.*, 2012; Ilenloh *et al.*, 2012). However, AET at secondary school level (National Qualification Framework level 2-4) in South Africa, is delivered poorly and the learners' failure rates are reported to be high (DoA, 2005). Moreover, agriculture has a poor image as a career choice in the eyes of most unprivileged youth in the region (DoA, 2005). Thus, an investigation into the attitude of learners to AET under local conditions is recommended.

One of the several factors that has a significant effect on AET is the attitude of the participants towards the delivery process of the AET curriculum. Attitude is important and is often used to understand and predict people's reactions to an object or change and how behaviour can be influenced (Fishbein and Icek, 1975). Attitude is the liking or disliking of an object, based on what is known about it (Rameela, 2004) People's interest to participate or not in an activity could be based on the person's knowledge, observations or other relevant information about the issue or occasion (Fishbein and Icek, 1975). This study examined the attitudes of students towards AET, as offered by the formal educational sectors at high school (Gade 10, 11, and 12) in South Africa.

4.2   Purpose

The primary purpose of the study was to determine the attitude of students in formal educational sectors, at high school Levels 2-4 (Grade 10, 11, and 12), towards AET in the context of their interest in the subject, their attitude towards jobs in the agriculture sector and the implementation of sessions that are in the system. The question that was used to guide the study was: What is the attitude of the agricultural science students towards AET in the formal educational sector at high school level?

4.3   Methodology

4.3.1   Source of Data and Sampling Design

The study area, KwaZulu-Natal Province, is one of the nine provinces of South Africa. The province is located in the eastern part of South Africa. Agriculture is a significant economic activity in the province, ranging from homestead and smallholder farming for home consumption, to large-scale, capital-intensive and market-orientated production. Out of the total population, a sample comprising of 375 agricultural science students was selected from 10 schools (Johnson and Christensen, 2012).

In South Africa there are a number of agricultural high schools that specialize in providing agricultural science modules as a main part of their curriculum. These dedicated Agricultural Schools are established specifically to teach Agricultural Science within the context of the normal high school curriculum. Several rural and urban high schools also offer agricultural science subjects. The study refers to them as Urban Agricultural High Schools (UAS) and Rural Agricultural Schools (RAS), which are regular public high schools that offer agricultural science subjects as a part of the standard high school curriculum; although not all students in these schools take agricultural science. Based on this reality, 10 high schools offering agricultural science, including four RAS, four UAS and two DAS were selected.

A Nested Concurrent Mixed Sampling Design (NCMSD) was used in this study. The quantitative and qualitative data were collected almost at the identical occasion (i.e. concurrently), but the qualitative sample was employed as a subset of the quantitative sample (that is, nested relation) (Johnson and Christensen, 2012). A multi-stage random and purposeful sampling procedure were implemented to select the 375 students from the total of 69 552 students studying agriculture at high school. The data were collected in the presence of the researcher. The sample students were registered for study Agricultural Science in Grades 10-12 during the 2012 academic year. The response rate of this sample was 97%.

4.3.2   Data Collection and Analysis

This study was carried out in two stages, using qualitative and quantitative data collection methodologies. Both qualitative and quantitative data were collected from the 375 respondents at the selected high schools.

Quantitative data were collected using a pre-tested structured interview schedule. For the collection of quantitative data, a structured interview schedule was prepared. Pre-testing of the structured interview schedule was performed before data collection, as a preliminary study, in order to check its validity and consistency and to make refinements. The questioner used structured and unstructured questions in line with the objective of the study.

The supplementary qualitative information was collected from the same agricultural science students, while qualitative data were collected from both categories of respondents, using an open ended questionnaire, observation and interviews.

The quantitative data was analysed using descriptive statistics, such as percentage and chi-square. The survey data were analysed using the SPSS v19 statistical software computer package (Bryman and Cramer, 2012). The qualitative data were coded, described and interpreted to supplement the quantitative data. The qualitative data was analysed using a spiral content analysis (Grbich, 2012).

4.3.3 Attitude Measurement

Attitude was defined in this study as the degree of positive or negative feeling of students towards AET. Student's attitude towards AET was measured through surveys structured questionnaires, using Likert scales. Attitude scales for this study attempted to determine what an individual student believes, perceives or feels towards the attitudinal objects. Attitudes can be measured towards self, others and a variety of other activities, institutions and situations. This scale was selected due to its strength, simplicity and ease of administration (Neuman, 2000).

Attitudes were measured by adding the total scores obtained for the attitude statements. This was done by attributing 5-score for 'strongly agree', the 4-score for 'agree', the 3-score for 'undecided', the 2-score for 'disagree' and the 1-score for 'strongly disagree' responses in the case of positive items. In the case of negative statements the scoring pattern was reversed. The scale, covering eight Statements, were developed after being reviewed by a panel of experts and pre-tested for relevance before the actual data collection. Pre-testing was done using Cronbach's Alpha. Out of, the ten attitude statements, the Corrected Item-Total Correlation scoring less than 0.40 was excluded from

the survey (Gliem and Gliem, 2003). Based on these analyses, eight items were identified and were used in the survey.

The total scores were calculated by adding the individual scores that each respondent obtained for all statements. For pooled data the total scores of attitude varied from 8 to 40. For the descriptive analysis three categories were employed: Low (8-18), Medium (19-29), and High (30-40). For the grouped data category, Low is equal to the number of attitude statements in that group and High is equal to the number of attitude statements times five (5), which is the highest score on the Likert Scale. Low, Medium and High were calculated by dividing the gap between High and Low by three and grouping accordingly. This study used four groups each, with two statements resulting in the following categorization: Low (2-4), Medium (5-7) and High (8-10). The Cronbach's alpha reliability coefficient was 0.8. This shows that the scale has good internal consistency of the items in the scale (George and Mallery, 2003).

The standardized Cronbach's alpha has been defined by (George and Mallery, 2003):-

$$\alpha_{s\tan dardized} = \frac{K\,\bar{r}}{\left(1+(K-1)\,\bar{r}\right)}$$

Where

$K=$ is the number of components (K-*items*),

$\bar{r}=$ the mean of the $K\,(K-1)\,/\,2$.

α=alpha is a coefficient of reliability

4.4   Results and Discussion

4.4.1   Descriptive Analysis of Survey Data

The survey was conducted, using the total sample number of 375 agricultural science high school students.

Demographics

The sample population consisted of 70.7% (265) males and 29.3% (110) females. 80.0% (193) were African, 18.2% (68) were White, 0.81% (3) were Coloured and 0.27% were Indian. In terms of gender, the racial background of the selected male students population comprised 72.8% (193) African, 26.0% (69) White, 0.8% (2) Coloured and 0.4% (1) Indian. The female population was 99.1% (109) African and 0.9% (1) Coloured.

Access to Fields for Practicals

Sixty eight present (253) of the students had access to practical fieldwork; 32% (122) had no access.

Family Monthly Income

The majority (about 60%) of the students had a family income of between R 500-5,000 per month, with the following further breakdown:

- 47.2% (177) had family incomes from R500 - R2,000;

- 13.1% (49) fell between R2,000 - R5,000;

- 13.9% (52) ranged between R5,000 - R1,0000; and

- 25.9% (97) had a family monthly income in excess of R10,000.

Family Farm Land

Fifty seven present (214) of the sample students' families had no farming land from which the majority (83.6%) of these were African, 15.9% were White, and the remaining 0.5% were Coloured. Conversely, 42.9% (161) of the students out of the total sample population have access to farming land. From those who own or have access to land, the majority (76.4%) (123) of these were African, 21.74% (35) were White, 1.24% (2) were Coloured and 0.62% (1) were Indian.

Extracurricular Discussions about Agriculture

79% of the respondents had discussions with others about agricultural science and education, including its future prospects.

Parental Care

The study found that:

- 36% (133) of the students were receiving care from both their parents (mother and father);

- 40% (148) were in the care of their mothers only;

- 8% (31) indicated that they were receiving basic care only from their fathers; and

- 17% (63) have no parental care, but were cared for by extended family members, in most cases from grandmothers.

4.4.2 Attitude of Students towards Farming and Studying Agricultural Sciences

Table 4.1 presents the summary of the respondents' attitudes towards farming and studying Agricultural Science at high school. The results indicate that 6.4% (24), 7.7% (29) and 12.3% (46) of the students strongly disagreed, disagreed and undecided, respectively, regarding the statement, "I love farming". On the other hand, out of the total sample of students, 37.1% (139) and 36.5% (137) of the students agreed and strongly agreed, respectively, to the statement, "I love farming". Out of the total sample population, about 73.6% (276) of the students positively agreed with the statement, "I love farming", which is significant at $P \leq 0.001$ level, when compared to the percentage (14.1%) of the respondents who unfavourably agreed with the attitude statement. Based on the above statistical implication, the majority of the students have a favourable attitude towards farming, which is in agreement with the findings of Shenaifi (2013).

As can be seen from the results presented in Table 4.1, 4.3% (16), 4.5% (17) and 9.6% (36) strongly disagreed, disagreed or were undecided, respectively, regarding the statement, "I love studying agricultural sciences". However, a far higher percentage (81.6%) of the respondents had a positive perception of this statement. It was found to be highly significant at $P \leq 0.001$ levels (Table 4.1). There was a favourable positive attitude of students towards farming and studying Agricultural Science at secondary school.

Table 4.1: The attitude of High School Agricultural Science students towards AET (n = 375)

Items		SD	DI	UND	AG	SA	Attitude Total	χ^2
Attitude of students towards farming and studying agricultural sciences								
I love farming	f	24	29	46	139	137	375	179.3***
	%	6.4	7.7	12.3	37.1	36.5	100	
I love studying agricultural science	f	16	17	36	149	160	375	275.1***
	%	4.3	4.5	9.6	38.9	42.7	100	
Attitude of students towards secondary school AET knowledge importance								
High school agricultural education is important in order to acquire knowledge of agricultural science	f	8	10	7	141	209	375	75.3***
	%	2.1	2.7	1.9	37.6	55.7	100	
								524.4***
The agriculture I am currently studying at high school is not helpful for my future carrier	f	19	43	48	100	165	375	
	%	5.1	11.5	12.8	26.7	44.0	100	
Student attitude towards AET session								
I do not like the agricultural sessions	f	13	18	24	145	175	375	327.9***
	%	3.5	4.8	6.4	38.7	46.7	100	
Practical lessons in agriculture are important in order to understand the content of subject	f	7	9	14	113	232	375	517.3***
	%	1.9	2.4	3.7	30.1	61.9	100	
Students' attitude towards AET career prospects								
I plan to apply the agricultural knowledge I am learning to my future career	f	16	28	64	137	130	375	169.1***
	%	4.3	7.5	17.1	36.5	34.7	100	
Studying agriculture is important to secure a public/government job	f	22	31	42	168	112	375	
	%	5.9	8.3	11.2	44.8	29.9	100	211.4***

SD: strongly agree; DI: Disagree; UND: Undecided; AG: Agreed; and SA: Strongly Agreed. *** significant at P ≤ 0.001.

Similar results have been observed in the earlier studies that were conducted by Dyer *et al*. (1996) and Onuekwusi and Ijeoma (2008). This indicates that students have a positive attitude towards farming and agriculture. The data also clearly indicated that taking high school Agriculture Science as a subject of choice has given students a positive attitude towards farming.

This finding was in agreement with the results reported by Dyer *et al*. (1996). This described students' positive attitude towards the field of Agricultural Science and could possibly indicate that their interest in Agricultural Science could contribute positively towards their future academic achievement and success in their area of study.

Table 4.2 presents the summary of attitude of students toward AET, which was categorised into Low, Medium and High attitude levels. There was a significant (P ≤ 0.001)

difference between percentages of respondents in each attitude category (i.e. low, medium and high) for all three different school types (Table 4.2).

Table 4.2: Comparison of the attitude of students in dedicated, urban and rural Agricultural Science schools towards farming and studying AET (n = 375)

Category	Dedicated schools		Urban schools		Rural school		Total		χ^2 (between schools)
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	
Low	24.0	19.2	1.0	0.8	3.0	2.4	28.0	7.5	
Medium	37.0	29.6	18.0	14.4	25.0	20.0	80.0	21.3	5.9^{ns}
High	64.0	51.2	106.0	84.8	97.0	77.6	267.0	71.2	
Total	125.0	100.0	125.0	100.0	125.0	100.0	375.0	100.0	
χ^2 (between categories)	20.0***		152.5***		116.0***				

***significant at P $\leq$ 0.001

Regarding the comparison of percentages of students between the three different schools, 64 (51.2%), 106 (84.8%) and 97 (77.6%) of dedicated, urban and rural high school Agricultural Science students have a highly favourable attitude towards farming and studying AET, respectively (Table 4.2). The attitude of students in the urban schools was slightly higher, when compared to the attitude of respondents in dedicated and rural schools. However, there was no significant difference between the attitude of students towards farming and studying AET between dedicated, urban and rural agricultural schools. The attitude of students in the urban schools was favourably higher when compared to the attitude of respondents in dedicated and rural schools which was in the high attitude level.

4.4.3 Attitude of Students towards Secondary School AET Knowledge Importance

Table 4.1 also displays the attitude of high school Agricultural Science students towards the importance of high school AET knowledge. The result indicates that only 2.1% (8), 2.7% (10) and 1.9% (7) of the student population strongly disagreed, disagreed or were undecided, respectively, towards the attitude statement, "High school agricultural education is important in order to acquire knowledge of agriculture sciences". By contrast, 93.3% (350) of the total student population agreed with the statement that explains the

importance of high school agriculture in acquiring knowledge of Agricultural Science. The percentage of the sample student population, who showed either an unfavourable attitude or remained undecided regarding the statement, was found to be significantly ($P \leq 0.001$) lower, when compared to those who showed a favourable perception towards the statement.

The total attitude scores for the two statements, "high school agricultural education is important in order to acquire knowledge of agricultural science" and "their future career /job prospects", was statistically analysed and presented in Table 4.3. Supporting the frequency distribution data presented earlier in this section, the response in terms of the positive attitude categories low, medium and high levels have significant $P \leq 0.001$ differences between the Agricultural Science student's response towards high school AET knowledge importance and their future career prospects.

62.4%, 72.0%, and 78.4% of dedicated, urban and rural high school agricultural students have favourable high attitude towards AET knowledge importance and its limitation for their future career prospects in Table 4.3. Rural agricultural school students have slightly higher attitude than urban and dedicated agricultural high school students. 34.4%, 27.2% and 21.6% of dedicated, urban and rural agricultural schools students have a favourable medium attitude towards AET knowledge importance, and its limitation for their future career prospects (Table 4.3). These results indicate that some sort of awareness creation and information sharing platform should be created between students and knowledgeable people about the importance of AET and future career opportunities. Talbert and Larke (1995) elaborated that most students were less likely to see opportunities for themselves in agricultural careers or to perceive agriculture as diverse, which is in agreement with the current study.

Table 4.3: The attitude of students in secondary schools towards High School AET knowledge importance (n = 375)

Category	Dedicated schools		Urban Schools		Rural school		Total		χ^2 (between categories)
	f	%	f	%	f	%	f	%	
Low	4.0	3.2	1.0	0.8	0.0	0.0	5	1.3	
Medium	43.0	34.4	34.0	27.2	27.0	21.6	104.0	27.7	
High	78.0	62.4	90.0	72.0	98.0	78.4	266.0	70.9	3.8^{ns}
	125.0	100.0	125.0	100.0	125.0	100.	375.0	100.0	
Total						0			
χ^2 (between categories)	65.8^{***}		97.2^{***}		40.3^{***}				

***significant at $P \leq 0.001$.

4.4.4 Student Attitude towards AET Session

The percentage data presented in Table 4.1 shows that 3.5% (13), 4.8% (18) and 6.4% (24) of the respondents strongly disagreed, disagreed or were undecided, respectively, to the statement, "I do not like the agricultural sessions". The majority of the students (85.4%) (320) either agreed or strongly agreed with this statement, which was found to be significant at $P \leq 0.001$ level. Furthermore, 92% (345) of the students agreed with the attitude statement, "Practical lessons in agriculture are important, in order to understand the content of the subject".

The categorised attitude score result presented in Table 4.4 shows that there was a significant ($P \leq 0.05$) difference observed between the attitude of dedicated, urban and rural agricultural school students attitude towards the statement that states practical lessons in agriculture are important in order to understand the content of subject and I do not like the agricultural sessions. Also, there is significant ($P \leq 0.001$) difference between the low, medium and high response categories of Agricultural Science students. This is in agreement with the results obtained by Onuekwusi and Ijeoma (2008). The quantitative and qualitative data confirmed that the lack of practical sessions to implement an applied science in the teaching learning process could determine the attitude of students towards agricultural science sessions.

On the other hand, 63.2%, 95.2% and 96.0% of dedicated, urban and rural high school agricultural students have favourable high attitude towards the importance of practical lesson and agricultural session's Table 4.4. This indicates that Agricultural Science students in rural and urban high schools have a slightly high favourable attitude towards the importance of practical lessons and an aversion to the existing agricultural science sessions, compared to the dedicated agricultural science high school students. This clearly shows that students need a balanced delivery of theory and practice in agricultural sciences. The practical implication of this finding is that the schools should consider agricultural science practicals during the delivery of the subject. This is in agreement with the qualitative results of this study. In the study area, except in the dedicated agricultural schools, the students in most rural and urban agricultural schools claimed the importance of practical lessons, laboratory work and libraries to reinforce the theory learned. Furthermore, the majority of agricultural schools in the study area that are currently offering Agricultural Sciences have a shortage of laboratories, libraries and fieldwork for use in practical education.

Table 4.4: The attitude of students in dedicated, urban and rural agricultural science secondary schools towards the importance of practical lessons sessions (350)

Category	Dedicated schools		Urban schools		Rural school		Total		χ^2 (between schools)
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	
Low	4.0	3.2	0.0	0.0	0.0	0.0	4.0	1.1	
Medium	42.0	33.6	6.0	4.8	5	4.0	53.0	14.1	9.0[*]
High	79.0	63.2	119.0	95.2	120.0	96.0	318.0	84.8	
Total	125.0	100.0	125.0	100.0	125.0	100.0	375.0	100.0	
χ^2 (between categories)	67.5[***]		102.2[***]		105.8[***]				

[*], [***] significant at P ≤ 0.05 or P ≤ 0.001.

Agricultural education is an applied science in which the acquisition of skills is very crucial (McGrath, 2012; McGrath and Akoojee, 2009). It is especially important to follow a pragmatic policy of presentation of theory, mixed with actual field practice. Logan and Skamp (2008) and Hedjazi and Omidi's (2008) found that in the teaching and learning process, the educators' instruction approach and the classroom environment have an effect on the students' attitude and interest in lessons. Also, the majority of students dislike excessive note copying. In the school environment, the absence of student-centred practical work, fewer opportunities for independent exploration, and implemented pedagogy in the classroom environment of secondary schools could have an important effect on the attitude of students towards the subject they are learning. Education should not centre on listing facts and depending on theoretical teaching, but should help students to become critical and capable of exploring, judging and using information for real and powerful purposes through practical education. The method of instruction is one of the contributing factors for agricultural science student's future achievements in the area and the created perception towards agriculture. Therefore, improving access to teaching infrastructure and support should facilitate and significantly strengthen teaching and improve student learning by changing the students' perception towards agricultural science sessions (Motala *et al.*, 2007).

4.4.5 Students' Attitude towards AET Career Prospects

The results presented in Table 4.1 indicated that 4.3% (16), 7.5% (28) and 17.1% (64) of the students strongly disagreed, disagreed or were undecided, respectively, towards the attitude statement, "I plan to apply the agricultural knowledge I am learning to my

future career". However, 71.2% (267) of the students were found to either agree or strongly agree with the statement. The difference was found to be significant at P ≤ 0.001 levels, when compared to the total percentage of the respondents (11.8%) who disagreed with this attitude statement (see Table 4.1).

Fourteen-point-two present (53) of the students gave unfavourable responses to the statement, "Studying agriculture is important to secure a public/government job", while 11.2% (42) of the respondents remained undecided towards this statement. Conversely, 44.8% (168) and 29.9% (112) of the students agreed and strongly agreed with the statement, indicating that 74.7% (280) of the students were positive about the importance of studying agriculture to secure a future public/government job.

In terms of attitude score, as shown in Table 4.5, 49.6%, 72.0% and 73.6% of dedicated, urban and rural high school agricultural science students have highly favourable attitude towards agricultural knowledge applicability in their future career prospects to secure a public/government job. A slightly lower percentage of dedicated agricultural high school students have highly favourable attitude towards agricultural knowledge applicability in their future career prospects to secure a public/government job, than rural and urban agricultural high school students. The rural and urban agricultural science high school students have a plan to apply the agricultural knowledge in their future career and they are targeting public/government jobs. This indicates that agricultural science students at rural and urban high schools lack agricultural entrepreneurial perspective except public/government jobs.

As presented in Table 4.5, there was a significant (P ≤ 0.001) difference observed between the attitude of dedicated, urban and rural agricultural school students perception towards agricultural knowledge applicability in their future career prospects to secure a public/government job. Also, there is significant (P ≤ 0.001) difference between the agricultural science students low, medium and high response categories. These indicate that agricultural science students have favourable but different perception based on the school type.

The majority of Agricultural Science students indicated that they were concern regarding agricultural career and jobs prospectus. They indicated that having a private farm and commercial agriculture enterprise would be unthinkable, due to the vast resources required to operate. They indicated that government job opportunity would be their

expected career choices. This is in agreement with the quantitative data presented in this section. The Agricultural Science students during qualitative data collection also indicated that, in most cases their families are not involved in farming, even at small-scale levels of production. It was also observed that in the study area, the rural communities that surround the respective agricultural schools are not practising agriculture well or even considering small backyard gardening to produce vegetables for personal consumption. The reason for this was attributed to the fact that society in the study area considers that undertaking agriculture at that level shows the low economic status of a person. Parents know about agriculture and AET could influence the attitude of agricultural science students towards agriculture and an agricultural career (Udoukpong *et al.,* 2012).

Those students studying agricultural science at high schools that are located around large-scale commercial farms responded that they have difficulty in seeing the future prospects of studying agriculture as a career opportunity. This could, in turn, be due to the fact that their parents were working on the farm as farm labourers and these students seem to consider other options for further study, other than agriculture. Most of the interviewed students indicated that they were studying agricultural education in order to work in any governmental or public organization with a reasonable salary. This implies that the respondents had a very low awareness of the existing opportunities to become entrepreneurs in one of many aspects in the agricultural sector.

Table 4.5: The attitude of secondary schools students towards agricultural knowledge applicability in their future career prospects to secure a public/government job (n = 375)

Category	School								χ^2 (between schools)
	Dedicated		Urban		Rural		Total		
	f	*%*	*f*	*%*	*f*	*%*	*f*	*%*	
Low	18.0	14.4	0.0	0.0	3.0	2.4	21.0	5.6	
Medium	45.0	36.0	35.0	28.0	30.0	24.0	110.0	29.3	20.2***
High	62.0	49.6	90.0	72.0	92.0	73.6	244.0	65.1	
Total	125.0	100.0	125.0	100.0	125.0	100.0	375.0	100.0	
χ^{2-} (between categories)	23.6***		24.2***		100.0***				

*** significant at $P \le 0.05$ or $P \le 0.001$

Generally, the attitude of students towards the importance of AET in securing future government career/job prospects was favourable. This is consistent with the results obtained by Osborne and Dyer (2000), in which students displayed positive attitudes

towards careers in agriculture in a public/government job. However, the respondents in this study were not planning to use their knowledge acquired in agriculture for private job creation and entrepreneur in the agriculture sector. This could be one of the reasons why, on the African continent, there are limited well-qualified, skilful agricultural specialists involved in farming businesses.

4.4.6 Student Attitude towards AET Using Pooled Data

Table 4.6 presents the statistical summary of the attitude score of student's attitudes towards AET. The results show that the majority of students' attitude scale was fall in the high attitude category. 82.4% (103), 63.2% (79) and 84% (105) of dedicated, urban and rural schools have favourable high attitude towards AET. As shown in Table 4.6, there was a significant ($P \leq 0.001$) difference observed between dedicated, urban and rural agricultural schools students' perception towards AET. Also, there is significant ($P \leq 0.001$) difference between agricultural science students low, medium and high response category. The result is in agreement with the results reported by Dyer *et al.* (1996).

The perception variances among dedicated, urban and rural agricultural science student regarding AET are significant ($P \leq 0.001$). The data shows that all agricultural science students have favourable high attitude towards AET, but there is an observed attitude difference between dedicated, rural and urban agricultural science school.

As shown in Table 4.6, 16.8% (21), 33.6% (42) and 13.6% (17) of dedicated, urban and rural schools have favourable medium attitude towards Agricultural Education and Training. Slightly higher percentage of urban agricultural science school students have favourable medium attitude towards AET compared to dedicate and rural agricultural schools students.

