

Examining of knowledge management systems applied by  
extension workers supporting community gardens in the  
uMgungundlovu District Municipality

by

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# DECLARATION

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Dr Marietjie van der Merwe

## **ABSTRACT**

South Africa as other African countries has not been spared from the rural poverty. The South African government is trying to address this problem through various government departments. One such ministry trying to address rural poverty is the Ministry of Agriculture, working together with the provincial Ministries of Agriculture in different provinces. The provision of appropriate agricultural extension services is regarded as a tool that may be used to address rural poverty and development in South Africa's rural areas. Appropriate extension services will depend on the knowledge management system applied by the organisation making it innovative and responsive to the needs of the farmers.

The objective of this research was therefore to identify knowledge management systems applied by extension workers to support community garden farmers in the uMgungundlovu District Municipality in KwaZulu-Natal. To address the objective, qualitative research methods, namely focus group discussion and semi-structured interviews, were used.

In this research, it was evident that the extension workers were not efficiently managing knowledge within their department, among themselves as well as among the farmers. The extension workers have potential knowledge management methods in place, such as departmental meetings. However, the extension workers' practices do not capture the true essence of knowledge management. There is no evidence that knowledge gained by extension workers during meetings and informal discussions in the organisation is translated into learning, which could lead to the development of new knowledge by the extension workers.

The extension workers claimed that they are using appropriate methods to learn from the farmers and to share knowledge with them. However, the farmers do not believe that the extension workers make use of any methods to encourage knowledge sharing and learning. It is thus evident that extension workers do not integrate knowledge gained from the farmers into the improvement of their own agricultural extension practices.

Agricultural extension organisations therefore need to adopt methods that encourage learning, reflection and engagement with the knowledge gained from the organisation and the farmers for real knowledge management to take place. This, in essence, will lead to the creation, sharing, utilization, absorption and transformation of knowledge.

## **DEDICATION**

*This research is dedicated to my parents Jowett and Irene for their endless love, support and believing in me.*

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## **INTRODUCTION AND OVERVIEW**

### **1.1 Introduction**

Rural poverty remains a great challenge in Africa, and needs to be addressed. According to Ashley and Maxwell (2001), poverty is widespread in rural areas of most African countries compared to the urban areas. South Africa is among the countries in Africa where poverty is widespread in the rural areas and it is more apparent in the former homelands (Machethe 2004). The population considered as rural in South Africa is estimated at between 40% and 45% of the total population (Jacobs and Andrew 2009).

South Africa has the majority of its poor still residing in rural areas. Approximately 3.24 million households on smallholdings are involved in a range of farming activities that can be food production for consumption or profit, or a combination of these (South Africa National Department of Agriculture 2001). Although these households take part in various activities, they are still considered to be resource-poor and they therefore remain vulnerable to poverty (Worth 2006). Provision of appropriate agricultural extension services among other initiatives may be used to overcome rural poverty. According to Jama and Pizarro (2008), there is ample evidence from countries such as Kenya, Nigeria and Ethiopia that, when smallholders are provided with the necessary support, they can become productive and competitive.

Agriculture has been and still is the backbone of most developing economies in Africa and continues to play a crucial role in the development of many African countries. The importance of agriculture towards the development of African countries relates to the potential of agriculture for poverty alleviation and the much-anticipated boost of food security (Machethe 2004; Kurwijila, Mkandawire and Jones 2006; Jama and Pizarro 2008). The established significance of agriculture as a sector consequently necessitates the need for efficient and reliable agricultural extension services.

Smallholders may be able to increase production and become competitive once extension services become revitalised and are accessible to the farmers (Jama and Pizarro 2008). Extension services need to be able to provide the farmers with the appropriate techniques and

services that will aid the farmers in their farming activities. Sadly, it is widely noted that there is a decline in extension services in Africa, even though there is still a lot that extension services can do for farmers (Jama and Pizarro 2008). The South African government has taken initiatives aimed at improving extension services for smallholders and other emerging farmers (Department of Agriculture 2005).

The South African government views the agricultural sector as the vehicle that will lead the country's rural development and poverty alleviation initiatives (Department of Agriculture 2005). The Department of Agriculture came up with a set of norms and standards, which is aimed to contribute towards the realisation of a prosperous agricultural sector. The norms and standards are aimed at achieving the mission of the Department of Agriculture through:

- improved access to agriculture support services (information, finance, inputs, regulatory services, technical expertise, markets, etc.), which will create an enabling environment for improved agricultural productivity;
- endowing farmers with skills and knowledge for ensuring sustainable resource management;
- facilitation of access to new technologies and awareness thereof; and
- enhancement of communication channels with farmers and farmer organisations, mentors and advisors (Department of Agriculture 2005).

The realisation of such an endeavour greatly requires strong extension and advisory services that will be guided by government's operations and appropriate role players (Department of Agriculture 2005). The success of the extension and advisory services may well depend on the agricultural knowledge and expertise of the agricultural extension service organisations and their extension workers.

The capability of the agricultural extension service organisations to be able to provide appropriate services to farmers will be greatly influenced by the extension organisation's knowledge management systems that are in place within the organisations. That is how the extension workers are able to share knowledge relating to farming amongst themselves and with farmers. For the agricultural extension service organisations to work as critical role players towards the realisation of the potential of agriculture and rural development, there is need for such organisations to be able within themselves to utilise and benefit from the knowledge and experience generated by the employees as part of their duties. Knowledge management as a tool within any organisation, such as agricultural extension service

organisations, may be used to achieve organisational success through innovativeness, competitiveness and responsiveness of employees (Nonaka 1994; Alavi and Leidner 2001; Quintas 2002:1; Gao, Li and Nakamori 2002; Haslinda and Sarinah 2009).

The nature of the environment within which most of the agriculture extension service organisations in Africa are required to become innovative, competitive and responsive to the needs of farmers is often challenging. Some of the challenges affecting the provision of agricultural extension services include addressing poverty, food security, natural resource management, economic growth as well as the human resource capacities of the extension workers (Department of Agriculture 2005). As a result, in Africa governments, stakeholders and donors have been experimenting during the past few decades with various extension approaches aimed at solving rural poverty, which continues to be persistent and disillusioning to their attempts (Jayne, Yamano Weber, Tschirely, Benfica, Chapota and Zulu 2003).

The success of extension services is linked to the extension workers' responsiveness to the needs of farmers and the prevailing market opportunities (Kurwijila, Mkandawire and Jones 2006). The ability of extension workers to respond to the needs of farmers will greatly depend on the extension workers' agricultural knowledge and also on their knowledge of the prevailing market situation. The knowledge that extension workers have will partly depend on the quality of their tertiary agricultural education. The quality of tertiary agricultural education is important, since it determines the extension workers' competence and expertise in various aspects of agriculture and related industries (Kurwijila et al. 2006). The quality of education provided to extension workers is critical as it influences the capacity of the extension workers to access knowledge and be in a position to adapt knowledge and technologies to current situations, as well as to be able to generate new knowledge and impart it to others (Kurwijila et al. 2006). The availability of this critical knowledge to the success of extension services consequently requires that the knowledge be properly managed within the extension service organisations, thereby making knowledge management an important aspect within the agriculture extension service organisations.

## **1.2 The need for the research**

South Africa's rural areas are characterised by poverty, where 65% of the country's poor are found in rural areas and 78% of them established to be chronically poor (Food and Agriculture Organisation 2004). Most people in rural areas participate in various agricultural activities either as a source of income or for food security. According to Machethe (2004),

farming plays an important role in South Africa as a source of income for many rural communities. Consequently, farming is an important role player in the alleviation of poverty.

As a result of the major role that farming plays in the rural communities, it becomes crucial that rural communities that are involved in farming activities, be able to access agricultural extension services, which will enhance their farming production. The provision of agricultural extension services that will be made available to the farmers needs to be of a high standard. The quality of the services that will be made available to the farmers will either have a positive or negative impact on the agricultural production.

An important aspect that will influence the quality of agricultural services is the capacity of extension workers as well as that of their organisations to provide extension services to farmers. A vital element that enhances the capacities of extension workers to deliver quality service is the workers' knowledge management competence as well as that of their organisation. Knowledge management is one of the competencies deemed necessary by the South African Department of Agriculture (Department of Agriculture 2005). In order to improve the productivity of farmers, the extension and advisory service providers should be able to promote the generation and sharing of knowledge and learning (Department of Agriculture 2005).

However, there is no evidence on how knowledge is managed by extension workers within their organisations, as well as how extension workers manage knowledge gained from farmers. Management of knowledge is critical as it may contribute to the success of services extension workers render to farmers.

It is therefore necessary to identify the way extension workers are actually managing knowledge in their organisations as well as knowledge shared with farmers.

### **1.3 The problem statement**

The knowledge management system that is used within an organisation needs to be managed effectively, since there are benefits that accrue to organisations with effectively operating systems in place. Knowledge management also entails institutional learning and sharing of good practices and methods, which benefit an organisation as well as its clients. If the knowledge management system within an organisation is not good then learning and sharing will not take place.



This may result in poor service delivery to the clients of the organisation. The problem addressed in this research was that rural subsistence farmers are still facing persistent poverty and food insecurity due to poor service delivery. One way of addressing this is to have a proper knowledge management system available for extension organisations, which will enable them to provide appropriate services to the farmers.

The following research question was therefore developed to explore the way extension organisations and extension workers manage knowledge within their organisations and knowledge gained from farmers:

*Are the knowledge management practices applied by extension workers adequate to support community garden farmers in the uMgungundlovu District Municipality?*

A community garden was chosen for the study as most of the extension workers work with community garden projects.

#### **1.4 The research objective**

The objective of this research required an in-depth understanding of the various processes that extension workers exploit in building knowledge, and the management of knowledge within their organisations and amongst extension workers. Hence, the following research objective:

*To identify the appropriateness of knowledge management practices applied by extension workers to support community garden farmers in the uMgungundlovu District Municipality in KwaZulu-Natal.*

#### **1.5 Sub-objectives**

In order to address the main objective of this research the sub-objectives were to explore how:

- extension workers manage knowledge within the provincial Department of Agriculture and Environmental Affairs related to community gardens;
- extension workers manage knowledge shared between themselves and community gardeners; and

- extension workers integrate knowledge gained from community gardeners into their practices.

## **1.6 Clarification of terms related to this research**

It is important to understand the different key terms as used in the empirical part of this research. This includes the following terms:

- *farmers* in this research refers to a group of adults both male and female working together in a community garden project and consume the produce and sell surplus;
- *extension worker* refers to a person who has undergone tertiary training in agriculture and obtained a National Diploma in Agriculture and who is currently working for the Department of Agriculture and Environmental Affairs;
- *extension supervisor* refers to the immediate manager to whom the extension workers report and from whom extension workers get their directives; and
- *community garden* denotes a piece of land that is more than a hectare in size where a group of adults farm vegetables and maize for consumption and sell surplus and divide the proceeds.
- *smallholding* refers to a piece of land used by rural households for a range of farming activities.

## **1.7 Description of concepts**

It is important to understand the following key concepts related to this research in the context within which it has been applied:

### **1.7.1 Knowledge management**

Knowledge management may generally be defined as the management of processes that allow creating, sharing, use, transformation, absorption and storage of knowledge within an organisation which support the intellectual capital of employees as well as the clients (Quintas, Lefrere and Jones 1997; Carnerio 2000; Martin 2003; Agus, Baker and Kandampully 2007).

### **1.7.2 Learning in organisations**

The concept of learning as used in this research is understood as the process of developing new knowledge as employees engage in meaningful dialogue, reflection and critical thinking processes (Calantone, Cavsgil and Zhao 2002; Sher and Lee 2004).

### **1.7.3 Agricultural extension**

Agricultural extension deals with commercial, small-scale and subsistence farmers to help them obtain relevant agriculture-related knowledge and skill to enhance their ability to farm in a productive, competitive and sustainable manner. Various advisory, participatory and learning approaches are applied by extension workers to address the specific needs of the different types of farmers (Department of Agriculture 2005).

## **1.8 Research design and methodology**

The study took the form of basic qualitative research, and made use of semi-structured interviews and a focus group discussion to collect data.

Purposeful sampling was used for selecting the participants. The research sample included both extension workers and farmers. There were seven extension workers who participated in this research together with their supervisor. The extension workers work in the different municipalities of the uMgungundlovu District Municipality where they are mainly responsible for supporting small-scale farmers involved in community gardens. Eight farmers took part in this research and they were all members of the same community garden in Imphendle. A community garden was chosen for the study as most of the extension workers work with community garden projects

In order for the researcher to familiarise herself with the extension practices as applied in the uMgungundlovu District Municipality, documents were reviewed and observations were made. The documents and observations also assisted the researcher to formulate questions for the semi-structured interviews and the focus group discussions. Documents reviewed and observations were thus not used to collect the data for this research but only assisted in the preparation of the semi-structured interviews and focus group discussion schedules. Seven extension workers and their supervisor took part in semi-structured interviews as well as a focus group discussion, while data from the farmers was collected using semi-structured interviews. The data was analysed using content analysis.

## **1.9 Limitations**

The data collection was delayed as the extension workers embarked on a month-long strike. During this period, the researcher tried to meet with the extension workers but was not successful. After the strike had ended, the researcher made appointments with the extension workers to set up interviews.

This research initially intended to interview ten extension workers working with community garden farmers. This was not possible as only seven extension workers managed to keep their appointments for the interviews. Even though efforts were later made to set up appointments with other extension workers, some of them did not honour the appointments as they were busy working in the field with the farmers.

Initially, the farmers were supposed to take part in a focus group discussion. The focus group discussion was conducted and soon after analysis of the data, the researcher discovered that the data collected from the farmers was not adequate. The farmers who had participated in the focus group discussion could not provide much information as the extension worker they worked with was present at the discussion. As a result, semi-structured interviews were conducted with the individual farmers without the presence of the extension worker.

## **1.10 Procedure during this research**

The following procedures were followed during this research:

1. The researcher visited the different projects on which extension workers work. During the visits to the projects, the researcher carried out observations to gain an understanding of the way the extension workers and the farmers worked together.
2. Different documents were reviewed by the researcher, which included minutes of meetings and reports that the extension workers had written to their supervisor.
3. The semi-structured interview schedules formulated for the interview with the extension workers were based on the observation and documents reviewed.
4. Transcription and analysis of the data as obtained through semi-structured interviews (procedure 3).
5. Formulation of questions for the semi-structured interview with the supervisor and the focus group discussion with the farmers were based on the analysed data (procedure 4).

6. A focus group discussion was conducted with the extension workers and their supervisor.
7. Data was transcribed and analysed (procedure 6).
8. The analysed data (procedures 4 and 6) were used to formulate the focus group discussion schedule for the farmers. The analysis of the data of this focus group discussion revealed that the farmers did not provide useful data (see Subsection 1.9).
9. A new interview schedule was developed based on the analysed data (procedures 4 and 6) to conduct semi-structured interviews with the farmers.
10. Data was transcribed and analysed (procedure 9).

## **1.11 Sequence of chapters**

Chapter 1 includes the introduction and an overview of this research, which reflects the importance of this research. The chapter justifies the need for this research and provides the research question, the objective and the sub-objectives.

Chapter 2 consist of the literature review that is linked to the research question, the objective and the sub-objectives. The literature review looks at what knowledge management is and will also provide the definition. The different knowledge management models are considered as well as the different extension models used by extension workers in connection with farmers. The knowledge management models illustrate the way knowledge is created and shared among employees in an organisation and also with clients of the organisation. The extension models show the way knowledge is shared between the farmers and the extension workers as well as the way learning takes place between them.

Chapter 3 comprises the methodology and the data analysis method. The chapter describes the way the participants of this research were selected and the reasons why they were selected. Once the participants had been selected, the data was collected using specific data collection methods. The data collected was analysed using content analysis.

Chapter 4 includes the results and the analysis of the results from the participants. The data was recorded using a digital recorder and was transcribed verbatim. The transcribed data was then analysed by the researcher using themes which emerged from the data.

Chapter 5 comprises the discussion of the analysed data. It provides interpretation of the data as guided by the literature. Recommendations and a conclusion on the research findings are provided.

## **1.12 Summary**

This chapter looked at the background of the current research and the need for the study and provided the research objectives and sub-objectives. All these aspects focused on an exploration of the way extension workers manage knowledge within their organisations as well as in their dealings with the community garden farmers. The next chapter describes the literature on knowledge management and the extension models used by the extension workers.

## **LITERATURE REVIEW**

### **2.1 Introduction**

Chapter 1 explained the background to the study and gave a description of the need of the study and the research question and, based on these, the main and sub-objectives were set. The main objective of the study was to identify knowledge management practices applied by extension workers to support community gardens in the uMgungundlovu District Municipality.

The sub-objectives were to explore how:

- extension workers manage knowledge within the Department of Agriculture, and Environmental Affairs related to community gardens;
- extension workers manage knowledge shared between themselves and community gardeners; and
- extension workers integrate knowledge gained from community gardeners into their practices.

This chapter reviews the literature on the basis of the main and sub-objectives mentioned above. This will be done by integrating three different aspects related to the main objective, namely knowledge management, learning and agriculture extension.

### **2.2 Knowledge management**

Since the 1990s, there has been a rapid increase in the interest regarding knowledge management across the world as knowledge management became a core capability for the success of organisations (McAdam and McCreedy 1999; Quintas 2002:1; Liao 2003; Haslinda and Sarinah 2009). The interest in knowledge management has mainly been on the part of private or commercial organisations and not chiefly on the part of government organisations. Knowledge management concepts and practices progressed in the 1990s as management in the post-industrial era came to realise that knowledge is an important asset within the organisation, and organisations are managing knowledge poorly (Earl 2001).

The attention on knowledge management is directed at the way knowledge could be managed among various organisations on the one hand, and the way individual organisations manage

knowledge within their organisations on the other. The interest in knowledge management is driven by the fact that knowledge is viewed as the primary business asset responsible for economic development, and this has therefore resulted in the need for the appropriate management of knowledge within organisations (Gao et al. 2002; Marouf 2004). Management of knowledge requires organisations to constantly create new knowledge, to spread it extensively throughout the organisation, and to embody it rapidly in the new technologies and products which contribute to the success of the organisation (Nonaka and Konno 1998; Liao 2003; Kiessling, Richey, Meng and Dublic 2009).

The concept of knowledge management has been articulated in literature as a beneficial tool, which can be used by employees of the organisations to achieve success through innovativeness, competitiveness and responsiveness (Nonaka 1994; Alavi and Leidner 2001; Quintas 2002:1; Gao et al. 2002; Liao 2003; Marouf 2004; Zheng 2009; Haslinda and Sarinah 2009). Innovativeness efforts are characterised by search and discovery, experimentation, new production processes, development of new technologies, new products and services (Carnerio 2000). Consequently, when knowledge management is influenced by innovativeness it leads to the development of new knowledge which may drive the organisation in a new business and in new markets which may be more rewarding for the organisation (Carnerio 2000). The innovativeness efforts need to be tactically combined with a competitive orientation for the organisation to achieve its anticipated results (Carnerio 2000).

The competitive edge for an organisation as a result of knowledge management may be attributed by what the organisation knows, how the organisation uses what it knows and how fast the organisation can get to know something new (Kok 2007). Although innovativeness and the competitive edge are crucial in knowledge management, the nature of the responsiveness of the organisation and its employees is an important factor. The ability of the organisation and its employees to respond quickly to new situations and to the needs of their clients is crucial as this may influence the success of knowledge management in any market conditions (Carnerio 2000; Agus et al. 2007).

### ***2.2.1 Defining knowledge management***

Knowledge management is a comprehensive concept that is centred on knowledge. It is necessary to have an understanding of the term since literature has various understandings of



knowledge, which are dependent on the context. In literature, knowledge does not just come into existence; it is built or is a build-up from data and information.

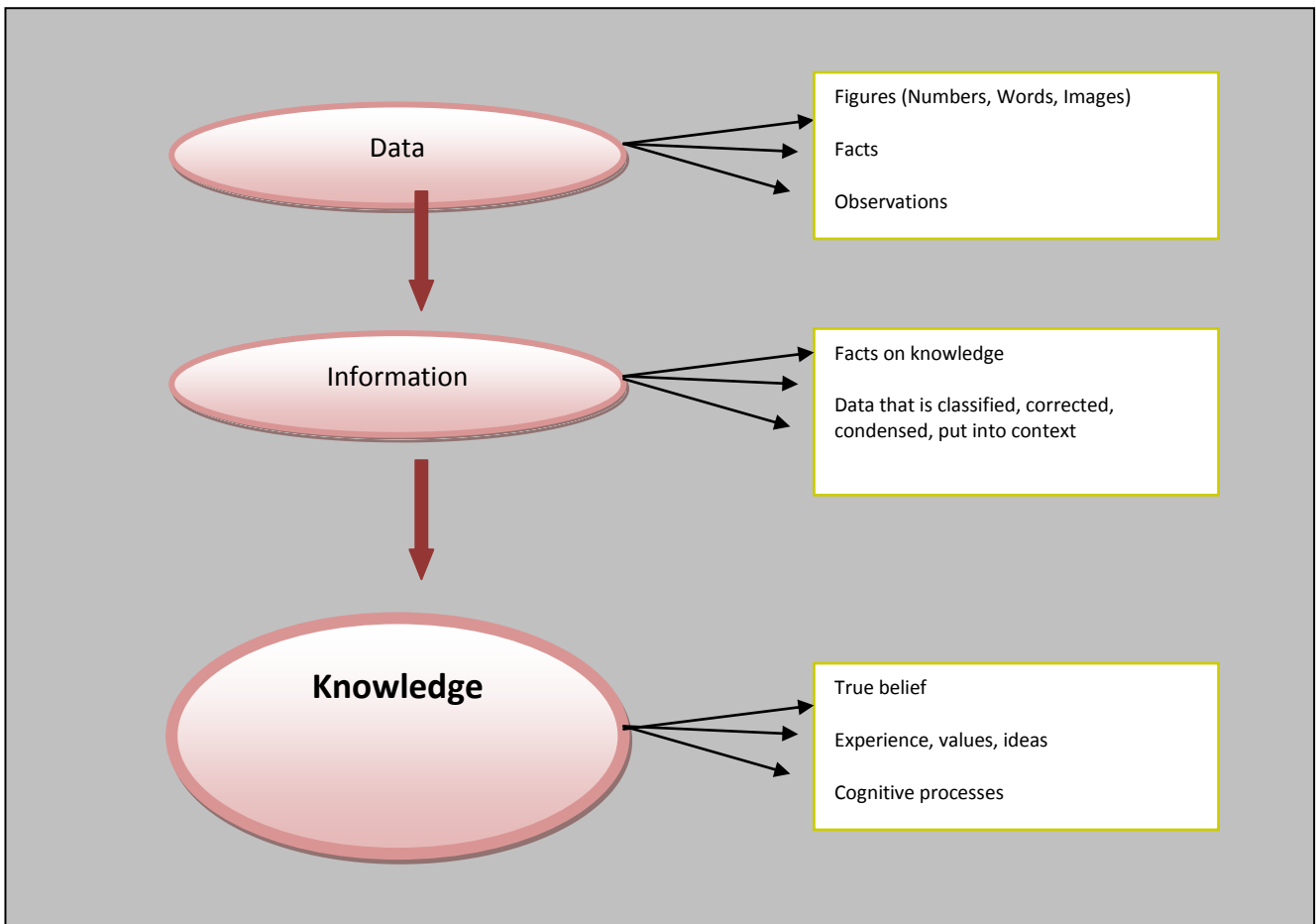
Knowledge management may generally be defined as the recognition and the management processes that support the intellectual capital of employees within the organisation over time. It is relevant to all job functions and processes and tries to capture institutional learning and the sharing of best practices that benefit the whole organisation and its clients (Quintas et al. 1997; Martin 2003).

Knowledge management is a continuous process that eventually leads to identification and exploitation of the existing and attained knowledge assets and the creation of new opportunities and new knowledge (Quintas et al. 1997; Kiessling et al. 2009). Knowledge management includes practices that enable organisations to expand the way they develop, adopt, validate, diffuse, store and utilise knowledge in order to reach their goals quicker and more successfully, and it encourages individuals to use knowledge effectively (Mchombu 2007; Wen 2009).

### **2.2.2 The knowledge value chain**

The term *knowledge* has often been used interchangeably with *information* and *data*, although these latter two terms are different. Attempts have been made in literature to distinguish between *knowledge*, *information* and *data* by defining these terms.

Knowledge may be described as a value chain built from data and information (Senge 2002; Lang 2001 Van Horne, Frayret and Poulin 2005). Figure 2.1 shows the build-up of the value chain of knowledge.



**Figure 2.1: The knowledge value chain**

As reflected in Figure 2.1, the term *data* may be defined as a combination of records of figures, facts, words, numbers, images and realistic measurements such as observations (Kroenke 1989; Tuomi 1999; Lang 2001; Seng, Zannes and Pace 2002; Van Horne et al. 2005; Soanes and Stevenson 2006). In contrast, *information* refers to facts on knowledge, which are learned in a given setting, in other words, information is data that is collected and analysed by classification, correcting and being put into context (Tuomi 1999; Senge 2002; Soanes and Stevenson 2006). According to Tuomi (1999), information becomes knowledge when meaning is given to information through interpretation.

*Knowledge* is a broad term that stems from data and information. There is no specific definition of knowledge since it is subject to specific contexts and perspectives (Handzic 2003; Cormican and Dooley 2007; Alavi and Leidner 2007). *Knowledge* may be defined as an individual's true belief that is context-specific and which results from the individual's perspectives and experiences (Nonaka and Takeuchi 1995; Devenport and Prusak 1998; Cormican and Dooley 2002; Diakoulakis, Georgopoulos, Koulouriotis and Emiris 2004). Furthermore, knowledge is information that has been used and incorporated along with the

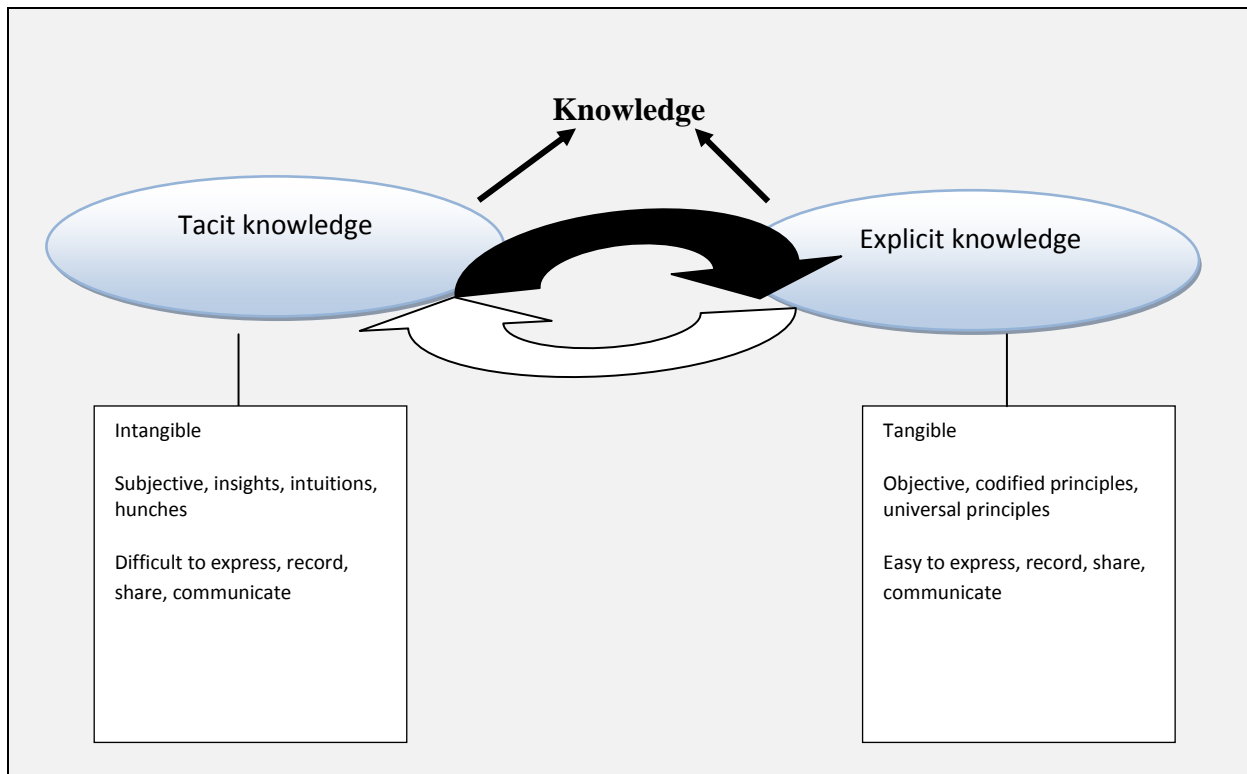
individual's knowledge-based experience and behavioural patterns, since individuals have different knowledge-based capacities and experiences, which give rise to the use of different approaches to problem-solving and decision-making (Kanapeckiene, Kaklauskas, Zavadskas and Senuit 2010). Knowledge related to individuals' experiences and capacities needs to be shared among such individuals to enhance performance in their organisation. Sharing individuals' capacities and experiences contributes to the success of knowledge management within organisations.

Knowledge may be understood as being both subjective and objective. Knowledge is subjective when it is based on the individual's perspectives and experiences, but becomes objective when individuals share their knowledge and experiences with others. Sharing one's knowledge and experiences can result in knowledge becoming objective once a common understanding is reached by people who will be involved in sharing the knowledge. The knowledge that an individual has or that has been shared between people will influence the manner in which they will tackle a problem and therefore their decision-making processes.

The fact that knowledge may be both objective and subjective results in knowledge existing in two forms, namely tacit and explicit knowledge. These two knowledge forms are influenced by the degree of individuals' experiences and by the groups' common experiences which are shared amongst the members of the group.

### ***2.2.3 Knowledge classification: Explicit knowledge and tacit knowledge***

Knowledge is known to exist in various forms, though two of these forms have emerged in literature as most common. These two forms have been generally accepted and are explained in depth in literature. The most common forms of knowledge are classified either as tacit knowledge or as explicit knowledge (Nonaka 1994; Nonaka and Takeuchi 1995; Tuomi 1999; Lim and Klobas 2000; Alryalat and Hawari 2008). Figure 2.2 illustrates knowledge classified as tacit knowledge and explicit knowledge.



**Figure 2.2: The classification of knowledge**

Figure 2.2 shows the difference between tacit and explicit knowledge as described in the next two subsections (2.2.3.1 and 2.2.3.2). The two arrows between tacit and explicit knowledge illustrate the transfer of tacit knowledge to explicit knowledge as well as the transfer of explicit knowledge to tacit knowledge.

### 2.2.3.1 *Explicit knowledge*

*Explicit knowledge* refers to knowledge that is tangible (Figure 2.2). This type of knowledge is depicted using pictures, numbers, words and formulae, codified procedures and universal principals. Explicit knowledge can be stored in books, manuals and databases, thus allowing it to be passed through communication and be shared among people easily and quickly (Nonaka and Takeuchi 1995; Handzic 2003; Chua 2003; Wong and Aspinwall 2004; Milton 2005).

### 2.2.3.2 *Tacit knowledge*

*Tacit knowledge* refers to intangible knowledge that is not easily visible, expressible or shared (Figure 2.2). Tacit knowledge comprises subjective insights, intuitions and hunches. Such knowledge is ingrained in one's experiences, actions, ideals, values and emotions,

making it difficult to store it in books (Nonaka and Takeuchi 1995; Nonaka, Toyama and Konno 2002:41; Handzic 2003; Richards and Busch 2003; Wong and Aspinwall 2004; Pascore and More 2005; Milton 2005).

Within tacit knowledge lies, among others, the concept of creativity that contains the use of figurative language and symbolism used to articulate and share insights and intuitions (Mchombu 2007). Therefore, tacit knowledge is action-oriented although having a personal quality component, which makes it not easy to communicate and which is only acquired through practical experience within the relevant context (Alavi and Leidner 2001; Boateng 2006). An individual's tacit knowledge may not be of value to other members of the organisation until it has been changed into explicit knowledge which may be shared with other members within the organisation (Nonaka and Takeuchi 1995; Inkpen and Dinur 1998).

For tacit knowledge to become explicit knowledge there is firstly a need to capture the tacit knowledge from individuals for the tacit knowledge to contribute to the knowledge management processes. Since tacit knowledge is covert and personal, it may be shared or communicated when the correct mechanisms have been put in place to retrieve the knowledge from the individual (Nonaka and Takeuchi 1995). Freire (2000) propose that, when people are holding onto any form of knowledge, they can be made to share it once they receive adequate motivation and support or they may change their attitude and share their experience and action with others. According to Freire (1984), individuals are able to share when they become curious about the object of knowledge and when they are willing and open to engage with theoretical readings and take part in discussions. In this view, when people with tacit knowledge willingly engage in action and discussions with other people it may give rise to them opening up their covert knowledge and sharing it with the other people.

The willingness to share knowledge among people is a crucial activity within any organisation as the willingness to share knowledge contributes to the creation of new knowledge. For any organisation to start the knowledge-creating process there is a need to start the sharing of tacit knowledge among individuals first (Nonaka and Takeuchi 1995; Calantone et al. 2002). To allow sharing to take place it is imperative that an environment be set which will allow people to interact with each other in face-to-face dialogues. This will allow sharing of experiences to take place (Nonaka and Takeuchi 1995). Knowledge sharing is essential as it keeps knowledge alive and prevents loss of knowledge when knowledge – especially tacit knowledge – is not shared (Calantone et al. 2002; Sher and Lee 2004). Shared

knowledge among employees in an organisation makes available shortcuts to decisions or solutions to other employees encountering similar problems, allowing learning to take place and enabling employees to respond quickly to arising situations (Sher and Lee 2004).

Explicit and tacit knowledge discussed above, are all-important and need to be captured and made accessible for the benefit of all people (Lim and Klobas 2000). These two forms of knowledge are not mutually exclusive but complement each other (Nonaka and Takeuchi 1995; Kok 2007). For knowledge to benefit all people, both tacit and explicit knowledge must be captured and managed effectively. For knowledge to be captured and made accessible, there is a need for adequate knowledge management practices to be put into place in order to encourage people to share their knowledge.

#### ***2.2.4 Knowledge management processes and outcomes***

Knowledge has been described in literature as being made up of personal and unrecorded knowledge or tacit knowledge, and explicit knowledge that is observable and spoken knowledge (Nonaka 1994; Nonaka and Takeuchi 1995; Tuomi 1999; Lim and Klobas 2000; Alryalat and Hawari 2008). This knowledge may not be systematically organised, giving rise to the need for both explicit and tacit knowledge to be managed for it to be optimally useful to members of the organisation. Knowledge management requires setting up an environment that allows workers of the organisation to create, capture and leverage knowledge leading to improved performance (Kwan and Balasubramania 2003; Mchombu 2002; Wen 2009).

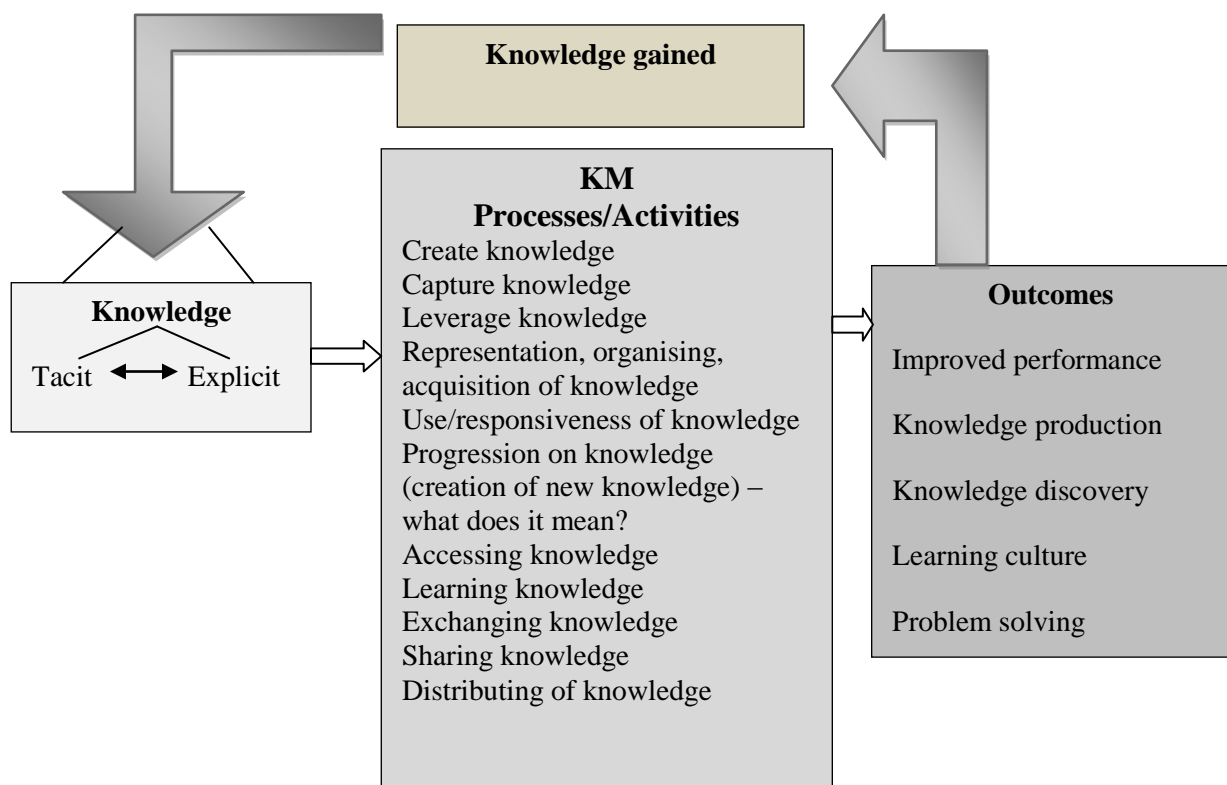
Knowledge management involves the processes which produce or discover knowledge and manage the use and distribution of knowledge inside and among organisations (Darroch 2003; Kiessling et al. 2009). Darroch (2003) further illustrates that knowledge consists of three components: acquisition, dissemination and use or responsiveness, and these components of knowledge management are dependent on each other. The effectiveness of the three components in knowledge management requires learning to have taken place to enable individuals to acquire, disseminate and use knowledge.

The knowledge management process involve a learning aspect. The process facilitates exchange and sharing, and institutionalising of learning as a process that is ongoing inside the organisation (Lopez, Peon and Ordas 2004; Call 2005). Knowledge management and learning go hand in hand; thus, the learning processes determine the quality of the knowledge that is shared within the organisation and the effectiveness with which knowledge is put to use

(Lopez et al. 2004). Learning is said to be inherent to problem solving as problems are not given and need to be framed and solved as unique instances (De Paula and Fisher 2006).

The various activities and processes involved in the knowledge management process give rise to the following outcomes by employees of an organisation:

- access to information;
- improved performance;
- ability to solve problems;
- production of new knowledge;
- a learning culture; and
- knowledge discovery (see Figure 2.3).



**Figure 2.3: Knowledge management defined as a process and an outcome** (as based on the work of Lim and Klobas 2000; Kwan and Balasubramania 2003; Darroch 2003; Jurisica, Mylopoulos and Yu 2004; Lopez et al. 2004)

Figure 2.3 demonstrates that the knowledge management process involves either tacit or explicit knowledge and the management of knowledge processes or activities. There are processes involved in knowledge management that lead to positive outcomes of knowledge

management. Tacit and explicit knowledge (see Subsection 2.2.3), which have been used in the knowledge management processes and activities lead to the positive outcomes of knowledge management.

Two dimensions of knowledge management processes/activities may be distinguished:

- managing already existing knowledge through various mechanisms; and
- managing different knowledge-specific activities (Gao et al. 2002).

The first dimension comprises management of existing knowledge. It involves developing knowledge repositories, knowledge compilation, arrangement and categorisation (Gao et al. 2002). The second dimension entails management of specific knowledge activities, namely knowledge acquisition, creation, distribution, communication, sharing and application (Gao et al. 2002). To sustain the processes or activities, hard and soft environments have to be created and nurtured. *Hard environments* refer to technological platforms such as facilities and devices; *soft environments* are related to trust, team spirit and learning environment (Gao et al. 2002). The success of these two dimensions will depend to a large extent on whether the organisational structure supports the hard and soft systems. These two systems may be identified within an organisation from the knowledge management model which the organisation has in place.

The knowledge management models can be used as templates to understand how organisations address the knowledge management practices within their organisations and the nature of their soft and hard systems. The models may further identify the better suited model which an organisation can adhere to for the organisation to fully benefit from its chosen or implemented knowledge management practices.

### **2.2.5 Knowledge management models**

There are various knowledge management models available in literature and these models explain the different processes which are involved to effectively benefit the organisations, the employees and the customers. Some of these models include Boisot's knowledge category model, Kogut and Zander's knowledge management model, Nonaka's knowledge management model, Hedlund and Nonaka's knowledge management model, Skandia's intellectual capital model of knowledge management, and Demerest's knowledge management model. These six models can be classified into three categories, which are related to the development of the following elements and categories within the organisation:



- knowledge category models: Boisot's knowledge category model, Kogut and Zander's knowledge management model, Nonaka's knowledge management model, and Hedlund and Nonaka's knowledge management model;
- intellectual capital category models: intellectual capital model of knowledge management (Skandia); and
- social structural category models (McAdam and McCreedy 1999).

### 2.2.5.1 *The knowledge category models*

The knowledge category models assume that knowledge is created through conversion, which takes place between tacit and explicit knowledge and which enables the proposition of four different "modes" of knowledge conversion: from tacit knowledge to tacit knowledge, from explicit knowledge to explicit knowledge, from tacit knowledge to explicit knowledge and from explicit knowledge to tacit knowledge (Nonaka 1994).

#### **i) Nonaka's knowledge management model**

Nonaka's knowledge management models have the following four knowledge-creating processes: socialisation, externalisation, combination and internalisation.

- *socialisation* involves the sharing of tacit knowledge among individuals by means of joint activities and physical proximity;
- *externalisation* allows the representation of tacit knowledge in publicly understandable forms;
- *combination* includes the transformation of explicit knowledge into more complex sets of explicit knowledge, namely combination, dissemination, systematisation of explicit knowledge; and
- *internalisation*, which is the process responsible for the transformation of externalised knowledge into tacit knowledge on the individual or organisational level. This is the embodiment of explicit knowledge into actions, practices, processes and strategic initiatives (Nonaka and Takeuchi 1995, Despres and Chauvel 2000).

Nonaka's knowledge management model depicts that knowledge is comprised of tacit and explicit knowledge (Nonaka and Takeuchi 1995). In this model, tacit knowledge can be transferred to tacit knowledge in other people through socialisation; thus, socialisation enables people to share tacit knowledge (Nonaka and Takeuchi 1995). The socialisation process involves sharing experiences, which lead to the creation of tacit knowledge like

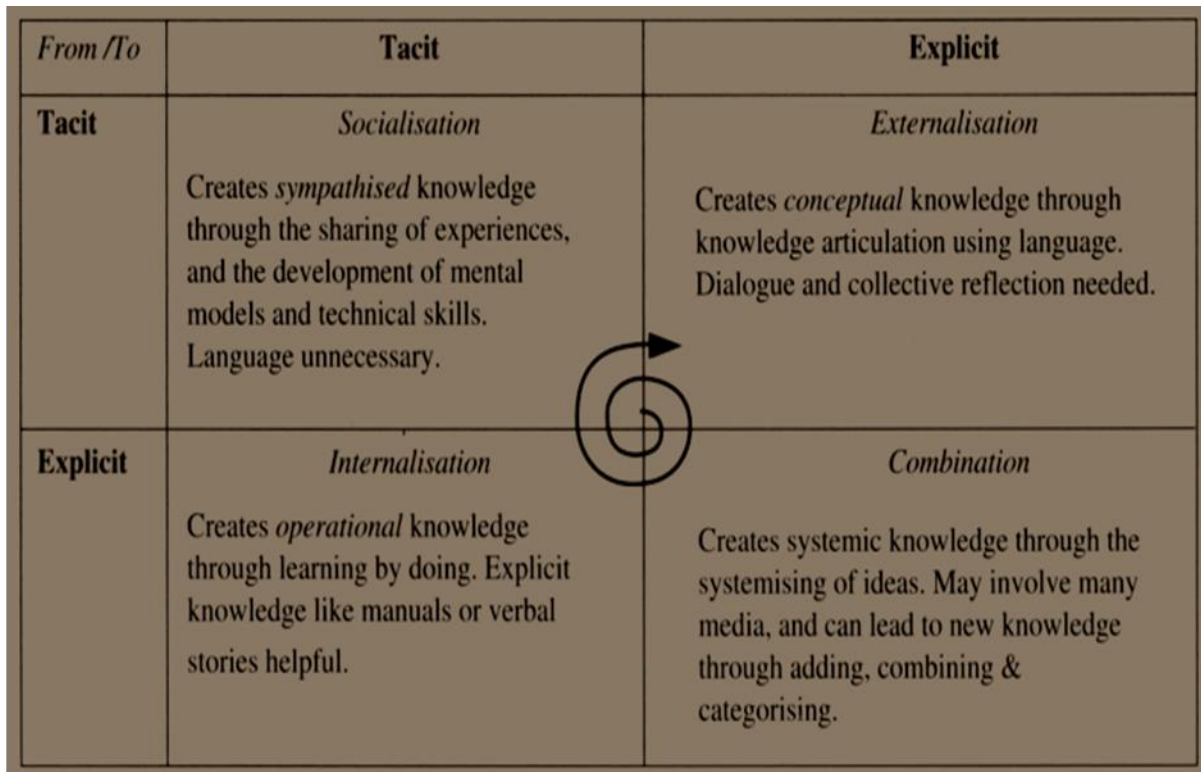
shared technical skills and mental modes (Nonaka and Takeuchi 1995). Sharing can occur without language as individuals acquire tacit knowledge from others through learning, observing, imitation and practice (Nonaka and Takeuchi 1995).

The externalisation process is experienced when there is meaningful dialogue or collective reflection by employees during which a body of knowledge is formalised to assist the employees to express hidden tacit knowledge that may be difficult to communicate (Nonaka and Takeuchi 1995; Haslinda and Sarinah 2009). The externalisation process enables tacit knowledge to be transferred to explicit knowledge. The dialogue process within the externalisation mode allows for sharing of knowledge among people, which is important in knowledge management and keeps knowledge alive within the organisation (Nonaka and Takeuchi 1995; Calantone et al. 2002; Sher and Lee 2004).

The internalisation process, on the other hand, assumes that explicit knowledge can be transferred into tacit knowledge by converting theory into practice, which becomes crystallised in new products and service (Nonaka and Takeuchi 1995; Haslinda and Sarinah 2009). The internalisation process, enables shortcuts to decisions on solutions and learning to take place as shared knowledge is used by other employees who may be experiencing similar situations as those discussed or shared.

The combination process of the model presumes that explicit knowledge can be changed into explicit knowledge in others by bringing together different theories, which leads to systematic knowledge (Nonaka and Takeuchi 1995; Haslinda and Sarinah 2009). In this mode of knowledge conversion, people exchange and coalesce knowledge through documents, meetings, telephone conversions and computerised communication networks (Nonaka and Takeuchi 1995). Knowledge that is created through formal education and training in schools or other training institutions takes this form (Nonaka and Takeuchi 1995). The combination process involves sharing of already formalised knowledge among people and may include reading out reports of past meetings and documented procedures of doing certain tasks within the organisation. Figure 2.4 illustrates Nonaka's knowledge management model.

## Doing



## Learning by doing

**Figure 2.4: Nonaka’s knowledge management model** (Nonaka and Takeuchi 1995)

Figure 2.4 shows that knowledge contents intermingle in a spiral form with each other, creating new knowledge. According to Nonaka (1991), the individual is always the source of new knowledge, and making this new knowledge available to everyone in the company is a vital aspect of the knowledge-creating company. Individuals are not there to receive new knowledge passively; they engage with it and actively interpret the knowledge to suit their circumstances and viewpoints. Consequently, what makes sense in a particular context may change or lose meaning when communicated to others in other situations. According to Nonaka (1991), there is a continued modification of meaning as knowledge is shared within an organisation.