Table 4.6: Comparison of the attitude of students in dedicated, urban and rural agricultural science schools towards AET using pooled data

School		Low	medium	High	Total	χ^2 (between schools)
				Attitude		
Dedicated agricultural	f	1.0	21.0	103.0	125.0	
	%	0.8	16.8	82.4	100.0	
Urban schools	f	4.0	42.0	79.0	125.0	
	%	3.2	33.6	63.2	100.0	
Rural schools	f	3.0	17.0	105.0	125.0	19.7[***]
	%	2.4	13.6	84.0	100.0	
Total	f	8.0	80.0	287.0	375.0	
	%	2.1	21.3	76.5	100.0	
χ^2 (between categories)		335.7[***]				

[***] significant at $P \leq 0.001$

The urban agricultural high schools need to make more effort to shift the attitude of students from medium to high attitude category. Otherwise, the significantly higher percentage of students in rural and dedicated schools falls in the favourable high attitude category. This is in agreement with (Shenaifi, 2013; Dlamini, 1997). Looking at the overall respondent's population highly significant frequency of students is in favourable high attitude category.

4.5   Conclusion

The vast majority (90%) of the respondents had a positive perception of high school AET, indicating that AET is important in order to acquire the knowledge of agricultural sciences. Moreover, the study identified that practical agricultural sessions are highly recommended, in order to understand the content of the subject acquired during classroom lectures and interactive discussion sessions. However, the majority of the students indicated that they are studying agriculture to work in government and are not for private employment. The results show that the students seemed not to have sufficient awareness of the link between knowledge in agricultural disciplines and the possible opportunities in agricultural production or processing as private job creation or entrepreneurship. Similarly, above 80% of the students indicated that they love studying agriculture sciences as a subject, but 85% also indicated that they have an aversion to the school agriculture sessions. Except for the students in dedicated agricultural schools, most of the students in rural and urban schools offering agriculture science suggested that practical agricultural

lessons, laboratories and libraries are vital as a good link between theory and practice. Hence, students seemed to have a strong interest in combining practices with more theoretical lectures in the classrooms. The majority of students have a positive perception of the overall importance of agriculture sciences, although they do have some problems regarding accessibility and a practical implementation of the knowledge acquired. In summary, the data shows that agricultural science students generally have a favourable attitude towards AET, but there is an observed attitude difference between dedicated, rural and urban agricultural science schools and there is generally an unfavourable perception towards private job creation in agriculture.

4.6   Recommendations

It is recommended that agricultural business-related entrepreneurship concepts be introduced into the high school agricultural science curriculum, to create awareness in learners of the potential of agriculture for job creation. There is a clear need to establish and appropriately resource libraries, laboratories and land for practical lessons in agricultural science in high schools. Further research is recommended, to identify factors that could affect the attitude of learners towards agricultural education.

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CHAPTER FIVE

FACTORS INFLUENCING HIGH SCHOOL AGRICULTURAL SCIENCE STUDENT ATTITUDES TO AGRICULTURAL EDUCATIONAL TRAINING: KWAZULU-NATAL, SOUTH AFRICA

Abstract

Positive and negative factors influencing high school student attitudes towards Agricultural Education and Training (AET) were identified, in order to improve agricultural education policy, resource allocation and curriculum design, which will result skilled agricultural manpower. The sample population of 375 pupils from selected high schools used a nested, concurrent, mixed sampling research design and both structured and unstructured questionnaires were administered. Racial background, family size, family access to farmland and AET discussions with others, had a positive and significant effect on student AET attitudes. A negative and significant effect on student AET attitudes was noted in students with a family monthly income of between R500-R5000 and those with mothers who had completed high schools. Responsible parties are encouraged to create farmland access and other income-generating, agribusiness opportunities to improve monthly household incomes.

Key words: Attitude, Education, High School, South Africa, Student, Training

5.1 Introduction

Student attitudes towards AET have a significant effect on the students' school achievement. Identifying factors affecting the attitudes of agricultural science students could support Agricultural Education and Training (AET) and the provision of skilled manpower in developing countries. In global economies, sustainable agricultural development requires trained, skilled manpower for productive, profitable and sustainable

agricultural production, agro-processing, agricultural research and relevant policy formulation, to benefit all farming sectors (Acker, 1999; Alam 2009).

Growing populations and economies in the developing world require innovative food production and processing, ranging from smallholder farming for home consumption, to large-scale, capital-intensive, market-orientated production. Emerging agricultural economies, are thus supported by effective education and training to promote job creation and alleviate poverty (Hamel, 2005). Trained manpower will support subsistence and commercial farming development (EADGDF, 2010). Globalization, unemployment and new subsistence farmer needs, agricultural knowledge and competent vocational skill to support emerging agricultural economy are components of AET (Usman and Pascal, 2009).

AET high school levels aim to provide background agricultural knowledge to learners, to prepare them for further studies in various agricultural science, engineering and technology disciplines (Vandenbosch, 2006). Agricultural sector development requires sufficient and available individuals to impart knowledge and skills across all disciplines, within broad agricultural fields (Rivera, 2006). Future student achievement and success in post-secondary agricultural science education depends on successful secondary school completion (Alam and Farid, 2011).

Both learner knowledge and attitudes have an effect on student behaviours (Wang *et al.*, 2010), because favourable student attitudes and determination could regulate success in agricultural sector development (Méndez, 2011; Talbert and Larke, 1995). Socio-economic factors, including parent education and income are indirectly related to student academic achievement and attitudes (Davis-Kean, 2005).

Agricultural careers in South Africa have a poor image among most youth and poor delivery at secondary schools resulted in high failure rates (DoA, 2005). Identifying factors influencing high school student attitudes to AET, therefore, will assist in planning and laying a foundation for AET promotion in South Africa and other developing countries. The identified factors could support and foster positive attitudes to agriculture and AET, contributing to improved social, economic and environmental conditions in South Africa (DOE, 2008).

Within this context, this study was designed to identify factors that could affect high school agricultural science student attitudes to AET, both in South Africa and other developing countries. Identifying factors will enable policy-makers and policy

implementers to improve and take appropriate action to provide the required manpower skilled in agricultural sciences.

5.2 Purpose and objectives

This study investigated what factors influence the attitude of high school students to AET. More specifically, the study sought to determine whether the identified factors would have a positive or negative effect on student attitudes.

Knowing and understanding what influences student attitudes to AET could assist AET planners and educators to develop and deliver AET programs to improve the image of agriculture as a career and encourage higher registration numbers at tertiary level in developing countries.

5.3 Research Methodology

5.3.1 Source of Data and Sampling Design

The study area, KwaZulu-Natal Province, is one of the nine provinces of South Africa. The province is located in the eastern part of South Africa. A Nested Concurrent Mixed Sampling Design (NCMSD) is used in this study (Johnson and Christensen, 2012). The quantitative and qualitative data were collected almost at the identical occasion (i.e. concurrently), but the qualitative sample was employed as a subset of the quantitative sample (that is, nested relation). A multi-stage, random, purposeful sampling procedure was implemented to select 375 students from the total of 69 552 agricultural science students registered in 2012. There was a 97% response rate from this sample.

5.3.2 Data collection and analysis

This study was carried out in two stages, using qualitative and quantitative data collection methodologies. The quantitative and qualitative data were collected almost at the identical occasion (i.e. concurrently), but the qualitative sample was employed as a subset of the quantitative sample (that is, nested relation). Quantitative data were collected using a pre-tested, structured interview schedule. For the collection of quantitative data, a structured interview schedule was prepared. Pre-testing of the structured interview

schedule was performed before actual data collection. The interviewer used structured and unstructured questions appropriate to the study objective. The supplementary qualitative information was collected from both categories of respondents, using an open-ended questionnaire, observation and interviews. The data were collected in the presence of the researcher.

The qualitative data were coded, described and interpreted, to supplement the quantitative data. The qualitative data was analysed, using a spiral content analysis. The quantitative data was analysed, using descriptive statistics, such as frequency, mean and the Tobit Model (Henningsen, 2011; Jöreskog, 2002; Niño-Zarazúa, 2012). A Censored Tobit Regression Model (CTRM) was used to look at the relationship between dependant and independent variables. CTRM statistical analysis, dependent variables are left and right censored (Jöreskog, 2002; Maguire and Marilyn, 2012; Niño-Zarazúa, 2012). The following CTRM general equation was employed in this study:

$$y_i^* = x_i^{'}\beta + \varepsilon_i$$

$$y_i = \begin{cases} a & if \ \ y_i^* \leq a \\ y_i^* & if \ \ a \prec y_i^* \prec a \\ b & if \ \ y_i^* \geq a \end{cases}$$

Where:

α- is the lower limit of the dependent variable

b- is the upper limit of the dependent variable

Yi*- is an observed ("latent") variable

β- is a vector of unknown parameters

εi- is a disturbance term

χi- is a vector of explanatory variable

is i=1,….,n (indicate the observation)

5.4   Definition of Variables

The magnitude and relationships between variables (dependant and independent) are investigated in this study.

5.4.1   Dependent Variables

5.4.1.1 Attitude Measurement

In this study, student AET attitudes are treated as the dependent variable. Attitude is the liking, or disliking of an object, based on what is known about it (Rameela, 2004), which is usually created due to direct exposure to the attitude's objects or ideas (Hossain *et al.,* 2010). For the purpose of this study, the focal dependent variable was the attitude of agricultural science students towards AET. Attitude is the degree of positive or negative student feelings towards AET (McIver and Carmines, 1981; Neuman, 2000).

Attitudes were measured by adding the total scores obtained for the attitude statements. A 5-score was attributed for' strongly agree', a 4-score for 'agree', a 3-score for 'undecided', a 2-score for 'disagree' and a 1-score for 'strongly disagree' responses, in the case of negative statements the scoring pattern was reversed. The scale covered various statements, which were developed after being reviewed by a panel of experts. Before the actual data collection, they were pre-tested for relevance.   Attitude statements and Corrected Item-Total Correlation less than 0.40 were excluded from the survey (Gliem and Gliem, 2003).

The scale was used with multi-item scales and summated rating scores (Gliem and Gliem, 2003; McIver and Carmines, 1981). Pre-testing was done using Cronbach's alpha. The standardized Cronbach's alpha can be calculated from the following equation:

$$\alpha_{\text{standardized}} = \frac{K\bar{r}}{(1 + (K-1)\bar{r})}$$

Where:

K= is the number of components (*K-items*),

$\bar{r}$ = the mean of the $K\,(K-1)\,/\,2$.

α=alpha is a coefficient of reliability

As shown in Table 5.1, the Cronbach's alpha reliability coefficient result was found to be 0.8. A high Cronbach's alpha, means that the reliability coefficient nearer to one indicates that there was good internal consistency of the items in the scale (Gliem and Gliem, 2003).

Table 5.1: Descriptive statistics of items used to assess the attitude of students towards farming and agricultural education in South Africa and Cronbach's alpha (n =375)

Variable	Mean	S.D.	Cronbach's Alpha if Item Deleted
1. I love farming	3.9	1.17	0.75
2. I love studying agriculture science	4.1	1.04	0.76
3. High school AET is important in order to acquire knowledge of agricultural science.	4.4	0.84	0.75
4. The agriculture I am currently studying at high school is not helpful for my future career.	4.5	0.76	0.76
5. I don't like the agriculture science sessions	4.2	1.00	0.77
6. Practical lessons in agriculture science are important with theoretical lesson	4.5	0.83	0.76
7. I plan to apply the agricultural knowledge I am learning to my future career.	3.9	1.09	0.74
8. Studying agriculture is important to secure a public/government job.	3.9	1.12	0.76
			Cronbach's alpha = 0.8

5.4.2 Independent Variables

The independent variables were selected based on evidence from past research, from published literature, as well as from discussion with experts. Based on these assessments, thirteen different independent variables were identified and listed for Relevancy Ratings. Relevancy coefficients of the independent variables were selected based on relevancy rating done by a panel of experts. For this procedure, the list of identified thirteen independent variables were subjected to rating in a four-point continuum; based on the relevancy coefficient, nine independent variables were selected. Those with relevancy coefficients below 50% were excluded from the list. The relevancy coefficients were calculated using the formula:

$$RC = \frac{OS}{PS} 100\%$$

Where:

RC = Relevancy coefficient

OS = Obtained score

PS = Potential score

The selected independent variables include:

Language: the home language of the students. These are: IsiZulu (1), English (2), Sesotho (3), Afrikaans (4), and Xhosa (5). The variable was discrete and expected to have a positive influence on the dependent variable; and Family Education, referred to the level of formal education of student families (father and mother). These are: No formal education (1); Grade1-9 (2); Grade 10-12 (3); Diploma (4); and Degree (5). The variable was expected to have a positive influence on the dependant variables and was measured as a discrete variable; Racial background referred to student racial backgrounds. The sample was measured as: (1) African, (2) White, (3) Coloured and (4) Indian. Racial background was expected to influence the dependent variable positively and was measured as a discrete variable; Field for practical lessons, referred to the availability of a field for practical education in the school. This variable was discrete and expected to have a positive influence on the dependent variable; Family access to land, referred to student parent accessibility to farmland. This variable is discrete and expected to have a positive influence on the dependent variable; Family size was measured as: number of people living with the student. This variable is continuous and expected to have a positive influence on the dependent variable; Family income referred to student family income earnings in a month. The sample was measured as: R 500-2,000 (1), R 2,000-5,000 (2), R 5,000-10,000 and (3), Above R 10,000. Family monthly income was expected to positively influence the dependant variables. Family monthly income was a discrete variable; Discussion about agriculture was operationally defined as the degree to which the respondent engaged in discussion with informed people about the prospects and opportunities in agricultural education training. This was measured as: exposure or lack of exposure to informed people and or information and opportunities in agriculture and agricultural educational training. This variable was expected to have a positive influence on the dependent variable and was

discrete; Cosmopolitan attitudes referred to the degree of exposure or intention of the respondents towards social systems outside their own to which they belong (Kaske, 2007). This was measured as: number or lack of visits to agricultural related activities.

5.5   Multicollinearity

This is the examination of existing relationships among the independent variables. Multicollinearity exists if the two independent variables are closely related. This makes it difficult for the model to determine which variables have the most influence on the dependent variable (Walker and Maddan, 2008). VIF (variance inflation factor) was used for testing the association among the hypothesized continuous variables. The VIF and tolerance value greater than 10 and 1 are known to have multicollinearity problems among the independent variables (Hamilton, 2009). The VIF (variance inflation factor) was worked out, using the formula:

$$\text{VIF } (x_i) = \frac{1}{1 - R_i^2}$$

Where, R_i^2 was the squared multiple correlation coefficient between X_i and the other explanatory variables (Maddala, 1992). To test the multicollinearity problem among discrete, as well as dummy variables, contingency coefficient tests were also conducted. The contingency coefficient test results were greater than 0.75, indicating the existence of multicollinearity problems between the independent variables. The contingency coefficients were calculated using the formula:

$$\text{C.C} = \sqrt{\frac{\chi^2}{n + \chi^2}}$$

Where: C.C = Contingence coefficient, n= sample size, χ^2 =Chi square value (Healy, 1984 as cited in Mesfin, 2005). However, the analysed results indicated that there was no multicollinearity problem among the explanatory variables (Appendix 1 and 2). Hence, all the hypothesized variables were acceptable; and were included of the analysis in the Tobit Regression Model.

5.6   Results and Discussion

5.6.1   Descriptive Analysis of Survey Data

The respondent population consists of 70.7% (265) male students and 29.3% (110) female students. With regard to the racial background of students, it was revealed that there was a majority of 80.5% (302) African, 18.4% (69) White, 0.8% (3) Coloured and 0.3% (1) Indian (Table 5.2). With regard to Student access to a practical, scientific, agricultural field, sixty-eight 68% (253) and 32% (122) indicated that they had no access to a practical, scientific, agricultural field in their respective schools.

With regard to Student family monthly income, 47.2% (177) of the total respondent population in the income category ranged of R500 to R2,000; 13.1% (49) fell between R2,000 and R5,000; 13.9% (52) ranged between R5,000 and R10,000; and 25.9% (97) had an income greater than R10,000. The majority (60%) of the student family monthly incomes were categorised in the range varying from R500-R5,000. The difference is significant at $P \leq 0.001$ level (Table 5.2).

Exposure of learners to farming could depend on whether student families own farm land or not, which in turn, might affect student experience levels of, as well as student perceptions about, agriculture. In this study, the results show that the majority 57.1% (214) of student families had no access to farmland. Conversely, 42.9% (161) of student families from the total population have access to farmland. The difference is significant at $P \leq 0.05$ level.

Table 5.2: Definition of variables and their descriptive statistics (n = 375)

Variable definition	Symbol	Mean (Std)	χ^2
Female	SEX 1	0.707 (±0.456)	64.1[1]
Male	SEX 2	0.293 (±0.456)	
Racial Background (African)	RBG 1	0.805 (±0.396)	
Racial Background (African)	RBG 2	0.184 (±0.388)	648.7[1]
Racial Background (Coloured)	RBG 3	0.008 (±0.089)	
Racial Background (Indian)	RBG 4	0.003 (±0.052)	
Family Monthly income R 500-2,000	FMI 1	0.472 (±0.500)	
Family Monthly income R 2,000-5,000	FMI 2	0.131 (±0.337)	113.9[1]
Family Monthly income R 5,000-10,000	FMI 3	0.139 (±0.346)	
Family Monthly income R 5,000-10,000	FMI 4	0.259 (±0.438)	
Mother Educational (No formal education)	MEd 0	0.155 (±0.362)	126.4[1]
Mother Educational level (grade1-9)	MEd 1	0.408 (±0.492)	

Variable definition	Symbol	Mean (Std)	χ^2
Mother Educational level (grade10-12)	MEd 2	0.128 (±0.334)	
Mother Educational level (Diploma)	MEd 3	0.235 (±0.424)	
Mother Educational level (Degree)	MEd 4	0.075 (±0.263)	
Home language (isiZulu)	LAN 1	0.765 (±0.424)	
Home language (English)	LAN 2	0.205 (±0.405)	
Home language (Sisotho)	LAN 3	0.016 (±0.126)	802.9[1]
Home language (Afrikaans)	LAN 4	0.008 (±0.089)	
Home language (Xhosa)	LAN 5	0.005 (±0.073)	
Visit to other towns/Cosmoplitness (Yes)	TV 1	0.875 (±0.332)	137.4[1]
Visit to other towns/Cosmoplitness (No)	TV 2	0.125 (±0.332)	
Families access to farming land (Yes)	FATL1	0.429 (±0.496)	7.5[2]
Families access to farming land (No)	FATL2	0.571 (±0.496)	
Discuss with experienced people about AET (yes)	DAA 1	0.784 (±0.412)	120.9[1]
Discuss with experienced people about AET (No)	DAA 2	0.216 (±0.412)	
Field for practical learning (Yes)	FFPL 1	0.675 (±0.469)	45.7[1]
Field for practical learning (No)	FFPL 2	0.325 (±0.469)	
People live with in students living house	FS	5.747 (±2.766)	444.1[1]

Significant at: (1) = (P ≤ 0.01), and (2) = (P ≤ 0.05)

Student Mother Education showed that: 7.5% had no formal education, 15.5% had Grade1-9, 40.8% had Grade10-12, and 12.8% had diploma and 23.5% a degree. The difference is significant at P ≤ 0.001 level. The majority of the respondents 78.4% of the respondents had opportunities to engage in discussions with others concerning issues related to agricultural sciences and education, including its future prospects.

However, 21.6% of the respondents indicated they were not involved in any kind of discussions concerning future possible prospects available in any AET areas. The difference is significant at P ≤ 0.05 level. Student home language showed the majority were 76.5%, 20.5%, 1.6%, 0.8% and 0.5% isiZulu, English, Sisotho, Afrikaans and Xhosa, respectively. The difference is significant at P ≤ 0.001 level (Table 5.2).

5.6.2 Factors Affecting the Attitude of Students towards AET

Tables 5.3 display, the likelihood ratio, Chi-Square, of 81.58 (df = 19) with significance level of P ≤ 0.0001, indicates that the model as a whole fits well and was found to be better than an empty model (i.e. a model with no predictors), with a 95% confidence interval.

Table 5.3: Coefficients obtained as the result of Censored Tobit Regression Model using primary data (n = 375).

Items	Coefficients	Standard Error	t-value	P > t
RBG 1	9.709369	4.469749	2.17	0.030[1]
RBG 2	8.58487	4.412842	1.95	0.053[2]
RBG 3	11.11341	5.146346	2.16	0.031[1]
FMI 1	-1.23831	0.680277	-1.82	0.070[3]
FMI 2	-1.42600	0.828826	-1.72	0.086[3]
FMI 3	-0.96484	0.795492	-1.21	0.226
MEd 0	0.481143	0.951518	0.51	0.613
MEd 1	-1.19817	0.836571	-1.43	0.153
MEd 2	-1.99539	1.008190	-1.98	0.049[2]
MEd 3	-1.59190	1.002001	-1.59	0.113
FATL 1	0.88945	0.476325	1.87	0.063[3]
LAN 1	-1.91201	3.146790	-0.61	0.544
LAN 2	-3.49729	3.240145	-1.08	0.281
LAN 3	0.113699	3.611909	0.03	0.975
LAN 4	0.471938	4.091612	0.12	0.908
TV 1	-0.39794	0.701287	-0.57	0.571
FFPL 1	0.083182	0.523927	0.16	0.874
DAA 1	2.900388	0.557116	5.21	0.000[1]
FS	0.208083	0.088083	2.36	0.019[1]
Cons	24.78177	5.667923	4.37	0.000[1]

$P \leq 0.0001$	Log likelihood = -1083.6315		Chi-Square of 81.58 (19)	

Significant at: [1]= $(P \leq 0.01)$,, [2] = $(P \leq 0.05)$ and [3] = $(P \leq 0.1)$ probability level. [ns] = Not significant.

5.6.2.1 Racial Background

The estimated coefficient for racial background (RaBG) indicated a positive and significant relationship between student attitude and racial background, as expected. A one unit increase in racial background, such as African, White and Coloured, was associated with a 9.70, 8.58 and 11.11 unit increase in the predicted value of student attitudes to AET,

respectively (Table 5.3). This is consistent with the findings of Catsambis, (2006); Johnson et al., (2001); Catsambis (1994); Mickelson (1990); and Clewell and Anderson (1991). This indicates that the racial background of the students has a positive relationship on the attitudes of agricultural science student towards AET; and is significant at ($P \leq 0.01$) and ($P \leq 0.05$) probability levels, respectively (Table 5.3). African, White and Coloured agricultural science students have a positive but different level of attitude towards AET, at different significance levels. This shows that perception differences towards agricultural education and training can be observed across various ethnic and racial groups.

5.6.2.2 Access to land

Family access to farmland (Access TL) was found to be positive and is statistically significant at $p \leq 0.1$ probability levels, as expected (Table 5.3). This implies that students responding affirmatively to family access to farmland, have a positive and significant ($P \leq 0.01$) probability level AET attitude. A one-unit increase in student family access to farmland is associated with a 0.88 unit increase in the predicted value of student attitudes towards AET (Table 5.3). The reason for this could be that student family access to farmland, as well as exposure to and awareness of the practical farming realities could motivate them to seek future careers in this sector. This could motivate them to explore prospects, innovate and practice in agriculture. Family access to farmland could provide opportunities to implement their knowledge for the survival or development of family agricultural activities (Brkić *et al.*, 2002; Carreira *et al.,* 2004). This is in agreement with their responses during informal discussions. In South Africa, the existing unequal land distribution, joblessness and rural poverty coupled with efficient commercial agriculture is the reality (Lahiff and Cousins, 2005). Availability of family access to farmland has a significant effect on the attitudes of agricultural science student towards AET and agricultural science knowledge. Positive attitudes could be created due to student family access to farmland. Positive student attitudes motivate students to seek further knowledge in agriculture and may lead them to study agricultural sciences at a higher level of education. AET is a solution for existing unemployment, poverty, food insecurity and joblessness, by facilitating knowledge based on agricultural development. Therefore, student family access to farmland has been found to be a motivator for positive agricultural science student attitudes towards AET.

5.6.2.3 Discussion about Agriculture

Discussion about agriculture refers to student opportunities to discuss what they are learning in a wider context, including agriculture as a career choice. Discussion can be developed by initiating and engaging students in discussions related to various areas in agricultural science. The relationship between discussions about agriculture and student attitudes to AET was investigated and presented in Table 5.3. Student attitudes to AET may be dependent on the amount of student awareness about agriculture and its prospects. The results show that a one unit increase in involvement in discussions concerning agricultural science and its future educational and job prospects, was associated with a 2.9 unit increase in the predicted value of student attitudes to AET. Students who have opportunities and access to discussions about AET, job prospects and opportunities in agriculture, have positive attitudes to the agricultural sciences.

The effect is found to be positive and significant at $P \leq 0.01$ probability levels, as expected (Table 5.3). This result is found to be consistent with the findings of Israel *et al.*, (2001) and Kilpatrick, (2000). Student interactions and sharing of information with an experienced person, thus can assist students to develop a favourable disposition towards AET (Ayanda *et al.*, 2012). Greater awareness and engagement in discussions about agriculture result in improvements in student attitudes to AET. Sufficient discussions and information on job and career opportunities in agriculture could create positive student attitudes to AET. Agriculture is playing its major part in promoting economic development and is currently taking place worldwide, including the African continent. It is, therefore, evident that the development of the agriculture sector requires a competent skilled manpower, with a knowledge and awareness about the modern principles of agricultural science and technology.