Knowledge sharing is a vital aspect towards the survival of an organisation in a dynamic economy. Shared knowledge keeps the organisation alive and is used as reference for future use by employees of the organisation. Shared knowledge furthermore allows learning and re-examination of the knowledge that was created, which is necessary for the organisation to have a competitive advantage. Employees thus become innovative and there is quick

responsiveness by the organisation to new situations. Knowledge sharing amongst employees contributes to the creation of new knowledge in the organisation, which is a critical activity that contributes to the success of the organisation as new knowledge becomes available for everyone in the organisation to take advantage of. This may lead to innovative initiatives within the organisation thus giving the company an advantage in the competitive world (Nonaka 1991). As knowledge is shared, people are no longer mere receivers of the new knowledge; instead, they become innovative actors with the new knowledge which makes it more context-specific to different situations. This is shown in Hedlund's and Nonaka's management model (see Table 2.1), which is a more comprehensive version of Nonaka's knowledge management model

**ii) Hedlund and Nonaka's management model**

Hedlund's and Nonaka's management model considers only four agents of knowledge within the organisation: individual, group, organisation and inter-organisational domains, and there articulated knowledge and tacit knowledge can be found on both levels (Hedlund 1994; McAdam and McCreedy 1999; Haslinda and Sarinah 2009). The inter-organisational agent consists of influential customers, suppliers and competitors. The agents are separated and linked with the type of knowledge area (Haslinda and Sarinah 2009; McAdam and McCreedy 1999).

**Table 2.1: Hedlund and Nonaka's management model** (Hedlund 1994; McAdam and McCreedy 1999; Haslinda and Sarinah 2009).

	<b>Individual</b>	<b>Group</b>	<b>Organisation</b>	<b>Inter-organisational domain</b>
<b>Articulated knowledge</b>	Knowing basic calculations	Quality circle's documented analysis of its performance	Organisation chart	Suppliers' patents and documented practices
<b>Tacit knowledge</b>	Cross-cultural negotiation skills	Team coordination in complex work	Corporate culture	Customer's attitudes to products and expectations

Hedlunds and Nonaka's management model shows that knowledge transfer is a complicated and complex matter as there is more than one agent involved in the transfer of knowledge within the organisation. The model then presumes that knowledge is categorised into the four agents, which are separated and have specific knowledge which is related to each individually. This is consistent with Nonaka's externalisation and combination processes (Haslinda and Sarinah 2009) (see Table 2.1 Nonaka's knowledge management model).

The two knowledge category models above – Nonaka's model and Hedlund and Nonaka's management model – illustrate that knowledge exists in two forms, namely tacit and explicit or articulated knowledge, and that these knowledge forms can be transferred from one form to the other. Knowledge is transferable between tacit and explicit knowledge through various activities in which people engage, such as socialisation, externalisation, combination and internalisation. These activities involve actually doing an activity, which enables individuals to experience the activity and to gain experience and skills by doing and learning from doing the activity. Learning by doing is considered as one of the best forms of knowledge creation and gaining experience (Nonaka and Takeuchi 1995; Rahman 2009). Hedlund and Nonaka's model further shows that knowledge may be transferrable in individuals, groups, organisations and inter-organisational domains, and the various types of activities within each agent can influence the organisation's innovativeness and strategies which may lead to success or failure of the organisation.

#### *2.2.5.2 Intellectual capital category models*

The intellectual capital model was developed by Skandia, a Swedish firm, to measure an organisation's intellectual capital (McAdam and McCreedy 1999; Haslinda and Sarinah 2009). The intellectual capital notion became popular in the early and mid-1990s. It arose as a result of the awareness that information is a feature of production which exists in the same category as land, labour, energy and capital (Koenig 1998).

According to McAdam and McCreedy (1999) and Kok (2007), intellectual capital or intellectual assets refer to the conversion of knowledge into important assets of the organisation. These assets of the organisation refer to intangible assets, which do not have an obvious financial value and which are characterised as "hidden assets" since they are not easily identifiable and assigned an economic value (McAdam and McCreedy 1999; Kok 2007). Intellectual capital is also known to be made up of three elements, namely human

capital, structural capital and relational (customer) capital (McAdam and McCreedy 1999; Kok 2007; Haslinda and Sarinah 2009):

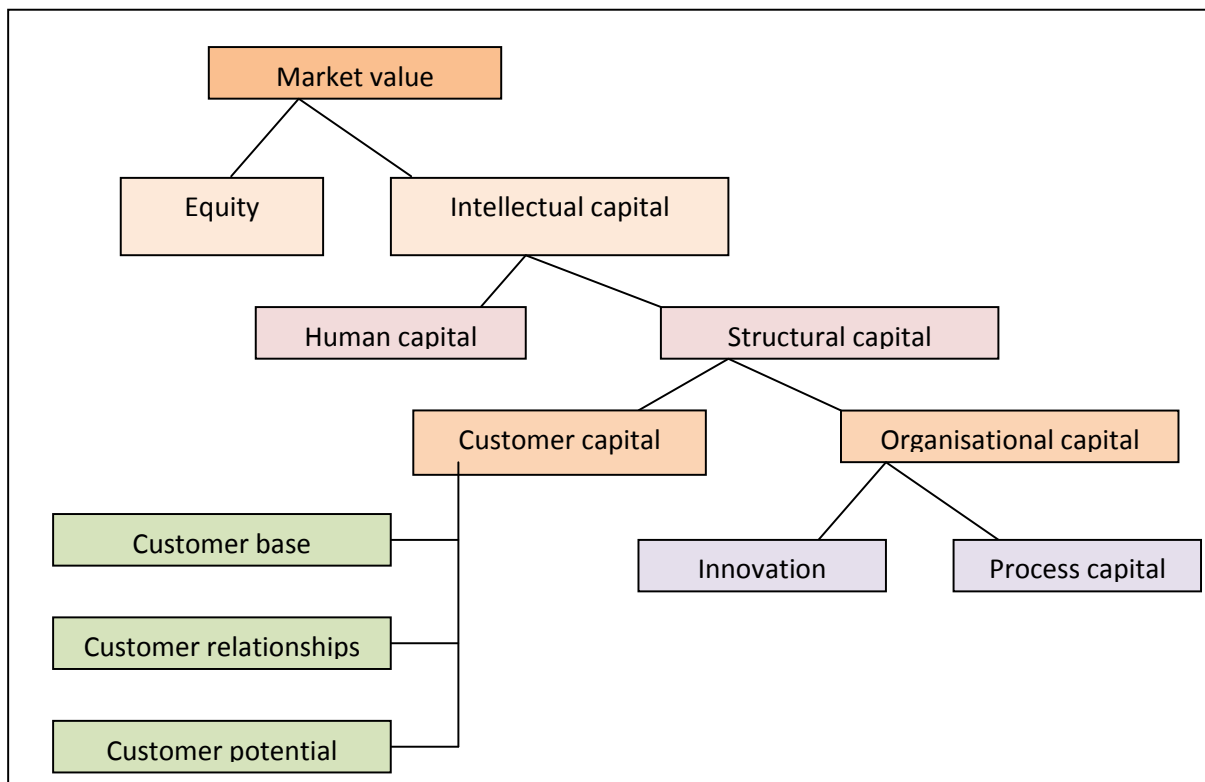
- *human capital* is made up of experience, know-how, capabilities, skills and expertise of employees of the organisation;
- *structural* (organisational) *capital* includes the system's networks, policies, culture, distribution channels and other "organisational capabilities" developed to address market requirements and intellectual property; and
- *relational* (customer) *capital* involves connections which people outside the organisation have with the organisation, such as loyalty, market share, level of back orders and other similar issues (Kok 2007).

Intellectual capital can also be understood as being made up of assets that are developed by intellectual activities, which include acquisition of knowledge through learning and inventions and which develop important relationships (Wigg 1997). According to Skandia, intellectual capital is knowledge possession; applied experience, organisational technology, customer relationships, and professional skills which provides Skandia AFS the competitive edge in the market (Edvinsson 1997; Zhou and Fink 2003). Intellectual capital therefore refers to knowledge that is owned by employees and that has been gained through learning by way of various activities. This knowledge is then transformed into valuable assets for the organisation.

Skandia's intellectual capital model centres on the significance of equity, human, customer and innovation in the management of the flow of knowledge within and outside the networks of partners (McAdam and McCreedy 1999; Kok 2007; Haslinda and Smith 2009). The intellectual capital model takes a stand that intellectual capital or knowledge management can be separated into human, customer processes and elements of growth that are contained in human capital and structural/organisational capital. The model adopts a scientific approach on knowledge and believes that knowledge can be changed into assets or commodities of the organisation, and thus creates a link with organisational capital in the model (McAdam and McCreedy 1999; Haslinda and Sarinah 2009).

Although the Skandia model takes a scientific view, it fails to take into account the social and political aspects of knowledge management (Lank 1997; Haslinda and Sarinah 2009). The transformation of human capital into what Skandia terms "structural capital" is the new

challenge of the knowledge era. This transformation of human capital into organisational structural capital will depend to a large degree on the willingness of members of the organisation to share their knowledge and expertise with each other (Lank 1997). If members are not willing to share their knowledge and expertise this will imply that there will be no organisational transformation of the human capital into the organisational capital. This will affect the function of the model negatively as there will be organisational capital being transformed from human capital. Figure 2.5 below describes Skandia’s intellectual capital model of knowledge management.



**Figure 2.5: Intellectual capital model of knowledge management (Skandia)** (based on the work of McAdam and McCreedy 1999; Haslinda and Sarinah 2009)

As reflected in Figure 2.5, the Skandia model has an intellectual capital view on knowledge management, which is mechanistic and ignores the political and social aspects of knowledge management. Like Nonaka’s knowledge management model, this model believes that knowledge management can be broken down into objective elements instead of being viewed as a social-political phenomenon (McAdam and McCreedy 1999; Haslinda and Sarinah 2009). The transformation of human capital into structural capital is at the core of the model. The model shares similarities with Nonaka’s knowledge management model as it views knowledge management as being composed of components derived from intellectual capital.

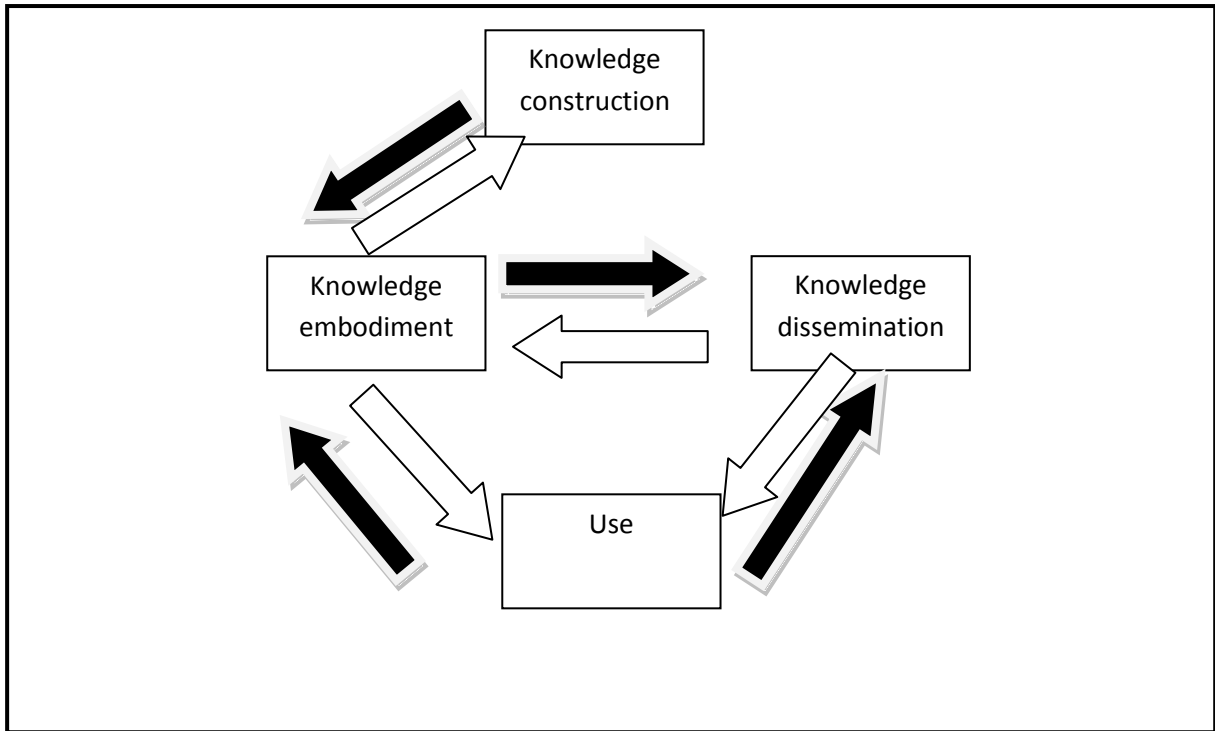
The model views all different capitals within it as assets of the organisation. This can also be illustrated by the need for transforming human capital into structural capital within the organisation (McAdam and McCreedy 1999; Haslinda and Sarinah 2009).

### *2.2.5.3 Social structural category models of knowledge management*

Social structural models of knowledge management put much more emphasis than the other models on the social construction of knowledge and the linkage with organisational learning and learning organisations (McAdam and McCreedy 1999; Rowley 2000). The social structural models adopt a holistic approach to knowledge construction and assume a wide definition of knowledge (McAdam and McCreedy 1999; Haslinda and Salinha 2009). One such model is Demerest's knowledge management model.

Demerest's knowledge management model accentuates that knowledge is constructed within the organisation and that knowledge is constructed from both scientific and social contributions to the construction processes (McAdam and McCreedy 1999; Rowley 2000; Haslinda and Salinha 2009). The model departs from the idea that knowledge is embodied inside the organisation through explicit programmes and processes of social interchange (McAdam and McCreedy 1999; Rowley 2000; Haslinda and Salinha 2009). Once knowledge is encompassed within the organisation, there is a follow-up process of dissemination of adopted knowledge all through the entire organisation and its environments (McAdam and McCreedy 1999; Rowley 2000). Figure 2.6 shows Demerest's knowledge management model.





**Figure 2.6: Demerest's knowledge management model (Demerest 1997)**

As shown in Figure 2.6, Demerest's knowledge management model has four phases, namely knowledge construction, knowledge dissemination, knowledge use and knowledge embodiment (Rowley 2000):

- *knowledge construction* is defined as the process of finding out or structuring a kind of knowledge. This can include how to diagnose a specific client's problem (Demerest 1997);
- *knowledge dissemination* involves human processes and technical infrastructure that encompass knowledge such as available documents for people to use in the organisation, which can explain how to carry out certain tasks (Demerest 1997);
- *knowledge use* is defined as the ultimate objective of the knowledge management system, which is the development of commercial value to clients (Demerest 1997); and
- *knowledge embodiment* comprises the process of selecting storage place for the created knowledge. This can be a document (Demerest 1997).

In Figure 2.5, the solid arrow demonstrates the primary flow of direction and the plain arrows demonstrate the extra recursive flows (McAdam and McCreedy 1999). In the model, knowledge is viewed as being of economic use in terms of the outlook of organisational

output and also the processes within which the model moves back and forth between the phases (Rowley 2000).

Demerest's knowledge management model demonstrates how knowledge is created, disseminated, used and embodied within the organisation and its environments. The various processes that the organisation goes through can be undertaken back and forth. The phases that lead to knowledge embodiment inside the organisation entail that all members of the organisation have access to all available knowledge, which may be generated within the organisation and members also benefit from the available knowledge found within the organisation (Demerest 1997; McAdam and McCreedy 1999; Rowley 2000).

#### *2.2.5.4 Summary of the knowledge management models*

The knowledge category models demonstrate that knowledge can be transferred from tacit to explicit or vice versa through various agents and modes. The models consider the environment within which the organisation exists as this has an impact on the transfer of knowledge between the agents and the modes. The knowledge category models assume that knowledge is mechanistically and demonstrates a socially constructed orientation (McAdam and McCreedy 1999; Haslinda and Salinha 2009).

The intellectual capital model takes on the notion that intellectual capital comprises important assets within the organisation and needs to be efficiently managed for organisational success (Haslinda and Salinha 2009). The model assumes a mechanistic approach and views knowledge as an asset that can be treated like other organisational assets (McAdam and McCreedy 1999). It ignores the social aspects of knowledge management in the build-up of knowledge. The model is not flexible and it is of the opinion that knowledge can become a commodity of the organisation that is separated from the employees and customers.

The social structure category model has a more flexible structure that allows the interchange of knowledge within its four phases. The Demerest model demonstrates that the social category models are inherently connected to the social and learning processes of the organisation (Haslinda and Salinha 2009). The model takes on a social-oriented construction of knowledge which allows for the interchange of knowledge among its four phases, namely knowledge construction, knowledge dissemination, knowledge use and knowledge embodiment. The social structure model takes into account the environment within which the organisation exists and the way the model may influence the knowledge process. The social

construction category models have a balanced outlook between the scientific and social approaches towards knowledge management (McAdam and McCreedy 1999). The social construction category model combines both the scientific and social aspects that influence knowledge management.

The knowledge management model that may be suitable for agricultural extension organisations is the Demerest model. This model values knowledge that comes from the external environment (political, natural, social and economic). This implies that also farmers and other stakeholders are viewed as important sources of knowledge, which may contribute to the success of extension services, by the extension organisation. Extension organisations work together with other stakeholders in the provision of services to farmers, which makes the model appropriate. Since Demerest model includes the external environment this means that farmers are considered to have knowledge which the extension workers can make use, as they capture and engage with knowledge from the farmers. Learning is also a crucial element of knowledge management and this model encourages learning. Learning should be able to take place between the farmers and the extension workers for adoption of knowledge to take place. Learning is an important aspect and makes the model suitable for agricultural extension.

### ***2.2.6 Outcomes of knowledge management***

Literature illustrates the vast benefits that accrue to organisations as they implement different knowledge management practices that suit their working environment. With the appropriate model in place in an organisation; the organisation has the opportunity to benefit from knowledge management, and could gain the much-required competitive advantage in their line of organisation. The following are some of the benefits of knowledge management, which may be gained through proper implementation of knowledge management models.

- **Ability to manage human brain power**  
According to Lank (1997), the ability to learn how to manage human brain power has incredible potential to improve the performance of businesses while employees' working lives can be made simple and more rewarding.
- **Effective organisational knowledge base**  
An effective organisational base allows or will allow employees not to waste time in a search for information and expertise that reside within the organisation, to improve

their performance and employability owing to the accessibility of the wide knowledge and expertise base (Lank 1997).

- **Employees becoming creative and innovative**

Knowledge management enables employees to become innovative and to create a new product which gives the organisation a competitive advantage (Nonaka and Takeuchi 1995).

- **Ability to capture knowledge (tacit and explicit)**

Captured knowledge will enable all employees in an organisation to have access to the knowledge, which may be utilised to benefit the organisation (Nonaka and Takeuchi 1995).

- **Ability to control and shift markets**

Through knowledge management, organisations will have an advantage in shifting markets when they can create, recognise, distribute widely and encompasses knowledge into new technologies and products (Nonaka 1991).

- **Creation of new knowledge within the organisation**

When people interpret the knowledge that they would have received through sharing, there is also creation of new knowledge as they shift the new knowledge to fit their own context and outlook (Nonaka 1991).

There are many different knowledge management models available. For any organisation to fully reap the benefits of knowledge management, it is crucial that the organisation puts in place a knowledge management system that relates to the nature of its work and what it intends to produce in the end. The nature of the relationship an organisation has with its customers also contributes to the kind of model that will be suitable for the organisation.

### ***2.2.7 Key drivers of knowledge management***

Even though there are different knowledge management models available, it is important that organisations be able to fully benefit from the knowledge that may be made available from the implementation of these models within an organisation. There are 24 key drivers, which bring about knowledge management as a convincing case for any organisation. Agricultural extension as a services delivery business links with the drivers since it seeks to deliver essential services to farmers. The literature on the key drivers of knowledge management is

based on work of Tiwana (2000) and no related literature could be found on the key drivers. The 24 drivers are clustered into six categories, namely: knowledge-centric drivers;

- technology drivers;
- organisational structure-based drivers;
- personnel drivers;
- process-focused drivers; and
- economic drivers (Tiwana 2000).

The category that will be explored further is the knowledge-centric drivers. These drivers were most relevant in terms of the current research and the literature on knowledge management models.

The knowledge-centric drivers category has six elements, namely:

- the failure of companies to know what they already know;
- the emergent need for smart knowledge distribution;
- knowledge velocity and sluggishness;
- the problem of knowledge walkouts and high dependence on tacit knowledge;
- the need to deal with a knowledge-hoarding propensity among employees; and
- a need for systematic unlearning (Tiwana 2000).

These six elements of the knowledge-centric drivers are explored below.

#### *2.2.7.1 Failure to know what they already know*

Companies have knowledge, which they can use to become innovative, although they may not know that such knowledge exists within the company. The use of knowledge management in an organisation may be able to make available the required knowledge within the organisation (Tiwana 2000).

The emergent needs to start knowledge distribution and companies are faced with problems which emanate from a lack of smart knowledge:

- employees cannot find critical existing knowledge in time. When the need arises to collate information necessary for a task it becomes an impossible task in the time allowed; and

- lessons are learned but not shared – sections within a company that deal with similar clients may be performing differently even though the underperformers are learning from the performers which may imply that there is neither a sufficient process nor the appropriate infrastructure that allows sharing or the transfer of appropriate practices within the organisation (Tiwana 2000).

#### *2.2.7.2 Knowledge sluggishness*

Knowledge sluggishness refers to an organisation's failure to provide knowledge when it is needed within the organisation. Organisations need to have in place mechanisms that enable employees to find knowledge which they need, as people usually tend to make use of incomplete knowledge which they may have. When the knowledge is not found at the time of need, it becomes of no or little value to the people in need of it. There is need for organisations to be able to support active and complete transfer of knowledge from projects that were successful to new ones without any wastage of resources (Tiwana 2000). It is also important that organisations do not undervalue knowledge which may be gained from failures. These failed methods and decisions usually make available important insights about projects on what should be done to avert failure. It is also necessary to retain and actively use knowledge from failed projects (Tiwana 2000). The knowledge made available through failed projects should be recorded using a reliable method, this will enable all the knowledge relating to the failure of the project to be captured and may be referred to later for other similar projects, to prevent the same failure (Tiwana 2000).

#### *2.2.7.3 Knowledge velocity*

Knowledge velocity refers to organisational mechanisms that assist the organisation in overcoming knowledge sluggishness and be able to put to use what they learn in a process at a much faster rate than competitors. Knowledge management systems that are effective enable people to learn from past decisions, which could be either good or bad (Tiwana 2000).

#### *2.2.7.4 Tacitness of knowledge*

Tacitness of knowledge refers to knowledge that is hidden in employees' heads, in the human intellect (Tiwana 2000). The organisation's intellectual ability is often then the human intellect. Employees usually have tacit knowledge which may be lost to the organisation when not shared and when the employee decides to leave the organisation (Tiwana 2000). It

is critical that employees are able to share their tacit knowledge as it may prove to be important towards the success of that organisation.

#### *2.2.7.5 Knowledge hoarding*

A knowledge-hoarding propensity implies that people have a tendency toward hoarding knowledge, which may undermine an organisation's potential to move quickly into new markets or even to compete (Tiwana 2000). To overcome hoarding, organisations need to come up with incentives that encourage sharing, such as introducing performance measuring and incentives which reward the sharing of knowledge, which benefits the entire organisation (Tiwana 2000). Within an organisation, it is necessary that task-focused workers be given time and space, which will allow them to share knowledge with other employees (Tiwana 2000).

#### *2.2.7.6 Systematic unlearning*

Systematic unlearning requirements refer to the need for companies to unlearn old practices, which are no longer applicable (Tiwana 2000). Knowledge management has the potential to provide organisations with mechanisms that enable them to unlearn old practices (Tiwana 2000).

#### *2.2.7.7 Summary of the six knowledge-centric drivers*

The six knowledge-centric drivers are important as they make the organisation aware that their knowledge management practices are effective in terms of the success of the organisation. The use of these drivers will make the organisation aware of its strengths and weaknesses in its knowledge management, which can be used to improve the effectiveness of the knowledge management processes for the organisation. These elements all require the organisations to be able to smartly disseminate knowledge within the whole organisations since this dissemination assists in the knowledge management process within an organisation" (Tiwana 2000).

The drivers provide the organisations with a guide, which will ensure that the knowledge management system of the organisation does actually benefit the organisation. As a result, the clients of an organisation are also able to benefit from the organisation's knowledge management system.

### **2.2.8 Summary of knowledge management**

The literature on knowledge management within organisations draws attention to different types of knowledge available within and outside organisations, learning which takes place among employees and clients, and knowledge management models. The knowledge management models demonstrate the different components and processes within each of the models, illustrating how knowledge may be gained and utilised within the organisation. It is also important to consider the outcomes of knowledge management and their importance in achieving a successful organisation. Since knowledge exists within organisations and outside them, it is important to harness the knowledge that individuals – either as employees or as clients of the organisation – have. Once knowledge is harnessed by the organisation, it is necessary that the organisation make use of knowledge drivers to view its own knowledge management effectiveness compared to its competitors.