5.6.2.4 Family education

A one-unit increase in the education of the student mothers who had completed high school, has a decreasing order by 1.99 units in the predicted value of student attitudes to AET. This trend was found to be negative and significant at $P \leq 0.05$ probability level (Table 5.3). Students, who have a mother with a high school education background, thus have a negative attitude to AET. A similar study by Schiefele (1999); Udoukpong *et al*

(2012) and Davis-Kean (2005) reported that parental beliefs and behaviours have a positive effect on student attitudes in school, their academic interests and performance.

This is because parental awareness and interest plays a major role in the activities students choose to pursue, both in and out of school. Parental attitudes to subjects in education have a significant effect on student achievement and attitudes (Hedjazi and Midi (2008). Mostly, positive or negative parental awareness of agricultural studies or agricultural sciences have an effect on student perceptions and attitudes. Parents may realistically guide their children towards future study and career choices. Parental guidance and other information sources concerning agriculture are responsible for student attitudes to school subjects. The emerging agricultural economy necessitates the provision skilled human resources in various fields of agriculture, to meet the increasing trends in modern agricultural technology applications in the industry. Hence, the findings of this study imply that effort is required to create awareness and improve the attitudes of both learners and parents towards agriculture as a field of studies and thereby prepare learners for emerging agriculture industry in the African continent or elsewhere worldwide.

5.6.2.5 Family Size

The results indicate that student attitudes to AET positively correlate with student family size (Table 5.3). A one unit increase in the number of people living in the student family is associated with a 0.20 unit increase in the predicted value of the student attitudes to AET. This trend was found to be significant at $P \leq 0.01$ probability level; the larger the family, the more positive the student is likely to be toward agriculture. When the family size increases, siblings are unlikely to receive equal shares of their parental resources, attention and perceptions of study areas (Booth and Kee, 2009). Therefore, large family size could be a possible source for the composition of diverse AET experiences and information, possibly creating opportunities to share AET experiences and information among family members. The larger the family, the more positive the student attitude is likely to be towards agriculture.

5.6.2.6 Family Monthly Income

The student family monthly-income between R500-5,000 also has a negative and significant effect on the student attitudes towards AET. The effect is significant at $P \leq 0.01$

probability level (Table 5.3). This shows that students from families with less than R5,000 as a monthly income have a negative attitude towards AET. A one unit increase in the family monthly income in the range of R500-2,000 and R2,000-5,000 is associated with a 1.23 and 1.42 unit decrease, respectively, in the predicted value of student attitudes to AET (Table 5.3). Family income has an effect on future student achievement by creating motives and developing positive attitudes to agricultural science studies. Davis-Kean (2005) and Acemoglu and Pischke (2001) explain an existing relationship between student achievement in studies and family income. As with any human aspiration, students aspire to a future attractive income. Student perceptions about future careers and other study area opportunities could depend on previous successes and the marketability of this study area. Students from low monthly-income families are more strongly guided by their parents to compensate for their financial conditions, by selecting a study area other than agriculture, which offer good job opportunities and better pay.

5.7 Conclusion and Recommendations

The results showed that family size, racial background and discussions with other people about AET have a positive and significant effect at P ≤ 0.01 probability level, respectively, and affect student attitudes towards AET. Furthermore, family access to farmland has a positive and significant P ≤ 0.1 level effect on the student attitudes towards AET. The students with high school, educated mothers and absence of family access to farmland have a negative and significant effect at P ≤ 0.05 probability level respectively, on student attitudes to AET. Also student family monthly-income between R500-5,000 has a negative and significant effect at P ≤ 0.01 probability level on student attitudes toward AET.

The results also showed that of nine independent variables in the model used to identify influences on agricultural science student attitudes to AET, at least six were found to be statistically significant, with the probability of influencing student attitudes to AET at high school. Family size, racial background, access to land and discussions about agriculture have a positive and significant effect on student attitudes to AET. Variables, such as family education and family monthly income, however, have a negative and significant influence on student attitudes to AET.

The findings suggest that the various bodies responsible for the governance of AET should create community and student agricultural awareness of its importance different innovative strategies. This could create community awareness of the importance of AET and its job prospects, considering both local and global contexts. It is also recommended that responsible parties should make every effort to create access to farmland and other income-generating sources for the community. This could be achieved through small agriculture-related, business projects that could support and facilitate resource sharing possibilities and awareness to improve monthly income of communities.

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CHAPTER SIX

THE ATTITUDE OF HIGH SCHOOL AGRICULTURAL SCIENCE TEACHERS TOWARDS AGRICULTURAL EDUCATION TRAINING, THE CASE OF KWAZULU-NATAL PROVINCE, SOUTH AFRICA

Abstract

The purpose of this study was to assess the attitude of agricultural education teachers' toward AET in the province of KwaZulu-Natal, South Africa. The reliability of the questionnaire was approved by calculating Cronbach's Alpha, which was found to be 0.73. The results indicated that about 91% of the secondary school agricultural science teachers had a highly positive attitude towards the variables, including teaching professions, further studies in Agricultural Sciences, Agricultural Science qualifications, their contribution to students achievement, models teacher character, job and entrepreneurial opportunities, agricultural career success and achievements, as well as AETs' contribution to future economic development. Seventy-four percent the respondents had high attitude towards the remaining variables, including teaching aids, availability laboratory, as well as field or farm for practice and support. The analysis of the pooled data displayed that 88% of teachers had high attitude towards AET. The qualifications of the teachers had a significant ($P \leq 0.01$) influence on the attitude of teachers towards the availability of infrastructure and support. This implied that the policy-makers, the Department of Education and Higher Education, should put in place a proper and sustainable mechanism to promote in-service agricultural science teachers training programs, to upgrade or train manpower specialising in any one of the relevant areas of agricultural sciences and technology. It was evident from the findings of this study that training agricultural science teachers for secondary school could have remarkable benefits for student success and could achieve the required levels of development in agricultural sectors.

Key words: Agricultural Education and Training, Teachers, Attitude, Secondary School, KwaZulu-Natal, South Africa

6.1   Introduction

The quality and availability of skilled manpower determine the sustainability of well-being of a community. Education is a means for ensuring the continuity of economic and social development in developed and developing countries. Specifically, to secure environmentally-friendly and sustainable agriculture sector development, Agricultural Education and Training should be able to make skilled manpower available in the market (Vandenbosch, 2006). This could assist the effort to maintain the required levels of agricultural development and could introduce innovative agricultural practices in Africa, as well as in South Africa.

AET provides required skilled manpower that could implement agriculture sector development strategies. Trained agricultural science manpower with the required levels of competencies could introduce innovative technologies, as well as build the capacity of farmers to use the technologies (Antholt, 1994; Watkins and Verma, 2008). The consistently growing demand for high agricultural productivity and the scarcity of natural resources needs a new agricultural science paradigm shift to improve the existing agricultural production, food processing and post-harvest sectors. AET is the source for the required manpower to introduce modern agriculture and technologies, such as genetics and agricultural biotechnology (Madan, 2005). To secure the future agricultural production demand and supply chain, it is important to invest in AET and research.

Teachers play a major part in preparing and producing well-trained professionals in various areas of agriculture (Bruner, 2009). To improve food self-sufficiency and to reduce unemployment, poverty, as well as rural urban migration, AET curricula and educational processes need continuous assessment and improvement. Teachers' attitudes towards AET need to be assessed to address the changing needs and new challenges in the demanding, fast-changing and developing economy (Kumar and Kashyap, 2012). Today, many governmental and non-governmental organizations are investing and increasing school participation (Bregman and Bryner, 2003). Wise educational problem-solving and decision-making, as well as the) effective usage of resources, needs research-based information.

Good teaching is defined as instruction that leads to an effective receiving of agricultural science knowledge, skills and values that a teacher has set out to communicate (Kumar and Kashyap, 2012). In the teaching and learning process, teachers are the major

role-players in shaping learner behavior for the future success and development of the agriculture sector. The role of teachers in secondary schools is the most important, when imparting a required level of agricultural science knowledge and skills to the students. Teaching is the process of guiding the interaction between students, teachers, subject matter and teaching infrastructure. The success of the agricultural science educational process depends on a character and skills of a teacher. Literature shows that levels of motivation and the attitude of teachers are important, as they directly affect the student's perception, knowledge and skill (Alam and Farid, 2011; Kumar and Kashyap, 2012). Effective curriculum delivery is dependent on the availability of quality teachers and the efforts they make, which ultimately might affect student achievement. Student achievement could also be influenced by the areas of the teachers' qualifications and experience (Sanders and Rivers, 1996).

Behavioural studies, including the attitude of teachers towards AET, are important to generate primary information directly from the educators (Grossman *et al*., 2007). This study emphasizes the importance of improving AET process by strengthening the capabilities of teaching and learning. This can only be achievable by generating the background information on the attitude and linkages that are useful for the effective delivery of AET curriculum at secondary schools, which was also recommended by (Spielman *et al*., 2008). In South Africa, the availability of empirical or primary data on the attitude of teachers towards AET is not available.

In this province the number of newly-opened agricultural secondary schools and the number of successful Grade 12 matriculation results, were found to be inversely related, with an increasing pattern in student dropout rates from AET (Chapter 2). This research is required to gather primary data directly from teachers who are currently actively engaged in teaching agricultural science subjects in secondary schools. Therefore, the main aim of this study is to evaluate the attitude of the secondary schools agricultural science teachers that are teaching in the province of KwaZulu-Natal, South Africa towards AET.

6.2   Research Methodology

6.2.1   Source of Data and Sampling Design

The study area, KwaZulu-Natal Province, is one of the nine provinces in South Africa. The province is located in the eastern part of South Africa. For this study, due to

the homogeneity and the nature of the sample, 180 high school agricultural science teachers were used. A multi-stage random purposeful sampling procedure was implemented to select the 180 agricultural science teachers. These teachers were selected from the teacher population that was activity involved in teaching Agricultural Science lessons during the 2012 academic year. The Nested Concurrent Mixed Sampling Design (NCMSD) was used in this study (Johnson and Christensen, 2012). The quantitative and qualitative data were collected almost at the identical occasion (i.e. concurrently), but the qualitative sample was employed as a subset of the quantitative sample (that is, nested relation). The data were collected in the presence of the researcher. The response rate of this sample was 97%.

6.2.2   Data Collection and analysis

The study was carried out in two stages, using qualitative and quantitative data collection methodologies. Quantitative data were collected using a pre-tested structured interview schedule. Qualitative data were collected from respondents, using an open-ended questionnaire, observation and interviews. The qualitative data was analysed using a spiral; content analysis. The quantitative data was analysed using descriptive statistics, such as percentage and chi- square. The survey data were analysed using the Stata Statistical Software computer package. Both primary and secondary data were gathered during the data collection from teachers engaging in teaching at different secondary schools in the province during the 2012 academic year.

6.2.3   Attitude Measurement

Attitude is used to understand and predict people's reactions to an object or change and how behavior can be influenced (Fishbein and Icek, 1975). Attitude is created due to the direct exposure to a given object or idea (Ahmed *et al*., 2012; Beyene and Tizazu, 2010). For the purpose of this study, the focus of this parameter was the attitude of educators towards AET. In this case, attitude is the degree of positive or negative feeling of teachers towards AET. Measuring teachers' attitudes towards AET was achieved largely

through structured survey questionnaire using Likert Scale. The Likert Scale was selected due to the real strength and simplicity of the scale (Neuman, 2000).

The attitude of a respondent was measured by adding the total scores obtained for the total item in the scale, by attributing 5-score for 'strongly agree', 4-score for 'agree', 3-score for 'undecided', 2-score for 'disagree' and 1-score for 'strongly disagree' responses in the case of positive items. In the case of negative statements the scoring pattern was reversed. Fourteen statements containing an equal number of favorable and unfavorable statements were prepared (Melver and Carmines, 1981). These were developed after they had been commented on by a panel of experts. Pre-testing was conducted before the actual data collection. This was carried out to look at the relevancy of the selected items. The relevancy test was conducted, using Cronbach's Alpha (Gliem and Gliem, 2003). As a rule of thumb, the items with the total correlation result less than 0.40, were excluded from the scale (Gliem and Gliem, 2003). The pre-testing of the structured interview was conducted before the actual data collection. Cronbach's Alpha was calculated to test and to look at the internal consistency, reliability for scale and sub-scales (Gliem and Gliem, 2003).

The standardized Cronbach's Alpha can be calculated from the following equation:

$$\alpha_{\text{standardized}} = \frac{K\bar{r}}{(1 + (K-1)\bar{r})}$$

Where:

K = is the number of components (K-*items*),

$\bar{r}$ = the mean of the K ($K-1$) / 2.

α = alpha is a coefficient of reliability

Based on the Cronbach's alpha values, ten items were identified, selected and further used in the final data analysis. The total Cronbach's alpha reliability coefficient result was found to be 0.73 (Table 6.1). A high Cronbach's alpha, which means that the reliability coefficient nearer to one indicates that there is good internal consistency of the items in the scale (Gliem and Gliem, 2003).

Table 6.1: The attitude of teachers' towards farming and studying AET (n = 180).

Attitude statements	Mean	Std. Deviation	Cronbach's Alpha if Item Deleted
1. I love teaching professions.	4.38	0.923	0.718
2. I want to pursue further studies in Agricultural Sciences.	4.49	0.822	0.709
3. Relevant qualifications are necessary to teach Agricultural science.	4.57	0.733	0.704
4. Agricultural training leads to better job and entrepreneurial opportunities.	4.61	0.735	0.709
5. Agricultural Education is important for career success and achievements	4.60	0.744	0.723
6. Agricultural Education is important for the future of the country.	4.23	1.354	0.706
7. Teaching aids, laboratory and field practice are important to teach	4.53	0.828	0.694
8. I am doing my best to change the student future in agricultural education	4.44	0.898	0.715
9. I am a responsible exemplar teacher for my agricultural education students.	4.38	0.741	0.688
10. Agricultural Educational and Training lacks relevant support from the responsible body for the batter achievement.	3.48	1.275	0.702

Cronbach's Alpha = 0.73

6.3   Results and Discussion

6.3.1   Descriptive Analysis of Survey Data

Based on the descriptive statistical analysis in Table 6.2, the respondents' population consisted of 56.7% (102) male teachers and 43.3% (78) female teachers. In terms of educators teaching experience, 26.1% (47), 26.7% (48), 23.9% (43), 12.2% (22), 8.9% (16) and 2.2% (4) of the educators had teaching experience in the ranges of 1-5, 6-10, 11-15, 16-20, 21-25, or >25 years, respectively. In terms of teachers' area of qualification or specialisation, 40% (72), 45% (81) and 15% (27) of the respondents population had qualification in agriculture, life science and social science, respectively. Forty percent (72) of the teachers replied that they had opportunities to participate in short-term training that were related to agricultural education, while the majority of respondents (60%) indicated that they had no opportunity to participate in short-term training with relevance to AET (Table 6.2). Half of the population of teachers had less than five years teaching experience.

Sixty percent of the respondents did not have agricultural science qualification and did not participate in agricultural science short-term training. This implies that the majority of agricultural science teachers' respondents who were currently teaching agricultural science at high schools are offering the subject using their natural or social sciences qualification. In the education system, having qualified and experienced teachers is important to produce competent students. Literature also shows that teachers with relevant qualifications and experience could have an effect on student achievement (Croninger *et al*., 2007).

In terms of practical education and an availability of fields for practicals, 25.6% (46) of the total respondent population responded that there was a farm or field for practicals in their respective schools. Seventy-four present (134), on the other hand, responded that there was no field or farm for Agriculture Science practicals in their respective schools (Table 6.2). Concerning the availability of laboratories, it was found that only 2.2% (4) of the sample teachers' positively responded that their schools had a laboratory to support theoretical teaching agriculture, whereas, interestingly a quite high percentage (97.8%) out of 176 teachers indicated that they were teaching agricultural science at secondary schools without supporting the theoretical lessons with practice due to the unavailability of laboratories in their respective schools. The results of this study demonstrated that high schools were delivering the subject without provision of sufficient teaching aids, infrastructure and support to deliver the agricultural science curriculum. This could have a commendable effect on the knowledge and skill shortcoming in the expected output of knowledge and skills when training efficient productive manpower for the agricultural industry (Hofstein and Lunetta, 2004). This might also have an impact on the preparedness of high school students who are taking pathway to agriculture studies in higher education.

Regarding the teachers' evaluation in terms of the teaching learning process, 50.6% (91), 32.6% (57) and 18.3% (32) of the respondents' reported that they were assessed once in each term, once in a year or more than one visit in each term respectively (Table 6.2). This assessment was carried out by different stakeholders, which might still need more detailed studies.

Fifty present (90) of the teachers' responded that they have specific departments for each one of the major subjects that their schools offer. The other half (50%) of the population of Agricultural Science teachers' indicated that there was no departmentalization in the structure for each major subject that they are currently delivering in their respective schools (Table 6.2). The lack of a mechanism for evaluation

and departmentalization in the schools could have a certain level of an influence on delivery of AET. Evaluation and departmentalization have strong support in the teaching and learning process. The teachers' evaluation could help in improving instruction and teachers can be held accountable for their performance and their outcomes (Milanowski *et al.*, 2004).

Table 6.2: Summary of descriptive statistics for explanatory variables (n = 180)

Variable definition	Symbol	Mean (Std)	χ^2
Male	AM	0.567 (±0.496)	3.200
Female	AF	0.433 (±0.497)	
Age 20-29 years	AGE1	0.311 (±0.464)	
Age 30-39 years	AGE2	0.339 (±0.475)	30.08[1]
Age 40-49 years	AGE3	0.272 (±0.446)	
Age 50-59 years	AGE4	0.078 (±0.268)	
Racial background African	RBG1	0.833 (±0.374)	
Racial background White	RBG2	0.056 (±0.230)	327.067[1]
Racial background Coloured	RBG3	0.072 (±0.259)	
Racial background Indian	RBG4	0.039 (±0.193)	
Teaching Experience 1-5 years	TEY1	0.261 (±0.440)	
Teaching Experience 6-10 years	TEY2	0.267 (±0.443)	
Teaching Experience 11-15 years	TEY3	0.239 (±0.428)	57.267[1]
Teaching Experience 16-20 years	TEY4	0.122 (±0.328)	
Teaching Experience 21-25 years	TEY5	0.089 (±0.285)	
Teaching Experience >25 years	TEY6	0.022 (±0.148)	
Qualification Certificate	QLN 1	0.189 (±0.393)	
Qualification Diploma	QLN 2	0.783 (±0.413)	171.033[1]
Qualification Degree	QLN 3	0.028 (±0.1648)	
Area of specialization Agricultural science	AOS 1	0.400 (±0.491)	
Area of specialization Life science	AOS 2	0.450 (±0.498)	27.900[1]
Area of specialization Social science	AOS 3	0.150 (±0.358)	
Library resources (Yes)	LIB 1	0.056 (±0.230)	142.222[1]
Library resources (No)	LIB 2	0.944 (±0.228)	
Access to a farm (Yes)	AF 1	0.256 (±0.437)	43.022[1]
Access to a farm (No)	AF 2	0.744 (±0.437)	
Access to internet (Yes)	IA 1	0.261 (±0.441)	41.009[1]
Access to internet (No)	IA 2	0.739 (±0.441)	
Heavy Teachers' workload (Yes)	TWL 1	0.556 (±0.498)	2.222
Heavy Teachers' workload (No)	TWL 2	0.444 (±0.498)	
High social value (Yes)	SV 1	0.522 (±0.501)	0.356
High social value (No)	SV2	0.478 (±0.501)	

Variable definition	Symbol	Mean (Std)	χ^2
Correct Teacher-student ratio (Yes)	TSR1	0.339 (±0.475)	18.689[1]
Correct Teacher-student ratio (No)	TSR2	0.661 (±0.475)	
Salary Satisfaction (Yes)	TSS1	0.400 (±0.491)	7.200[2]
Salary Satisfaction (No)	TSS2	0.600 (±0.491)	
Satisfactions on the school ministration (Yes)	TS1	0.739 (±0.441)	41.089[1]
Satisfactions on the school administration (No)	TS2	0.261 (±0.441)	
Satisfactions on Nature of school communication(Yes)	SNC 1	0.717 (±0.452)	33.800[1]
Satisfactions on Nature of school communication (No)	SNC 2	0.283 (±0.452)	

Significant at: (1) = (P ≤ 0.01), and (2) = (P ≤ 0.05)

The teacher to students' ratio is also reported to be a good indicator of quality at secondary schools (Lee and Barro, 2001). In this study, 33.9% (61) of the teachers believed that their respective schools had an appropriate teacher-student ratio. While 66.1% (119) of the teacher population indicated that the current teacher-student ratio in their respective schools is not in line with the recommended teacher-student ratio (Table 6.2). The majority of educators indicated that there was an unbalanced student-teacher ratio. The lower student-teacher ratio may lead to the effective use of school resource inputs and produce a higher level of academic achievement (Dahar *et al*., 2009). Similarly, (Katie *et al*., 2003) reported that a manageable minimized ratio has its own positive effect on learners' attitude and achievement. Hence, there is a need to create and manage a student-teacher ratio, in order to improve the teaching and learning environment and thereby upgrade the quality of learning outcome.

6.3.2 Attitude of teachers towards AET as career/profession/responsibility

As shown in Figure 6.1, over 90% of the teachers agreed that relevant qualifications are vital to teach Agricultural Science. They were responsible exemplar teacher and doing their best to make change on their student's achievement. Over 80% of the teachers indicated that they love teaching Agriculture Science as a profession and plan to pursue their further studies in the field of agriculture. The results in Figure 6.1 show that teachers have a favorable attitude towards AET, qualification and goals in their profession. Efficient Agricultural Science curriculum delivery needs teacher's relevant skill and knowledge in the area. It was evident from the qualitative data that teacher's qualifications in Agricultural Science empowers them to become more innovative and engaged in combing

theory and practice during the subject delivery. Competency and relevant qualifications play an important role in enhancing the quality of Agricultural Science teaching to produce manpower at the required level of competency (Osborne *et al*., 2003). Teachers' qualifications and school inputs availability have a significant effect on the students' attitude towards AET and their academic achievement (Darling-Hammond, 1999). Good school outcomes and improved learner's perceptions towards the subject requires comprehensive knowledge, unshakable convictions and a high level of pedagogical skill (Gay, 2010). Teachers with the required knowledge and skills could create and stimulate student interest and engagement in subject delivery. The attitude of learners was influenced positively with qualifications of teachers and the quality of Agriculture Science delivery, while the inverse is true with teachers having qualifications in other natural or social science areas (Osborne *et al*., 2003). Agricultural Science teachers with desired knowledge and skill in their subject matter could be innovative in combining theory with practicals under farm or field conditions or in a controlled laboratory. At present the majority of educators are teaching agricultural science without having a relevant qualification. Desouza *et al.* (2004) found that the teacher's qualifications have an effect on the school outcomes. Teaching agricultural science subjects based on teachers experience without the Agricultural Science qualification could affect school and student outcomes. Similarly, the qualitative data indicate the need for short and long-term training in agricultural science to upgrade the educators' knowledge to handle both theoretical and practical lessons. Likewise, the data presented in Figure 6.1 show that agricultural science teachers have a favorable attitude towards AET and they love their profession and are willing to participate in agricultural science teacher training and skills upgrading.
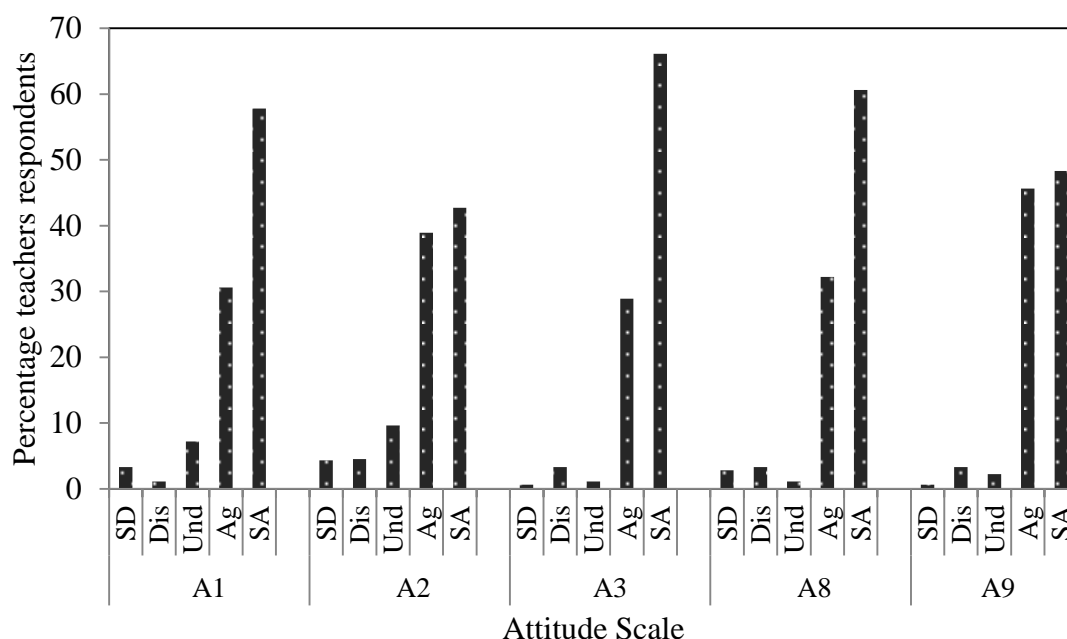
Figure 6.1. Teachers' attitude towards AET. SD: strongly agree; DI: Disagree; UND: Undecided; AG: Agreed; and SA: Strongly Agreed. A1: I love teaching professions. A2: I want to pursue further studies in Agricultural Sciences.A3: Relevant qualifications are necessary to teach Agricultural Science. A8: I am doing my best to change the student future in agricultural education and A9: I am a responsible exemplar teacher for my agricultural education.