With an efficient knowledge management system in place, clients will also benefit from such a system. In the context of agriculture extension organisations, farmers as clients of extension services have indigenous knowledge, which they have gained from experience and which could be incorporated with the scientific knowledge and experience of extension workers. This requires that the extension workers to be able to manage knowledge among themselves and knowledge from the farmers. For extension workers and farmers to gain from each other, a platform that encourages learning from each other and from one's experiences is necessary. This may contribute to better farming practices for the farmers and better services provision by agricultural extension organisations.

## **2.3 Learning**

Knowledge management is associated with various processes or activities taking place within the organisation. For knowledge management to be effective, learning has to take place within the organisation. Learning is associated with the development of new knowledge, which is important for the organisation's innovativeness, which contributes to the organisation's competitive advantage (Calantone et al. 2002; Sher and Lee 2004). This type of learning takes place as employees engage in processes of dialogue, critical thinking and reflection.



### **2.3.1 Learning organisations**

Technological development and change in the natural environment require agricultural extension organisations to become adaptive and to learn and acquire knowledge from the environment. This may enable organisations to address new situations and problems that may arise. There is also a need for organisations to create new practice to be followed by the organisation, which will contribute to discoveries and inventions within the development of the organisation to address challenges, e.g. climate change (Crocetti 2002). Knowledge management consequently becomes the key for any organisation to succeed in these changing environments, and this perspective on knowledge management gives rise to a market analysis, which observes learning as the most vital survival factor for an organisation to succeed and prosper (Clarke 2001; Crocetti 2002; Hailey and James 2002; Hall and Paradise 2005; Law and Ngai 2007). In this sphere of learning, reflective learning is an aspect which needs to be considered since reflective learning is a prerequisite for deeper learning (Xia, Ke and Sharma 2008).

Learning within organisations is a tool that can be used to increase and create corporate knowledge, which is vital for the success and survival of the organisation. Learning involves the organisation's continuous testing of experience, and the change of that experience into knowledge, that can be readily available to the entire organisation, and which will be applicable to the core purpose of the organisation (Senge, Ross, Smith, Roberts and Kleiner 1994; Lank 1997). It also involves the ability to harness brainpower and knowledge (Lank 1997). For effective learning to take place within the organisation, there is a need for the organisation to have certain characteristics (Subsection 2.3.2) which encourage learning.

### **2.3.2 Development of learning organisations**

According to Metaxiotis and Psarras (2003), and Roper and Pettit (2003:1) and Daft (2007), learning organisations are required to have the following characteristics:

- development of an environment in which individual members are encouraged to learn and to develop their full potential;
- development of a culture in which employees can engage in dialogue processes to encourage critical thinking, reflection and creative thinking;
- advancement of leadership development of employees on all levels of the organisation;

- extension of a learning culture to include customers, suppliers and other significant stakeholders; and
- encouragement to identify barriers that cause employees to not engage in creative thinking or the ability to influence situations that negatively affect employees.

For learning to take place, a learning process has to be encouraged between the various stakeholders and the employees to enable the identification and solving of problems (Ng 2004; Daft 2007).

### **2.3.3 Learning process in learning organisations**

Learning takes place when there is sharing of data, information and knowledge (tacit and explicit) among the employees in the organisation (Metaxiotis and Psarras 2003). The learning process occurs as we learn new knowledge by gathering information which may be mainly memorised. We learn by relating new knowledge to ways that lead to new understanding (Rogers 1996; Tuomi 1999; Senge 2000; Soanes and Stevenson 2006). This process involves organising and reorganising knowledge to generate new patterns of relationships, learning new skills or the development of new skills (physical skills, critical thinking skills, problem-solving skills, ability to learn skills and survival skills), and learning new attitudes. This involves adoption, by learning to change the way we behave (Rogers 1996). Table 2.2 shows the various work practices that produce learning.

**Table 2.2: Learning produced from work processes** (Rogers 1996; Clarke 2001; Eraut 2008:40)

<b>Work processes (with learning as a by-product)</b>	<b>Description of process</b>
Participation in group processes	This involves teams working for a common outcome. Involves learning through working alongside other employees.
Working alongside others	This enables people to listen and observe other people in the work environment: learning new practices and perspectives, becoming aware of new knowledge and expertise, and gaining tacit knowledge from others.
Consultation	Either within or outside the work teams or organisation – is

	useful for getting advice.
Tackling challenging tasks and roles	Involves learning whilst doing the job, and enhances motivation and confidence.
Problem solving	In groups or as individuals; it results in learning.
Trying things out	This can be used to improve other work-related aspects.
Working with clients	Brings about learning through interaction with clients and new ideas can arise through the encounter.

Participation in groups begins with dialogue. This enables members to overcome suspicions and begin sharing ideas and brainstorming, which will generate a wealth of ideas (Clarke 2001; Ng 2004). It is important that all team members are able to overcome being suspicious of each other and that they are comfortable and open to each other to allow the sharing of ideas. The organisation needs to have in place structures that will encourage members to interact more with each other and get to know each other as individuals to overcome any suspicion (Clarke 2001; Ng 2004). The dialogue process, which is part of team learning, has been mentioned as important in knowledge management as it allows the sharing of knowledge, experiences and skills (Nonaka and Takeuchi 1995; Calantone et al. 2002; Sher and Lee 2004; Haslinda and Sarinah 2009).

Working alongside other employees within the organisation enables learning to take place through observation and listening to what others will be saying (Nonaka and Takeuchi 1995; Smith 2003). When employees – both new and old – work together there is the opportunity that, through this interaction, they learn from each other by seeing how the other person goes about his or her work, and they get the opportunity to observe, ask and listen and gain new knowledge (Nonaka and Takeuchi 1995; Smith 2003). When employees are working alongside each other they are able to acquire tacit knowledge from each other, as they are able to observe what the other person is doing and this contributes to knowledge creation, which is part of knowledge management (Nonaka and Takeuchi 1995).

Consultation among the teams enables learning as there is exchange of know-how, experience and innovative ideas (Nonaka and Takeuchi 1995; Clarke 2001; Metaxiotis and Psarras 2003). Through consultation, employees are able to ask what they do not understand and also to gain insight into the work that they will be doing, from experienced employees.

Consultation contributes to knowledge management as new knowledge is gained through the exchange of know-how, experience and innovative ideas.

Tackling challenges within the organisation enables employees to learn directly by carrying out the work and by becoming innovative as they try and find solutions to the problems they encounter (Calantone et al. 2002; Sher and Lee 2004; Ng 2004). Problem solving may require that people work as individuals or as groups, and this allows learning to take place (Calantone et al. 2002; Sher and Lee 2004; Ng 2004). Tackling challenges enables employees to learn by doing which, according to Nonaka and Takeuchi (1995), contributes to knowledge management as the process allows the creation of new knowledge when people are trying to solve a problem.

Working with clients enables learning to take place for both the clients and the employees, as both groups get to learn from each other and they also get the opportunity to share ideas and suggestions (Calantone et al. 2002; Hall and Paradice 2005). Interaction between clients and employees is important, as it allows the sharing of knowledge about clients and what employees can do to meet the needs of clients (Calantone et al. 2002; Hall and Paradice 2005). The work processes mentioned in Table 2.2 are linked to learning activities. The learning activities found in learning processes are listed below in Table 2.3.

**Table 2.3: Learning activities** (Nonaka and Takeuchi 1995; Clarke 2001; Calantone et al. 2002; Metaxiotis and Psarras 2003; Sher and Lee 2004; Ng 2004; Hall and Paradice 2005)

<b>Learning activities</b> (found in work or learning processes)	<b>Activity description</b>
Asking questions	Employees are able to ask questions in situations where they are not clear or do not understand what they should do.
Getting information	Employees are able to take the initiative to seek for information that they need.
Locating resource people	Employees are able to approach resource people, and resource people are readily accessible to employees.
Listening and observing	Employees take the initiative to listen and observe when they are taught something new at work.

The above learning activities enable employees to take the initiative in seeking knowledge through various activities. For learning to take place, there is a need for the organisation and its employees to be able to take initiatives to seek the knowledge (Smith 2003; Ng 2004).

According to Hailey and James (2002), a learning organisation involves the following processes: individual learning, capacity building and organisational development. Individual learning is important as organisations are composed of individuals, and organisations cannot learn independently of individuals (Kim 2007:29). Individuals within organisations learn and share knowledge, which contributes to the knowledge management process. For effective learning to take place learning organisations need to ensure that an environment is created within the organisation that allows creation of values, practices and procedures which enable the coexistence of working and learning alongside each other (Calantone et al. 2002; Sher and Lee 2004; Metaxiotis and Psarras 2003). For learning to be effective, it is also necessary that employees take part in reflective learning, which contributes to deep learning (Xia et al. 2008).

The importance of an organisation being a learning organisation can never be overlooked as there are many benefits that come with the learning. Furthermore, such knowledge can be gained within the organisation to improve the organisation. Knowledge that is gained by the employees from learning and which is managed adequately through implemented knowledge management systems, gives the organisation a much-needed competitive advantage that is required in a dynamic economy. Learning and knowledge management are pivotal for the success of any organisation and have also been noted in other industries such as banking, manufacturing, consulting and software (Koh, Gunasekaran, Thomas and Arunachalam 2005).

#### ***2.3.4 Summary of learning***

Learning is an important aspect for the creation of new knowledge and it is a vital tool, which contributes to knowledge management. For any organisation to be able to implement knowledge management techniques there is need to have initiated learning to take place within its boundaries. Agricultural extension organisations need to have the characteristics of a learning organisation to allow learning to take place among the extension workers and the farmers among and with whom they work. It is important to have a clear understanding of the characteristics of a learning organisation and the way such characteristics are linked to the implementation and success of knowledge management techniques.

## 2.4 Agricultural extension

Agricultural extension organisations have the potential to accrue the benefits from knowledge management systems that are properly implemented in their organisations. Agricultural extension has various extension models which extension workers apply to achieve their extension goals with farmers. These extension models have different practices, which define the nature of the interaction and the sharing of knowledge between the farmers and the extension workers. In view of the benefits of knowledge management and learning, it becomes essential to explore the extension models in order to find those that follow the knowledge management practices, allowing for learning to take place among the extension workers and also the farmers. As agriculture is an important sector in most developing countries, it is important that agricultural extension organisations be able to deliver appropriate services to their clients. Stakeholders need to be able to work together and share knowledge and learn from each other, since this may contribute to the success of the organisation by providing a competitive advantage, quick responsiveness to the needs of clients and innovation in a dynamic economy.

Agricultural extension has a crucial role to play in the uplifting of lives of many rural farmers in developing countries. Through the provision of appropriate agricultural extension services to rural farmers, there is a possibility that poverty may be alleviated. As a result, there is need for extension services that meet the needs of the farmers. Appropriate extension service may be achieved through knowledge management, which is described in literature as employees being able to make organisations more responsive to the needs of their clients.

The different extension models available to such organisations, and an understanding of the way knowledge management techniques are implemented as well as the way learning is achieved within these extension models will be explored.

Agricultural extension deals with different types of farmers, namely commercial, small-scale and subsistence farmers, who all have their own indigenous knowledge of which they make use. It is necessary to understand the ways extension workers and their organisation capture this indigenous knowledge and incorporate it into knowledge management systems. It is also important to understand how this knowledge is used to assist both the extension workers and the farmers when addressing any problems which either may encounter.

### **2.4.1 Agricultural extension services**

The provision of agricultural extension services for farmers greatly depends upon the capacities of the extension workers. Extension workers have a critical role to play in agriculture that depends on their ability to realise that they need to acquire and improve their knowledge, skills and insights concerning the multifaceted process of behaviour change in terms of the people they will be serving and the farmers (Griffith 1994:18). Extension workers have important roles towards the provision of services to their clients.

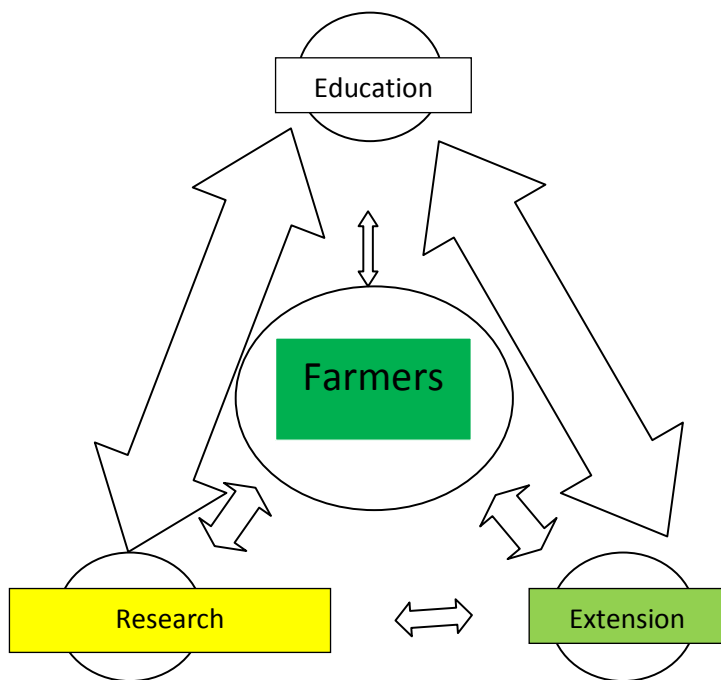
Bembridge (1991) puts forth the following roles for extension workers:

- teaching new farming practices and assisting in the identification of farmers' needs and problems;
- assisting rural people to build on their leadership and organisational skills;
- supporting farmers to gain the knowledge and technical and managerial skills necessary to cope successfully with their needs and demands; and
- inspiring farmers.

Van den Ban and Hawkins (1997) argue that extension workers with the appropriate knowledge and insight may be in a better position to analyse the current situation of farmers and to give sound advice to farmers. However, Duvel (2005) argues that there is currently a paradigm shift in extension towards a more participatory approach.

Since extension workers have various roles to play in supporting farmers, such as that of advisory, technician, middleman, teacher, facilitator, partner and analyst (Bembridge 1991; Van den Ban and Hawkins 1997; Department of Agriculture 2005; Duvel 2005), it is crucial that extension workers have the appropriate knowledge and insight to be able to be of any assistance to the farmers. Extension workers need to have a framework within which to work that will guide them in their practice (Riveria 2006). A framework may enable workers to achieve their goals for the various activities among the farmers with whom they work. A framework for extension workers is shown in Figure 2.6.

In the case of agricultural extension organisations, there are various role players who contribute to the organisations' capability to cater successfully for the needs of their customers. The nature of agriculture extension is often depicted using the Agricultural Knowledge Information System (AKIS) model (see Figure 2.7).



**Figure 2.7: AKIS model** (World Bank 2004)

The AKIS model shows the relationship between the major role players and stakeholders in agricultural extension and provides a foundation for understanding agricultural extension (Worth 2002). Farmers are at the core of the model that shows that they are the main beneficiaries of various activities that take place within the model. Agricultural extension organisations have farmers as their main customers and it is important that these organisations provide their customers with the best possible services. Farmers are also known to have indigenous knowledge that has been accumulated over generations (Agrawal 1995; Hart and Vorster 2006). Extension workers need to take note of the indigenous knowledge that farmers have and should incorporate it in their work, as farmers are at the core of the AKIS model.

Indigenous knowledge is concerned with various aspects that relate to people in a locality. It comprises the wisdom and knowledge that people share and that has been passed on from generation to generation (Magoro and Masoga 2009; Agrawal 1995; Hart and Vorster 2006). The indigenous knowledge that people in a community may share could, for example, be related to farming approaches, management of the environment or the use of medicines (Magoro and Masoga 2009). Indigenous knowledge is based on experience and may also be influenced by externally derived knowledge. It has been tried and tested over many generations or centuries (Agrawal 1995; Hart and Vorster 2006).



Indigenous knowledge is vital for an area in order to develop its potential, and the use of indigenous knowledge by extension workers may provide extension services with low-cost solutions (Agrawal 1995; Hart and Vorster 2006; Adeya 2007). Generally, local indigenous knowledge is seen as having a positive effect towards local agricultural activities since it is adapted to tackle the local and physical challenges (Hart and Vorster 2006). According to Adeya (2007), farmers' local practices are the root for innovation since such practices are context-specific and they enable farmers to be aware of aspects which allow or hinder farmers adopting new technology. Therefore, in order to enhance development it is necessary that extension workers incorporate indigenous knowledge into their work.

For any extension organisation to be able to provide excellent service to its clients there is a need for knowledge management to be implemented within the organisation and, in the case of extension, there is a dire need to incorporate farmers' indigenous knowledge. In agricultural extension, there are no direct knowledge management models like the ones discussed in Subsection 2.2.5. However, there are extension models that are used to allow the interactions between farmers and extension workers at different levels. Such interactions may enable the sharing of knowledge and could allow learning to take place.

### **2.4.2 Extension models**

Five different extension models will be described in this section. Each of the models will be linked to extension approaches that can be applied when using the particular model. The implications of using a specific model and the way this will impact on the relationship between farmers and extension workers will also be discussed.

#### **2.4.2.1 The linear model: Transfer of technology**

The linear model shows agricultural extension research centres as the source of technological innovation, which the research institutions they give to the extension organisations who, in turn, will deliver the technological innovations to the farmers (Röling 1995b). The basic function of extension in terms of the linear model is to make certain that the farming community has a sufficient amount of high-quality knowledge on agricultural technology (Dexter 1986:121). The technology transfer approach is commonly referred to as the linear model since it takes on a linear relationship involving researchers, extension workers and farmers (Sulaiman and Hall 2001). Technology transfer uses the top-down approach, where the

researcher passes on information to the extension agency, and the extension agency provides the farmer with the information. The farmer is only a recipient.

The linear model does not take into consideration the innovations from farmers. The extension worker is the authority on knowledge and has the duty of transferring the knowledge to farmers. The extension worker is seen to have all the solutions to the farmers' problems and the farmers are regarded as not being capable of comprehending their situation, and it is believed they cannot come up with any meaningful solutions. Extension workers need to have certain approaches and methods that will enable the effective delivery of technology (Dexter 1986:121; Röling 1995b; Sulaiman and Hall 2001).

The approach to be applied by extension workers for this model is the training-and-visit approach. This approach uses the diffusion of knowledge from extension workers as they visit farmers who, in turn, will share with other farmers (Röling 1995b). According to Van den Ban and Hawkins (1996), the training-and-visit approach seeks to bring change in production technologies that are used by farmers, by having extension workers transferring technology from research institutions to farmers. This approach only makes use of knowledge/technology from the research institutions, and extension workers transfer this knowledge to farmers; thus, a top-down approach. Extension workers make use of various methods for this approach.

The above model, together with its associated approaches and methods, does not consider farmers as having valuable knowledge which they can share with extension workers. Farmers are appreciated to be fountains of indigenous knowledge that has accrued over generations (Hart and Vorster 2006). Indigenous knowledge may be shared and used to improve farming practices. It may also be used by extension workers to understand the farming practices used by farmers. They could then try and improve such practices without introducing new farming practices which the farmers may not necessarily adopt. Farmers need to be active participants in problem solving as they can contribute their indigenous knowledge to find solutions. The advisory model takes a different stand on the role of the farmers, and involves them in problem solving.

#### *2.4.2.2 The advisory model*

The advisory model views farmers as active problem solvers with the capacity of looking for advice from extension workers when they fail to solve a problem (Havelock in Röling

1995b). The advisory model is applied in terms of farmers who have already achieved a high level of competence and who are capable of recognising their own problems (Department of Agriculture 2005). Röling (1995b) views this model as being driven by the farmer. Farmers learn by improving their problem-solving ability through problem and opportunity definition. The farmers also learn by adopting the introduced technology given by the extension workers that would have come at the request of the farmer (Röling 1995a).

The advisory model views farmers as capable of seeking out assistance from extension workers who will only visit farmers upon request. Farmers are already aware of the problems they have and need specific advice from the extension worker. Upon receiving the advice, farmers will then adopt the technology as discussed.

Through the sharing of knowledge between farmers and extension workers, the advisory model brings together different ideas that may be discussed as people try to come up with a suitable solution. Both tacit and explicit knowledge may be shared, since tacit knowledge may be transferred to explicit knowledge. The use of this model will require the capturing of indigenous knowledge, which the farmers have, and the transfer of tacit knowledge into explicit knowledge. The available knowledge that is shared and captured may also be shared with other farmers and extension workers who might be experiencing similar problems. The model recognises the role that the farmers can play in problem solving and appreciates the knowledge that farmers have.

#### *2.4.2.3 The participatory model*

The participatory approach focuses on the capacities of farmers to influence the decision-making process and the ability of the extension organisation to organise farmers into groups (Black 2000; Department of Agriculture 2005). Farmers are grouped to identify the needs and main concerns, to plan extension projects and to implement and evaluate such projects (Department of Agriculture 2005).

The need to encourage farmers to participate is a result of the understanding that the socioeconomic and ecological circumstances of farmers are multifaceted, varied and risk prone (Farrington 1998). Farmers are individuals who operate in varied conditions and circumstances, and from these situations, they have different farming experiences. The participation of farmers will enable them to contribute their own insights to extension projects. The participatory approach has the following broad principles:

- Community participation and involvement – according to the democratic principle, clients should participate in decision-making that will affect them. Participation will encourage ownership and strengthen the clients.
- Needs-based development – project identification will be done based on the identification, assessment and prioritisation of the needs of the community/farmers.
- Coordinated extension and advisory services – coordination is necessary with the many available service providers to ensure quality and to stick to the norms and standards. Provinces have the mandate to coordinate and link the service providers to the farmers.
- Monitoring, evaluation and accountability – the criteria for monitoring and evaluation need to include as much evidence as possible. There is a need to set indicators for inputs, activities, participation, client reactions, knowledge gain, attitudinal change, practice adoption, and impacts on social, economic and environmental factors (Department of Agriculture 2005).

The Participatory extension approach (PEA) tools that will enable participation through the model are Participatory rural appraisal (PRA) and Participatory Action Research (PAR). In terms of the PRA, the following will take place: analysis, planning, action, monitoring and evaluation. These elements are part of the participatory approach. The PAR will enable both farmers and extension workers to generate knowledge regarding their projects and the way to improve the project situations. In terms of PAR and the participatory model, farmers are encouraged to become active participants in the farming activities within which they are involved. These two tools allow farmers to become active participants in solving problems and making decisions. Learning is another important aspect between farmers and extension workers. The learning model (below) is one such model where learning between farmers and extension workers is encouraged.

#### *2.4.2.4 The learning model: Agriflection model*

The learning model is learning-centred, and it focuses on learning taking place in the stakeholders of agricultural extension, namely farmers, extension workers, research institutions and other stakeholders (Worth 2006). The focus on learning in the case of farmers and extension workers will enable the adoption of a culture of learning that will be maintained by continuous reflection, which will enable farmers to engage with scientific

enquiry thus generating knowledge which is testable and shared (Worth 2006). According to Van den Ban and Hawkins (1997), farmers learn through their own actions or experience, by observing other people's actions and by discussing cause and effect, while the learning is driven by the farmers' initiatives.

The learning model emphasises the importance of learning that takes place for all the stakeholders. This requires their ability to be reflective as either an individual or group. Through the process of reflection, people will share, learn and gain new knowledge on problem solving. There is need for effective participation by all stakeholders to enable the learning to take place (Van den Ban and Hawkins 1997; Worth 2006). There are approaches and methods that encourage learning to take place.

The PEA allows learning with the following tools: Participatory Rural Appraisal (PRA) and Participatory Action Research (PAR). The PRA tool is concerned with learning, analysis, planning, action, monitoring and evaluation (Chambers 1997). While the PAR involves people, generating knowledge is concerned with the stakeholders own situations and how such situations may be changed. Both tools require farmers to be active participants in solving their problems. Through such processes they become learners and develop knowledge that they can share with others, especially with extension workers and research institutions (Chambers 1997).

The learning model allows a partnership between all stakeholders and sharing of knowledge that enables learning to take place among stakeholders. The model draws from the knowledge that stakeholders have and makes it crucial that the knowledge shared needs to be captured for it to be of benefit to other stakeholders.

Except for the linear model, the extension models that have been discussed so far show acknowledgement that knowledge exists within both farmers and extension workers. Such knowledge may be exploited when sharing is allowed to take place and may be captured for the benefit of others. Through sharing, people learn, while the captured knowledge may be taught to others, which allows learning to take place. The availability of knowledge that has been demonstrated by some of the extension models calls for the need of extension organisation to be able to manage this knowledge properly as the knowledge may have huge benefits to both the work of extension organisations and of farmers.