The data presented in Table 6.3 displays that 91.1% and 8.9% of high school agricultural science teachers were found to be in the high and medium attitude categories, respectively. There were no respondents in the low attitude category. Thus, the vast majority of agricultural science teachers have high and favourable attitudes towards teaching Agriculture Science, agriculture as a career choice, and the importance of having relevant qualifications, personal good character and the overall importance of AET for future advancement. In summary, the data shows that, in general, agricultural science teachers have favourable high attitude towards AET, such as their profession, a need for qualifications, their teaching outcome consequences and personal good character in the teaching learning process. High and favourable agricultural science teacher's attitudes could have an important effect on the teaching outcomes and process. Kennedy and Kennedy (1996) found that teaching is a complex process involving several factors, the main one being the role of favourable teachers' attitude towards teaching. Teachers play a considerable role in the implementation of AET curricula at secondary school level. Their attitude towards agricultural AET has an impact on the student's achievement and

agricultural sectors future development. In many African countries, including South Africa agriculture is the major source of GDP growth. Quality AET curriculum delivery could have an influence on the production of skilled youth, which could play important part in food self-sufficiency, poverty alleviation and job creation, these are the positive aspects of the findings of this study.

Table 6.3: The attitude of teachers towards teaching profession, pursuing further studies in agriculture, relevancy of respondents qualification in teaching, motivation towards training students and responsibility as teacher in the context of AET

Variable	Attitude	f	%	χ^2
Agricultural science profession (A1,A2,A3,A8 and A9)	High	164.0	91.1	
	Medium	16.0	8.9	121.7***
	Low	0.0	0.0	
Total		180	100	

*** significant at $P \leq 0.01$. A1: I love teaching professions; A2: I want to pursue further studies in Agricultural Sciences; A3: Relevant qualifications are necessary to teach Agricultural Science; A8: I am doing my best to change the student future in agricultural education; and A9: I am a responsible exemplar teacher for my agricultural education.

6.3.3   Attitude of teachers towards AET related Job opportunities and career choice

The results showed that 94.5%, 94.4% and 81.7% of the secondary school teachers' responded that there are potential of agriculture jobs, entrepreneurial opportunities in the field of agriculture and AET contribution for the future development of the country, respectively (Figure 6.2). This implies that teachers had a positive perception towards the importance of AET for job and entrepreneurial opportunities. Cognitive and emotional identities of teachers towards AET jobs and entrepreneurial opportunities could have a significant effect on a student's cognitive and emotional ability towards job creation and entrepreneurships. The educator's favorable attitude plays an important role in preparing learners to develop workplace skills and to prepare for self-employment in the agriculture sector and could ultimately contribute positively towards job creation and poverty reduction in the country (Dailey *et al*., 2001). In the teaching and learning process, having entrepreneurship intention, attitude and content were shown to have a significant influence on a student's self-employment intentions and job creation (Emmanuel *et al*., 2012). Teacher's favorable high attitude towards entrepreneurship and job creation was found to be positive aspect, which needs further study in curriculum content evaluation in delivery process at secondary schools.

Table 6.4 presents the details and summary of teacher attitude towards the role of AET from the job, entrepreneurial and development aspects. The majority of high school agricultural science teacher 165 (92%) respondents had high favorable attitude towards the role of AET in job creation, entrepreneurial opportunities and contribution to the future development of the country. Only 15 (8.3%) of the respondents was found to be in the medium attitude category with none in the low attitude category. This demonstrated that the majority of high school agricultural science educators had favorable high perception towards AET roles in creating job and entrepreneurial opportunities, career success and achievements, as well as the future of the countries development.

Figure 6.2. Teachers' attitude towards job and entrepreneurial opportunity. SD, strongly disagree; Dis, disagree; Un, undecided; Ag, Agree; SA, Strongly Agree. A4: Agricultural training leads to better job and entrepreneurial opportunities. A5: Agricultural Education is important for career success and achievements in life. A6: Agricultural Education is important for the future of the country.

The teacher's highly favourable attitude should be coordinated with the interrelated theoretical and practical entrepreneurial curriculum content and delivery. Coordinating educator's a favourable job and entrepreneurial attitude with efficient curriculum delivery could encourage the development of Agricultural Science student's entrepreneurial skills and self-reliance (Henderson and Robertson, 2000).

In South Africa and other developing countries, agricultural development could increase GDP by improving export earnings and unemployment. In the heart of high inequality and unemployment, producing a younger agricultural student population with a favourable entrepreneurial attitude could contribute positively to the economic transformation of the country.

Table 6.4. Teachers' attitude towards job and entrepreneurial opportunity arising

Variable	Attitude	f	%	χ^2
(A4,A5 and A6)	High	165	92.0	
	Medium	15	8.0	125.0***
	Low	0	0	
Total		180	100	

*** significant at P ≤ 0.01. A4: Agricultural training leads to better job and entrepreneurial opportunities. A5: Agricultural Education is important for career success and achievements in life. A6: Agricultural Education is important for the future of the country.

6.3.4 Teaching Aids and Support

Nighty two percent of the high school Agricultural Science educators agreed to the statement that "teaching aids, laboratory and farm or field practice is important to teach agricultural sciences" (Figure 6.3). Teachers suggested that to implementing agricultural science curriculum practicals is the main component to complement the theoretical lessons. However, the challenge was associated with the availability of fields or farms, to deliver agricultural science more meaningfully. Agricultural science involves as an interplay between theoretical and practical teaching. Practical teaching in agricultural science could help students to develop links between theoretical concepts and practical teaching. The educators' qualitative response showed the need for short or long-term trainings to upgrade theoretical and practical knowledge and skills in agriculture sciences. Agricultural science teachers' qualifications and teaching experience could result in agricultural science students achievements (Darling-Hammond, 1999). AET theoretical presentation should be supported by practical lessons. Students might learn theoretical ideas from what they did and observed in the field or laboratory. Theoretical teaching, in collaboration with practice, could maximize the effectiveness of teachers and assist in implementing the agricultural science curriculum in a more effective and meaningful way. The teacher's attitude towards teaching aids and relevant support indicates the teacher's positive attitude towards

acquisition of skills in agricultural lesson. Teachers could implement the presentation of theory mixed with actual field practice. Teacher's instruction approach determines student school achievement and achievement in life.
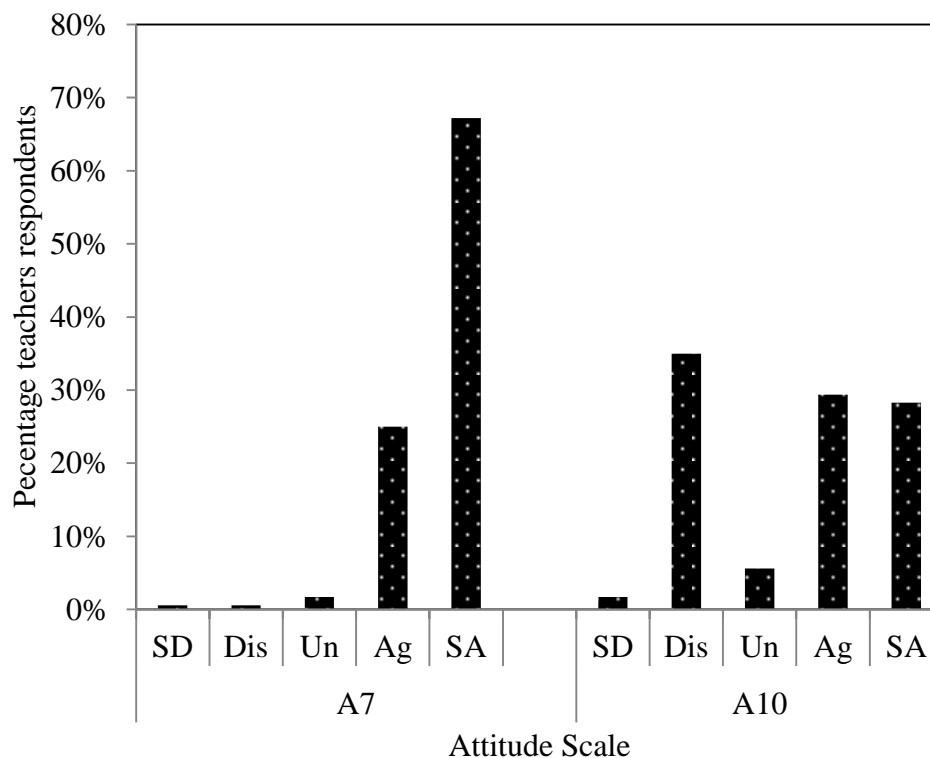
Figure 6.3. Teachers attitude towards teaching aids and relevant teaching and learning support. SD, strongly disagree; Dis, disagree; Un, undecided; Ag, Agree; SA, Strongly Agree. A7: Teaching aids, laboratory and field practice are important to teach, and A10: Agricultural Educational and Training lacks relevant support from the responsible body.

Figure 6.3, displays the summary of agricultural science teacher respondents' attitude towards the importance of teaching aids, laboratory and field practice and a lack of relevant support to teach agriculture. The result indicates that 57.7% of respondents agreed to the statement "AET lacks relevant support from the responsible body". The minorities of respondents (42.3%) either disagreed or were undecided about the statement that states "AET lacks relevant support from the responsible body". 36.7% of agricultural science teachers disagree with the statement that "AET lacks relevant support from the responsible body". This implies that 36% of teachers indicates that the availability of relevant support from the responsible body. This indicates what the agricultural science teachers believe about the nature of agricultural science curriculum delivery and what they require to

deliver it. High school agricultural science teachers must have subject methodological knowledge and experience to recognize the type and source of support (McComas *et al.*, 2002). Their methodological and pedagogical knowledge depends on the relevancy between the subjects they deliver and the type of qualification they have. As shown in Figure 6.4, the variation of Agricultural Science teachers' responses was based on the type of qualification they have.
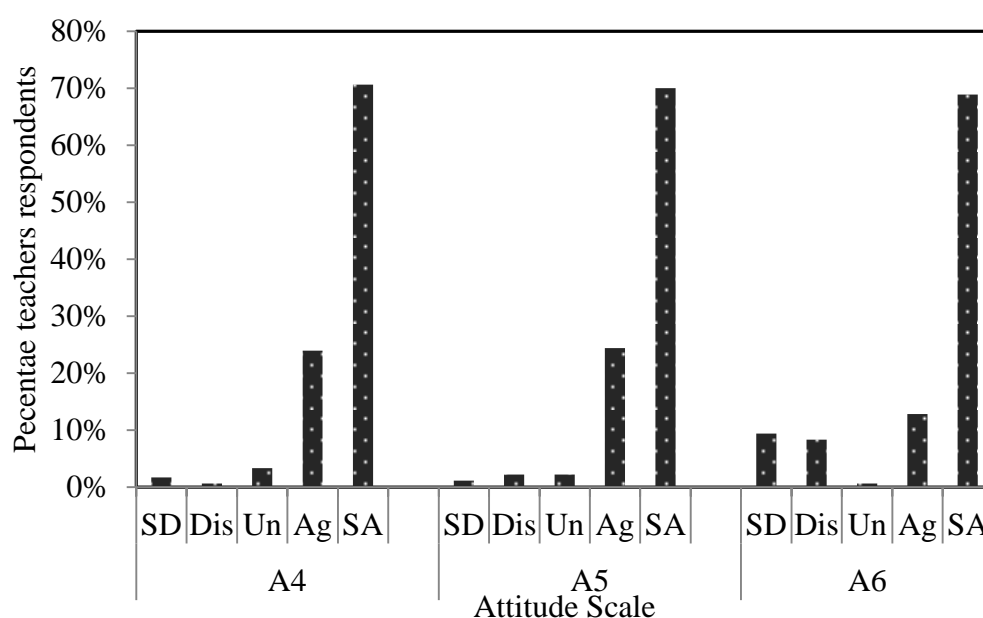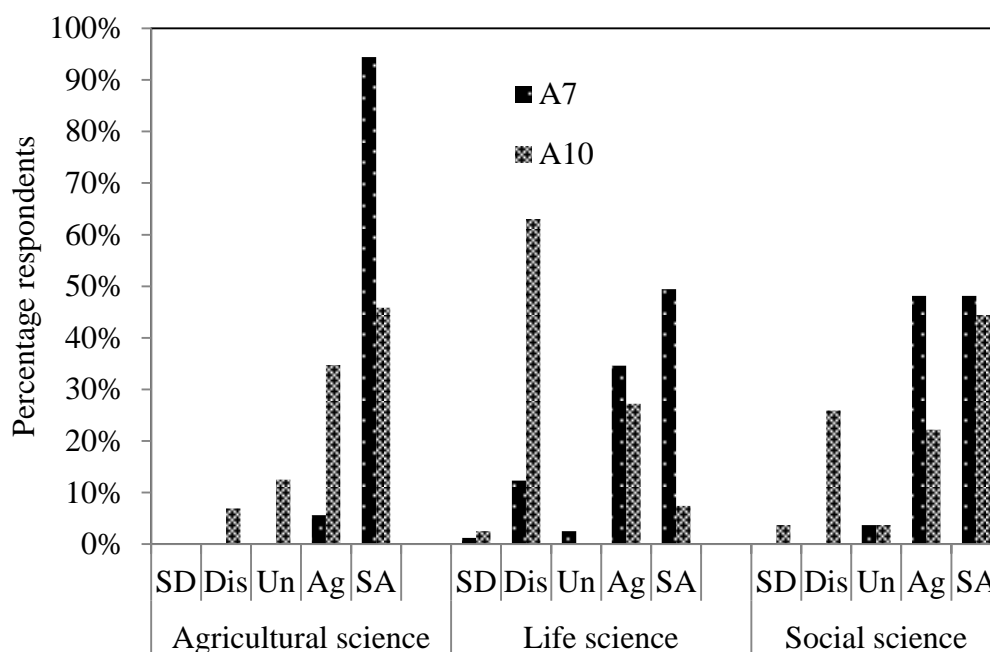

Figure 6.4. Teachers attitude towards teaching aids and relevant support. SD, strongly disagree; Dis, disagree; Un, undecided; Ag, Agree; SA, Strongly Agree. A7: Teaching aids, laboratory and field practice are important to teach. A10: Agricultural Educational and Training lacks relevant support from the responsible body.

AET as a vocational science depends on the support that assists its effective delivery during the teaching and learning process. Eighty-one present, 34.6% and 66.6%, of agricultural science teachers with the educational background in agricultural science, life science and social science, respectively, responded that they agreed to the attitude statement which states "AET lacks relevant support from the responsible body", as shown in Figure 6.4. The minority of respondents, 6.9%, 65.5% and 29.6% of agricultural science educators with the educational background in agricultural science, life science and social science, respectively, perceived that they disagree with the statement "AET lacks relevant support from the responsible body". The majority of agricultural science high school teachers' with agricultural science qualifications believed that the agricultural science

lesson needs more support to implement the curriculum effectively, by properly combining theory and practice, which is in agreement with the nature of AET.

As indicated in Figure 6.4, 100%, 80% and 96.2% of teachers with agricultural science, life science and social science qualifications had a favorable attitude towards an importance of teaching aids and support to deliver of AET curriculum. Having qualifications improves and helps teachers to recognize what support they need to effectively implement the curriculum. Using school resources, teaching infrastructure and support are positively related to school outcomes and changes in social capital, which is students' achievement and effective implementation of curriculum. (Greenwald *et al.,* 1996).

Table 6.5:Teachers attitude towards teaching aids and relevant support

Variable	Attitude	f	%	χ^2
(A7 and A10)	High	134	74.44	
	Medium	35	19.44	141.7***
	low	11	6.11	
Total		180	100	

*** significant at $P \leq 0.01$. A7: Teaching aids, laboratory and field practice are important to teach. A10: Agricultural Educational and Training lacks relevant support from the responsible body.

Based on the total attitude score data presented in Table 6.5, 74.4%, 19.4%, and 6.1% of agricultural science teachers have high, medium and low attitude towards teaching aids and relevant support to teach agricultural science at high school level, respectively. There was a significant difference between the percentages of respondents in the three attitude categories. Generally, the majority of the respondents had favourable high attitude towards the need for teaching aid and support in the delivery of AET curriculum in secondary schools, which were indicates the favourable educator's attitude and agricultural science curriculum delivery for efficient student's outcome.

6.3.5 Pooled attitude data

Table 6.6 shows that 158 (87.8%) of the agricultural science high school teacher's attitudes towards AET was found to be in the high attitude category. This means that the majority of teachers had a positive perception towards AET. Only 12.2% of high school agricultural science teachers' attitude towards AET was found to be in the medium attitude category. This verified that high school agricultural science teachers had high and positive

attitude towards AET. However, teachers with qualifications other than agricultures sciences, had a medium attitude scores, compared to the attitude of teachers with agricultural science background. As discussed earlier in the previous section, the qualitative data showed that the majority of agricultural science teachers (60%) were teaching agricultural science at secondary school without having an agricultural science qualification. Teachers' qualifications could have a significant influence on students' achievements. If teachers teach without the relevant qualifications, this could lead to lower student performance (Goldhaber and Brewer, 2000).

As can be seen from the data presented in Table 6.7, 98%, 82.7% or 74.1% of agricultural science teachers had Agricultural Science, Life Science or Social Science qualifications, respectively. This was found to be in the high category of attitude towards AET, which was found to be significant. The majority of high school agricultural science teachers with agricultural science qualifications were found to be in the high attitude category, when compared to those with either a life science or social science background. This emphasized that there is a strong positive correlation between the teacher's qualifications and their attitude towards AET. Moreover, teachers were found to be highly useful in order to improve the attitude of teachers towards teaching agricultural science. Investing in teachers' qualifications proven to be important and could have a positive influence on teachers' attitude towards the agricultural science. Similar findings by Aikens and Barbarin (2008) and Darling-Hammond (1999) indicated that investing in teacher's training in the area of the subject they are teaching benefits the AET. Relevant teacher qualification is one of the contributing factors for the students' achievement. Literature also supports that subject matter knowledge has a strong effect on student's achievement (Darling-Hammond and Youngs, 2002).

Table 6.6: Pooled data attitude of teachers towards AET.

Variable	Attitude	f	%	χ^2
Attitude of teachers towards AET (A1-A10)	High	158.0	87.8	102.8***
	Medium	22.0	12.2	
	Low	0.0	0.0	
Total		180	100	

*** significant at $P \leq 0.01$

Table 6.7: Pooled data of teachers' showing the influence of their areas of qualification on their attitude towards AET.

Area of specialization		Attitude				χ^2
		Low	Medium	High	Total	
Agricultural science	f	0.0	1.0	71	72	
	$\%$	0.0	1.4	98.6	100.	
Life science	f	0.0	14	67	81	
	$\%$	0.0	17.3	82.7	100.0	14.5***
Social science	f	0.0	7.0	20.0	27	
	$\%$	0.0	25.9	74.1	100.0	
Total	f	0.0	22	158	180	
	$\%$	0.0	12.2	87.8	100.0	

*** significant at $P \leq 0.01$

In general, the results show that the majority of the educators had a favourable attitude towards AET (Table 6.6). The educators have favorable and positive attitude towards teaching aids, laboratory, field for practice and support to teach agricultural science, which is in agreement with the findings of Rice *et al*. (2011). Rice *et al*. (2011) reported that having motivated learners, good classroom and laboratory conditions were found to be effective motivational factors to implement and motivate teachers to teach agricultural science. In turn, when considering the delivery of AET, the perception of teachers' towards the importance of teaching aids and support have a remarkable effect on students' achievements. This is mainly because teachers are the medium in the delivery of Agricultural Science curriculum (Shuell, 1996). Moreover, teachers' knowledge and skill is crucial to determine the mode of curriculum delivery and to identify or use the existing teaching infrastructure and support. AET is an application of science in which the acquisition of skills is very crucial. It is argued that teachers' practical skill is considered to be the most desirable quality that should be considered in teaching agriculture science (Kumar and Kashyap, 2012). This was evident from the qualitative data obtained in this study that teachers' perceptions towards the use of teaching aids and support during delivery of the subject contribute significantly to the success of learners.

6.4   Conclusion and recommendations

The majority (91%) of agricultural science high school teachers had a favourable attitude towards teaching occupations, needs for advanced study in Agricultural Sciences, the importance of relevant qualifications in AET, their contribution to the students

impending opportunities in AET, their character and commitment to teach AET, AET-related careers and entrepreneurial opportunities, importance of AET for future development and the importance of teaching aids, laboratory and field or farm for practicals to teach agricultural science. There were significant differences between the educators' attitudes towards the importance of teaching aids, laboratory, field or farm for practice and support. This difference was influenced by their qualifications. The teacher's attitudes favourably increased when they had relevant agricultural science qualifications. The pooled data showed that 87.8% of agricultural science teachers have high and favourable attitude towards AET. Teachers who have the agricultural science qualification had the highest positive attitude towards AET, when compared to the attitude of teachers with life and social science qualifications, which were found to be significant at $P \leq 0.01$ levels. This study suggests that policy-makers and the Department of Education should give consideration to teacher's qualification, in order to ensure proper delivery and student achievement in the teaching learning process at secondary schools. It is recommended a mechanism to arrange in-service agricultural science teachers training programs. The Department of Education should give emphasis in teacher training, relevancy of their qualifications and professional development in agricultural science, in the context of secondary school teachers' capacity building.

It was recommended that a government should give special grants for practical subjects like agriculture. Schools should also start viable income-generating activities to raise funds, which in-turn, can be re-invested in agricultural production. Schools should establish small agriculture projects, which do not require a lot of funds to train students in agricultural skills.

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CHAPTER SEVEN

FACTORS INFLUENCING THE ATTITUDES OF TEACHERS TOWARDS AGRICULTURAL EDUCATION AND TRAINING, THE CASE OF THE KWAZULU-NATAL PROVINCE, SOUTH AFRICA

Abstract

Teaching is a profession which could influence the attitudes of learners towards the subjects which they study and could consequently affect their levels of achievement. This study was designed to identify the factors that affect the attitudes of teachers towards Agricultural Education and Training (AET). The concurrent mixed sampling design was used with 180 teacher respondents. The Censored Tobit Regression Model was used to identify factors that could positively or negatively affect the attitudes of Agriculture Science teachers. Based on the relevant statistical analysis, eight independent variables were identified to be of significance.

The results showed that in the age category delete between 20 and 29 years, the availability of internet access and having salary satisfaction had a negative and significant ($P \leq 0.05$) influence on teachers' attitudes towards teaching AET. Racial background, an area of teachers' specialisation, teachers' satisfaction with support from administration, social value (societal respect for Agricultural Science teachers) and the nature of communication in the school micro-environment, had a positive and significant ($P \leq 0.01$) effect on the teachers' perception towards teaching AET. The Department of Agriculture, Forestry and Fisheries, as well as the Department of Education and the Department of Higher Education should be required to intensify the organisation of coordinated solutions, to create information-sharing platforms for high school Agricultural Science teachers and administrators. These could be in the form of short- and long-term training programs relevant to secondary school agricultural education, as well as through formally organized in-service programs. This could have an important influence on maintaining and further improving the positive perception of teachers towards AET and thus also improving the secondary school students' level of achievement.

7.1   Introduction

Teachers' attitudes towards AET have significant effects on students and their school achievement. Identifying factors affecting Agricultural Science teachers' attitudes could support Agricultural Education and Training AET and the provision of skills and manpower in the emerging agricultural economy. Teachers instruct to implement the designed curriculum in the teaching and learning process. Their personal effort and good attitudes towards the subject might have an effect on students' emotions and their level of knowledge and achievement during their subsequent progression. Efficient teachers with good perception could transform students' knowledge and skills to develop knowledge-based agriculture and sector industries (Kumar and Kashyap, 2012).