Knowledge management thus becomes a crucial aspect for all extension organisations since it has huge benefits that may accrue to the organisations and the farmers. Through knowledge management, extension organisations may be able to fully realise their goal and have a huge impact on the livelihoods of the farmers and the economy of most developing countries.

#### *2.4.2.5 Summary of extension models*

The literature on agricultural extension and the agricultural extension models shows how extension workers work with farmers and make use of the models. It is essential that agricultural extension models be understood in the light of the sharing of knowledge between extension workers and farmers and the way this knowledge-sharing process is encouraged by the various models. Through the various processes involved in each model, identification may be made on the models that encourage knowledge sharing and this is important for the building of a knowledge base. It is important that the models that encourage learning be identified, as learning is an important component of knowledge management that relates to the sharing of experiences. Learning involved in knowledge management found in the agricultural extension models may lead to improved farming techniques, problem-solving capability and the ability of both farmers and extension workers to make informed decisions. Given that farmers have indigenous knowledge and experience, it is vital that extension workers be able to capture the indigenous knowledge and incorporate it into their knowledge management system. In view of this fact on farmers, it is important to understand how indigenous knowledge and farmers' experiences may be used to assist both extension workers and farmers when addressing any issues that both extension workers and farmers may encounter during improvement of their farming practices. Table 2.4 below shows that there is sharing of knowledge in three of the models, but not in the linear model where no sharing takes place. Learning is clearly experienced in the learning model and it could be encouraged through application of the participatory model.

**Table 2.4: Summary of extension models in relation to knowledge management**

<b>Model</b>	<b>Sharing knowledge with farmers</b>	<b>Learning</b>
Linear model	No sharing of knowledge	No learning takes place
Advisory model	Sharing of knowledge	Limited learning
Participatory model	Sharing of knowledge	Does not employ specific initiatives to encourage learning, but learning is likely to take place through participatory processes
Learning model	Sharing of knowledge	Learning takes place

## **2.5 Summary**

Knowledge management and learning are vital components that need to exist within an agricultural extension-related organisation to ensure that the organisation is able to provide the appropriate services to the farmers. The organisation needs to be able to cope in a dynamic economic environment. The dynamic environment requires that knowledge management be implemented within the organisation and also that the organisations become learning organisations. The success of these initiatives depends mostly on the organisation's norms and culture, the employees and the clients of the organisation. There is a need for the organisations themselves, the employees and the clients or even other stakeholders of agricultural extension organisations to be involved in partnerships that will allow continuous learning to take place between them and also for knowledge to be shared and captured for the benefit of all people involved in the partnerships. Agricultural extension organisations have a lot to gain from proper knowledge management implementation, practices and the encouragement of innovativeness which can lead to new ideas and products being created. The newly created knowledge will allow the organisation to have the competitive advantage for survival. Any organisation can benefit from knowledge management, and agricultural extension organisations are also in the midst of benefiting and this will have a positive impact on farmers as the clients of extension. This may lead to much-needed development in less

developed countries where agricultural activities are the main source of livelihood for most of the rural poor.

This chapter looked at knowledge management, learning and agricultural extension. These aspects focus on the management of knowledge in organisations and how efficiently practices for knowledge sharing and learning may be encouraged. The following chapter describes the research design and methodology.



## **RESEARCH DESIGN AND METHODOLOGY**

### **3.1 Introduction**

Chapter 2 discussed the literature on knowledge management, learning and extension models. The literature showed that knowledge management is an important aspect of any organisation and described the way agricultural extension organisations may benefit from knowledge management. This chapter will discuss the research methodology applied in this research and also the following research aspects: the setting, sample, research design and methodology, and the data analysis approach. The research studied the uMgungundlovu District Municipality community garden projects that work with extension workers from the Department of Agriculture. The basic qualitative research methodology was applied in this research by using the following two methods:

- 1 **Semi structured interviews:** The researcher formulated questions, which were used to interview seven extension workers. Separate questions were formulated for the supervisor, which were guided by the responses of the extension workers after analysis. Semi-structured interviews were conducted with the farmers who participated in this research.
- 2 **Focus group discussion:** The seven extension workers and their supervisor took part in a focus group discussion. The focus group discussion took place after the semi-structured interviews and was guided by the responses of the participants of the semi-structured interviews.

### **3.2 Research setting**

South Africa is divided into nine provinces. Each of these provinces has provincial departments that function under specific ministries. The Department of Agriculture and Environmental Affairs is one such department that is found in the Ministry of Agriculture. The provincial Department of Agriculture and Environmental Affairs in each province has responsibilities that are aimed at securing the success and productivity of the agricultural

sector (Department of Agriculture 2005). Within each of the provinces, there are several district municipalities that carry out various activities. One such activity is to manage and coordinate agricultural and extension services in a particular district (Department of Agriculture 2005).

South Africa has an estimated population of 49.99 million people (Statistics South Africa 2010). Of the country's population, it is estimated that 39 892 white commercial farmers produce 95% of the agricultural output (Statistics South Africa 2007). According to the South African Strategic Plan, there are an estimated 240 000 black farmers who provide a livelihood for approximately one million of their family members and who make available temporary employment for over 500 000 people (Department of Agriculture 2001). There is also an estimated 3 million small-scale farmers who produce crops for their own consumption (Department of Agriculture 2001).

The above statistics show that there are less commercial farmers compared to small-scale farmers who are involved in agricultural production, although commercial farmers produce 95% of the agricultural output of the country. Although there are more small-scale farmers compared to commercial farmers, the small-scale farmers main aim is to provide food for household consumption. With the emerging new small-scale farmers, there is a need for comprehensive extension services to be provided to these small-scale farmers to increase their production, which falls far behind that of commercial farmers even though the latter are the minority. The Department of Agriculture has been bequeathed a huge task to provide extension services to small-scale farmers in the different provinces. According to the Department of Agriculture (2005), the agricultural extension services were recognised as the key towards the transformation of disadvantaged small-scale farmers to improve their production.

KwaZulu-Natal is the province with the second largest population in South Africa, with an estimated population of 10.95 million people (Statistics South Africa 2010). The province is characterised by some of the most advanced commercial farms and some of the poorest subsistence farming areas (Adeya 2007). Since 1994, the new KwaZulu-Natal Department of Agriculture and Environmental Affairs has made available research and extension services to small-scale farmers in the province (Adeya 2007). The Department of Agriculture has an important role to play in poverty alleviation in the country, with extension and advisory services playing a critical role in rural development.

The current research was carried out in the KwaZulu-Natal Province, in uMgungundlovu district, involving extension workers from the Department of Agriculture and Environmental Affairs in uMgungundlovu district. The extension workers were selected from the following municipalities within the district: Msunduzi, Umgeni, Mbofana and Imphendle. The extension workers work mainly with small-scale farmers who are involved in community gardens.

The Imphendle Municipality was selected for the study on account of the ease of access for the researcher to farmers.

### **3.3 Research design**

The study adopted a basic qualitative research approach (Merriam 1999). The research drew its methods from the interpretivist research paradigm. The interpretivist paradigm focuses on experience and interpretation. It is focused on meaning and an understanding of social construction by people (Henning, Van Rensburg and Smit 2004; Bryman 2004). The interpretivist research paradigm aims to produce an analysis that is descriptive, emphasising a depth and an understanding of the social phenomenon that is interpretative (Henning et al. 2004). This paradigm links with the focus of this research, which was to gain an understanding of the knowledge management practices that are applied by extension workers supporting community garden farmers.

#### **3.3.1 Research participants**

The participants were selected using a purposive sampling technique. According to Silverman (2010), purposive sampling enables the researcher to select a case since it demonstrates some characteristic or process such as that which this research is interested in. Purposive sampling requires that the researcher think critically about the features of the participant that he or she will be studying and then select the case sample carefully on the basis of the identified features (Patton 1990; Silverman 2010). The logic and strength of the purposive sampling technique rest in the selection of information-rich cases that have the necessary features identified by the researcher (Patton 1990; Silverman 2010). The critical features for extension workers were that they had to have been employed as extension workers in the department for more than two years and that they were working on community garden projects with the farmers at the time.

Seven extension workers employed by the Department of Agriculture and Environmental Affairs from the uMgungundlovu District Municipality were identified along with their supervisor to take part in this research. These extension workers took part in the semi-structured interviews and focus group discussions. It was intended to interview 10 extension workers, but three of them did not turn up for interviews. The extension workers worked with assistants who helped them with provision of services to farmers. These assistants were not considered as participants.

Eight farmers were purposively selected to take part in a focus group discussion. The farmers were members of a community garden project and worked with extension workers from the department. The farmers were from Mpumuiza 2 Local Municipality, which falls under the Mbofana Municipality. The focus group discussion with the farmers did not yield enough information. This required the researcher to change from the focus group discussion method to individual face-to-face semi-structured interviews with all eight farmers from Imphendle Local Municipality. In other words, all farmers of the community garden in Imphendle were interviewed.

### **3.3.2 Data collection methods**

The research made use of four methods, namely observations, documents, focus group discussions and semi-structured interviews. Of the four methods, only two were used for data collection, namely focus group discussions and semi-structured interviews.

#### **3.3.2.1 Observation**

The researcher was a complete observer. Being a complete observer implies that the researcher observes the participants without actively participating in their activities (Creswell 2009). The researcher took field notes on the behaviour and activities of the participants while they were carrying out their activities as suggested by Creswell (2009). Observation may make it possible for the researcher to notice unusual aspects although at times the researcher may be regarded as intrusive (Creswell 2009).

The researcher went out with different extension workers on various occasions in the course of a month to observe how the extension workers work together with the farmers. The researcher visited different projects that farmers were working on and wrote down what was observed. The extension workers introduced the researcher to the farmers and explained what

the researcher had come to do. After the introduction, the extension workers and the farmers carried on with their work.

Observations enabled the researcher to become familiar with the work that the extension workers do with the farmers. It made the researcher aware of how extension workers interact with farmers.

### *3.3.2.2 Documents from the extension workers and supervisor*

The researcher collected reports that extension workers write about each of their visits with the farmers from the supervisor of the extension workers. These reports also included the feedback which extension workers had received from their supervisors. Other documents that were made available to the researcher included minutes of meetings.

The documentation reviewed enabled the researcher to understand the work that the extension workers do with the farmers and the way they interact with each other in terms of how knowledge is transmitted between the extension workers and the farmers. The reports from the supervisor allowed for the interpretation of the performance of the extension workers by the supervisor and showed how the extension workers were expected to do their work.

This information was used to formulate some of the questions which the researcher included in the semi-structured questionnaire for the extension workers, their supervisor and for the focus group discussion with the extension workers.

### *3.3.2.3 Semi-structured interviews*

Semi-structured interviews were conducted with extension workers and farmers. Interviews enable the researcher to have control over the questions being asked (Creswell 2009). The presence of the researcher may, however, bias the interviewees' responses, and some participants may not be equally articulate and share their perspective (Creswell 2009). The same interview schedule was used to interview all the extension workers. This allowed the same questions to be asked to the extension workers, allowing a clear understanding of the way knowledge is managed within their organisations and the way they share knowledge and integrate the knowledge gained from farmers into their working practices. The farmers were all interviewed using the same interview schedule.

### **i) Interviews with the extension workers**

The main themes covered in the interview schedule were according to the sub-objectives. In addition, the interview schedule was developed using the insights that were gained from the observations regarding the work extension workers do with farmers. The documents that were made available by the extension supervisor also contributed towards the development of the questions for the interview schedule.

The interview schedule (see Appendix A) acted as a guide for the questions to be asked. The response from the extension workers led to the adjustment of further questions to be asked during the focus group discussion and questions for the supervisor of the extension workers.

### **ii) Interviews with the supervisor**

The semi-structured interviews held with the supervisor were guided by the responses of the extension workers to the questions. The observations and the documents were also used to develop the questions for the supervisor and were used to explore how extension workers and farmers work together. The main themes for the interview schedule were guided by the sub-objectives (see Appendix B).

### **iii) Interviews with the farmers**

Semi-structured interviews (see Appendix D) were held with individual farmers from a community garden in the Imphendle area. The themes of the interview schedule for the farmers were guided by the sub-objectives and the responses of the extension workers and their supervisor in the semi-structured interviews and focus group discussions.

#### ***3.3.2.4 Focus group discussion***

Focus group discussions are made up of at least four interviewees who share a common experience and who come together for an in-depth discussion of a selected topic (Bryman 2004; Welman, Kauger and Mitchell 2005). The focus group discussions bring together participants with common experience. Information provided by the participants may be indirect information that may be filtered by the views of other participants (Creswell 2009).

In this research, a focus group discussion was held with the extension officers and their supervisor. The development of a schedule for the focus group discussion (Appendix C) was

based on the analysed data of semi-structured interviews. The focus group discussion was held at the workplace of the extension workers, in an office provided by the extension supervisor.

Farmers took part in a focus group discussion although it did not provide adequate data and lead to the use of semi-structured interviews (Appendix D) with the farmers (Subsection 1.9).

Before starting the focus group discussion, the participants were thanked for taking time to participate in the focus group discussion. A brief introduction was given by the researcher on the discussion and the way the focus group was going to be conducted. The participants were informed that their names would be held in confidence and no direct link was going to be made to their names.

The focus group discussion was recorded using a digital recorder and the data was transcribed verbatim after the focus group discussion. According to Bryman (2004), the recording of the focus group discussion is necessary, as it is difficult to write down exactly what the participants say.

### **3.4 Data analysis**

The semi-structured interviews and the focus group discussion were recorded and transcribed verbatim. The transcribed data was analysed using content analysis. Content analysis is a process of identifying keywords, themes, concepts and meanings within the text, which could assist in the understanding and interpreting of the raw data (Burns 2000; Nieuwenhuis 2007). In this research, content analysis was done as follows:

- keywords were identified from the data;
- the keywords were put in categories which emerged from the analysis of the key words;
- themes were developed using the categories and this was compared with the sub-objectives and relevant literature; and
- the categories were then grouped under each theme.

### **3.5 Validity**

Validity is truth about whether the findings are really about what they say they are about (Bryman 2004; Silverman 2010). To account for validity, the researcher used member validation and triangulation as methods of validity.

*Member validation* refers to the researcher providing the participants with an account of the research findings. This is done to give research participants an opportunity to confirm the findings that the researcher has arrived at (Guba 1981; Bryman 2004). In this research, the researcher gave the extension supervisor an opportunity to verify the findings after data analysis for member validation.

*Triangulation* refers to the use of more than one method or source of data in order to verify data obtained from a particular method (Guba 1981; Bryman 2004). The researcher first made use of semi-structured interviews with extension workers. Focus group discussions were used with the same participants to verify the data obtained through the semi-structured interviews. Semi-structured interviews with the farmers were also used to verify the data obtained from the extension workers.

### **3.6 Ethical considerations**

It is important that the researcher take into account the ethical considerations as a precautionary measure that will ensure that no harm befalls any of the research participants. The research took into account the following: informed consent, confidentiality and nonmaleficence.

#### **3.6.1 Informed consent**

The extension workers were given a questionnaire regarding their demographic details to fill in before they were interviewed individually. The questionnaire had a preamble that summarised the conditions for participation and the confidentiality concerned (Appendix A). All the participants were asked to sign the informed consent form before taking part in the interview. The informed consent form addressed confidentiality and nonmaleficence.

#### **3.6.2 Confidentiality**

The research participants volunteered to take part in this research. None of the participants who took part in this research were referred to using their actual names on the transcriptions and all written material; pseudonyms were used. All the focus group participants were asked to respect the confidentiality of the other participants in the discussion and not to share information or names of participants with other people who were not part of the focus group discussion.



### **3.6.3 Nonmaleficence**

Nonmaleficence compels the researcher to make certain that no harm comes to the participants as a result of the research (Wassenaar 2006:60). The participants were ensured that no harm or any wrongdoing would befall them as a result of this research. The participants were informed that they were free to leave the interview if they felt uncomfortable. The participants were not deceived in any way as they were well informed about this research and were told to feel free to ask any questions when they did not understand.

## **3.7 Summary**

This chapter described the research design and methodology, the procedure for sampling and the way data was collected from the participants. The process of data collection also took into account ethical considerations to protect the participants. The collected data was analysed using content analysis, which was described in the chapter.

The research design and methodology involved the preparation of the study, namely the documents and observation to gain insight into the work being done by the extension workers and the farmers. The data collection methods used in this research enabled in-depth data to be gathered from the participants. The in-depth data gathered was used for analysis, as described in Chapter 4.

## ANALYSIS OF FINDINGS

### 4.1 Introduction

The previous chapter looked at the research design and research methodology. The research made use of the qualitative research method. Content analysis coding principles informed the analysis and interpretation of the findings of this research. The analysis of the findings of this research were guided by the research sub-objectives, which were to explore how:

- extension workers manage knowledge within the Department of Agriculture, and Environmental Affairs related to community gardens;
- extension workers manage knowledge shared between themselves and community gardeners; and
- extension workers integrate knowledge gained from community gardeners into their practices.

The chapter is divided into five main sections. The first section reports on the demographics of the research participants, namely the extension workers and the farmers. The following three sections are concerned with the analyses of the findings, which follow under three different themes and eight categories as shown in Table 4.3 and the summary.

### 4.2 Demographics

The demographic information described here provided background information on the research participants, namely extension workers and farmers.

#### 4.2.1 *Extension workers*

Three male extension workers and four female workers took part in this research. Tables 4.1 and 4.2 indicate the ages of extension workers, their work experience and whether they are working with a male or female assistant.

**Table 4.1:** Male extension workers (n=3)

<b>Gender of extension worker</b>	<b>Qualification</b>	<b>Age of extension worker</b>	<b>Work experience of extension worker</b>	<b>Working with an assistant</b>
Male A	National Diploma in Agriculture	35 years old	15 years	Yes
Male B	National Diploma in Agriculture	40 years old	15 years	No
Male C	National Diploma in Agriculture	46 years old	15 years	Yes

**Table 4.2:** Female extension workers (n=4)

<b>Gender</b>	<b>Qualification</b>	<b>Age</b>	<b>Work experience</b>	<b>Working with an assistant</b>
Female	National Diploma in Agriculture	37 years	13 years	No
Female	National Diploma in Agriculture	38 years	4 years	Yes
Female	National Diploma in Agriculture	40 years	12 years	Yes
Female	National Diploma in Agriculture	38 years	9 years	Yes

According to Tables 4.1 and 4.2, all the extension workers have a National Diploma in Agriculture.

The ages of the male extension workers ranged from 35 to 46 years. Each of the three male extension workers had been working for the department for 15 years.

The four female extension workers who took part in this research had an age range of 37 to 40 years. The female extension workers had varying years of work experience, from 4 years to 13 years.

The age range of the extension workers, which is above 34 years, suggests that they were mature enough to work with the farmers. Both male and female extension workers worked well with the farmers, whether male or female.

#### *4.2.1.1 Extension workers' supervisor*

The extension workers report to a supervisor, whose responsibility it is to support the extension team with knowledge on how they may execute their duties with the farmers efficiently. He holds monthly meetings with extension workers and has an open-door policy where the extension workers are free to approach him at any time. This suggests that there is exchange of knowledge between him and the extension workers through dialogue during meetings and when they visit his office.

In this case, the supervisor of the extension workers was male and he held a National Diploma in Agriculture. Within the department, his title was that of deputy manager. He had 36 years' work experience with the department and was responsible for four municipalities within the uMgungundlovu District Municipality. This suggests that he had more years' experience working with farmers than the extension workers and that he was more knowledgeable. This enabled him to share his knowledge and experience with the extension workers. He was responsible for uMsunduzi, uMgeni, Mpofana and Imphendle Municipalities.

#### *4.2.1.2 Summary of demographics*

The demographics show that all the extension workers and their supervisor hold the same qualifications, namely a National Diploma in Agriculture. The extension workers' supervisor

had the most work experience of all, 36 years'. The male extension workers also had more work experience than the female extension workers.

#### **4.2.2 Farmers**

In this research, the farmers were not the main focus even though they took part to confirm data obtained from the extension workers. Eight farmers participated in this research. The group of farmers comprised four male and four female community garden members. The age range for the farmers was 45 to 50 years. Since 2008, the farmers were all part of the same community garden group in Imphendle Municipality. Interviews with the farmers revealed that the farmers' community garden started as a government initiative to provide food for the members of the community garden. The farmers mentioned that they grow maize and beans in their community garden for consumption, and the surplus is sold on their behalf by the extension workers, as a source of income. When farmers earn extra income from the sale of produce, they purchase inputs to augment what the government provides.

### **4.3 Categories and themes developed for the discussion of the findings**

The data obtained from the extension workers was used to develop categories and themes to guide the analysis of the data. The data obtained from the farmers was used to verify the data from the extension workers.

The transcribed data of the individual interviews and the focus group discussions held with the extension workers revealed the perspectives of the extension workers related to the knowledge management system they are applying to support community garden farmers in the uMgungundlovu District Municipality (Subsection 1.3). The findings were grouped into eight categories shown in Table 4.1. From the eight categories, three themes were developed, which are shown in Table 4.3. The three themes are set as the basis for understanding the knowledge management practices which the extension workers apply. Table 4.3 shows the linkage between the categories, the themes and the literature found in sections of Chapter 2.

**Table 4.3: Analysis of findings based on developed themes**

<b>Categories</b>	<b>Themes</b>	<b>Objective</b>	<b>Related subsection in literature review</b>
<p>Knowledge sharing between supervisors and extension workers as well as among extension workers.</p> <p>The organisational procedures followed by extension workers when conducting meetings in relation to knowledge management.</p>	<p>The extension workers' methods of knowledge sharing within the department.</p>	<p>Explore how extension workers manage knowledge within the Department of Agriculture and Environmental Affairs related to farmers involved in community gardening.</p>	<p>Subsection 2.3.1</p>
<p>Methods used by extension workers to advise farmers.</p> <p>Methods used by extension workers to transfer technical knowledge to the farmers.</p> <p>The level of participation of farmers as encouraged by the extension workers.</p>	<p>The extension approaches used by extension workers.</p>	<p>Explore how the knowledge is shared between extension workers and farmers involved in community gardening is managed by extension workers</p>	<p>Subsections 2.3.1 2.4.1 2.4.2 2.5.2.2 2.5.2.4</p>
<p>The consideration of farmers' indigenous knowledge and their farming practices in the work practices of extension workers.</p>	<p>Integration of farmers' knowledge into the extension workers' knowledge management practices.</p>	<p>Explore how extension workers integrate the knowledge gained from the community gardeners into their practices.</p>	<p>Subsections: 2.3.1 2.3.2 2.3.3 2.3.5 2.4.1 2.4.2 2.5.2.2</p>

## **4.4 The extension workers methods of knowledge sharing among themselves within the department**

The theme *extension workers' methods of knowledge sharing among themselves within the department* refers to the perceived methods applied by the extension workers when they share knowledge with each other and with their supervisor. For the extension workers to be able to apply different methods of sharing knowledge, the organisation should be in a position to sustain the sharing process. For the organisation to be able to sustain the sharing process, it is necessary to create and nurture a soft environment (Gao et al. 2002). A soft environment is created when there is trust, teamwork and an environment that encourages learning to strengthen employee productivity (Gao et al. 2002). Employees who are able to trust each other may be in a better position to seek knowledge from and to share knowledge with other employees (Gao et al. 2002). It is thus expected that, in order for sharing of knowledge to take place, the development of a soft environment be encouraged in the organisation.

The methods used for knowledge sharing that emerged from the findings in this research included the following:

- asking colleagues for assistance (Subsection 4.2.1.1);
- asking supervisor for assistance (Subsection 4.2.1.2);
- discussing issues in meetings (Subsection 4.2.1.3); and
- recording the minutes of the meetings (Subsection 4.2.1.4).

### **4.4.1 Asking colleagues for assistance**

It was evident from the findings of this research that extension workers ask colleagues for assistance to acquire new knowledge when they clarify issues or have a problem. This is shown in the statements below:

*“My relationship is good with other extension workers because if I have something that I don't know I feel free to ask them how to do that work.” (Respondent F)*

*“Sometimes you have got something that you don't know. On my projects I got a problem on planting onions, they don't have that big bulb. And I ask someone to help me in what was the cause of that.” (Respondent D)*

*“You see we are used to help one another because there are new extension officers and I am new compared to other extension officers who came before me. So we are*

*used to assist one another if there is a problem, I don't hesitate. And there has never been a problem you know regarding assistance". (Respondent E)*

The three statements above demonstrate that the extension workers are able to consult their colleagues when they have problems which they are not sure how to solve. The statements demonstrate that the extension workers are free to ask other extension workers for assistance. In order to be able to ask for assistance freely there is a need for trust between the extension workers. Through dialogue, the extension workers were able to build trust among themselves for reassurance and clarity on the points of doubt. This is also related to Nonaka and Takeuchi's (1995) view that dialogue contributes to trust as a result of open sharing with each other. Dialogue also makes it possible for knowledge to be made available when someone needs knowledge and it is shared (Tiwana 2000).