In both developed and developing countries education remains a means for social development and empowerment. In Africa, it is essential to have trained manpower in the various areas of agricultural sciences and technologies. On the continent, 65% of the population are young and 66% of employment is in the agriculture sector. Therefore, the provision of appropriate Agricultural Education and Training (AET) is vital and can also build capacity, empower, as well as transform the younger generation's competence to determine the fate of the continent in terms of agriculture sector development (FAO, 2006; Kumar and Kashyap, 2012). Securing quality agricultural education is important and could lift the nations out of poverty by transforming and changing the trends in all areas of social and agricultural development.

Likewise, in the Southern African Development Community (SADC) member countries, agriculture is the source of earning for more than 70% of the population, 13% of the total exports and 66% of intra-regional trade earnings. Therefore, achievement and performance in AET have a pronounced effect on the agricultural sector's wellbeing and GDP growth by strengthening, the level of employment, economic stability, agricultural entrepreneurism, food security and overall poverty reduction in the region (SADC, 2011).

As a result, the main purpose of agricultural education starting in secondary schools is to train professionals in the various fields of Agricultural Science and technology (including those in allied vocations which are required in the sector), since agriculture is

multi-disciplinary by nature (Kumar and Kashyap, 2012). Moreover, the main AET objective is to play a major role in developing sustainable agricultural industries by producing a strong, skilled workforce, such as efficient farmers, researchers, educators, extension staff, members of agri-businesses and others, that help to create a sustainable agricultural development. However, both qualitative and empirical studies concerning educational processes, teachers, students and administration are required in order to, run effective agricultural education programs at all levels of studies, including secondary education.

Offering AET at the secondary level of education is the basis for the transformation and development of the agricultural sector and lays a firm foundation for preparing and producing skilled manpower for the sectors. In secondary schools, the objective of AET is to prepare potential students for further studies in various agricultural education areas of science, engineering and technology (Vandenbosch, 2006). Moreover, due to the vocational nature of AET, it also equips students for careers in agriculture from the point of exiting secondary school. Realizing the importance of training in agriculture, the majority of agricultural high schools in South Africa now offer Agricultural Science as a subject. After 1994, the Urban and Rural High Schools opened the Agricultural Science Programs by either replacing or adding to the programs that had been running. Among the several factors influencing the effective delivery of AET at secondary schools, issues related to teachers, students and administration are important.

Having motivated and dedicated teachers could have remarkable effects on the production of successful, productive and innovative manpower, which could play a part in poverty alleviation and food security efforts in the country. However, in most cases, sufficient empirical data is not available on the different aspects of role players, including the high schools in the region.

In South Africa in general, it is noted that AET has a negative image as a career choice in the eyes of most youth (DoA, 2005). Also, according to the recent report, an inverse relationship between rates of student dropouts and Agricultural Science matriculation results were observed (Chapter 2). Thus, empirical studies need to be conducted in order to, generate basic background information on the attitude of teachers and factors affecting the attitude of teachers in the region. The reason for this could be attributed to the fact that the Agricultural Science teaching and learning process is mainly implemented by agricultural schools and its teachers (Alam and Farid, 2011). The majority

of youth having a negative perception of the career and the increase in dropout rates might be influenced by teachers' perceptions towards the subject. However, there is no data available to draw conclusions that can assist in solving the prevailing problems. Therefore, studying the attitudes of educators and identifying factors which could affect the attitudes or perceptions of teachers could contribute positively to solving the existing problems and hence, could be highly valuable for an effective teaching and learning process.

In this context, this study was designed to identify factors affecting the attitude of teachers towards AET at high school level. The specific question of this study was "What are the factors affecting the attitude of teachers and students' towards Agricultural Educational Training at high school (Level 2-4)". Moreover, the study sought to determine whether the identified factors would have a positive or negative effect on the attitudes of Agricultural Science educators. In addition, identification of the factors that could either positively or negatively affect the teachers' attitudes, could create valuable background information for policy-makers and implementers at all levels and hence allow for possible adjustments and improvements to be made to the existing AET system. The expectation of this study is to look at the influence of different factors on the perceptions of high school teachers towards AET and thus the effect of 13 different independent variables on the attitude of high school Agricultural Science educators towards AET has been investigated. This study is based on an earlier report in Chapter 2, which suggested that further study on the factors affecting teachers' attitudes towards AET need to be investigated to generate the background information that is required to attend to AET.

7.2   Research methodology

7.2.1   Source of data and Sampling design

The study area, KwaZulu-Natal (KZN) province, is one of the nine provinces of South Africa. It was specifically selected for this study, since there is an inverse relationship between an inverse relationship between an increasing number of new agricultural schools opening and Grade 12 matriculation results, as well as increasing student dropout rates in AET (Chapter 2)**.** The province is located in the eastern part of South Africa. Its capital, Pietermaritzburg, is about 444 km away from Johannesburg and 68km away from Durban. A total of 180 Agricultural Science teachers were selected as the sample group for this study, using the methodology as described by Johnson and

Christensen (2012). A multi-stage random and purposeful sampling procedure was implemented to select 180 teachers engaged in teaching Agricultural Science at high schools during the 2012 academic year. The response rate of this sample was 94%. This study was carried out in two stages, using both qualitative and quantitative data collection methodologies. The quantitative and qualitative data were collected almost at the identical occasion (i.e. concurrently), but the qualitative sample was employed as a subset of the quantitative sample (that is, nested relation). The survey was conducted by using a standardized questionnaire. Quantitative data were collected from the teacher respondents, using a pre-tested, structured interview schedule. Qualitative data, which was in line with the objectives of the study, were collected using open-ended questionnaires and interviews. The data were collected in the presence of the researcher.

7.2.2 Data analysis

The quantitative data was analysed, using descriptive statistics such as frequency, mean and the Censored Tobit Regression Model (Henningsen, 2011; Jöreskog, 2002; Niño-Zarazúa, 2012). The qualitative data were coded, described and interpreted to supplement the quantitative data. The qualitative data was analysed, using a spiral content analysis. For quantitative data, the Censored Tobit Regression Model (CTRM) was used to look at the relationship between dependent and independent variables (Niño-Zarazúa, 2012). The CTRM was employed to estimate the linear relationships between the variables, when there is either left or right censoring in the dependent variable, which was the attitude of educators towards AET. The following CTRM general equation was employed in this study:

$$y_i^* = x_i^{'}\beta + \varepsilon_i$$

$$y_i = \begin{cases} a & if \ \ y_i^* \leq a \\ y_i^* & if \ \ a \prec y_i^* \prec a \\ b & if \ \ y_i^* \geq a \end{cases}$$

where

α - is the lower limit of the dependent variable

b - is the upper limit of the dependent variable

y_i* - is an observed("latent") variable

β - is a vector of unknown parameters

ε_i - is a disturbance term.

χ_i - is a vector of explanatory variable is $i = 1,\dots, N$ (indicate the observation)

7.3   Definition of Variables

The magnitude and relationships between variables (dependent and independent) are investigated in this study. Dependent variables are a response or outcome, whereas independent variables are changeable. A dependant variable is the phenomenon affected or changed by other actions or phenomena. Independent variables are the variables that cause changes in other variables (Sarantakos, 1998).

7.3.1 Dependent variables

In this study, the attitude of teachers towards AET was treated as the dependent variable. Attitude can be defined as the liking or disliking of an object, based on what is known about it (Rameela, 2004). This is usually created due to direct exposure to the objects or ideas about which one is developing an attitude (Hossain *et al*., 2010). In this case, attitude is the degree of positive or negative feelings which the Agricultural Science teachers have towards AET. Measuring these attitudes was achieved largely by means of a survey, structured questionnaires, Likert Scales.   Five options, between Agree and Disagree, were presented.

To administer these scales, five options, between Agree and Disagree, were presented to the teacher respondents for the 13 original statements only. Ten statements containing an equal number of favorable and unfavorable statements were prepared (McIver and Carmines, 1981). The scale were used with multi-item scales and summated rating scores (Gliem and Gliem, 2003). The pre-testing of the structured interview was conducted before the actual data collection began. Cronbach's coefficient alpha was calculated to test and to look at the internal consistency, as well as reliability for scale and sub-scales (Gliem and Gliem, 2003). The standardized Cronbach's Alpha coefficient can be calculated from the following equation:-

$$\alpha_{\text{standardized}} = \frac{K\bar{r}}{\left(1 + (K-1)\bar{r}\right)}$$

Where:

K= is the number of components (*K-items*),

$\bar{r}$ = the mean of the K (K − 1) / 2.

α=alpha is a coefficient of reliability

Based on the Cronbach's Alpha values, ten items that are presented in Table 7.1 were identified out of the thirteen statements' and further used in the final data analysis. Cronbach's Alpha reliability coefficient result was found to be 0.73 (Table 7.1). The fact that it was close to 1 indicates that there was good internal consistency of the items in the Likert Scale (Gliem and Gliem, 2003).

Table 7.1 The attitude of educators towards farming and studying AET (n = 180).

Variables	Mean	Standard deviation	Cronbach's Alpha if Item is deleted
1. I love the teaching profession.	4.38	0.923	0.718
2. I want to pursue further studies in Agricultural Sciences.	4.49	0.822	0.709
3. Relevant qualifications are very important to teach Agricultural Science.	4.57	0.733	0.704
4. Agricultural training leads to better job and entrepreneurial opportunities.	4.61	0.735	0.709
5. Agricultural Education is important for career success and achievements in life.	4.60	0.744	0.723
6. Agricultural Education is important for the future of the country.	4.23	1.354	0.706
7. Teaching aids, laboratory and field practice are important to teach agriculture.	4.53	0.828	0.694
8. I am doing my best to change the students' future in agricultural education and profession.	4.44	0.898	0.715
9. I am a responsible exemplar teacher for my agricultural education students.	4.38	0.741	0.688
10. Agricultural Educational and Training lacks relevant support from the responsible body for better achievement	3.48	1.275	0.702
			Cronbach's alpha = 0.73

7.3.2 Independent variables

The independent variables were selected, based on evidence from past research, from published literature, as well as from the series of discussions that were carried out with experts. Based on these assessments, 15 different independent variables were identified and listed for Relevancy Rating. Relevancy coefficients of the independent variables were selected based on relevancy rating done by panel of experts. For this procedure, the 15 identified independent variables were subjected to the rating, using a four point continuum. Based on the relevancy coefficient result, only 13 independent variables were selected. Those with relevancy coefficients below 50% were excluded from this list of independent variables. The relevancy coefficients were worked out, using the formula:

$$RC = \frac{OS}{PS} 100\%$$

Where: RC = Relevancy coefficient; OS = Obtained score; PS = Potential score. The selected 13 independent variables include:

Age: this refers to the age of respondent teachers. The sample measured in terms of; namely (1) 20-29 years, (2) 30-39 years, (3) 40-49 years, (4) 50-59 years, (5) 60-69 years and (6) >70 years. These variables were discrete and were expected to have a positive influence on the dependent variable and the attitude of teachers towards AET. This variable was suitable for the statistical analysis technique employed in this study. Racial Background (RBG): this refers to the racial background of teachers. The sample was measured in terms of (1) African, (2) White, (3) Coloured and (4) Indian. Racial background was expected to have a positive influence on the dependent variable and was measured as a discrete variable. Teaching experience (TEY): this refers to the teaching experience of teachers. The sample was measured in terms of experience of teachers such as (1) 1-5 years, (2) 6-10 years, (3) 11-15 years, (4) 16-20 years, (5) 21-25 years and (6) > 25 years. The variable was expected to have a positive influence on the dependent variables and was measured as a discrete variable. Qualification of teachers (QLN): qualification refers to the level of qualification of teachers who are currently teaching agricultural sciences in agricultural schools and who were used as respondents in this study. The sample was measured in terms of (1) certificate, (2) Diploma, (3) Degree (4) Masters and (5) PhD. Area of specialization (AOS): this refers to the area of their expertise. The sample was measured in terms of (1) Agricultural Science, (2) Life Science and (3) Social Science. This variable is discrete and was expected to have a positive

influence on the dependent variable which was the attitude of teachers towards Agricultural Sciences. Library resources (LIB): this was associated with the availability of sufficient agricultural materials in the school library. This variable is discrete and expected to have a positive influence on the dependent variable. This was measured in terms of teachers' access to available agricultural books and other relevant educational documents. Access to a farm (AF): this refers to the availability of a field for Agricultural Science practical exercises or else was associated with the availability of a farm field either on the school grounds or not, to implement practical agricultural learning activities. This variable was expected to have a positive influence on the dependent variable and was discrete. This was measured in terms of teachers' access to a farm for practical lessons. Access to internet (IA): this refers to the accessibility of internet service in the school for teaching purposes. This was measured in terms of teachers' access to the internet or not. Teachers' workload (TWL): refers to the teaching work load that teachers had in the school. This was measured in terms of whether teachers perceived that they were being overloaded or not. Social Value (SV): refers to the levels of societal respect for Agricultural Science teachers. Salary Satisfaction (TSS): refers to teacher's salary satisfaction.

Teachers' satisfaction (TS): refers to the level of satisfaction of teachers with the relevant schools' administration efficiency. Nature of communication (SNC): refers to the teaching and learning environment, as well as to the nature of communication in the teaching and learning process in the school environment. This assessed the satisfaction of Agricultural Science teachers towards the nature of communication that exists in the respective schools. The qualifications of teachers, access to internet, work overload, social value, salary satisfaction, teachers' satisfactions and nature of communication were expected to have a positive influence on the dependent variables and hence it is a discrete variable.

7.4   Multicollinearity

Multicollinearity is the examination of the existing relationships of the independent variables to one another. Multicollinearity exists if the two independent variables are closely related. This makes it difficult for the model to determine which variables have the most influence on the dependent variable (Walker and Maddan, 2008). In order to test the multicollinearity problem between discrete as well as dummy variables, the contingency

coefficients test was also conducted. The contingency coefficient value close to 1 is known to have multicollinearity problems between the independent variables. The contingency coefficients test result greater than 0.75 indicates the existence of multicollinearity problem between the independent variables. The contingency coefficients were worked out, using the formula:

$$C.C= \sqrt{\frac{\chi^2}{n + \chi^2}}$$

Where: C.C = Contingence coefficient, n= sample size, χ^2 =Chi square value (Mesfin, 2005). However, the analysed results indicated that there is no multicollinearity problem among the explanatory variables and hence all the hypothesized variables were acceptable and included in the analysis in the Tobit Regression Model (Appendix 3).

7.5   Results and discussion

7.5.1   Descriptive analysis of survey data

In this study, a total of 180 high school Agricultural Science educators were used as respondents. The respondents were selected from the Agricultural Science educators who were engaged in teaching Agricultural Science, during the 2012 academic year. As indicated in Table 7.2, the respondents' population consisted of 56.7% (102) male teachers and 23.3% (78) female teachers. In terms of racial background, 83.3% (150), 5.6% (10), 7.2% (13) and 3.9% (7) of the respondents were African, White, Coloured and Indian, respectively. The difference is significant at $P \leq 0.001$ level (Table 7.2).

The descriptive statistics showed that 40% (72) of the teachers' population had an Agricultural Science qualification while 45% (81) and 15% (27) of the total respondent's population indicated that they had a life science and social science qualification, respectively. The difference is significant at $P \leq 0.001$ level. Out of the total sample of Agricultural Science teachers, 31% (56), 33.9% (61), 27.2% (49), and 7.8% (14) were in the age range of 20-29, 30-39, 40-49 and 50-59 years, respectively. In terms of the respondent teachers' satisfaction levels, out of the total respondent population, 40% (72) of them indicated that they were satisfied with the remuneration that they were receiving as a result of their teaching job, while slightly more (60% or 108) educators responded that they

were not satisfied with what they were earning (Table7.2). The difference is significant at P ≤ 0.05 level (Table 7.2).

A total of 52.2% (94) of the respondent educators perceived that there is respect and good social value for Agricultural Science teachers. Conversely, a slightly lower percentage, 47.8% (86), of them perceived that they were dissatisfied with the social value for teachers from the stakeholders. A total of 33.9% (61) of the selected respondent educators indicated that the teacher-student-ratio matches the existing standard for secondary schools. However, a slightly higher (66.1%) percentage of the educators indicated that the teacher-student-ratio is not in the range of this ratio, as proposed by the Department of Education for Secondary School Education (Table 7.2). The majority 73.9% and 71.7% teacher respondents indicated the existence of good administration and school communication in the school. The difference is significant at P ≤ 0.001 level. Good administration and school environment have an effect on students and school achievement.

Table 7.2: Definition of variables and their descriptive statistics (n = 180)

Variable definition	Symbol	Mean (Std)	χ^2
Male	AM 1	0.567 (±0.496)	3.200
Female	AF 2	0.433 (±0.497)	
Age 20-29 years	AGE 1	0.311 (±0.464)	
Age 30-39 years	AGE 2	0.339 (±0.475)	30.08[1]
Age 40-49 years	AGE 3	0.272 (±0.446)	
Age 50-59 years	AGE 4	0.078 (±0.268)	
Racial background African	RBG 1	0.833 (±0.374)	
Racial background White	RBG 2	0.056 (±0.230)	327.067[1]
Racial background Coloured	RBG 3	0.072 (±0.259)	
Racial background Indian	RBG 4	0.039 (±0.193)	
Teaching Experience 1-5	TEY 1	0.261 (±0.440)	
Teaching Experience 6-10	TEY 2	0.267 (±0.443)	
Teaching Experience 11-15	TEY 3	0.239 (±0.428)	57.267[1]
Teaching Experience 16-20	TEY 4	0.122 (±0.328)	
Teaching Experience 21-25	TEY 5	0.089 (±0.285)	
Teaching Experience >25	TEY 6	0.022 (±0.148)	
Qualification Certificate	QLN 1	0.189 (±0.393)	
Qualification Diploma	QLN 2	0.783 (±0.413)	171.033[1]
Qualification Degree	QLN 3	0.028 (±0.164)	
Area of specialization	AOS 1	0.400 (±0.491)	27.900[1]

Variable definition	Symbol	Mean (Std)	χ^2
Area of specialization Life	AOS 2	0.450 (±0.498)	
Area of specialization Social	AOS 3	0.150 (±0.358)	
Library resources (Yes)	LIB 1	0.056 (±0.230)	142.222[1]
Library resources (No)	LIB 2	0.944 (±0.228)	
Access to a farm (Yes)	AF 1	0.256 (±0.437)	43.022[1]
Access to a farm (No)	AF 2	0.744 (±0.437)	
Access to internet (Yes)	IA 1	0.261 (±0.441)	41.009[1]
Access to internet (No)	IA 2	0.739 (±0.441)	
Heavy Teachers' workload	TWL 1	0.556 (±0.498)	2.222
Heavy Teachers' workload	TWL 2	0.444 (±0.498)	
High social value (Yes)	SV 1	0.522 (±0.501)	0.356
High social value (No)	SV 2	0.478 (±0.501)	
Correct Teacher-student ratio	TSR 1	0.339 (±0.475)	18.689[1]
Correct Teacher-student ratio	TSR 2	0.661 (±0.475)	
Salary Satisfaction (Yes)	TSS 1	0.400 (±0.491)	7.200[2]
Salary Satisfaction (No)	TSS 2	0. 000 (±0.491)	
Satisfactions on the school	TS 1	0.739 (±0.441)	41.089[1]
Satisfactions on the school	TS 2	0.261 (±0.441)	
Satisfactions on Nature of	SNC 1	0.717 (±0.452)	33.800[1]
Satisfactions on Nature of	SNC 2	0.283 (±0.452)	

7.5.2 Factors affecting the attitude of teachers towards AET

The teaching and learning process is directly related to teachers and students. The effectiveness of teachers in transferring knowledge and skills to agricultural sciences students depends, in part, on the attitude of teachers towards agricultural science. Several factors could positively or negatively affect the attitude of educators towards teaching agricultural sciences. Hence, these sections explore some selected factors that influenced the attitude of teachers towards Agricultural Science at secondary school level, as shown in Table7.3.

The Censored Tobit Regression model final analysis result is presented in Tables 7.3. The likelihood ratio chi-square of 178.83 (df=23) with a p-value of 0.0001 indicate that our model as a whole fits significantly better than an empty model (i.e. a model with no predictors) with a 95% confidence interval. The CTR model coefficients of the thirteen identified independent variables are also presented in Table 7.3. Based on this analysis, eight independent variables, including age, racial background, areas of specialisation,

internet access, salary satisfaction, teachers' satisfaction and nature of communications were found to be significant (P < 0.01) factors influencing changes in the attitude of educators towards AET.

Table 7.3: Summary of descriptive statistics for explanatory variables (n = 180)

Variables	Coefficient	Standard Err.	P > t
AGE 1	-2.72285	1.249176	0.031 [2],,
AGE 2	0.72390	1.225371	0.556
AGE 3	0.66346	1.122007	0.555
RBG 1	6.44440	1.315199	0.000 [1]
RBG 2	4.26783	1.638707	0.010 [1]
RBG 3	4.38327	1.469329	0.003 [1]
TEY 1	0.48218	2.495839	0.847
TEY 2	-1.56239	2.485198	0.530
TEY 3	-1.35986	2.389472	0.570
TEY 4	-3.76181	2.475317	0.130
TEY 5	-3.02535	2.573428	0.242
QLN 1	2.60397	2.203409	0.239
QLN 2	1.31652	2.184340	0.548
AOS 1	2.31957	0.749807	0.002 [1]
AOS 2	0.32980	0.783699	0.674
LIB 1	-0.17692	1.155453	0.879
AFPRAC 1	-0.58171	0.624202	0.353
IA 1	-3.56908	0.679426	0.000 [1],
TWL 1	0.17659	0.481981	0.715
TSS 1	-1.93925	0.641243	0.003 [1]
TS 1	3.40062	0.698534	0.000 [1]
TSS 1	1.49436	0.535633	0.006 [2],
SNC 1	4.10611	0.773146	0.000 [1]
_cons	32.49097	2.205724	0.000 [1]
P ≤ 0.0001	Log likelihood=-	Chi-Square 178.83(23)	

NS, (1), or (2) non-significant or significant at P ≤ 0.001 or P ≤ 0.01 level, respectively.

7.5.2.1 Age of teachers

The attitude of Agricultural Science teachers had a significant correlation with their ages in the category of teachers aged between 20-29 years (Table7.3). There was a negative correlation between the young age of respondents and their attitude towards AET

at secondary schools. The attitude of the respondents was decreased by -2.71, corresponding to a one unit change in the teachers' age. This was found to be statistically significant at P ≤ 0.05 probability levels. Teachers in the age category of 20-29 years have a negative correlation with their attitude towards AET. Teachers in the age category varying from 30 to 59 years were positively correlated with their attitude towards AET. This means that the attitude of teachers towards AET was positively influenced, with an increase in the age of teachers above 30 years.

Younger teacher had a more negative attitude than older Agricultural Science teachers. This suggests that there should be more focus on motivating and supporting younger teachers to positively influence learner attitudes towards AET. A similar study by Hickson and Oshagbemi (1999) showed that there was a significant relationship between the age of teachers and their satisfaction levels, which could be the reason for this negative correlation. Teachers' satisfactions could have its own effects on teachers' interest in teaching AET. Out of the total sample population used in this study, only 31% (56) of the sample population belong to the age group varying from 20-29 years. Concurrently, out of this population, 12.8% (23) of them have an Agricultural Science qualification while 18.3% (33) of the respondent teachers have either life or social science qualifications. These clearly showed that the majority of teachers in the age category varying from 20-29 years have been teaching the Agricultural Science subject without having the relevant qualification to do so. This could create stress and negative feelings towards teaching due to the fact that they are responsible for teaching a subject outside of their knowledge and skill competency areas.

Teachers' innovation during the delivery of theory and practical aspects of the courses may also be influenced by their qualifications. Furthermore, the report on the attitude of youth towards AET indicated that, in the eyes of most youth in South Africa, agricultural education has a very poor image as a career choice (DoA, 2005, 2006, 2007, 2008), which is in agreement with the findings of this study. This might be attributed to their background qualifications, as is evident from the present study, as well as job inaccessibility and the unavailability of opportunities in the agriculture sector. This is clearly demonstrated by the results obtained in this study that the current teachers in the age categories varying from 20 to 29 years seem to have a negative attitude towards AET, which is in line with the findings of Dehghan and Jalilzadeh (2011). During the interview, the educators responded that they have a strong desire to further their studies in other

relevant and marketable fields and hence, indicated their future interest to change their career to a profession other than in the agricultural sciences.

During, the qualitative data collection it was observed that teaching Agricultural Science without relevant qualifications, teaching aids and support could be a challenge to teachers with a background or experience in other disciplines. Based on the observation made during qualitative data collection, the respondents clearly indicated that they need support in terms of training, teaching aids and improved infrastructure, all of which would assist them to effectively teach the subject, moving beyond theory and including innovative practical activities. Failing this, it is evident from the qualitative data obtained in this study, that these conditions may encourage the teachers to seek career development in areas other than agriculture and related professions.