All the findings from the extension workers confirmed that it is not difficult for extension workers to seek help from their colleagues and that there is good teamwork among them. The extension workers' supervisor confirmed in the semi-structured interview that he has never been called to address any negative issues between the extension workers and that there is a good working relationship between them. This shows that there is a nurtured soft environment (Subsection 2.2.4) within the organisation that encourages sharing among extension workers.

There was one extension worker who mentioned that male extension workers are more willing to assist compared to female extension workers. This is reflected in the statement below:

*So do you think it is important that extension workers are able to share experiences with each other? (Researcher)*

*"Especially, especially men. If I have something that I don't know I usually go to men and ask them how may I go there or how may I do that thing and they usually help they are better than women, men are better. But there are those women who are fine; they have no problems to help you if there is a problem. But men they help a lot. They are not selfish like us, sometimes women are selfish and jealous" (Respondent F).*

Respondent F said that, if she needs help, she approaches male extension workers. The gender of employees may thus influence the sharing of knowledge within an organisation.



From the statement, it is clear that male employees may contribute more to the knowledge management sharing process compared to women.

The findings further showed that there are some extension workers who are not willing to share their knowledge with others. Tiwana (2000) argues that humans have a strong tendency to hoard knowledge and this may be overcome through the introduction of performance measures and incentives, which reward employees who share knowledge with others. By sharing knowledge, tacit knowledge may also be shared. When employees with knowledge decide not to share it, it impedes the efficient operation of the knowledge management system as it hinders the availability of critical knowledge which would be needed by other employees (Tiwana 2000).

#### **4.4.2 Asking supervisor for assistance**

After the extension workers had mentioned that they are free to seek help from the other extension workers, they also mentioned that they can ask help from their supervisor. The ability of the extension workers to seek help from their supervisor is evident in the following statements:

*“We meet every day. We discuss on the challenges facing either myself as an advisor to the people and comments or problems that clients do bring into the office and at times all the consultation within the department. And we also lease together with the supervisor as to see to it whether people do get funding not only from the department but also from other stakeholders that are available within our country”.* **(Respondent A)**

*“He is a good supervisor for me, the relationship is fine. If you have got a problem he takes note of that and understands and gives you some advice if you got a problem”.* **(Respondent D)**

The two statements show that the extension workers are able to discuss problems that they experience in their work with their supervisor. Through the discussions, the extension workers are able to get advice for problems which they may be experiencing. According to Nonaka and Takeuchi (1995), the discussion process enables the sharing of knowledge and keeps knowledge alive within the organisation. Through discussions, the supervisor shares his knowledge and experience as he gives the extension worker advice to address a problem situation. According to Freire (2000), individuals are willing to share in a dialogue when they

are interested in the dialogue process. It is thus required of extension workers to take the initiative to participate in a dialogue process which contributes to sharing of knowledge.

#### **4.4.3 Discussing issues in meetings**

The extension workers attend meetings with their supervisor together with other extension workers to discuss work-related issues. The issues which are discussed in the meetings are related to:

- extension workers' work with the farmers and any problems that extension workers experience;
- solving problems;
- budgets for the projects for the farmers; and
- progress updates of extension workers' work with the farmers.

The extension workers described the meetings that they have as a place where they are able to share ideas with each other. From the findings it is clear that all extension workers agreed that they are able to share ideas during meetings. In the meetings, the extension workers are able to get help on problem issues from other extension workers.

*“So I will say with the meetings, it's good for us with the extension officers that we meet on these meetings because it's where we share a lot of ideas”.* **(Respondent B)**

*“We improve a lot because we are not the same and our qualifications are not the same. You would find that one is good or majored in plant production and one majored maybe in animal production and you will find that one I would say specializes on some certain subjects within agriculture. So in the meetings it's where it's easy then to get somebody that can assist you, maybe it's not your field of study, you see.* **(Respondent A)**

*“At the meeting they share because sometimes like X (extension worker), the one that you interviewed he is an animal specialist. So if you have got a problem I will ask him to help at my site because at uMngeni I am the one working. There is no one doing animal production”.* **(Respondent D)**

The three statements above illustrate that the extension workers are able to share ideas during meetings with each other and also with their supervisors. Tiwana (2000) argues that organisational knowledge management initiatives that enable transfer of knowledge from

both successful and failed projects, provide important insights into what should not be done in projects. As extension workers attend the meetings they are able to take part in face-to-face dialogue. As described in Subsection 4.4.1, this creates an environment for sharing knowledge and experiences as the extension workers engage in dialogue in meetings. Meetings provide an environment where people are able to exchange and coalesce knowledge (Nonaka and Takeuchi 1995).

The second statement illustrates that some extension workers might already have experienced a similar problem which may be discussed in a meeting. Those extension workers who may have experiences with farmers are in a position which makes them able to share their experiences with other extension workers. Through the dialogue in the meeting, the experienced extension workers are able to share with other extension workers their tacit knowledge (Subsection 2.2.3), which is the experience they gained through working with the farmers. Through sharing experiences gained from working with farmers, the employees are able to reflect on their shared experiences. As people share experiences, the tacit knowledge becomes explicit knowledge. It might have been difficult to express this tacit knowledge before sharing had taken place (Haslinda and Sarinah 2009). Tacit knowledge is the largest part of an organisation's prowess and not the organisational intellect (Tiwana 2000).

The third statement by an extension worker shows that the workers take advantage during the meetings of the different areas of other extension workers' specialisation. The extension worker mentioned that they may have a problem in an area where they are not specialised, and during meetings, they are able to get help from other extension workers who are specialised in a specific area. The specialised extension workers have explicit knowledge gained from their extension education and chosen areas of specialisation and through experience working with the farmers. According to Nonaka and Takeuchi (1995) and Haslinda and Sarinah (2009), explicit knowledge in individuals may be changed to explicit knowledge (new theoretical knowledge) in others by bringing together different theories. As people sit in meetings and share different theories they are also able to coalesce the knowledge gained and use it in their own situations.

#### ***4.4.4 Recording the minutes of the meetings***

The extension workers mentioned that their meetings are recorded by an assigned person who takes minutes. Before the start of a meeting, minutes of the previous meeting are read to all the extension workers. This is illustrated by the following statements;

*“...a meeting without a scribe is not a meeting generally speaking. All minutes are being kept by the supervisor for references in fact they are a record of what the district is doing. And for that then every meeting before it starts there is an item of reading of minutes where we even approve these minutes to say they are correct we know about them, we were on the meeting we were on that particular meeting. So I would say that these minutes serve as a record or bible where we refer to as what was agreed.” (Respondent B)*

*“...that is very important that someone takes the minutes of the meeting because all what we are discussing needs to be recorded. So that on the following meeting we know where we ended the last meeting.” (Respondent C)*

The statements showed that all the meetings attended by the extension workers are recorded and minutes records are kept with the supervisor. The supervisor assigns someone to record the minutes of the meetings. Before a meeting starts, the minutes of the previous meeting are read for the extension workers to agree on what they have previously discussed. The process of reading the previous minutes enables extension workers to share recorded knowledge and experiences. According to Nonaka and Takeuchi (1995), sharing of knowledge takes place as people in meetings share already formalised knowledge through reading of reports of previous meetings. The extension workers are able to use the stored minutes of previous meetings to clarify issues. When discussions at meetings are recorded, information becomes formalised and explicit knowledge which may be shared and communicated through reports (Nonaka and Takeuchi 1995; Handzic 2003; Chua 2003; Wong and Aspinwall 2004; Milton 2005). Recording of minutes enables the extension workers to compile all the minutes of their meetings, which will be a record of explicit knowledge they have discussed and the way they have addressed problems during meetings.

Even though the extension workers mentioned that they have records of their meetings it is critical to consider whether the extension workers actually use these minutes or whether they are just stored in their supervisor's office. Not referring back to the reports does not contribute to the knowledge management process, which means that the recorded minutes fail to serve their purpose. The findings of this research reflected that only two of the seven extension workers referred back to the reports when they encountered a technical problem that the farmers expect them to address.

The findings of this research further showed that the standard of the recorded minutes may also affect its effectiveness to contribute to knowledge management, as reflected by the following statement:

*“...we do have someone to record the minutes. It’s just that sometimes in other cases is not up to standard may be because if maybe someone who has been selected has no access to a computer of her/his own so he/she has to depend or to ask for using the colleague’s computer. But that leads to the minutes of the meeting being submitted on the last minute, at the last day, on the day of the meeting”.* **(Respondent B)**

In addition to the problem of poor quality of the minutes, the extension workers also referred to the delay in submitting minutes before the next meeting. This could affect the knowledge management process if someone needs to look at the minutes and these are not available. Tiwana (2000) argues that it is critical that employees be able to access knowledge on time and the documents with recorded information should always be perfect, as this also contributes to the organisation’s competitive advantage.

It is thus clear from the findings of this research that minutes are recorded but in order for these minutes to be effective for knowledge management, a way should be found to:

- make minutes easily accessible to the extension workers;
- submit minutes well before the next meeting; and
- improve the quality of the minutes.

#### **4.4.5 Summary of the extension workers’ methods of knowledge sharing among themselves within the department**

This section describes the different methods that extension workers use within their department for knowledge sharing among the extension workers. Most of the extension workers agreed on the methods that were identified in the findings. However, some of the extension workers had more to say in terms of the effectiveness of some of the methods. The effectiveness of certain methods used is affected by the availability of resources. Access to a personal computer or laptop may facilitate timeous typing and handing out of minutes to others.

The extension workers have in place methods that may enable good knowledge management practices although the level of effectiveness may still not be good. The meetings that they have

offer an opportunity for dialogue to take place but there are some extension workers who are unwilling to share their knowledge with others. The extension workers record their meetings. However, the quality of the minutes is questionable as extension workers do not have the necessary equipment that will ensure that everything is recorded. Minutes at times may not be ready before the next meeting resulting in poor knowledge management practices. Previous minutes need to be read before the commencement of a meeting. During the meetings held by the extension workers, there is no evidence that learning takes place through the engagement with knowledge shared as well as the evidence that the extension workers are able to apply the knowledge gained into their own work practices.

For learning to take place there is a need for teamwork that allows for dialogue, thus allowing people to share. In the case of the extension workers, they do have meetings as a team of extension workers but some of the extension workers are unwilling to share which leads to no dialogue. Problem solving in a group enables learning to take place. In the case of the extension workers, there are sometimes people not willing to share, and then learning is hindered.

There is no clear knowledge management model being used by the extension workers, as there is no clear evidence of dialogue that leads to sharing.

#### **4.5 The extension models/approaches used by the extension workers to share knowledge with the farmers**

The theme *The extension models/approaches used by extension workers* refers to the different agricultural extension models that extension workers use to transfer, pass on and share knowledge with farmers. In South Africa, there is no one model that may be suited for all the farming situations. The extension models/approaches used by extension workers need to be adapted to suit specific situations (Department of Agriculture 2005). Extension workers have various models which they can use in their work, and the following are the models which the extension workers use:

- the extension workers advise the farmers (4.2.2.1);
- the extension workers demonstrate, use pamphlets and train farmers (4.2.2.2); and
- the extension workers allow farmers to participate (4.2.2.3).

#### **4.5.1 Methods used by the extension workers to advise farmers**

It was evident from the findings that giving advice to farmers was among the approaches which the extensions workers use with the farmers.

*“The approach that I use with my farmers is we have a consultation. Where the farmers will call me to come to their sights where projects are being done, people will consult me where they want to start new projects, they want me assess their land to see if their land is suitable for a particular function”.* **(Respondent A)**

*“But if there is the need like if there is the disease infestation or pest infestation, anything that is new to the farmers that they need me to observe and give the advice. They call me they do have our numbers, mobile numbers. I do then visit them and I also do as it is done on my schedule but I even do it on the request”.* **(Respondent B)**

The statements from the extension workers show that extension workers are in a position to give advice to farmers when necessary. Farmers may be viewed as being able to seek advice from the extension workers, which is part of the advisory model. The advisory model views farmers as active seekers of extension advice when these farmers fail to come up with their own solutions (Havelock in Röling 1995).

The first statement demonstrates that farmers need extension workers to assess the land on which they want to start a project. Farmers seek the knowledge of extension workers on land which they might not have before starting a project. Farmers need extension workers to be able to advise them on whether the land would be suitable for their particular project after the extension worker had assessed the land for them.

In the second statement, the extension worker gave farmers their contact numbers, which enabled the farmers to contact the extension worker if they needed help. The statement showed that the farmers are able to contact the extension workers when they have encountered something with which they may not be familiar, for instance a new pest infestation. The farmers are able to ask the extension workers to come and advise them on ways to solve their problem.

The extension workers are not making use of extension models that allow participation and learning to take place with the farmers, since they do not encourage sharing of knowledge with the farmers.

### **4.5.2 Farmers' response to advisory model**

The farmers mentioned that they consult the extension worker when they are faced with a problem. This is evident in the statement below.

*“Well on our own without her, we don't know how to deal with the problems. We just have to phone the extension worker to come help us .The extension worker normally comes and helps us solve the problem, explaining how we can solve it”.* (Farmer E).

The extension worker responds to farmers when they call and cannot solve a problem. The statements illustrate that the farmers on their own cannot solve problems. The farmers are dependent on the extension worker. The advisory model views the farmers as active seekers of extension services when they fail to solve a problem on their own. The above statement from a farmer did not show that the farmers try to solve problems on their own. The farmers mentioned that, on their own without the extension worker, they do not know how to deal with problems.

The extension workers use the linear model. The extension worker is seen as having all the knowledge to solve problems, and farmers are on the receiving end of the solutions without any input from their side. The model does not encourage any sharing and learning to take place for both farmers and extension workers. This model does not promote any knowledge management methods or practices, such as allowing dialogue, that aids the sharing of knowledge. Also there is no teamwork between the extension workers and the farmers which would allow participation by farmers and learning.

### **4.5.3 Method used by extension workers for transferring technical knowledge to the farmers**

The extension workers mentioned that they use demonstration, pamphlets and training of farmers as they carry out their work among the farmers. The following statements demonstrate the approach that the extension workers use.

*“And also there is an approach whereby I train and visit, so as to monitor the technology that was transferred to them whether are they doing as per training. So the visit will be gradually maybe once a week it depends on the particular type of the project”.* (Respondent A)



*“Mainly when we do demonstrations for a particular technology that we want to introduce to them, I will normally allocate land or a space to them to do it their own way. Then I will have an opposite side so that we compare the new technology to the indigenous one. It’s were then you see people changing their vision when you do the harvesting then you compare then they see the yield from what they have been doing and what you have produce”.* **(Respondent A)**

*“If there is a, new technology we arrange a course with the farmers so that we can train them on that issue. Maybe we used to conduct what we called a demonstration. Where you demonstrated to the farmers new technology”.* **(Respondent D)**

*“Yeah. If there are pamphlets they got then, we use the pamphlets sometimes. Not sometimes but usually the demonstrations, we usually use the demonstrations to teach the farmers”.* **(Respondent F)**

All the statements from the extension workers illustrate that the extension workers use demonstrations when working with farmers in order to transfer new technology to farmers. Extension workers only demonstrate the new technology which they have to farmers and farmers are expected to adopt the new technology from the extension workers. Using demonstrations and the train-and-visit approach fits in with the linear model. The linear model comprises the transfer of new technology by extension workers to farmers, where farmers are mere recipients (Dexter 1986; Röling 1995b; Sulaiman and Hall 2001).

In the first three statements, the extension workers mentioned training of farmers. Farmers are trained by extension workers who later return to see the progress of the farmers. Training of farmers by extension workers implies that farmers receive new technology where the extension workers are the sole source of knowledge and the farmers mere recipients. The training that takes place is the transfer of technology from the extension worker to the farmer. This extension approach used by the extension workers does not encourage sharing of knowledge between farmers and extension workers since extension workers only show the farmers what to do and later return to see whether the farmers have followed the instructions. This top-down approach does not encourage any learning to take place.

In the last statement, the extension worker mentioned that they use pamphlets, which is a way of transferring technology in a written form. Farmers are taught using pamphlets and they have to implement what they have been taught. There is thus a linear relationship in the

transfer of technology from extension workers to farmers. This also demonstrates that there is no sharing of knowledge between farmers and extension workers; knowledge is only being transferred from extension workers to farmers.

All the statements by extension workers clearly illustrate that extension workers use the technology transfer model in their work with farmers. Farmers do not actively participate in technology transfer; they just receive and accept what they have been taught by the extension workers. This approach does not take into consideration any technical knowhow, which the farmers already might have. The model seems to assume that farmers do not have any of their own technical knowhow and that they depend on the extension workers' to solve problem for them (Dexter 1986:121; Röling 1995b; Sulaiman and Hall 2002).

#### **4.5.3.1 The farmers' response to demonstrations**

The farmers who were interviewed pointed out that the extension workers use demonstrations or that someone comes to demonstrate for them. The following statements illustrate what the farmers mentioned.

*“Well as farmers we always trust what she says. We are satisfied with the fact that is she shows us a sample saying that this is how we should do it, we just do as the extension worker says”.* **(Farmer D)**

*“She gives us samples and a portion where we can practice as sample farming so that we just don't plant without direction. When she does the samples, she gives seed so that we can practice as samples. And also she demonstrates to us how we should plant it”.* **(Farmer D)**

*“There was once a man who came to help us, this tall man. He came and showed us how to plant the maize seed”.* **(Farmer F)**.

The first statement illustrates that the extension workers give demonstrations with the farmers as new technology is being transferred to the farmers. The farmers follow what the extension workers show them without contributing their own input. This confirms that the linear model is being used by extension workers.

The second statement revealed that the extension workers give farmers samples of seed and a portion of land for the farmers to practice. The extension worker also does demonstrations for the farmers to see how to plant the seeds.

The third statement shows that other role players are also involved in giving demonstrations to farmers. The extension workers are able to seek assistance from other stakeholders to come and assist the farmers.

All the above statements agree with that which the extension workers mentioned in Section 4.2.2.3 concerning demonstrations. Two farmers agreed with the extension workers that they give demonstrations which the farmers attend. The following statements show that some of the farmers do not agree with the extension workers.

*“And we also need demonstrations. They should show us exactly how to do everything”.* (Farmer B)

*“With farming let me just take you back in the days. When parents went to the fields, they would take their plough and seed and while at that they will be demonstrating showing you how to do everything. Like you plough here and seed here. With them, why don't they do the same”?* (Farmer C)

The statements above suggest that the extension workers only tell the farmers what to sow without clearly showing the farmers how to plant the seeds. This suggests that there is a top-down approach (linear model) where no sharing of knowledge takes place between the farmers and the extension workers (Dexter 1986:121; Röling 1995b, Sulaiman and Hall 2002). Since no sharing takes place, the implication is that no knowledge management practices or methods are being used by the extension workers and that no learning takes place

#### 4.5.3.2 *The extension workers allow the farmers to participate in discussions*

There was one extension worker who mentioned that they allow farmers to take part in the process which extension workers undertake towards trying to pass on new agricultural technologies to farmers. This is evident in the following statement.

*“We want them to be part of this project; they need to be fully involved. How do we involve them we just let them come up with their ideas? What do they want us to do*

*and how, it comes from them so that it helps them to feel as part of the project. So we, that's what we do, yeah". (Participant E)*

*"You know extension is all about, it's about participation, is all about involvement of the farmers. You see for the farmer to see, make their level of production become higher they have to be actively involved in their programme. So we are concerned with their level of participation". (Participant E)*

The extension worker mentioned that they want the farmers to be part of the project, and the farmers need to be fully involved in the project as they are able to contribute their own ideas and let the extension workers become aware of what the farmers want the extension workers to do. When farmers contribute their ideas there is dialogue between the farmers and the extension workers, which allows the sharing of knowledge. Nonaka and Takeuchi (1995) argue that, through dialogue, there is the sharing of knowledge between individuals. Furthermore, the participation of farmers ties together the capacities of farmers, identification of their needs and priorities, planning of extension activities and making use of the indigenous knowledge to improve production systems (Rivera & Qamar 2003). Participation by the farmers promotes the sharing of knowledge between the farmers and the extension workers as farmers are able to contribute their own ideas.

In the two statements, the extension workers mentioned participation as it is the ideal model for extension even though it is clear that this is not the model which the extension workers use with the farmers, as they use the linear model. In order for the extension workers to share knowledge with farmers, the participation model is necessary. The use of the participation model is in line with the practices of knowledge management, which allows sharing of knowledge to take place. Through the participation model, the farmer becomes an active role player in farming activities with the extension workers. According to Allahyari (2008), the participation process enables farmers to be considered as contributors to the learning and teaching process of extension compared to only being recipients of science and technology (linear model).

#### **4.5.3.3 Farmers' participation**

It is evident that all the farmers agreed that the extension workers do not involve them in any decision-making. The farmers are told what to do. The participation model is not evident from the farmers' responses.

*“They do not come to us ask us about our farming schedules here or what the appropriate time to plant is. They just come with their materials then they tell us this is what you will plant”.* (Farmer C).

*“Yes, it is actually we don’t have a mechanism where we can actually write or explain how we would wish things to work out. It is just that they came with their own knowledge and then tell us that this is how you will do everything. And then we would not know how to go beyond that”.* (Farmer G)

*“Yes, we would like them to ask us too about what we might also want to grow here. Instead of imposing crops on us. Even when we disagree they do not listen to that. It’s the same with the timings here. You see it’s different. Even when we tell them about it they don’t listen because they would have arrived with their materials and they just proceed with planting”.* (Farmer G)

The statements above show that the participation model is not being applied with the farmers. The farmers mentioned that what they do is imposed by the extension workers. No discussion takes place; the farmers are just told what to do by the extension workers even though the farmers may not be happy with the decision.

Since the farmers are not involved in any decision-making, they may not be able to share their own knowledge and insights with the extension workers. The farmers mentioned that the extension workers do not listen to them.

#### **4.5.4 Summary of the extension models/approaches used by the extension workers to share knowledge with the farmers**

This section is concerned with the different models that extension workers use to pass on agricultural technology to the farmers. Although there are different extension models which extension workers can use to pass on any agricultural knowledge to the farmers, only three models were mentioned as being used by the extension workers. From the findings it became clear that the extension workers are all using the linear model and the farmers confirmed the use of the linear model. The linear model uses one-way transfer of knowledge from the extension workers to the farmers; there is no sharing of farmers’ knowledge with extension workers.

Although the extension workers mentioned that they use the participation model and the advisory model, this was not evident from the farmers’ responses. The farmers mentioned

that the extension workers do not listen to what they say. The extension workers merely tell the farmers what to do. In terms of the advisory model, there was no evidence that the farmers try and solve a problem on their own and when they fail, they seek extension advice. It is evident that the farmers on their own cannot solve problems; they have to wait for the extension workers to tell them how to deal with problems. Since existence of the linear model is evident even from the farmers' interviews, the suggestion is that there is no knowledge sharing from the farmers which the extension workers have to manage.

#### **4.6 Integration of farmers' knowledge gained from the community gardeners into extension practices**

This theme refers to the way extension workers assimilate the knowledge which farmers share with them into their work practices, to share with other extension workers as well as other farmers with whom they work. For the extension workers to be able to assimilate the farmers' knowledge it is necessary that extension organisations have knowledge management practices that enable extension workers to adopt, validate, diffuse and utilise knowledge gained for them to reach organisational goals (Mchombu 2007; Wen 2009). The interaction between extension workers and the farmers may be a source of gaining the farmers' knowledge and experiences. The interaction between the clients and the employees is important since it enables the sharing of knowledge between the clients and the employees; the employees get the opportunity to know the needs of the clients (Calantone et al 2002.; Hall and Paradice 2005). Below are some of the methods for diffusing farmers' knowledge:

- sharing of farmers' knowledge and experiences between extension workers and other farmers (4.2.3.1);
- accepting farmers knowledge (4.2.3.2); and
- recording farmers knowledge (4.2.3.3).

##### **4.6.1 Sharing with other extension workers knowledge from farmers' knowledge with extension workers**

It is evident from the two statements below that the extension workers share farmers' experiences with each other.

***Researcher:** "With such an incidence, the one you mentioned about the potatoes. Do you in your meetings share such experiences that you have seen the way farmers do things with the other extension workers".*

**Participant:** “We do share all that and we also organise tours were the other extension officers will go to different sights and see what the particular official is doing with his clients or with his farms”. **(Participant A)**

**Researcher:** “But do you think as extension workers you are sharing that indigenous knowledge with other extension workers”?

**Participant:** “We are sharing maybe when you are just talking we talk about the farmers knowledge shared. But on our meeting we don’t maybe tell that farmers in such an area I do this and this. But when you are just talking together”. **(Participant C)**

The first statement demonstrates that the extension workers are able to share knowledge with farmers with other extension workers. Sharing which takes place through visiting other projects could enable both farmers and extension workers to gain new knowledge and insights into best farming practices (Quintas et al. 1997; Martin 2003). The effective sharing of knowledge necessary for the integration of shared knowledge will occur when extension workers listen and observe what might occur when they visit other projects (Nonaka and Takeuchi, 1995; Clarke 2001; Calantone et al. 2002; Metaxiotis and Psarras 2003; Sher and Lee 2004; Ng 2004; Hall and Paradise 2005). The extension workers have an opportunity to visit other projects and see what the farmers are doing. This allows them to learn from what the farmers are doing in order to integrate the farmers’ practices and experiences with their own practices. However, based on the findings of this research, there is no evidence that learning, the sharing of knowledge and integration of the knowledge are taken place.

The second statement showed that extension workers are able to share knowledge as they engage in general talk with the other extension workers. The extension workers did not mention that they actually integrate what they share into their work. This may suggest that the extension workers may actually know these things but do not implement the knowledge gained. From the statement, it did not seem as if the knowledge shared and gained is incorporated into the farming activities carried out by the extension workers. There is no evidence that the workers integrate knowledge gained into their work practices.

#### **4.6.2 Accepting farmers’ knowledge**

Knowledge management involves acquisition and utilisation of knowledge, which contribute to organisational performance (Wen 2009). The following statements show whether the

extension workers are able to fully integrate the farmers' knowledge and use it together with their own knowledge and experiences.

*“Sometimes the extension officers like to read the book only. They don't want to listen to the communities. But if they, all extension workers record the indigenous from the farmers it will help lots”.* **(Participant D)**

*“We have two pieces of land where the indigenous knowledge is performed or practiced and the new knowledge. Then we compare the results. Then if the side with a new knowledge has got better results then we know which one we have to go for. Then usually the one with new knowledge is usually better than that one. At times we combine two together, we find some good things so we use the indigenous knowledge. We don't just forget about it. We take those good things and incorporate them into the new knowledge that we are coming with”.* **(Participant E)**

*“That is very important really because those people practice that what they have and we come with the technical knowhow or they also know the climatic conditions of that area, they know everything about that area. So they should integrate the information of the farmers and what they have, yeah. Like I remember when we, there was a time when we planted beans it was late. The farmers told us it was late but the department pushed the project and the project was a total failure, yeah”.* **(Participant H)**

The first statement illustrates that some of the extension workers do not integrate the knowledge which the community has. The extension workers are described as entirely dependent on using academic resources to do their work and they do not listen to the communities. The extension workers need to be in a position to listen to and observe the farmers as they share their knowledge (Nonaka and Takeuchi 1995; Clarke 2001; Calantone et al. 2002; Metaxiotis and Psarras 2003; Sher and Lee 2004; Ng 2004 Hall and Paradise 2005). When there is no sharing of knowledge by the farmers, the extension workers make use of their own knowledge. The extension workers however do not make use of any knowledge management practices. Knowledge management involves sharing best practices between the organisation and its clients (Quintas et al. 1997; Martin 2003). The last statement (Participant H) demonstrates that there is limited knowledge management practice in place when the extension workers do not listen to the farmers. Since the extension workers do not listen to the farmers, the extension workers may be viewed as not incorporating farmers' knowledge into their work.



In the second statement, the extension workers mentioned that they compare by way of demonstration the practices of the farmers and their own, and later decide which is the best practice. Through this comparison, they are able to decide which farming practice is better and then to use it. Usually, the new technology is better, according to the extension workers. The extension workers further mentioned that they incorporate good aspects from the farmers' knowledge and they do not totally discard the farmers' knowledge. The method that the extension workers are using is the linear model, though they seem to allow the farmers to show them (extension workers) their practices. However, in the end, the practice being used is that of the extension workers.

The third statement shows that the extension workers are aware of the importance of the farmers' knowledge. Farmers are known to have indigenous knowledge which they have gathered over time and which is concerned with aspects that may relate to farming or the environment (Agrawal 1995; Hart and Vorster 2006; Magoro and Masoga 2009). Although the extension workers mentioned that the farmers shared with them knowledge about climatic conditions, the extension organisation (Department of Agriculture and Environmental Affairs) did not take it into consideration and overlooked the farmers' knowledge. The organisation went ahead with the project without incorporating the knowledge which the farmers had shared with them. Although the extension workers view the farmers' knowledge as important, their organisation does not consider the knowledge that the farmers share with the extension workers.

#### **4.6.3 The farmers' responses regarding whether the extension workers accept their knowledge and use it**

All the farmers mention that the extension workers and their organisation do not consider the knowledge the farmers share with them. It is evident from the statement below.

*“When we plant beans, the calendar starts in January. In 2008, they started the planting for us in February till the 4<sup>th</sup> of March. That year we did not benefit all of it died. We did not get anything that year. Before they planted it for us we told them that they should start in January but they started in February till March 4”.* (Farmer A)

The farmers mentioned that they shared their planting calendar with extension workers. The extension workers did not pay attention to the knowledge that the farmers had shared with them. The extension workers do not incorporate the indigenous knowledge which the farmers

shared about their environment. The extension workers do not make use of any knowledge management practices with the farmers. The extension workers only make use of the knowledge that they have.

#### 4.6.3.1 Recording farmers knowledge

The extension workers all agree on the importance of recording the farmers' indigenous knowledge. It is evident in the statements below that not all of them record the farmers' indigenous knowledge.

*“Yes, because we are learning when you are, if you are working with farmers, we are learning. I used to record the indigenous knowledge down and maybe I will go to my supervisor and tell them that people from that area they said they do things like this and that and we discuss”.* **(Participant C)**

**Researcher :** *“The indigenous knowledge that the farmers have how best should we capture it and use it so that other people can read about and use it elsewhere”.*

**Participant:** *“Yeah, I think we need to keep it the minutes. Such that we keep it in black and white or we record it as so that it will, the other farming community will be able to accept it and yeah. And I hope in combination with new knowledge can help the farmers produce quality crops and lift up their level of production”.* **(Participation E)**

*“Sometimes other extension officers didn't record because some other technicians don't like to listen to the farmers. They don't want to listen to the communities. But if they, all extension workers record the indigenous from the farmers it will help lots”.* **(Participant F)**

The first statement shows that the extension worker recorded the knowledge gained from the farmers and shared it with the supervisor. Recording the farmers knowledge makes it possible for knowledge to be stored to be used later when solving problems. Recording the farmers' knowledge may make it possible for sharing the knowledge if the records are kept and made accessible to other extension workers. Stored knowledge may be easy to communicate and shared between people (Nonaka and Takeuchi 1995; Handzic 2003; Chua 2003; Wong and Aspinwall 2004; Milton 2005). Recording the farmers' knowledge and sharing the knowledge contribute to knowledge management practices. For good knowledge management to take

place, there is still need for learning to take place and for the extension workers to engage with farmers' knowledge instead of just recording and not demonstrating what they will later do with the knowledge they have gained.

The second statement shows that the extension worker viewed the knowledge of farmers as important and that it should be recorded. Although there is no evidence from the extension workers that they actually record the farmers' knowledge and share it with other farmers, the extension workers seem to know what they should do with the farmers' knowledge but are not doing anything towards knowledge management practices..

In the third statement the extension worker illustrates that the farmers' knowledge is important and that it should be recorded but there is no evidence that the extension workers are recording the farmers' knowledge and that they actually use it in their extension practices. Furthermore, there are still extension workers who do not want to record the farmers' knowledge and only stick to academic resources. There is not much for which the extension workers use the farmers' knowledge. They acknowledge the farmers' knowledge but at the same time do nothing with it. The farmers' knowledge is thus not integrated into their extension practices.

#### ***4.6.4 Summary of integration of farmers' knowledge by extension workers into their knowledge management practices***

The extension workers mentioned that they integrate the farmers' knowledge into their work. This is not evident from the responses of the farmers, which showed that the extension workers do not integrate the farmers' knowledge into their practices. The extension workers and their organisations do not take into consideration the knowledge which the farmers share with them, which implies that the extension workers do not apply adequate knowledge management practices. This also indicates that there is no learning taking place between the farmers and the extension workers. Although the farmers are willing to share their knowledge with the extension workers and their organisations, the extension workers and their organisations still overlook the knowledge that farmers have.

### **4.7 Summary**

The extension workers within their department have in place methods for knowledge management, although they still need to ensure the efficient use of these methods. There are still many hindrances to knowledge management which, in a good system, may be overcome.

The extension workers make use of only the linear extension model when working with the farmers, which does not promote any knowledge sharing. This shows that the extension workers do not have adequate knowledge management practices in place, since no participation and sharing of knowledge are encouraged. The extension organisation also seemed not to be doing much to encourage any knowledge management practices between the extension workers and the farmers.

The inadequate knowledge management practices and the use of the linear model by the extension workers indicate that there is no sharing of knowledge and no integration of the farmers' knowledge with their (extension workers) practices. Knowledge gained from farmers could assist extension organisations and extension workers to gain knowledge on the needs of their farmers and how best to address these needs.

This chapter looked at the data analysis of the findings. The following chapter provides the synthesis, conclusion and recommendations from the research.

## **SYNTHESIS, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

The previous chapter looked at the analysis of the findings of this research. The analysis and the interpretation of the findings were done using three themes. The themes were developed from categories that emerged from the findings and were guided by the objective and sub-objectives of the study. The main objective of the study was to identify the appropriateness of knowledge management practices applied by extension workers to support community garden farmers in the uMgungundlovu District Municipality of KwaZulu-Natal. In order to achieve these, the sub-objectives were to explore how:

- extension workers manage knowledge within the provincial Department of Agriculture, and Environmental Affairs related to community gardens;
- extension workers manage knowledge shared between themselves and community gardeners; and
- extension workers integrate knowledge gained from community gardeners into their practices.

The chapter summarises the key findings that emerged from the analysis done in Chapter 4. Conclusions are made based on the knowledge management systems of which the extension workers make use within their organisations and with the farmers. Based on the conclusions, recommendations will be made, and areas of further study will be suggested.

### **5.2 Summary of key findings**

The key findings of the study are summarised in Subsections 5.2.1 to 5.3.3 based on the sub-objectives (Section 5.1) of the study.

#### ***5.2.1 Explore how extension workers manage knowledge within the department of agriculture and environmental affairs related to community gardens (Sub-objective 1)***

The first sub-objective was to explore how extension workers manage knowledge related to community gardens within the Department of Agriculture and Environmental Affairs. This

sub-objective is addressed by means of knowledge-centric drivers and processes of learning which ensure the effectiveness of the knowledge management practices as well as the knowledge management model applied. These three aspects were involved while establishing whether knowledge management methods were effective.

### 5.2.1.1 Knowledge-centric drivers

Literature outlined the factors of the knowledge-centric drivers that organisations need to be aware of for efficient knowledge management practices that support a knowledge management system. Table 5.1 illustrates the relationship between literature on knowledge management practices and the findings of the research.

**Table 5.1: Summary of knowledge management practices required for knowledge management practices**

<b>The knowledge-centric drivers based on literature (Subsection 2.2.7)</b>	<b>Findings</b>	<b>Suggestions</b>
<p><b>Failure of companies to know what they already know</b></p> <p>Knowledge within an organisation must be shared and made known to the employees.</p>	<p>The extension workers have meetings with their supervisor where they share knowledge that relates to their extension worker practices. This sharing enables the extension workers to gain knowledge related to their projects (Subsection 4.4). However there was no evidence of reflection on the knowledge shared in the meetings to encourage learning.</p>	<p>It is necessary that knowledge sharing in meetings be accompanied by reflection and learning on how the shared knowledge can be applied.</p>
<p><b>Emergent need for smart knowledge distribution</b></p> <p>Organisational documents (reports) need to be perfect</p>	<p>According to the extension workers, the quality of their recorded minutes is at times not good as the minutes are not recorded, which causes failure to capture all information. The minutes are not always available before the next meeting (Subsection</p>	<p>The extension organisation should ensure that the scribe of meetings is qualified to record the minutes properly.</p> <p>The extension organisation needs to provide digital recorders for the extension</p>

	4.4).	workers during meetings.  The minutes should be ready on a day as scheduled before the next meeting.
<b>Knowledge sluggishness</b>  Successful and failed approaches and decisions on projects should provide insights on what to do and what not to do.	There was no evidence that the extension workers referred back to previous reports to find any knowledge that may assist them in their work (Subsection 4.4).	The extension organisation needs to make previous reports available to the extension workers and should encourage referring back to them.
<b>Knowledge velocity</b>  Knowledge management practices enable people to learn from previous decisions, whether good or bad	There was no evidence that learning is taking place from knowledge gained from previous decisions since the extension workers do not take the initiative to implement insights from previous decisions (Subsection 4.4).	When extension workers face problems they should be encouraged to find out whether there has been a similar situation earlier on and how it was solved, and they should then try and apply that knowledge to their own problem.
<b>Tacitness of knowledge</b>  The experience of an organisation resides in the human intellect of its employees	The extension workers have a good relationship with each other and are able to share knowledge although there some extension workers who are unwilling to do so (Subsection 4.4).	The extension organisation needs to provide incentives so that experienced employees are retained. Extension workers who are willing to share with other extension workers could be rewarded.
<b>Knowledge hoarding</b>  Knowledge hoarding may be overcome by having performance measured and incentives which reward knowledge sharing	There are some extension workers who are not willing to share their knowledge when asked for assistance (Subsection 4.4).	Creation of an organisational culture that would encourage interaction and sharing of ideas among extension workers. This could be done by identifying ways of sharing suitable for individual extension workers according to their preferred mode of sharing.
<b>Systematic learning</b>	There was evidence that extension workers are still	The extension workers should use the participation

Organisations should unlearn previous experiences that are no longer applicable.	using the old extension approach which does not encourage knowledge sharing and learning in terms of the farmers (Subsection 4.4).	approach and the learning approach with the farmers. Extension workers need to be educated on these approaches and ways to apply them in terms of farmers.
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Based on the findings of this research the extension organisation should be aware of practices that hinder the efficiency of the knowledge management system in place. Extension organisation could make use of the knowledge-centric drivers to be overcome impediments of an effective knowledge management system.

### 5.2.1.2 Processes of active learning

Learning is an important aspect within any knowledge management system and there are various work process that encourage leaning. Table 5.2 describes the relationship between what the literature had revealed and the findings of the research.

**Table 5.2: Summary of the processes of active learning required for knowledge management**

<b>Processes of active learning based on literature (Subsection 2.3.3)</b>	<b>Findings</b>	<b>Suggestions</b>
Participation in group processes involves team work and working alongside each other.	Extension workers do not work in groups. Each extension worker is assigned projects to work on. This does not allow interaction and sharing of knowledge among the extension workers when they are working in the field (Subsection 4.4).	Extension workers working on similar projects may be put into teams to work alongside each other.
Consultation, using other	The extension workers also	Additional workshops and meetings



departments or stakeholders to get advice on problem situations	work with other stakeholders. However it has not been determined whether the sharing is effective (Subsection 4.4).	between the extension workers and other stakeholders could be organised to encourage networking between stakeholders and extension workers.
Tackling challenging tasks and roles	This has not been determined in this research but it was evident that extension workers carry out the same tasks with the farmers and they do not change their extension approaches (Subsection 4.4).	Extension organisations need to create an environment where extension workers are given challenging tasks which will enable learning and development of new skills and knowledge to take place.
Problem solving in groups results in learning.	Extension workers ask for assistance during their meetings but there was no evidence of learning that will result in their ability to solve problems taking place (Subsection 4.4).	Learning within the organisations needs to be encouraged through group work where extension workers reflect upon their practices and find ways to apply the knowledge shared within a specific context.
Working with clients enables dialogue and sharing of ideas.	There was no evidence that the extension workers encourage participation and learning together with farmers (Subsection 4.4).	Extension workers should be exposed to the application of extension approaches that support participation and learning of the farmers such as the participatory approach and the learning approach (Subsections 2.4.2.3 and 2.4.2.4).

For active learning to take place, extension workers need to implement the processes of active participation described in Table 5.2. In terms of the learning processes, extension

workers do consult with other stakeholders but the following learning processes need to be encouraged to ensure knowledge management takes place through learning:

- extension workers should be encouraged to participate in groups;
- the extension organisation should create an environment where extension workers are encouraged to act upon challenging tasks;
- extension workers should be encouraged to work in groups and reflect on their practices together; and
- there is need for extension workers to work together with farmers and to encourage sharing of ideas.

### *5.2.1.3 Knowledge management model*

The literature review revealed different knowledge management models. It was suggested that Demerest's knowledge management model (Subsection 2.2.5.3) is the most suitable model to use in agricultural extension organisations (Subsection 2.2.5.4).

Demerest's knowledge management model describes the following process to be taken into consideration:

1. construction of knowledge should take place in the organisation and also outside the organisation (external environment, including political, social, natural and economical environments);
2. knowledge should be managed through overt organisational processes through social exchange within the organisation;
3. knowledge shared should be disseminated, and the process of dissemination should be evaluated; and
4. the above (numbers 1–3) should be applied so that farmers would be able to benefit from the knowledge constructed, stored and shared (Demerest 1997).

**Table 5.3: Application of Demerest’s model to the findings of this research**

<b>Components of Demerest’s model</b>	<b>Application to this research based on the findings</b>
Knowledge construction (construct)	<p>Extension workers seek knowledge and share knowledge to address problem situations though it is not efficiently done. (Subsection 5.2.1.1 and 5.2.1.2, Table 5.1 and Table 5.2)</p> <p>It was not determined in this research whether the extension workers take into consideration knowledge from the social, political, natural and the economical environments.</p>
Knowledge embodiment (store)	<p>The extension organisation has written reports where shared knowledge in meetings is recorded, although the practice is not very effective (Subsection 5.2.1.1, Table 5.1).</p> <p>Knowledge that is shared informally among the extension workers and with the farmers is not recorded and stored</p>
Knowledge dissemination (dissemination)	<p>The extension worker’s share knowledge among themselves but it is not effective (Subsection 5.2.1.1 and 5.2.1.2, Table 5.1 and Table 5.2).</p>
Use of knowledge constructed, stored and disseminated in the organisation (use)	<p>The extension organisation has a knowledge management foundation in place; however, it is not of much value to the farmers (Subsection 5.2.1.1 and 5.2.1.2, Table 5.1 and Table 5.2).</p>

As reflected in Table 5.3, it is clear that elements from Demerest's model are applied, but this should be improved to ensure adequate knowledge management practices which would benefit the farmers.

#### *5.2.1.4 Summary*

Based on Demerest's knowledge management model, it is clear that the extension workers have a foundation in place for knowledge management to construct and store knowledge, even though it is not done effectively. In addition, dissemination of knowledge and storage of knowledge was not clearly demonstrated. The knowledge gained from extension knowledge management is not being used effectively to improve their own practices and the practices of the farmers. This includes the following activities:

- there is sharing of knowledge which enables the extension workers to have access to knowledge within the organisation (construct);
- the extension worker's have a good relationship with each other, which enables the sharing of tacit knowledge (construct);
- the extension worker's are taking minutes of each meeting but the quality is not good (store);
- the extension workers are able to consult other stakeholders (construct); and
- the extension workers' assist each other in problem solving but there was no evidence of learning taking place (construct).

Although the extension workers use the above they still need to apply the following in order to improve on their knowledge management practices and methods:

- participation in groups to share knowledge on their extension practices (construct);
- extension workers should be given new tasks that are challenging (construct);
- smart knowledge (quality documents) should be applied to improve the quality of the organisation's documents (store);
- extension workers do not store knowledge shared informally with other extension workers and farmers (store);
- insights from both failed and success projects should be used (disseminate and construct);

- an organisational culture that promotes interaction, sharing of ideas and finding ways to apply the knowledge shared (construct, store and disseminate) should be created; and
- extension workers should be exposed to agriculture extension approaches that encourage sharing and learning with the farmers such as the participatory approach and the learning approach (use).

### ***5.2.2 Explore how the knowledge shared between extension workers and community gardeners is managed by extension workers (Sub-objective 2)***

The second sub-objective explored how the knowledge shared between extension workers and community gardeners is managed. In order to address this sub-objective, extension models that allow the sharing of knowledge and learning to take place between the farmers and the extension workers were used. These are the participatory approach and the learning approach. Table 5.4 describes the relation between the findings of the research and literature reviewed on the two models.

**Table 5.4 Summary of models that encourage knowledge sharing and learning changes required for knowledge sharing and learning to take place**

<b>Requirement for the extension models that encourage knowledge sharing and learning based on literature (Subsection 2.4.2)</b>	<b>Findings</b>	<b>Suggestions</b>
<p><b>Participation model</b></p> <p>Extension workers need to encourage farmers to become active participants.</p> <p>Farmers need to become involved in decision-making.</p>	<p>There is no evidence that the extension workers encouraged the farmers to participate and to make decisions (Subsection 4.5)</p>	<p>There is need for dialogue between the farmers and the extension workers which will allow knowledge sharing and learning to take place.</p> <p>Extension workers need to encourage farmers to make decisions that affect them.</p> <p>Shared knowledge gained through the participatory process should be shared among extension workers, reflected upon and recorded for future reference.</p>
<p><b>Learning model</b></p> <p>There is need for a partnership between the farmers and the extension workers as well as other stakeholders.</p> <p>Farmers should be encouraged to learn from experience, observation and discussions.</p>	<p>There was no evidence of the existence of a partnership between the extension workers and the farmers since the farmers are not involved in decision-making (Subsection 4.5)</p> <p>Extension workers showed no evidence of encouraging learning for the farmers from experience, observation and discussion since they use the linear model with the farmers (Subsection 4.5).</p>	<p>Extension workers should work in partnership with the farmers and involve them in decision-making. This should be done through dialogue, reflection and participation.</p> <p>There is need for the extension workers to encourage farmers to learn from their own experience, observation of each other's farming practices and they should discuss it among themselves.</p>

Even though there are various extension models that the extension workers could use, there is only one model which emerged from the findings and which the extension workers use. The linear model, which the extension workers use with the farmers, does not encourage the sharing of knowledge and learning between extension works and farmers. Extension workers need to ensure that participation by farmers is encouraged by allowing the farmers to become active participants involved in decision-making. For learning to take place, extension workers and farmers as well as other stakeholders have to work together in partnership, and farmers need to be encouraged to learn from experience, observations and discussions. The implementation of the above suggestions from Table 5.4 may lead to knowledge management practices between farmers and extension workers, which would encourage knowledge sharing and learning between farmers and extension workers to take place.

### **5.2.3 The integration of farmers’ knowledge by extension workers into their knowledge management practices (Sub-objective 3)**

Agricultural extension should be able to take into account the insights of farmers and integrate these into their work. It is important to take into account the farmers’ insights since they have experience of their area and knowledge that would have been passed on for generations (Agrawal 1995; Hart and Vorster 2006; Magoro and Masoga 2009). Table 5.5 summarises how extension workers integrate farmers’ knowledge into their knowledge management practices.

**Table 5.5: Summary of the changes required by extension workers to integrate farmers’ knowledge into their practices**

<b>Integration of farmers’ knowledge (occurs through learning and sharing knowledge) based on literature (Subsection 2.3)</b>	<b>Findings</b>	<b>Suggestions</b>
Learn through listening, observing and sharing knowledge with the farmers	There was no evidence that the extension workers learn from farmers through listening, observing and sharing with the farmers since the extension workers use the linear model	The extension organisation should encourage the extension workers to integrate the farmers’ knowledge into their practices. This could be done by discussing knowledge gained from the farmers’

	(Subsection 4.6.3)	practices and finding ways to apply it.
Working with customers to share knowledge and find solutions to problems	There was no evidence that extension workers work together with the farmers in sharing ideas (Subsection 4.6.3.)	The extension organisation should encourage extension workers to share ideas with farmers through dialogue. As a group, they should then critically reflect on the ideas and the suitability of the ideas in order for it to be assessed.
Organisations need to unlearn old practices that do not apply any more	There was no evidence that the extension workers are willing to change their extension approaches and adopt the participation and learning approach (Subsection 4.6.3)	The organisation needs to create a culture that supports reflection and critical thinking on their current practices to find whether the current practices are effective. This would enable them to develop practices suitable for farmers.