7.5.2.2 Racial background of teachers

The racial background of teachers was positively correlated with their attitude towards AET (Table7.3), irrespective of their racial background. A one unit increase in the racial background, such as African, White and Coloured was independently associated with 6.6, 4.4, and 4.5 unit increases, respectively, in the predicted value of the change in the attitude of teachers towards AET as, shown in the Table7.3. This means the racial background of the Agricultural Science educators had a positive and significant ($P \leq 0.01$) influence on their attitude towards AET. African teachers had more positive attitude towards AET, compared to the White and Coloured teachers. Regardless of their differences in racial background, all teachers appear to have positive perceptions towards AET, although the level of influence of this parameter on the attitude of teachers towards AET varies slightly. However, these differences could be related to other socio-economic factors, levels of information and awareness of AET prospects that might need to be further investigated. A similar study by Wiley *et al*., (1997) showed that there were attitude differences based on the level of information about the general opportunity prospects and other benefits of Agricultural Science teaching at secondary school, which could also vary with the background of teachers.

7.5.2.3 Teacher qualifications

Having an Agricultural Science qualification had a positive and significant effect on the teachers' perceptions about AET. According to the Censored Tobit Regression Model, a one unit increase in the educators' Agricultural Science area of qualification has a 2.3 unit increase in the changes pertaining to their attitude towards AET, which was found to be significant at $P \leq 0.01$ levels. It was evident from the results obtained in this study, that a positive attitude of educators can be achieved when teachers who are qualified in Agricultural Science are engaged in teaching AET. It is noted that 60% (108) of the educators were teaching Agricultural Science without having the relevant Agricultural Science qualification (Table7.2). Goldsmith, (2004) reported that teachers' area of qualification and the subject that they are assigned to teach have an influence on their attitude towards teaching. Similarly, other literature also showed that teachers' qualifications have a significant effect on the way that they manage the teaching and learning process (Darling, 1999). Teacher qualification is the most important and core factor in order to, improve the attitude of teachers towards teaching and hence to enhance student achievement. In similar studies, teachers' qualifications were shown to have a positive relationship on student outcomes in science subjects (Darling, 1999; Zuzovsky, 2003). Looking at teachers' qualifications is very relevant when one takes into consideration other teaching and learning inputs, including classroom administration, curriculum delivery and teaching infrastructure and support. Similarly, the qualitative data also indicate that the majority of Agricultural Science teachers perceived that their qualification does not fall in one of the fields of agriculture science or technology. Surprisingly, the majority of teachers who have Agricultural Science qualifications and background clearly indicated that they wanted to further their studies in any one of the existing Agricultural Science or technology disciplines. However, the interviewed teachers who are teaching without having relevant qualifications indicated that they love the teaching profession but that they need short-and long-term training on teaching aids, facilities and other support to upgrade their competency in agricultural sciences.

7.5.2.4 Teacher access to internet

The Agricultural Science teachers access to internet facilities were negatively correlated with the attitude of teachers towards AET. A one unit increase in access to

internet has a decreasing effect on the attitude of educators by -3.6, which was found to be significant at P ≤ 0.01 probability level (Table7.3). Those teachers that had access to internet had a negative perception about AET, which could be attributed to the extent of the influence of the availability of communication and information technology on educators' outlooks towards AET. This was attributed to the fact that they are not accessing AET related information through their respective schools, mainly due to lack of computer and internet facilities in the schools. Personal accessing and gathering information concerning job availability and future career prospects in agriculture seems to encourage teachers to be more likely to view Agricultural Science at secondary school level in a negative light. The findings are contrary to those of Albirini, (2006) and Tekerek *et al.*, (2012) whose results indicated that teachers showed positive attitudes toward the importance of ICT and the internet in education. The majority of teachers have internet access at home and have a positive attitude towards internet use. However, based on information gathered during qualitative data collection, the majority of Agricultural Science high school teachers do not have sufficient access to internet and computer facilities at school. The respondents pointed out that they accessed the internet for private and personal use and, in general, did not have enough access to the internet to obtain information on and increase their scientific awareness of AET. The respondents also suggested that sufficient access to information technology, mainly internet access, could create adequate opportunities for teachers to search for and acquire both theoretical and practical knowledge and skills relevant to agricultural science. This could be the most likely reason for the trends observed in this study.

7.5.2.5 Teacher salary satisfaction

Teachers' salary satisfaction, job satisfaction and motivation are interrelated and can be influenced by several factors. In this section the correlation between the perception of Agricultural Science teachers in terms of the levels of their salary satisfaction and salary satisfaction as an independent variable was explored (Table 7.3). A unit increase in educators' salary satisfaction led to a two-point decrease in the attitude of educators towards AET and teaching the subject. The relationship shows a negative influence on teachers' attitude towards AET. Unexpectedly, teachers' salary satisfaction had a negative correlation with the attitude of teachers towards Agricultural Science teaching (Table7.3), which was found to be significant at P ≤ 0.01, level of significance. This result showed that

more percentage of Agricultural Science high school teachers were offering AET without having Agricultural Science qualification and hence, even if they were more satisfied in terms of salary, their attitude towards AET was still negatively influenced. This might be due to the influence of the responses of the majority (60% or 108) of teachers who have qualifications other than agricultural sciences (Table 7.2). This means that the majority of Agricultural Science high school teachers are teaching Agricultural Science without having relevant qualifications in agriculture, but related disciplines instead. (Currall *et al*., 2005) indicated that there was a positive correlation between pay satisfaction and school achievement. Similar findings by Eric *et al.* (1999) also showed a strong correlation between highly experienced teacher's salary satisfaction and student achievement. Reasonable pay given to experienced teachers was reported to have an indirect impact on student achievement in secondary schools, whilst the coupled effects of newly-employed teachers and their salary satisfaction were reported not to have much impact on student achievement at secondary school level.

The qualitative data also supports the trends reported earlier in this section that teaching the subject with limited background may influence teachers' levels of involvement in practical teaching. They strongly suggested that there is a need for further training to upgrade skills. Similarly, the respondents indicated that there is a lack of proper teaching infrastructure and support to teach practical education in the majority of high schools, which could be partly responsible for the negative relationship observed in this study. Moreover, the majority of the respondents were at the younger end of the age range, with limited teaching experience. The minority of these teachers have relevant Agricultural Science qualifications, which could lead to a negative correlation between salary satisfaction and the attitude of educators towards AET. Also, the educators indicated that even if they were satisfied with their pay, there remains a problem in that there is a need for further education and training in agricultural sciences or technology, to upgrade their knowledge and skills in the area and play a valuable part in teaching AET in secondary schools. Hence, this could empower teachers, since low stress levels will aid in the effective delivery of the curriculum, as well as satisfactory teaching achievements.

7.5.2.6 Teacher satisfaction with support from administration

Teachers' attitudes towards AET positively correlated with teachers' satisfaction with the administration support in the selected schools offering agricultural sciences. Based on the Censored Tobit Regression Model output, a one-unit increase in teachers' satisfaction in school administration leads to a three-unit increase in the changes in attitude of educators towards AET, which was found to be significant at $P \leq 0.01$ levels (Table 7.3). This finding implies that having a good working environment and good support from school administration within the school micro-environment could have a positive effect on the educators' perceptions of teaching AET. Under realistic conditions, the school administration environment has either positive or negative potential effects on the effectiveness of teaching in schools. Similar results were reported by Hinkson and Kieth, (1999) who indicated that there was a strong relationship between the nature of communication between the school administrators and Agricultural Science teachers. Having good communication with the school administration, a good work environment, was known to motivate and improve the perceptions of teachers towards their career. The qualitative data shows that the majority of teachers pointed out that two-way open communication within the school environment could help them to effectively provide solutions for teaching and learning process related problems in a timely manner. Having a good school environment promotes the creation of unity and common goals among the staff, administrators and students, which results in motivation towards a common goal and creates a better academic work environment. This, in turn, may assist in meeting the goals of the school achievement plan which could, in turn, result in overall student academic success. Educators, staff and administrators can become effectively engaged in the provision of innovative solutions for day-to-day teaching and learning shortfalls in order to achieve the students' success.

7.5.2.7 Teacher social value

Teachers' social aspects deals with teachers experience regarding human relationships in schools and the larger community. A unit increase in the social value towards educators as an independent variable in the CTRM correlated with a 1.5 increased effect on the attitude of teachers towards teaching AET. A positive or good social value towards AET educators has a positive and significant ($P \leq 0.01$) effect on the educators'

perception towards teaching AET (Table 7.3). Teachers' contributions to student knowledge development have a direct effect on learners, as well as an indirect effect on the community. Community acceptability and respect for teachers influences the teachers' perceptions towards teaching Agricultural Science and the level of commitment they make to change the future of their students in particular and their community in general. Thus, both the qualitative and quantitative data proves that societies have to value teachers operating at different levels of education. It is obvious that social values can significantly influence many of the judgments that teachers make and have an impact on the levels of support that teachers provide to their learners. It was evident from the results obtained in this study that a high level of social value for teachers is a great reward and motivator to teachers and hence encourages them to contribute their best, to the satisfaction of the larger community. They also indicated that teachers need recognition from the school community and society at large.

7.5.2.8 Nature of school communication

In this study, it has been noted that the nature of communication in the school has a positive influence on the teachers' attitude towards teaching AET (Table 7.3). The results show that a unit improvement in school communication leads to a four unit increase in the attitude of teachers towards teaching AET. The availability of good communication between teachers, students, administrators and support staff in the school micro-environment, positively influenced teacher attitude towards AET. Good communications in the schools' teaching and learning environments assists in creating positive teacher attitudes towards teaching and AET. A similar study by Thompson and Balschweid (1999) showed that the nature of communication in the school environment has a partial influence on the effectiveness of teaching and achievement. Stewart (2008) also reported that the nature of school communication and its structural characteristics play an important role in contributing towards a successful school outcome. Similarly, Avramidis and Norwich (2002) reported that human and physical supports, including communication, are important entities that have an enabling effect on schools, resulting in an effective teaching and learning environment. Agricultural Science teachers indicated that it was important to have good communication with other schools, allowing for information about relevant teaching and learning activities to be shared, departmentalization within the school, an experience sharing platform within the school and participating in organizational level activities, while

having evaluations, rewards and relevant recognition could encourage teachers to innovate teaching and feed into healthy work environments. Moreover, good school communication and a positive environment promote mutual helpful learning, respect, unity and mutual trust in the teaching and learning process. These positive school environments have been shown to lead to improvements in teaching and learning environment in the school (Ghaith, 2003; Kerr *et al*., 2004; Finnan, *et al*., 2003). Usually, the nature of communication and environment in the school, such as the physical environment, the social system, relationships between principals, teachers and administrators, teachers and students, the sense of community, teacher and student morale, norms among peers and safety, have a significant effect on student achievement and success (Blum, 2002; Rutter, 1983).

7.6   Conclusion and recommendations

Out of thirteen independent variables used in the Censored Tobit Regression Model, only eight independent variables had a significant effect on the attitude of educators towards teaching AET. Age, internet access and salary satisfaction had a negative and significant ($P \leq 0.05$) effect on teachers' outlook towards teaching AET. Conversely, racial background, area of qualifications, teachers' satisfactions with school administration, social value and the nature of school communication in the school environment have positive and significant ($P \leq 0.01$) influences on the teachers' perceptions towards teaching AET. Improving teachers' quality, school administration support and the nature of communication in the high schools which offer Agricultural Science has a beneficial impact on improving teachers' attitudes towards AET. Therefore, the directly related parties, including the Department of Agriculture, Forestry and Fisheries and the Department of Education and Department of Higher Education, should work in a coordinated manner to solve the existing AET limitations. These could include the creation of opportunities for short- and long-term training through formally organized in-service programs for Agricultural Science high school teachers and school administrators. A Provision of appropriate information about the importance of AET, as well as a job and developmental contribution prospectus communicated through various channels, could also be important in creating positive teachers' attitudes towards AET. Hence, innovative communication amongst the above mentioned stakeholders may also help information-sharing and thereby create a platform for Agricultural Science high school teachers. Other

communication media, including newsletters, pamphlets, short-term training, experience sharing and visiting programs, dialogue with successful agricultural experts and organizations in the agricultural sectors, might also need some attention.

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CHAPTER EIGHT

AGRICULTURAL EDUCATION AND TRAINING IN SOUTH AFRICA: A SYSTEMS PERSPECTIVE

Abstract

This study focuses on Agricultural Education and Training (AET) limitations to improving its system effectively. The paper draws on two main sources of information: emerging literature on AET in South Africa and a summary of gathered data from primary sources and literature. Access to resources, capacity building and information were found to be the major areas needing attention, to foster positive attitudes among teacher and students in high school AET programmes and improve student achievement and the performance of the AET system.

The AET system considers open information-sharing and networking between policymakers, GO's and NGO's, society, students and teachers, school administrators, principals, researchers and all educational process stakeholders targeted for AET improvement. The system can strengthen the capabilities of AET organizations and professionals, change organizational cultures and behaviours and build innovative efficient networks and linkages. The outcome can develop favourable high school teachers' and students' attitudes and students' academic achievement. AET plicy and interventions with efficient implementation aimed at improving information-sharing, agricultural knowledge building and income generating, need to be taken into consideration. Therefore, the efficient implementation of AET policy and interventions, aimed at improving information-sharing, agricultural knowledge building and income generation, need to be taken into consideration.

Key words: Agricultural Education and Training, policymakers, teachers, community, students, research, South Africa.

8.1   Introduction

Improving AET assists in the development of agriculture and agricultural sector industries. To achieve this, skilled agricultural science professionals and practitioners are needed to increase agricultural sector's productivity, as well as competitiveness for an efficient functioning of agricultural and sector industries (Aliber *et al.,* 2009; Lahiff and Cousins, 2005; Meijerink and Roza, 2007).

The evaluation and modification of AET, when required during the delivery process, could help to maintain the quality of AET (Smit and Oosthuizen, 2011). Empirical information that considers the actual agricultural development under local conditions is required to help the system to function properly (Ojiambo, 2009). For the improvement of the system, research focusing on the assessment of the AET implementation process, the attitude of the participants and the factors influencing the attitude of teachers and students towards AET, are the most important elements. Identification of the existing gaps and limitations in the AET process could help to develop solutions to strengthen knowledge-based agricultural development (Spielman *et al.*, 2008).

This study is based on two main sources of information, comprising the emerging literature on AET in South Africa and a summary gathered from the primary data sources in 2012. The paper deals with AET background information, its educational processes and recommendations for improving its system.

8.2   Research aim and questions

The aim of this study was to indicate how approaches in AET educational processes can sustainably improve the attitudes of participants and the contributions of other role-players. The key question of this chapter was having the completed study result and the sub-question further retained and presented as follow:

- What is the scenario of AET in South Africa?
- What are the factors affecting teacher and student attitudes toward AET?
- In what ways do the identified factors suggest AET can be improved?
- What are the main constraints on the solutions and needs that are required to meet AET limitations?

- What is the role of stakeholders for the development of the educational process in AET?

- How should AET at Level 2-4 be designed to meaningfully contribute to the advancement of the agricultural sector in South Africa?

8.3   Methodology

The summaries of quantitative and qualitative data that were presented in Chapters 2, 3, 4, 5, 6 and 7 are used in this section. This study was proposed as a response to the earlier work (Chapter 2), which suggested that positive teacher and student attitudes toward AET, in addition to the use of efficient educational processes, can contribute positively to student academic achievement. The conclusions drawn from the study were employed and used to develop relationships between different AET actors and thereby recommend alternative best solutions for possible implementation.

8.4   Conceptual framework of AET

8.4.1   AET in South Africa

Before 1994, there were gaps in AET educational opportunities. Students were trained in agriculture, combined with other non-scientific subjects (DoA, 2005). Since 1994, new AET policies, programmes, strategies and governance structures have been introduced and established (Didiza, 2005). In the National AET Strategy document, it was reported that there are some limitations and challenges facing AET in South Africa (DoE, 2005). After 1994, urban and rural high schools that consist of agricultural science as a subject or program of study, were opened. The Agricultural Science programme was introduced, by either replacing or adding to the programmes that had already been in place.

AET is the source of skilled manpower in agriculture. Knowledge-based agriculture is required for the advancement of agricultural sectors, food security and rural livelihood (Mafunzwaini *et al*., 2003). In addition, the current trend in globalization and market computation demands for technical vocational skills, to support the emerging agricultural development (Usman and Pascal, 2009). In South Africa, modern scientific agriculture could contribute to the economy by promoting the export of agricultural products and thereby reducing the level of existing unemployment and poverty (Lahiff and Cousins, 2005). Similarly, it is evident from literature that strengthening knowledge-based

agriculture is vital for food self-sufficiency and success in global market competition, thereby generating capital to create jobs in the country (Hamel, 2005; Lahiff and Cousins, 2005). The question that may arise in this context is: Can the current AET efficiently support the production of highly skilled and practically oriented agricultural proferssionals?

Agriculture as a career choice has a negative image among South African youth (DoA, 2005). However, there is not much literature available on the factors that influence the perceptions of students and educators towards AET. Similarly, there is not much literature available that deals with the AET educational processes. Therefore, assessing the educational process and the attitudes of participants, such as teachers and students, is vital to gather primary data about AET. The existing report implies that there is a lack of coordination and harmonisation between AET policy requirements and curriculum implementation (AFF, 2008). Thus, this study focuses on the identification of these existing gaps in the process of AET implementation, coordination and the development of approaches to improve the attitude of participants.

8.4.2 Factors affecting the attitude of students towards AET

Family size, racial background, availability of land for parents and discussion about agriculture, all positively influence student attitudes towards AET (Chapter 5). Family monthly income (R500-R5000) and high school educated mothers have a negative influence on student attitudes towards AET. Different racial groups of agricultural science teachers and students have positive, but different attitude levels towards AET (Figure 8.1). It is evident from Chapter 5, that information about AET can have a positive influence on learner attitudes towards AET. Making an adjustment and improving on the identified positive or negative factors can have significant effects on student achievement and attitude. Sufficient information on agriculture, adequate income and access to relevant resources have positive effects on the attitudes students towards AET. The identified positive and negative factors might help policy-makers and implementers to solve the existing AET shortcomings through positively motivated innovative skilled manpower production. Basically, securing the quality of AET and producing productive forces that could support agriculture, remains a priority. Secondary schools play a key role in this process of producing skilled manpower for advancement of the agricultural sector (Mafunzwaini *et al*., 2003). In Africa, as well as in South Africa, the emerging vibrant

agriculture industry needs skilled manpower. Therefore, system harmonisation is required between research, policy, curriculum and implementation (AFF, 2008).

Student family education and monthly income were also found to be important factors, since they were found to have a negative and significant influence on the attitude of students towards AET (Chapter 5). Creating opportunities for open and increased family participation in the teaching and learning process has beneficial effects on learners and parents attitudes towards AET. This is particularly effective when applied to low-income families in school teaching and learning programmes (Lawson and Lawson, 2012), as many families of agricultural science students fall into the low-income catetory. Parent participation in school activities may also increase parent responsibility, hence positively reinforcing the attitudes of parents towards AET.
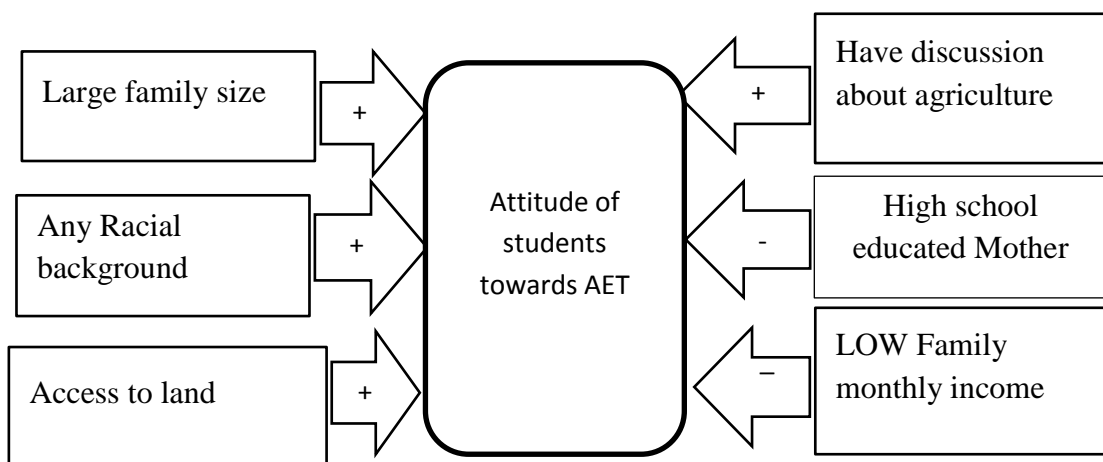
Figure 8.1: The identified factors that could affect the attitude of learners towards AET (Chapter 5).

8.5   Factors affecting the attitude of teachers towards AET

School organisations, a community and teachers are the most important entities that assist in the implementation of the AET curriculum in secondary schools. The primary data generated in this study and discussed in Chapter 7, show that teachers' age, salary satisfaction and access to the Internet negatively correlated with the teachers' attitude towards AET. Teacher salary satisfaction does not seem to positively influence the teachers' attitude towards AET. Communication in the school environment, teachers'

acceptance by and respect of the community (social value), satisfaction with administrative support services, an area of specialization and racial background, all had positive influences on teachers' attitudes towards AET. The relationship between these factors and the educators' attitude is presented in Chapter 7. In this chapter, the overall relationship is investigated, to recommend a holistic model that has a potential for easy implementation. Figure 8.2 show that qualifications, a good school environment and a favourable society outlook towards teachers have a positive influence on the participants' attitude towards AET.

Positive teachers' attitudes towards the area they teach can have significant effects on student achievement. Research-based policymaking might help to provide alternative and optimal solutions to the problems identified, and hence, could lead to efficient implementation, by ensuring good stakeholder inter-connection and transparency with the coordinated action, to create positive teacher attitudes towards their area of teaching.
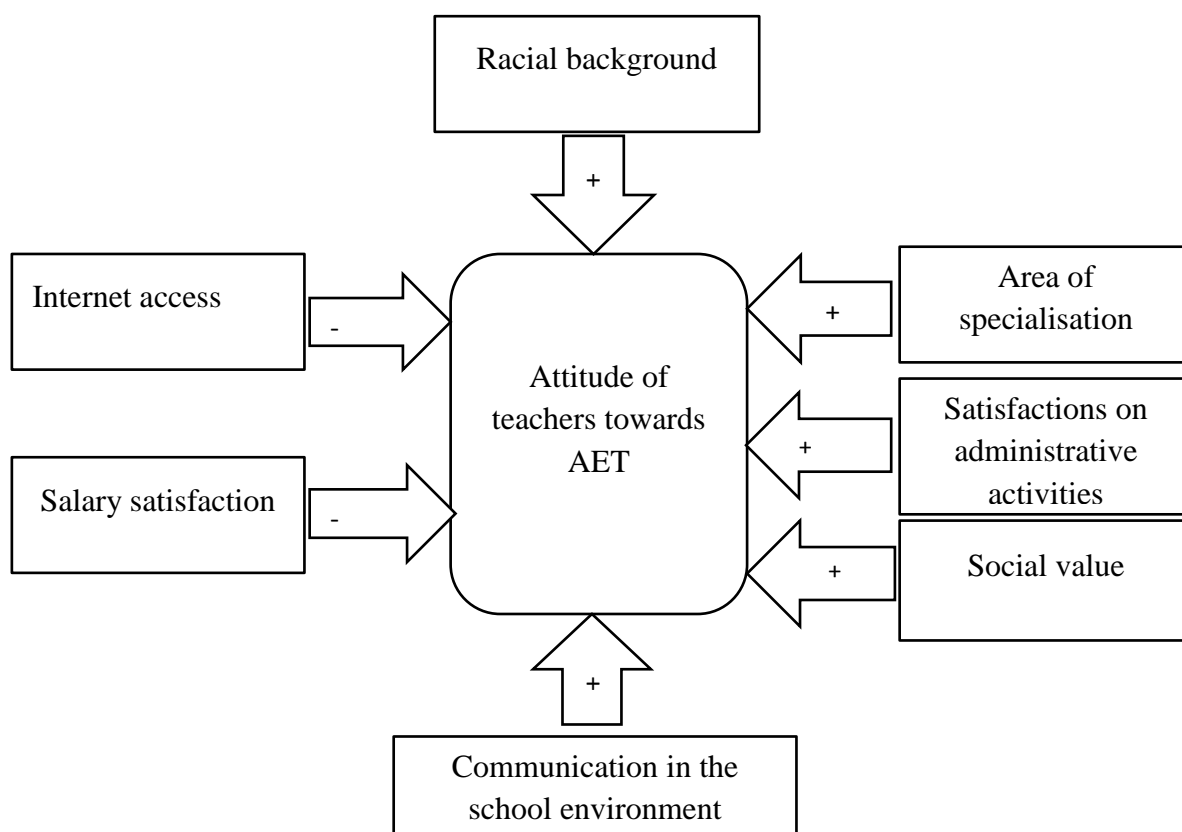
Figure 8.2: Factors affecting the attitude of teachers towards AET

8.6   Pooled data, factors influencing teacher and student attitude towards AET

The factors that affect the attitude of teachers and students towards AET identified in this study and presented in Chapters 4 and 6, are categorised into four major groups, namely, socio-economic, socio-cultural, situational factors and information technology-related variables.

The attitude of teachers and students towards AET was influenced positively, while the family education, family monthly income and salary satisfaction correlated negatively with the attitude of teachers and students towards AET (Figure 8.3). These findings clearly demonstrate that creating positive attitudes is not only limited to economic factors and teacher satisfaction. This is evident from the direction of relationships between the dependent variable, namely, the attitude of teachers towards AET and the independent variable grouped under socio-cultural factors, socio-economic factors, situational factors in the teaching and learning process and situational factors, as well as information access-related variables (Figure 8.3).

The racial background, the area of specialisation and family size significantly and positively correlated with student and teacher attitudes towards AET. In agreement with this result, personal variables and demographic variables had a significant and positive influence on these attitudes towards AET (Major and O'Brien, 2005). Situational factors, such as social value, teacher satisfaction with administrative support and communications in the school environment, all correlated significantly and positively with the attitude of learners and educators towards AET. This is in agreement with the findings of Koh *et al*. (1995) and Papanastasiou and Zembylas (2004).

Relevant AET-related information receiving and distribution mechanisms are the knowledge management tools that can assist in improving perceptions of students and teachers towards AET. Obviously, information is power and facilitates development and hence leads to security. The independent variable, such as discussions about agriculture, has a positive influence, while conversely, Internet access has a negative influence on teacher attitude towards AET. In this case, relevant information from identified sources was proven to be beneficial, which positively improves the attitude of students and teachers towards AET. Information could bring a fundamental change in personal

understanding and learning, which the individuals have and experience (Leidner and Jarvenpaa, 1995).

Socio-economic factors
- Access to land (+)
- Family education (-)
- Low family income (-)
- Salary satisfaction (-)

Socio-cultural factors
- Any racial background (+)
- Specialisation (+)
- Family size (+)

Attitude of Teacher's and learners' towards AET

Situational factors in the teaching and learning process
- Having Social value (+)
- Satisfactions on administrative (+)
- Communication in the school environment (+)

Information variables
- Having discussion about agriculture (+)
- Internet access (-)

Figure 8.3: Factors affecting the attitude of teachers and students towards AET (Chapter 3).

8.7   AET programme processes

The efficiency of the AET process determines the success of agriculture and agricultural sector industries. In the teaching and learning process, there was variation between dedicated, urban and rural secondary schools on curriculum delivery, classroom administration, infrastructure and support (Chapter 3). The rural, dedicated and urban secondary school students all indicated that they did not receive classes to compensate for missed lessons. Dedicated and rural agricultural schools suffer from a shortage of Agricultural Science teachers, compared to, urban agricultural science high schools. The results showed that the absence of missed lesson compensation was related to the shortage of agricultural science teachers in a respective high school (Chapter 3). Rural and dedicated secondary schools have shortages of agricultural science teachers (Chapter 3). This implies that it is important to build the capacity, to increase the number of trained

teachers in the system (Figure 8.4). Similarly, the lack of equipped laboratories for Agricultural Science-related experimentation in the schools was also emphasized by students and teachers respondents. Urban secondary schools have a comparatively good teaching infrastructure and support, compared to the dedicated and the rural Agricultural Science secondary schools (Chapter 3). The majority of agricultural science students in most schools visited during the study period, indicated that there was not sufficient infrastructure and support. Absence of sufficient infrastructure and support could have an influence on AET quality delivery, school outputs and student achievement (Greenwald *et al.*, 1996). This could be the reason for students' lower AET matriculation results.

8.8   Factors influencing the attitude towards AET and the implementation process

AET supplies the required skilled manpower for the agro-industry. In principle, in a more holistic approach, educators, learners and parents work together to achieve the desired objectives (Lawson and Lawson, 2012). Participation and interaction between communities, students, teachers and school systems could contribute positively to the success of teaching and learning. Continuous evaluation and systems overhauling is a realistic way to increase the implementation efficiency of AET in secondary schools, since the foundation work starts at this stage.

Variation in the required resource availability and distribution was implied between dedicated, urban and rural secondary schools (Chapter 3). The level of skilled agricultural science manpower production is determined by quality and type of educational process, as well as resource distribution amongst schools. Researchers, policymakers and other implementation organizations, such as GOs, NGOs, schools and communities, should work together through open, transparent and two-way communication systems. Information, access to resources, capacity building and having an enabling environment are vital in making the right choice and producing a positive attitude towards AET. Therefore, it is important to have innovative, engaging, coordinated, open and transparent AET processes in the system to establish a continuous overhauling of educational processes.

8.9 The Main Constraints on AET

The constraints of AET include lack of relevant information, capacity building, access to resources and enabling environments. In this study, these constraints and needs, which need to be attended to, are presented as follows:

8.9.1 Information about AET

The availability and access to relevant AET information has an impact on the attitude of the community, teachers and learners towards the subject. Moreover, having information about agriculture could also influence learners' subject choices, career outlook, economic benefits and other related opportunities that determine the participants' attitudes and achievements in agriculture. The planning and evaluation of information delivery systems and facilities should be applied, to transfer relevant information to AET (Figure 8.4).

The delivery of planned and relevant agricultural information to targeted audiences can have significant effects, by influencing the recipient attitude positively towards AET. Literature shows that knowledge of the targeted audience and their experience determines the type and nature of information needed (Verbeke, 2005). Organised agricultural science information delivery systems are therefore required to improve community, parent, teacher and student attitudes towards AET. This assists in empowering the participants to have the right attitude and make more informed decisions, which can contribute positively to the advancement of agriculture and the sector industry (Dooley *et al*., 2013).

Information dissemination through electronic media, such as radio, television, pamphlets and newsletters, as well as the publication of examples of successful individual agricultural entrepreneur experiences, are also beneficial for developing favorable perceptions towards AET (Farooq *et al*., 2007). In summary, cost-effective techniques for the dissemination of information are useful to create agricultural knowledge and positive attitudes of the participants. The suggested changes thereby ensure emerging agricultural development (Reddy and Ankaiah, 2005). Information about future AET career and job prospects also has an influence on student, teacher and participant attitudes towards AET, and this favourable attitude has an effect on student achievement and on the agriculture and sector industry (Papanastasiou and Zembylas, 2004).

8.9.2 Capacity development

Knowledge of AET by teachers, students and the community plays a major role in promoting agriculture and AET achievement objectives. This in-turn also affects the participants' attitude towards agriculture and AET. Agricultural knowledge and practical skill has a meaningful impact on agriculture, especially when it comes to emerging agriculture industry in South Africa. Agricultural sector development can be realized through both short-term and long-term AET. This in-turn would lead to building the capacity of teachers, students, the community and parents in the AET systems network (Figure 8.4).

Agricultural education is an applied and vocational science in which the acquisition of skills is very crucial. Students' practical and theoretical knowledge is required, to respond to both the existing and the emerging agriculture and sector industry (McGrath 2012; McGrath and Akoojee, 2009). The provision of the required agricultural science knowledge will assist in building the capacity of students to play an important role in modern agriculture and inspire the emerging agriculture industry in regions in Africa and worldwide.

Teacher, student, community and parent participation in agricultural science knowledge and skills development, using different means, such as farmers training centers, community gardens and small-scale entrepreneurial agribusinesses, could also improve the knowledge, attitudes and agricultural production practices. In addition, short-term training could also be useful in imparting agricultural science knowledge to participants and could hence develop a favorable attitude towards AET.

The provision of short-term agricultural science training through in-service programs or long-term postgraduate studies is important to create a favourable attitude, knowledge and skills among teachers and students. It was evident from the results of the report presented in Chapters 3, 6 and 7, that holding a relevant qualification has a significant influence on teachers' attitudes towards AET. Likewise, the literature shows that relevant teachers' qualifications have a significant consequence on school outcomes (Darling-Hammond, 1999; Croninger *et al.*, 2007).

8.9.3 Access to resources

The attitude of agricultural science students and teachers is influenced by the availability of relevant resources for AET. Access to resources improves the community livelihood and thereby could create a favorable attitude towards AET. Knowledge of agriculture, combined with agribusiness income generating opportunities, could also lead to the creation of positive student attitudes towards AET. Access to resources, such as teaching infrastructure and support, for example, libraries, laboratories and fields or farms for practical education, textbooks and trained teachers, all have a significant effect on the attitudes of Agricultural Science teachers and students towards AET.

Creating access to resources such as agri-business projects, community green gardens and agriculture-related income earning possibilities, could improve community, parent, teacher and student attitudes towards AET (Figure 8.4).

8.9.4 Enabling environment

Transparency and information-sharing coordination among the participants of AET, such as policy-makers, GOs, NGOs and researchers would be useful in creating an enabling environment for an effective delivery of AET and would impact significantly on participants' attitudes and school outcomes.

An efficient and enabling school environment plays a role in the success of agriculture and agricultural sector industries and promotes positive participant attitudes. An enabling environment is the foundation for the production of skilled manpower for agriculture and a designed policy and strategy within the existing educational systems is being implemented. Policy-makers, researchers, GOs and NGOs have a role to play in the formulation and implementation of an appropriate policy (Figure 8.4). Research remains a tool for identifying the limitations and solutions needed, to adjust the existing system. A continuous evaluation and adjustment is crucial in AET implementation process success. Based on research and the existing policy and strategy, policy-makers will then aim for the required improvement and adjustment. Timely gap identification, adjustment and appropriate implementation with open and transparent systems, can create positive attitudes of the participants towards AET.
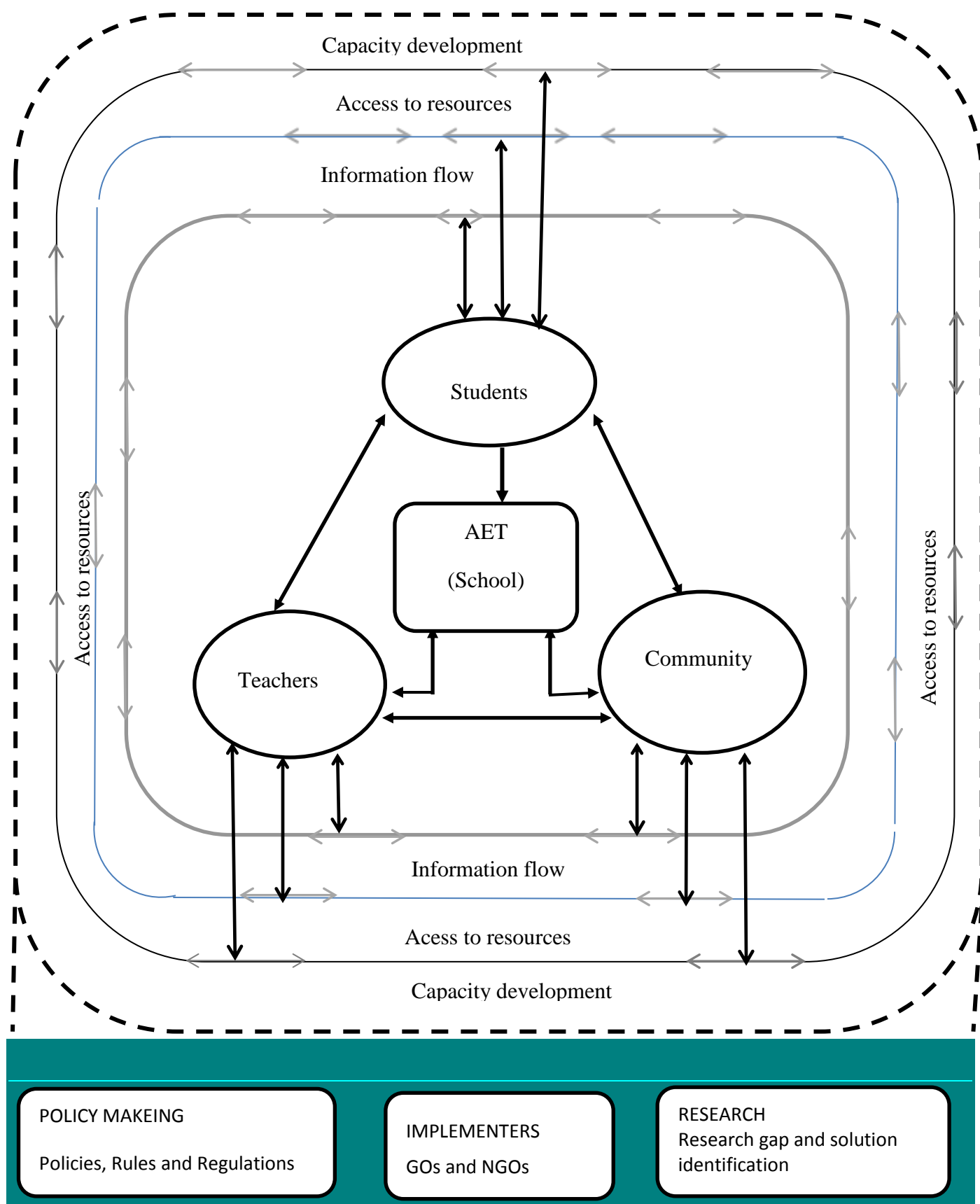
Figure 8.4: Trigger issues that can have positive effect on AET

8.10   The role of stakeholders in AET

The creation of suitable coordination between communities, schools, teachers, students, school principals, GOs, NGOs, policy-makers and researchers is the main need in the AET educational system. Based on the results presented in in this study, it is recommended that improvement should be made to boost the economic earnings, training opportunities, provision of relevant AET information and the creation of community awareness, all of which have huge potential to create a favourable attitude towards AET.

An integrated plan and the urgent execution of the recommendations are needed to improve AET teaching, the learning processes and the environment. To achieve this, policy-makers play an important role in the formulation of policies that can address the existing AET shortcomings and the complex relationships between all the stakeholders. AET policies and implementation strategy need continuous evaluation and research. Schools GOs and NGOs are the main educational policy implementers in the AET system. Teachers, students and parents are the main role-players in the teaching and learning process, while policy implementers, communities, family, parents and teachers, as well as mutual AET coordination and connection, could have an influence on student achievement, overall school outcomes and attitude towards AET (Marjoribanks, 2002; Sheldon *et al*., 2008).

8.11   AET implication system in educational processes

In this study, the empirical data indicated that there were many deficiencies within the current AET system (Chapters 3 - 7). The improvement and adjustment of these limitations could help AET to respond to the existing and future demands, such as job creation, food self-sufficiency, skilled agricultural manpower production and institutional development. The following conceptual model is proposed, to show the complexity of the relationships between different implementing organizations, including policy-makers, researchers, school administration, society, governmental and non-governmental organisations, students and teachers. The circles in the model indicate each organisation and entity that play role in AET. The names of each organisation or entity are presented in the circles.

In the model presented in Figure 8.5 displays the relationship between different role-players in the AET implementation system. In the model, the arrows show the direction

and flow of relationships that exist between the role players. These two-way connections between AET role-players can assist in facilitating and developing information sharing, transparency and accountability in the AET system. The AET implementer entity or organisation identity, their roles and relationships shown in Figure 8.5 are described in the subsequent sections.

8.11.1 Policy-makers

Policymakers, especially those in official bodies, have the authority to decide which of the problems within an educational sector are to be addressed and how they are to be handled. Policymakers gather systematic information from the researchers, GOs, NGOs, society, students and school administrators (Figure 8.5).

Transparent two-way communication and links between policymakers, GOs, NGOs, society, students and school administrators can help the system to identify AET gaps and possible solutions in implemented educational policy. Policymakers need to learn from current research findings and resources. Open two-way linkages between policy-makers, GOs, NGOs, society and AET schools have a positive effect on community, student and teacher attitudes towards AET. Literature shows that the improvement of vocational AET policy could support the development of capabilities and the positive attitudes of participants in AET (McGrath, 2012).

Figure 8.5 shows the initial research role-players in order to upgrade teacher and student attitudes through AET information and delivery as well as systematic linking between communities, teachers and students. An efficient educational process could enhance the agricultural science teaching and learning environment.

8.11.2 Research

The leading objective of producing research is to understand and explain, to produce possible solutions, to improve participant intervention and prevent specific problems. Research and researchers could generate alternative and best solutions, based on the identified problems.

Research is a process of investigation. In the teaching and learning process, educational research is required to investigate gaps from different sources. Information is a source for innovative solutions to the existing AET limitations.

Coordinated action between policy-makers, implementers, communities, teachers, students and researchers could provide a working solution to improve attitudes of teachers and students towards AET. The model also shows the role of researchers at different levels and their association with policy-makers, GOs, NGOs, communities, school administrators, students and teachers.
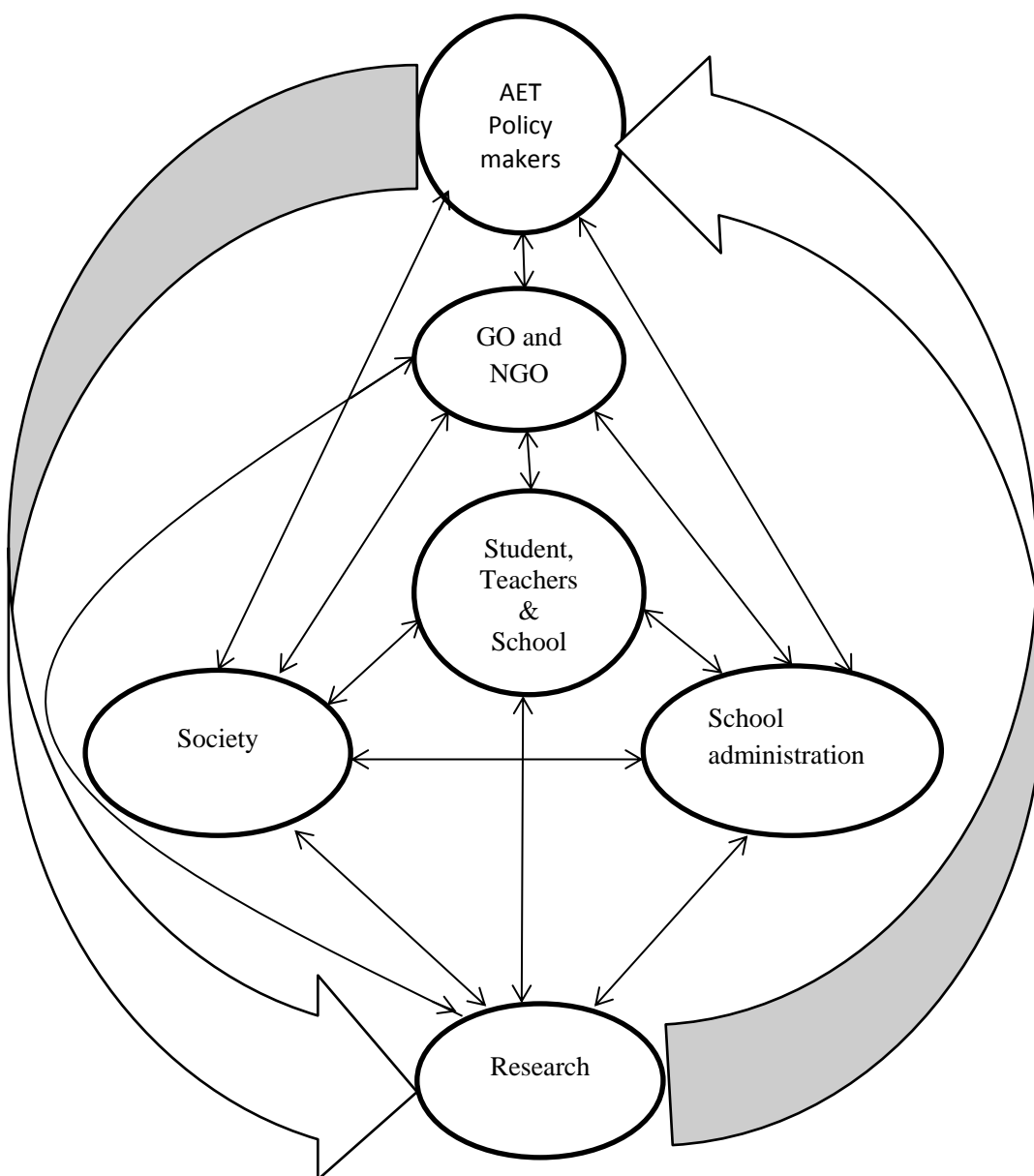
: Information exchange processes; Direction and flow of information

Figure 8.5: Conceptual model of educational process role-players' relationships.

8.11.3 Governmental and non-governmental organisations

Different governmental organisations (GOs) and non-governmental organisations (NGOs) are involved in AET policy implementation, organization, delivery and evaluation in the system. Governmental organisations (GOs), such as the Department of Agriculture and the Department of Education and non-governmental organisations (NGOs), are the main role-players and implementers in the teaching and learning process.

In the proposed conceptual model in Figure 8.4, policymakers are working with GOs and NGOs on the implementation and evolution of the AET policy. This approach could possibly lead to facilitative, planned, transparent and two-way links with society, school administrators, teachers and students, which could integrate the existing human and financial resource for efficient AET implementation. Open two-way connection and shared useful information could create positive attitudes towards AET among participants.

8.11.4 School administrators

In the school teaching and learning environment, there are principals, teachers, administrators and support staff working together to achieve the school objectives. School administrators are a group of people such as principals, vice-principals and department leaders who run the school. School administration is the process of managing, coordinating and monitoring the school teaching and learning process. The school administrator's work is a combination of brain and grunt. Organization skills are key. They have to work in association with teachers and students, NGO's and GO's, communities, researchers and policymakers for effective AET processes implantation (Figure 8.5).

Schools have to create opportunities for GOs, NGO's and students' parents to participate in school activities to contribute positively in quality school administration and in their children's achievement (Henderson and Berla., 1994; Pickeral *et al*., 2009). Literature shows that effective school administration has an effect on student attitude and on school achievement (Koh *et al.,* 1995; Papanastasiou and Zembylas, 2004).

The school administrators should provide useful AET information to parents, for example, on careers in agricultural education, parental skill and other curriculum-related requirements to positively influence learners attitudes towards AET (Pickeral *et al*., 2009). The school administrator has to encourage innovative collaboration with GOs, NGOs,

families and community partners and show a willingness to use the existing resources to achieve AET objectives.

Good leadership and a conducive school environment with appropriate goals, planning and structure can create an enabling school working environment. A good school working environment would have an effect on school outcomes, such as school administration, staff job satisfaction and student achievement (Niemiec *et al.,* 1999). Furthermore, conducive school environments and good school administration have a positive influence on student and teacher attitudes towards AET (Chapters 7). Therefore, open two-way working collaboration and association between educators, students, society and implementers in the system, could provide the attention and time to solve the existing problems in the teaching and learning process.

8.11.5 Teachers and students

Teachers and students are a core element of agricultural education and training. Agricultural science teachers are society's instruments in preparing its young citizens as future agriculture scientists, farmers and entrepreneurs. Agricultural Science teachers play a key role in helping Agricultural Science students to find their way in the agriculture and agricultural sector industries and guiding and counselling them, by pointing them in the right direction to a career in agriculture (Mauet *et al*., 1998).

In the school environment, teachers and students are the ultimate implementers and users of the AET process. Students are a product of society and remain the centre for the future of sustainable agricultural development in a country. GOs and NGOs, school administrators and society play a support and facilitation role in the implementation of AET programs in schools. Parts of the systems, such as educators combined with students and society coupled with school administrators, should have two-way, open and accountable communication, to maintain the existing strengths and solve any shortcomings (Figure 8.5).

Teachers' identities and attitudes are highly affected by career and situational factors (Day *et al*., 2006). AET effectiveness could be determined by the level of association between teachers, administrators, policy-makers and other stakeholders in the teaching and learning process. Two-way continuous information-sharing, association and evaluation could have a positive effect on student and teacher attitudes towards AET (Fullan, 2007).

8.11.6 Community

Students and teachers are part of the community. The whole community, including students' parents and family members, make an effort to grow and develop young people. GOs, NGOs, communities, parents, educators and school administrators should work together to develop their children and work towards a school's shared vision, as shown in Figure 8.5. Literature confirms that the role played by parent-family-community participation and partnership is vital to produce motivated high aspiring young students in the school system (Paul, 2003).

Connected communities, teachers, students and school administrations also have a positive effect on risk prevention, AET information-sharing and learning. Strong school-parent-community partnerships are essential to improve schools and students achievements (Epstein and Salinas, 1992).

Learning is not the sole responsibility of educators and schools. It needs interconnected and responsible partnerships between policymakers, GOS, NGOs, community leaders and parents (Smit and Oosthuizen, 2011). The continuous involvement of parents and the support of family and the school education system, all have a positive effect on student learning and attitude towards AET.

Facilitating the voluntary contribution of communities and parents could have a positive effect on the school outcomes, community resource utilization and participant attitude towards AET (Henderson. and Mapp, 2002; LaBahn., 1995; Niemiec *et al.,* 1999; Lawson. and Lawson., 2012).

8.12 Conclusion

Socio-economic variables have a negative and significant effect on teacher and student attitudes towards AET. Situational factors, socio-cultural factors and information factors all have a positive effect on their attitude towards AET. Also, there is a shortage of teaching infrastructure and support in agricultural science high schools. Those identified shortcomings that need due consideration include information about AET, access to resources, capacity building and an enabling environment. This study proposes an educational process conceptual model, which indicates an open two-way information-sharing, collaborative culture between policymakers, researchers, GOs, NGOs, school

administration, communities, teachers and students. The model indicates the direction of collaboration in the system. The system assumes to have open linkages and evaluation processes, to assess the effectiveness and relevancy between education policy and its execution. This can create and sustain emerging AET improvement initiatives and fill the existing gap, to develop positive teacher, student and community attitudes towards AET. Positively-motivated teachers, students and parents have an effect on student achievement and their positive attitude towards AET could also help students themselves to have a positive attitude towards AET. This in-turn, could help learners to gain an opportunity for post-secondary education. Quality agricultural education with motivated students will become the potential source for the skilled agricultural science manpower needed to support the emerging agriculture and agricultural industry.

8.13 Recommendations

Policy should be based on research results, real data and relevant information to support policy-making. Policy-makers should have to collect systematically realistic information from society, GOs, NGOs, students and school administrator. Consideration should be given to a teaching-learning infrastructure, income-generating agribusiness sources, such as the establishments of small-scale farming, and in-service training programmes for agricultural science teachers.

Education research findings implementer agencies should be organised to implement and secure the invested wealth and knowledge gained from research. Considerations should be given for policy making and implementation systems.

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CHAPTER NINE

GENERAL DISCUSSION AND CONCLUSION

9.1 Conclusions

This thesis has explored various aspects of Agricultural Education and Training (AET) in South Africa through a questionnaire-based survey administered to Agricultural Science teachers and students at 12 selected high schools in KZN, South Africa, representing rural, urban and dedicated high schools offering Agricultural Science on NQF Level 2-4 (Grade 10-12). The premise for the study, as outlined throughout the thesis, was the high failure and dropout rate experienced by the subject, despite the government investing in establishing new dedicated agricultural schools and increasing the number of mainstream high schools offering Agricultural Science. There is, in fact, an inverse relationship between the increase in the number of schools offering Agricultural Science and the failure rate – that is, the failure and dropout rates increase with the offering of the additional subject. This suggested that there was something more fundamental to offering AET, than mere access and availability.

This study sought to understand why this would be the case and what could be done to address the situation, so that the high school level AET could make the kind of contribution it should make to advancing the knowledge and skills available to South Africa's agricultural sector, which is undergoing significant change and transformation.

As discussed in Chapter 2, AET plays a major role in agricultural development. At high school level, it provides the foundation for studying and gaining tertiary level qualifications in agriculture. It does this in two very significant ways. First, it clearly provides the academic grounding needed to continue studying agriculture. Although, agricultural science is not required to study agriculture at tertiary institutions (colleges and universities) it can provide a distinct advantage. Secondly, in part related to the advantage that studying agriculture in high school provides, it potentially also helps create the desire to take up agriculture at the tertiary level and as a profession.

In this second aspect, how AET is offered and the support it is given can positively or negatively influence prospective agricultural students. This is particularly important

because, as also discussed in Chapter 2, agriculture in South Africa is perceived negatively as a career choice. There has been a steady decline in tertiary enrolments in all branches of agriculture (with the notable exception of Agricultural Economics).

The difficulty this presents is that the government of South Africa has implemented a wide range of programmes aimed at strengthening the country's agricultural sector, making it both sustainable and profitable, and the latter in the context of being globally competitive. It seeks to accomplish quality AET in the further context of social transformation which is, largely, driven by land reform and market access for the sector of society that has historically been excluded from participating in the sector, beyond subsistence level home food production and market gardening.

The transformational and developmental goals set for South African agriculture cannot be achieved without an appropriately trained, educated and qualified agricultural workforce in all spheres of agriculture, including pre-production (input supply), primary production, marketing, finance, management, fundamental and adaptive research and agricultural extension and education. Seen in this light, the role of AET takes on greater significance and, in many ways, high school Agricultural Science becomes the gatekeeper.

Thus, the South African AET system is particularly concerned with the provision and maintenance of quality education and training to support environmentally and economically appropriate and sustainable agriculture. That the formal AET learning in South Africa starts at the high school level, gives example justification to examine how AET is offered from various vantage points and what drives it success or failure.

The main aim of this study was to conduct research on the dimensions of AET in formal education centres through a case study in KwaZulu-Natal (KZN), South Africa. The primary focus of the study was: How should AET at Level 2-4 be designed to meaningfully contribute to the advancement of the agricultural sector in South Africa? Ancillary to this the study also had the following objectives:

- To analyse different aspects of formal Agricultural education program processes at high school (Level 2-4).

- To determine the attitude of teachers and students towards AET at high school (Levels 2-4).

- To identify factors affecting the attitude of teachers and student's towards Agricultural Educational Training at high school (Level 2-4).

- To develop proper agricultural educational process model for effective agricultural education system implementation at high school level.

To meet its objectives, the study examined student and teacher' attitudes, factors affecting those attitudes and perceptions of students towards different aspects of agricultural education programme processes offered in selected secondary schools in KZN.

Preparing students for the emerging agriculture industry requires the effective delivery of the AET curriculum that conveys sufficient knowledge and practice of AET. As presented in Chapter 3, the dedicated, urban and rural schools have different grades of classroom administration, curriculum delivery and teaching infrastructure. The shortage of Agriculture Science subject teachers, learners' exposure to more theory than practice, the absence of classroom attendance monitoring and uncovered missed lessons were also found to have an effect on the students' knowledge, competence and passion towards a subject. The identified limitations in the dedicated, urban and rural high schools teaching and learning process influenced the student's achievement and this in-turn led students to struggling to keep up. In general, this could have an impact on the provision of the required level of knowledge-based trained manpower in the emerging agriculture industry.

As discussed in (Chapter 4), the vast majority of the students studying agricultural science at the selected schools were positively disposed toward AET, as offered at their respective schools. In the main, they also confirmed the importance of AET in the acquisition of agricultural knowledge. Key among the factors that made AET work for them was the inclusion of practical sessions. These helped the students to understand the content covered in theory in lectures and discussion sessions. This is consistent with the notion of experiential learning, which has the power to reinforce and augment learning.

The majority of the students at these schools are studying agriculture to work in government, rather than in the private sector. This suggests that the students may not be aware of other career opportunities in the sector's value chain, including entrepreneurial opportunities (Chapter 4).

While positive about studying Agriculture and Science, the majority of the students were negative about their school Agriculture Science sessions. The students attending non-dedicated schools, particularly pointed out the need for more practical lessons, laboratories and libraries, as they are the bridge between theory and practice. This again supports the need for experiential learning to reinforce theoretical learning (Chapter 4).

The results presented in Chapter 4 and 6 displayed that teachers and students have positive attitude towards Agriculture Science and agricultural education and training. Having the relevant and required information about agriculture, access to resources, capacity development and an enabling AET school teaching and learning environment, have a positive influence on the production of trained manpower as per the agricultural sector requirements (Chapter 5 and 7).

The results presented in Chapter 6 indicated that teachers have a favourable attitude towards Agriculture Science and AET. The observed differences in the attitude of teachers are directly related to teachers' qualifications (Chapter 6). Teachers with an Agricultural Science qualification, believe in the delivery of theory, in combination with practice in a balanced manner. This in-turn could significantly impact the training methodology that the educators are currently using in AET. AET is an applied science and technology and hence it is important for the learners to acquire skills that enable them to play a key in agricultural sector development.

Teachers who have agricultural science knowledge and information have an impact in the student's attitude and school achievement (Chapter 7). Good school administration as well as acceptance and respect by the school community and students family, positively influence teachers' attitude towards teaching and AET achievement (Chapter 7). However, the results displayed that younger teachers have a negative attitude towards AET, confirming the report by the Department of Education.

A responsive educational system could be a source of trained agricultural science professionals, entrepreneurs and farmers. A two-ways, transparent and responsive educational system could bring a well-functioning AET system (Chapter 8). The development of a knowledge-based agricultural sector depends on the teachers', students' and community's positive attitude towards AET. Personal innovation and entrepreneur ability is determined by the type of system implemented in the AET system (Chapter 8).

9.2   Recommendations

The Ministry of Education and schools should support to strengthening the teaching infrastructure and, more specifically, providing laboratories to all agricultural high schools.

Ministry of Education and schools have to give due consideration to fulfil the existing shortage and absence of teaching infrastructure and support to agricultural high schools.

Thoughtful consideration should be given to proper compensation for classes and for the lessons not covered by a normal schedule.

Consideration should be given to improve rural agricultural science schools infrastructure and entrepreneur ideas to support and change student's perception towards AET sessions and job prospectus.

Policy-makers, the Department of Education and Higher Education should put in place a proper and sustainable mechanism to promote in-service agricultural science teachers training programs, to upgrade or train manpower specialising in any one of the relevant areas of agricultural sciences and technology.

Students and educators involvement in the teaching and learning process should support and facilitate, by enabling school teaching and the learning environment.

Consideration should be given to teaching-learning infrastructure, income-generating agribusiness sources, such as the establishment of small-scale farming and in-service training programmes for agricultural science teachers.

The school administrators should provide useful AET information to parents, such as career in agricultural education, parental skills and other curriculum-related requirements, to positively influence learners and teachers attitudes towards AET.

Agencies implementing education research outcomes should be coordinated in order to secure the effective use of the capitalised time, wealth and knowledge to improve the AET delivery.

Consideration should be given to policy-making and the implementation of systems.

9.3   Future research

- Future studies should focus on assessing the perception of the community towards AET and factors influencing the communities' perception towards AET.
- Perception of tertiary agricultural science students towards agriculture should be investigated.

- Research tracking graduates of high school AET in terms of their continuing with studying agriculture should be conducted to identify factors in the AET system that affect post-high school study choices including teacher training, curriculum, and curriculum implementation.

- Research similar to this study on the effectiveness of AET training should be conducted in other provinces of South Africa to provide a comprehensive assessment of the country's high school AET system with a view to creating a national framework that will facilitate the overall strengthening of education's contribution to South Africa's agricultural sector.

- AET high school curricula should be evaluated against tertiary AET and industry requirements and updated accordingly. The evaluation and updating process should involve all relevant stakeholders including high school and tertiary education students and educators, farmers from the full spectrum of primary producers in the country, agribusiness, and relevant non-governmental and governmental organizations.

APPENDICES

Appendix 1: Variance inflation factor test of selected continuous variables (n =375)

Variables	VIF	1/VIF
Family size	1.00	1.00
Mean VIF	1.00	

Appendix 2: The contingency test of selected discrete, as well as dummy variables (n =375)

	RBG	FMI	MEd	FATL	LAN	TV	DAA
RBG	1						
FMI	0.4009	1					
MEd	0.1998	0.3089	1				
FATL	-0.1034	-0.1416	-0.1104	1			
LAN	0.4487	0.33	0.1517	-0.096	1		
TV	-0.0141	-0.0866	-0.0156	0.068	-0.086	1	
DAA	0.0022	-0.071	0.0431	0.1018	0.0011	0.0166	1

Appendix 3: The contingency test of selected dummy and descript independent variables

	Gen	RBG	TEY	QLN	AOS	LIB	AF	IA	TWL	SV	TSR	TSS	TS	S N
Gen	1													
RBG	-0.301	1												
TEY	0.358	-0.080	1											
QLN	0.271	-0.393	0.187	1										
AOS	-0.088	0.127	0.018	-0.114	1									
LIB	0.163	-0.184	0.068	0.188	-0.156	1								
AF	0.075	-0.189	0.166	0.105	-0.06	0.303	1							
IA	0.214	-0.199	-0.074	0.244	-0.177	0.353	0.261	1						
TWL	0.176	-0.102	0.142	0.032	0.012	0.083	0.199	0.055	1					
SV	0.008	-0.034	-0.002	0.125	-0.016	0.119	0.040	0.003	0.121	1				
TSR	-0.051	0.083	0.027	-0.13	0.039	-0.011	0.076	0.113	0.238	0.040	1			
TSS	0.279	-0.297	0.098	0.244	-0.113	0.198	0.289	0.289	0.110	-0.114	0.170	1		
TS	-0.265	0.068	0.017	-0.041	0.122	0.034	0.262	0.065	0.132	0.003	0.340	0.279	1	
SNC	-0.265	0.068	0.017	-0.041	0.122	0.034	0.116	0.262	0.268	0.008	0.337	0.438	0.440	1

Appendix 4: Relevancy rating

Questionnaire that was used to collect expert's opinion for relevancy rating to select independent variables for the study

I kindly request you to spare some of your valuable time to rate the listed factors for their degree of relevance to the dependent variable "The Attitude of the Participants towards Agricultural Education Training in Formal Educational Sector". The result of this relevancy rating will help the researcher to identify more relevant independent variable that could affect the attitude of student in formal educational processes. You are also free to add more factors that are, in your opinion, found relevant. For rating the variables, indicate (✓) mark in the most appropriate column listed below.

This study will contain the following independent variables. Please rate the relevance of the independent variable to the study.

No	Variables	Degree of relevance			
		Highly relevant	Somewhat relevant	undecided	Not Relevant
1	Language				
2	Family Education				
3	Racial background				
4	Field for practical lesson				
5	Family access to land				
6	Family size				
7	Family income				
8	Discussion about agriculture				
9	Availability of field Practical education				
10	Town visit				
11	Country visit				
12	Internet access				
13	Computer access				

I thank you for your invaluable professional assistance

Appendix 5: Questionnaire that was used to collect expert's opinion for relevancy rating to select independent variables for the study

I kindly request you to spare some of your valuable time to rate the listed factors for their degree of relevance to the dependent variable "The Attitude of agricultural science teachers towards AET in Formal Educational Sector". The result of this relevancy rating will help the researcher to identify more relevant independent variable that could affect the attitude of teachers towards AET. You are also free to add more factors that are, in your opinion, found relevant. For rating the variables, indicate (✓) mark in the most appropriate column listed below.

This study will contain the following independent variables. Please rate the relevance of the independent variable to the study.

no	Variables	Degree of relevance			
		Highly relevant	Somewhat relevant	undecided	Not Relevant
1	Age				
2	Racial Background				
3	Teaching experience				
4	Qualification of teachers				
5	Area of specialization				
6	Library resources				
7	Access to a farm				
8	Access to internet				
9	Access to computer				
10	Teachers' workload				
11	Social Value				
12	Salary Satisfaction				
13	Teachers' satisfaction on schools' administration efficiency (TS)				
14	Nature of communications in the teaching and learning process				
15	Nature of teacher evaluation				

I thank you for your invaluable professional assistance.

Appendix 6: Questionnaire that was used for gathering required information from students

Instruction:

All the identifying information that you have provided will remain confidential.

The information collected will be used to adjust and improve AET.

Please rate the following statements. Please indicate your response by using this (✓) mark or write your response accordingly

Grade/Level: _____ Gender: _____

Racial background:

South African	African	
	White	
	Coloured	
	Indian	

South African	
Non-South African	

Please rate the following statements. Please indicate your response by using this (✓) mark or write your response accordingly

	Attitude of students towards AET	Strongly disagree -1	Disagree -2	Undecided -3	Agree -4	Strongly agree -5
1	High school agricultural education is important in order to acquire knowledge of agricultural science.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
2	The agriculture I am currently studying at high school is important for the future development of South Africa.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
3	I plan to apply the agricultural knowledge I am learning to my future career.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
4	Study agriculture is important to secure a public/government job.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
5	Practical lessons in agriculture are important in order to understand the content of subject.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
6	I love farming.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree

7	I love studying agriculture.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
8	The agriculture I am currently studying is not helpful for my future carrier and for job creation.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
9	I don't like the agricultural sessions	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
10	It is difficult to achieve success in an agricultural profession.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree

Instruction: Please rate the following statements. Please indicate your response by using this (✓) mark or write your response accordingly

1. How much is the monthly income of your family?

   a) R 500-2,000   b) R 2,000-5,000   c) R 5,000-10,000   d) Above 10,000R

2. What is highest level of education that your father completed? Please (tick on your answer).

1	2	3	4	5
Grade10-12	Grade10-12	Diploma	Degree	No formal education

3. What is highest level of education that your mother completed? Please (tick all that is Relevant).

1	2	3	4	5
Grade10-12	Grade10-12	Diploma	Degree	No formal education

4. Do your families have access to farming land?

   a)Yes   b) No

5. How many people in your household earn an income (either with a job or in a business).

6. Who is your primary care-giver

1	2	3	4	5	6	7
mother	father	both parents	aunt	gogo	brother	You are the care-giver

7. How many people live with you in your house_____

8. How many rooms do you have in your house? _____

9. How many bedrooms do you have in your house_____

Is your school in a

1	2	3
rural area	urban area	pre-urban area

10. Describe the community around your household

1	2	3	4
Racially mixed	Racially similar	Culturally mixed	Culturally similar

10. Main language spoken:_____

12. Do you ever visit other towns?

    a) Yes   b) No;

13. if yes; name at least one town: _____

14. If yes, how often do you visit?

    a) Yearly   b) Monthly   c) only one time

15. For what purpose do you visit the town?

    a) To visit relatives   b) For educational visit   c) For weekend or vacation

16. Do you ever visit other countries?

    a) Yes   b) No;

17. If yes, name at least one country you have visited: _____

If yes, how often do you visit?

    a) Yearly   b) Monthly   c) only one time

18. For what purpose do you visit the country?

    a) To visit relatives   b) For educational visit   c) For weekend or vacation

19. Do you ever discuss with experienced people about the future prospects of studying Agriculture.

     a) Yes   b) No

20. If yes, what was the general view of these people about the future prospects of studying agriculture?   a) positive   b) negative

21. Which of the following have you visited within the last year: (tick all that are relevant)

SN	Item	Yes(1)	No(2)
1	Large-scale commercial farm		
2	Small-scale commercial farm		
3	Small-scale subsistence farms/household farms		
4	Small-scale agricultural processing business		
5	Large-scale agricultural processing business		

Other: explain: _____

22. Do you have access to a computer?

     A) Yes   b) No

23. If yes, where: (e.g. School, Library, Home, Friend's home, Other (specify) _____

24. Do you have internet access?

     A) Yes   b) No

25. If yes, indicate the source

1) School,   2) Library,   3) Home,   4) Friend's home,   5) other (specify) ___

Instruction: Please rate the following statements. Please indicate your response by using this (✔) mark.

	Statements	Yes	No
26	Do you think your teachers properly covers all the agricultural lesson throughout the year	Yes	No
27	Do you ever get compensate makeup classes from your teacher instead of uncovered agricultural science lesson due to teachers absence?	Yes	No
28	Does the school have a farm or filed for practical lesson?	Yes	No
29	Is there a shortage of agriculture teachers in your school?	Yes	No
30	Do you have library in your school?	Yes	No
31	Do you have sufficient agricultural science books in your school library?	Yes	No
32	Do you have well equipped laboratory for agricultural science related	Yes	No

	Statements	Yes	No
	experimentation in your school?		
33	Do you getting notes for each lesson from your teacher?	Yes	No
34	Are you given agricultural student text book by your school?	Yes	No
35	Do you think that the teaching time for agriculture is sufficient to the text book material?	Yes	No
36	Do you have class representative?	Yes	No
37	Are their meetings between class representatives and administrators about the learning process?	Yes	No
38	Do you sign the class registration when you attend the lesson?	Yes	No
39	Is their detention in your school for undisciplined student action?	Yes	No

40. Do you have any suggestion on the improvement of agricultural training teaching and learning process in your school?

I thank you for your honest contribution for this study!

Appendix 7: Questionnaire for Teachers

Instruction: Please indicate your response by <u>Using this (✓) Mark</u> or <u>write your</u> <u>response</u> <u>accordingly</u>

All the identifying information that you have provided will remain confidential.

The information collected will be used to adjust and improve AET.

1. Your age category:

1	2	3	4	5	6
20 to 29	30 to 39	40 to 49	50 to 59	60 or 69	70 ≥

2. Gender

1	M	
2	F	

3. Nationality:

South African	
Non-South African	

4. Racial background

South African	African	
	White	
	Coloured	
	Indian	

5. Teaching Experience in Years

1	2	3	4	5	6
1 to 5	6 to10	11 to 15	16 to 20	21 or 25	26 or grater

6. Qualification

1	Certificate	
2	Diploma	
3	Degree	
4	Masters	
5	PhD	

7. Area of specialization

1	Agriculture science	
2	Educational Psychology	
3	Mathematics	
4	Social science	
5	Natural science	

Other: _____

Please indicate to what extent do you agree with each of the following statements by ticking (✓) the appropriate box.

	Statements	Strongly Disagree-(1)	Disagree-(2)	Undecided –(3)	Agree-(4)	Strongly agree-(5)
1	I love teaching professions.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
2	I want to pursue further studies in Agricultural Sciences.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
3	Relevant qualifications are very important to teach Agricultural Science.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
4	Agricultural trainings lead to better job and entrepreneur opportunities.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
5	Agricultural Education is important for career success and achievements in life.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
6	Agricultural Education is important for the future of the country.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
7	Theoretical teaching methods are sufficient to teach agricultural sciences.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
8	Teaching aids, laboratory and field practice are important to teach agriculture.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
9	Current student text books lack of relevancy and consistency in terms of content and continuity.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
10	Agricultural Educational and Training is important for people who have access to land	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
11	I am doing my best to change the student future in agricultural education and profession.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
12	I am responsible exemplar teacher for my agricultural education students.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
13	Agricultural Educational and Training lack relevant support form responsible body for batter achievement.	Strongly disagree	Disagree	Undecided	Agree	Strongly agree

Instruction: Please indicate your response by using this (✓) mark.

Items		Yes	NO
1	Does your school have a laboratory for agricultural lesson?	Yes	No
2	Does your school library have a sufficient teaching material for supporting education?	Yes	No
3	Does your school have access to a farm for practicals?	Yes	No
4	Do you ever participate in short term training relating to Agricultural Education?	Yes	No
5	Do you have access to computers in the school?	Yes	No
6	Do you have internet access at the school?	Yes	No

Items		Yes	NO
7	Is the content of the agricultural science teaching text book distributed relevantly at each grade level?	Yes	No
8	Do you think that the time allotted is sufficient to adequately cover the text book?	Yes	No
9	Is the time table for practical and theoretical period fairly distributed in as per the content of the text book?	Yes	No
10	Is the school principal frequently assessing teaching process problems?	Yes	No
11	Do you have a specific department for each major subject thought in the school?	Yes	No
12	Does your school have a system which allows similar subject matter teachers to have meetings to share their teaching strategies, course content, experiences, problem and solution on the various areas you are working on?	Yes	No
13	During the meeting does somebody take down the minutes?	Yes	No
14	Do you think that there is an appropriate teacher student ratio in your school?	Yes	No
15	Do you teach more than other subject teachers?	Yes	No
16	Do you think the content of the AET is relevant to the existing opportunities and need in South Africa?	Yes	No
17	Does the society respect agricultural science teacher?	Yes	No
18	Does the school give an award to motivated teachers?	Yes	No
19	Are you satisfied with your salary?	Yes	No
20	Are you happy with your school principals and administration support?	Yes	No
21	Do you like the nature of communication within your school?	Yes	No
22	Do you want to learn more about agriculture?	Yes	No
23	Do you have teacher evaluation programs in the teaching and learning process in your school?	Yes	No

24. If your answer for Question 23 is "yes", how many times?

　　　a) Once in each term   b) Once a year   c) more than one visit in the semester

25. What requirements are essential to ensure a successful agricultural teaching and learning setting at your school? Please write your suggestion below:

26. Do you believe that the content of agriculture text book content is relevant for level 2-4 (Grade 10-12)? Please write your suggestion(s) and concerns below:

27. What types of effort would you like to suggest in the current teaching and learning process in order to improve the existing Agricultural Education and Training at level 2-4 (Grade 10-12)?

28. What types of reform is important for effective and gradual change as well as the improvement of Agricultural Educational and Training in the country?

Questionnaire which was used to interview schedule for Experts in Agriculture, Education organisation and Department of Education

1   What are the current statuses of Agricultural Education and Training process at level 2-4?

2   Are you satisfied with the existing agricultural education and training? If you say Yes/no please discuss your reason.

3   Do you think that the available resources are sufficient to teach practical part of Agricultural Education Training hand in hand with the theoretical concepts? If you say yes/no please specify the reasons.

4   What types of improvement in the system do you suggest to integrate theory with practice?

5   What do you suggest for further achievement of agricultural education d training in South Africa?

Appendix 8: Research Ethical Clearance

**UNIVERSITY OF
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14 September 2011

Mrs T T Kidane (211546496)
School of Agricultural Sciences and Agribusiness

Dear Mrs Kidane

PROTOCOL REFERENCE NUMBER: HSS/0848/011D
PROJECT TITLE: DIMENSIONS OF AGRICULTURAL EDUCATION TRAINING IN FORMAL EDUCATION CENTRES IN SOUTH AFRICA

EXPEDITED APPROVAL

I wish to inform you that your application has been granted Full Approval through an expedited review process:

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steven Collings (Chair)
HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

cc. Supervisor Dr Steve Worth
cc. Ms M Francis

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