The findings clearly showed that the extension workers are not doing much to integrate the knowledge that the farmers had shared with them. The extension workers do not use extension approaches which would enable them to learn and share knowledge with the farmers. For integration of the farmers' knowledge, the extension workers need to use the participation model and the learning model which would enable the extension workers to learn together with the farmers and work in partnership with the farmers in order to encourage the farmers to become active participants.

The extension organisations should encourage the extension workers to unlearn old practices that may no longer be applicable to the farmers, and generally the extension workers should be encouraged to work and share ideas with the farmers.



## 5.3 Conclusion

The conclusion provided in this subsection is based on the findings of this research. The development of the conclusion is drawn from the sub-objectives and the discussion in Subsection 5.1.

1. As a department, the extension works have set a foundation for knowledge management through the construction and storing of knowledge. However, these practices need to improve to form an efficient knowledge management system and additional practices need to be included, such as managing of the knowledge and finding ways for it to be applied with the farmers (use) (Subsection 5.2.1).
2. The approach (linear approach) that the extension workers use with the farmers prevents knowledge sharing and learning from taking place between the farmers and the extension workers. The use of the participatory approach and the learning approach by the extension workers would enable learning and knowledge sharing between the farmers and the extension workers to take place (Subsection 5.2.2).
3. There is a need for the extension workers to use extension approaches that would enable learning, knowledge sharing and integration of farmers' knowledge into the extension workers' practices. The extension organisation should adopt a culture of unlearning old practices for the organisation to be able to integrate the farmers' shared knowledge and to use other extension approaches (Subsection 5.2.3).

## 5.4 Recommendations

The recommendations are based on the findings from the study and are guided by the main objective of the research. The recommendations will be on practice, theory and further research.

### 5.4.1 *Recommendation for practice*

- The extension organisation should ensure that effective practices for construction, storage, dissemination and use of the knowledge are in place.

- There is a need for continuous evaluation of effectiveness of the extension approaches in use by extension workers to establish whether they encourage knowledge sharing and learning between farmers and extension workers.
- The extension organisation should encourage a culture of unlearning old practices that may no longer be applicable in their line of work. The organisation should always be aware of any developments in the field of extension and should always strive to make new developments available to the extension workers that would encourage efficient knowledge management practices within the organisation as well as with the farmers.

#### **5.4.2 Recommendations for further research**

The following are some areas that may need to be explored to enhance further understanding of knowledge management practices applied by extension workers:

- Development of a knowledge management model for extension organisations which will take into consideration the needs of agriculture extension stakeholders.
- Exploration of the ways extension organisations support extension workers in capturing farmers' indigenous knowledge.

### **5.5 Conclusion**

This research was aimed at exploring the knowledge management practices which extension workers use to support community garden farmers in the uMgungundlovu District Municipality. Literature and the findings revealed that the extension organisation does have a foundation in place for knowledge management practices. However, there is still a need for the extension organisation to address the effectiveness of the knowledge management practices, within the department as well as with the farmers.

This research sought to answer the following research question: *Are the knowledge management practices applied by extension workers adequate to support community garden farmers in the uMgungundlovu District Municipality?* This question was answered by three sub-objectives:

- explore how extension workers manage knowledge within the Department of Agriculture and Environmental Affairs related to community gardens;

- explore how the knowledge shared between extension workers and the community gardeners is managed by extension workers; and explore how extension workers integrate the knowledge gained from the community gardeners into their practices.

Literature was applied to reflect critically on the data in order to have an understanding of the actual and ideal situation for the knowledge management at the department of agriculture and environmental affairs uMgungundlovu District. Based on the three sub-objectives, the first finding of this research is that the extension organisation does have in a foundation place for knowledge management to construct and store knowledge, however the extension workers are not effectively managing the knowledge gained from the knowledge management to improve their own practices and the practices with in terms of farmers. The second finding was that the extension workers' practices do not encourage learning and sharing of knowledge with farmers. The third finding was that the extension workers do not integrate the knowledge shared by farmers into their worker practices.

The effectiveness of knowledge management within an organisation is important since benefits that result from knowledge management not only accrue to the organisation but also to the clients. In the case of agricultural extension, farmers as clients of extension will also benefit. To overcome the lack of effectiveness of knowledge management it is important that the extension organisation has in place practices that encourage sharing of knowledge and learning to take place, within the organisation as well as in terms of the farmers.

## REFERENCE LIST

- Adams, M.E. 1982. *Agricultural extension in developing countries*. Essex: Longman.
- Adeya, S. 2007. *A journey without maps: Towards sustainable subsistence agriculture in South Africa*. University of KwaZulu-Natal, Pietermaritzburg.
- Agrawal, A. 1995. Indigenous and scientific knowledge: Some critical comments. *Development and Change* 26:413–439.
- Agus, A., Baker, S. and Kandampully, J. 2007. An exploratory study of service quality in the Malaysian public service sector. *International Journal of Quality and Reliability Management* 24(2):177–190.
- Alavi, M. and Leidner, D. E. 2007. Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly* 25(1):107–136.
- Allahyari, M.S. 2008. Redefining of agricultural extension objectives towards sustainability in Iran. *American-Eurasian Journal of Agriculture and Environmental Science* 4(3):349–353.
- Alryalat, H. and Hawari, S.A. 2008: Towards customer knowledge relationship management: Integrating knowledge management and customer relationship management process. *Journal of Information and Knowledge Management*, 7(3):145–157.
- Ashley, C. and Maxwell, S. 2001: Rethinking rural development. *Development Policy Review*, 19(4):395–425.
- Bembridge, T.J. 1991: *The practice of agricultural extension: A training manual*. Halfway House: Development Bank of Southern Africa.
- Black, A.W. 2000: Extension theory and practice: A review. *Australian Journal of Experimental Agriculture*, 40:493–502.
- Boateng, W. 2006: Knowledge management working tool for agricultural extension: The case of Ghana. *Knowledge Management for Development Journal*, 2(3):19–29.
- Breakwell, G. M. 2000: Introducing research methods in psychology. In Breakwell, G. M., Hammond, S. and Fife-Schaw, C. (eds.), *Research methods in psychology*, (2<sup>nd</sup> ed.), 2-4. Sage: London
- Bryman, A. 2004: *Social research methods*. Oxford University Press: London.

- Burns, R. B. 2000: *Introduction to research methods*. Sage Publications: London.
- Calantone, R. J., Cavsgil, S. T. and Zhao, J. 2002: Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, 31:515–524.
- Call, D. 2005: Knowledge management: Not rocket science. *Journal of Knowledge Management*, 9(2):19–30.
- Carnerio, A. 2000: How does knowledge management influence innovation and competitiveness? *Journal of Knowledge Management*, 4(2):87–98.
- Chambers, R. 1997: *Whose reality counts?: Putting the first last.:* Intermediate Technology Publications: London.
- Chua, A. 2003: A framework for knowledge management implementation. *Journal of Information and Knowledge Management*, 2(1):79–86.
- Clarke, A. 2001: *Learning organisations: What they are and how to become one*. NIACE: Leicester.
- Connell, J. G., Photakoun, V., Pathanmavong, O. and Miller, J. 2005: Participatory extension approaches in support of technology development and adaptation. [www.nafri.org.la](http://www.nafri.org.la) (Accessed 3 April 2010).
- Cormican, K. and Dooley, L. 2007: Knowledge sharing in a collaborative networked environment. *Journal of Information and Knowledge Management*, 6(2):105–114.
- Creswell, J.W. 2009: *Research design: Qualitative, quantitative, and mixed methods approaches*, (3rd ed.) Sage: London.
- Crocetti, C. 2002: Corporate learning: A knowledge management perspective. *Internet and Higher Education*, 4:271–285.
- Daft, R.L. 2007: *Understanding the theory and design of organisations*. Thomson South-Western: Mason.
- Darroch, J. 2003: Developing a measure of knowledge management behaviours and practices. *Journal of Knowledge Management*, 7(5):41–54.
- Davenport, T.H., and Prusak. L. 1998: *Working knowledge: How organizations manage what they know*. Cambridge: Harvard Business School Press.

- De Paula, R. and Fisher, G. 2006: Knowledge management: Why learning from the past is not enough! In Davis, J., Subrahmanian, E. and Westerberg A. (eds.), *Knowledge management: Organizational and technological dimensions*. Physica-Verlag: German.
- Demerest, M. 1997: Understanding knowledge management. *Long Range Planning*, 30(3):374–384.
- Department of Agriculture 2001: *Strategic plan for South African agriculture*. Department of Agriculture: Pretoria.
- Department of Agriculture. 2005: *Norms and standards for extension and advisory services in agriculture*. Directorate: Scientific Research and Development: Pretoria.
- Despres, C. and Chauvel, D. 2000: A thematic analysis of the thinking in knowledge management. In Despres, C. and Chauvel, D. (eds.), *Knowledge horizons: The present and the promise of knowledge management*. Butterworth-Heinemann: Boston.
- Dexter, E. 1986: Strategies in the transfer of agricultural technology, with reference to Northern Europe. In Jones G. E. (ed.), *Investing in rural extension: Strategies and goals*, 121-127. Elsevier Applied Science Publishers: London.
- Diakoulakis, I.E., Georgopoulos, N.B., Koulouriotis, D.E. and Emiris, D.M. 2004: Towards a holistic knowledge management model. *Journal of Knowledge Management*, 8(1):32–46.
- Duvel, G.H. 2005: Principles, realities and challenges regarding institutional linkages for participatory extension and rural development in South Africa. *South African Journal of Agricultural Extension*, 34(2):188–200.
- Earl, M. 2001: Knowledge management strategies: Towards a taxonomy. *Journal of Management Information Systems*, 18(1):215–233.
- Edvinsson, L. 1997: Developing intellectual capital at Skandia. *Long Range Planning*, 30(3):366–373.
- Eraut, M. 2008: Learning from other people in the work place. In Hall, P. K., Murphy, P. and Soler, J. (eds.), *Pedagogy and practice: Cultures and identities*, 40-57. Sage: Los Angeles.

- Farrington, J. 1998: Organisational roles in farmer participatory research and extension: Lessons from the last decade. *Natural Resources Perspective 27*, Overseas Development Institute. London. <http://www.odi.org.uk/resources/download/2130.pdf> [Accessed 3 July 2010].
- Food and Agriculture Organisation (FAO). 2004: *Socio-economic analysis and policy implications of the roles of agriculture in developing countries*. Research programme summary report: Rome
- Freire, P. 2000: *Pedagogy of the oppressed*. Transl. M. Bergman Ramos. Continuum: New York.
- Gao, F., Li, M. and Nakamori, Y. 2002: Systems thinking on knowledge and its management: Systems methodology for knowledge management. *Journal of Knowledge Management*, 6(1):7–17.
- Griffith, W.S. 1994: Applying learning theory in extension work. In Blackburn, D. J. (ed.), *Extension handbook: Processes and practices*, (2<sup>nd</sup>ed.), 18-25. Thompson Educational Publishing: Toronto.
- Guba, E.G. 1981: Criteria for assessing the trustworthiness of naturalistic inquiries. *ECTJ Annual Review Paper*, 29(2):75–91.
- Hagman, J., Chuma, E., Murirwa, K. and Connolly, M. 1998: Learning together through participatory extension: A guide to an approach to development in Zimbabwe. AGRITEX: Harare.
- Hailey, J. and James, R. 2002: Learning leader: The key to learning organisations. *Development in Practice*, 12(3):398–405.
- Hall, D.J. and Paradice, D. 2005: Philosophical foundations for a learner-oriented knowledge management system for decision support. *Decision Support*, 39:445–461.
- Handzic, M. 2003: An integrated framework of knowledge management. *Journal of Information & Knowledge Management*, 2(3):245–252.
- Hart, T. and Vorster, I. 2006: *Indigenous knowledge on the South African landscape: Potential for agricultural development*. HSRC Press: Cape Town.
- Hart, T.G.B. 2003: Land reform: What have we learned. *South African Journal of Agricultural Extension*, 32:15–27.

- Haslinda, A. and Sarinah, A. 2009: A review of knowledge management models. *Journal of International Social Research*, 2(9):187–198.
- Hedlund, G. 1994: A model of knowledge management and the N-form corporation. *Strategic Management Journal*, 15:73–90.
- Henning, E., Van Rensburg, W. and Smit, B. 2004: *Finding your way in qualitative research*. Van Schaik Publishers: Pretoria.
- Inkpen, A. and Dinur, A. 1998: Knowledge management processes and international joint ventures. *Organisational Science*, 9(4):454–468.
- Jacobs, P. and Andrews, N. 2009: *Nourishing rural poverty-South Africa's unchanging land relations*. Paper presented at the 11<sup>th</sup> IESE Conference, in Maputo, Mozambique, 22–23 April. [http://www.hsrc.ac.za/Research\\_Publication-21521.htm](http://www.hsrc.ac.za/Research_Publication-21521.htm) (Accessed 17 September 2010).
- Jama, B. and Pizarro, G. 2008: Agriculture in Africa: Strategies to improve and sustain smallholder production systems. *Annals of the New York Academy of Science*, 1136:218–232.
- Jayne, T.S, Yamano, T., Weber, M.T., Tschirely, D., Benfica, R., Chapota, A. and Zulu, B. 2003: Smallholder income and land distribution in Africa: Implications for poverty reduction strategies. *Food Policy*, 28:253–275.
- Jurisia, I., Mylopoulos, J. and Yu, E. 2004: Ontologies for knowledge management: An information systems perspective. *Knowledge and Information Systems*, 6:380–401.
- Kanapeckiene, L., Kaklauskas, A., Zavadskas, E.K. and Senuit, M. 2010: Integrated knowledge management model and system for construction projects. *Engineering Applications of Artificial Intelligence*, 23(7): 1200-1215.
- Kiessling, T.S., Richey, R.G., Meng, V. and Dubic, M. 2009: Exploring knowledge management to organizational performance outcomes in a transitional economy. *Journal of World Business*, 44:421–433.
- Kim, D.H. 2007: The link between individual and organisational learning. In Starkey, K., Tempest, S. and Mckinlay, A. (eds.), *How organisations learn: Managing the search for knowledge*, 29-50. Thomson Learning: London.



- Koenig, M.E.D. 1998: From intellectual capital to knowledge management: What are they talking about. *INSPEL*, 32(4):222–233. <http://forge.fh-potsdam.de/~IFLA/INSPEL/98-4koem.pdf> (Accessed 13 October 2010).
- Koh, S.C.L., Gunasekaran, A., Thomas, A. and Arunachalam, S. 2005: The application of knowledge management in call centres. *Journal of Knowledge Management*, 9(4):56–69.
- Kok, A. 2007: Intellectual capital management as part of knowledge management initiatives at institutions of higher learning. *The Electronic Journal of Knowledge Management*, 5(2):181–192. <http://www.jps-dir.com/forum/uploads/13352/Kok.pdf> (Accessed 26 June 2010).
- Kroenke, D. 1989: *Management information systems*. McGraw-Hill Book Company. New York.
- Kurwijila, R., Mkandawire, R. and Jones, M.P. 2006: *Framework for African agricultural productivity*. [http://www.caadp.net/pdf/FAAP\\_English\\_13Oct06.pdf](http://www.caadp.net/pdf/FAAP_English_13Oct06.pdf) (Accessed 30 November 2010).
- Kwan, M.M. and Balasubramania, P. 2003: Process-oriented knowledge management: A case study. *Journal of the Operational Research Society*, 54(2):204–211. [www.jstore.org](http://www.jstore.org) (Accessed 9 April 2010).
- Lang, J.C. 2001: Managerial concerns in knowledge management. *Journal of Knowledge Management*, 5(1):43–57.
- Lank, E. 1997: Leveraging the invisible assets: The human factor. *Long Range Planning* 30(3):406–412.
- Law, C.C.H. and Ngai, E.W.T. 2007: An empirical study of the effect of knowledge sharing & learning behaviours on firm performance. *Expert System with Applications* 34:2342–2349.
- Liao, S.-h. 2003: Knowledge management technologies and applications-Literature review from 1995 to 2002. *Expert Systems with Applications* 25:155–164.
- Lim, D. and Klobas, J.2000: Knowledge management in small enterprises. *The Electronic Library*, 18(6):420–432.

- Lopez, S., Peon, J. and Ordas, C. 2004: Managing knowledge: The link between culture and organization learning. *Journal of Knowledge Management*, 8(6):93–104.
- Machethe, C.L. 2004. *Agriculture and poverty in South Africa: Can agriculture reduce poverty*. [http://cfapp1-docpublic.undp.org/eo/evaldocs1/sfcl/eo\\_doc\\_357114047.pdf](http://cfapp1-docpublic.undp.org/eo/evaldocs1/sfcl/eo_doc_357114047.pdf) (Accessed 15 March 2010).
- Magoro, M.D. and Masoga, M. 2009: Aspects of indigenous knowledge and protection in small-scale farming systems: A challenge for advancement. *African Journal of Indigenous Knowledge Systems*, 4(2): 414-428.
- Marouf, L. 2004: Role and contribution of corporate information centers toward KM initiatives: An analysis of managers' perceptions. *Journal of Information & Knowledge Management*, 3(1):9–25.
- Marr, B., Gupta, O., Pike, S. and Roos, G. 2003: Intellectual capital and knowledge management effectiveness. *Management Decision*, 41(8):771–781.
- Martin, K. 2003: Evaluating the benefits of knowledge management. [http://www.providersedge.com/docs/km\\_articles/Evaluating\\_the\\_Benefits\\_of\\_KM.pdf](http://www.providersedge.com/docs/km_articles/Evaluating_the_Benefits_of_KM.pdf) (Accessed 10 October 2010).
- McAdam, R. and McCreedy, S. 1999: A critical review of knowledge management models. *The Learning Organisation*, 6(3):91–100.
- Mchombu, K.J. 2007: Harnessing knowledge management for Africa's transition to the 21<sup>st</sup> century. *Information and Development*, 23(1):25–41.
- Merriam, S.B. 1999: Introduction to qualitative research. <http://ct.childrensfriends.com> (Accessed 2 November 2010).
- Metaxiotis, L. and Psarras, J. 2003: Applying knowledge management in higher education: The creation of a learning organisation. *Journal of Information and Knowledge Management*, 2(4): 1-7.
- Milton, N. 2005: *Knowledge management for teams and projects*. Chandos Publishing: Oxford.
- National Department of Agriculture (NDA). 2001: *The strategic plan for South African agriculture*. Department of Agriculture: Pretoria.

- Ng, P.T.2004: The learning organisation and the innovative organisation. *Human System Management*, 23:93–100.
- Nieuwenhuis, J. 2007. Analysing qualitative data. In K. Maree(ed.).*First steps in research*, 99-122. Van Schaik: Pretoria.
- Nonaka, I. 1991: The knowledge creating company. *Harvard Business Review*, 69:96-104.
- Nonaka, I. 1994: A dynamic theory of organisational knowledge creation. *Organization Science*, 5(1):14–37.
- Nonaka, I. and Konno, N. 1998: The concept of Ba: Building a foundation of knowledge creation. *California Management Review*, 40(3):40-54.
- Nonaka, I. and Takeuchi, H. 1995: *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press: New York.
- Nonaka, I., Toyama, R. and Konno, N. 2002: SECI, Ba and leadership: a unified model of dynamic knowledge creation. In Little, S., Quintas, P. and Ray, T. (eds.), *Managing knowledge: An essential reader*, 41-67. The Open University: London.
- Pascore, C. and More, E. 2005: Communication climate and organisational knowledge sharing. *Journal of Information and Knowledge Management*, 4(4):247–255.
- Patton, M.Q. 1990: *Qualitative evaluation and research methods*, (2<sup>nd</sup> ed.). Sage Publications: London.
- Quintas, P., Lefrere, P. and Jones, G. 1997: Knowledge management: A strategic agenda. *Long Range Planning*, 30(3): 385–391.
- Quintas, P.2002. Managing knowledge in a new company.In S. Little, P. Quintas& T. Ray (eds.), 1-18. *Managing knowledge: An essential reader*. The Open University: London.
- Rahman, S. 2009: Learning from experience in urban programming: the case of the SHAHAR project in Bangladesh. *Development in Practice*, 19(2): 173-186.
- Richards, D. and Busch,P. 2003: Acquiring and applying contextualised tacit knowledge. *Journal of Information & Knowledge Management*, 2(2):179–190.
- Riveria, W.M. 1998: Agricultural extension as adult education: Institutional evolution and forces for change. *International Journal of Lifelong Education*, 17(4):260–264.

- Riveria, W.M. 2006: Agricultural knowledge and development in a new age and a different world. *International Journal of Lifelong Education*, 13(2):57–67.
- Riveria, W.M. and Qamar, M.K. 2003: *Agricultural extension, rural development and the food security challenge*. Rome: FAO.
- Rogers, A. 1996: *Teaching adults*, (2<sup>nd</sup> ed.). Open University Press: Buckingham.
- Röling, N. 1995a: *Extension science*. Cambridge University Press: Cambridge.
- Röling, N. 1995b: What to think of extension. *AERDD Bulletin*.
- Roper, L. and Pettit, J. 2003: Development and the learning organisation: An introduction. In Roper, L., Pettit, J. and Eade (eds.), 1-21. *Development and the learning organisation: Essays in development practice*. Oxfam: Oxford.
- Ross, R., Smith, B., Roberts, C. and Kleiner, A. 1994: Core concepts about learning in organisations. In Senge, P., Ross, R., Smith, B., Roberts, C. and Kleiner (eds.). *The fifth discipline: Fieldbook*. Currency Doubleday: New York.
- Rowely, J. 2000: From learning organization to knowledge entrepreneur. *Journal of Knowledge Management*, 4(1):7–15.
- Seng, C.V., Zannes, E. and Pace, R.W. 2002: The contributions of knowledge management to workplace learning. *Journal of Workplace Learning*, 14(4):138–147.
- Senge, P. 2002: The learning organisation. <http://goliath.ecnext.com> (Accessed 3 July 2010).
- Senge, P., Ross, R., Smith, B., Roberts, C. and Kleiner, A. 1994: *The fifth discipline: Fieldbook*. Currency Doubleday: New York.
- Senge, P.M. 2000. *Schools that learn: A fifth discipline fieldbook for educators, parents, and everyone who cares about education*. New York: Doubleday.
- Sher, P.J. and Lee, V.C. 2004: Information technology as a facilitator for enhancing dynamic capabilities through knowledge management. *Information & Management*, 41:933–945.
- Silverman, D. 2010: *Doing qualitative research*, (3<sup>rd</sup> ed.) Sage: London.
- Smith, P. J. 2003: Workplace learning and flexible delivery. *Review of Educational Research*, 73(1): 53-88.

- Soanes, C. and Stevenson, A. 2006: Concise Oxford English Dictionary, (11<sup>th</sup> ed.). Oxford University Press: Oxford.
- Statistics South Africa. 2007: *Mid-year population estimates 2007*. <http://www.statssa.gov.za/publications/P0302/P03022007.pdf>. (Accessed 12 October 2010).
- Statistics South Africa. 2010: *Mid-year population estimates 2010*. <http://www.statssa.gov.za/publications/P0302/P03022010.pdf>. (Accesses 12 October 2010).
- Sulaiman, V.R. and Hall, A. 2001: Beyond technology dissemination: Reinventing agricultural extension. *Outlook on Agricultural*, 31(4):225–233.
- Tiwana, A. 2000: *The knowledge management toolkit: Practical techniques for building a knowledge management system*. Prentice Hall: New Jersey.
- Tuomi, I. 1999: Data is more than knowledge: Implications of the reversed knowledge hierarchy for knowledge management and organisational memory. *Journal of Management Information Systems*, 16(3):107–121.
- Van den Ban, A.W. and Hawkins, H.S. 1997: *Agricultural extension*, (2<sup>nd</sup> ed.). Blackwell Science: Oxford.
- Van Horne, C., Frayret, J.M. and Poulin, P. 2005: Knowledge management in the forest products industry: The role of centres of expertise. *Computers and Electronics in Agriculture* 47:167–184.
- Wassenaar, D.R. 2006: Ethical issues in social science research. In Terre Blanche, M., Durrheim, K. and Painter, D. (eds.), 60-79. *Research in practice: Applied methods for the social sciences*. UCT Press: Cape Town.
- Welman, C., Kruger, F. and Mitchell, B. 2005: *Research methodology*, 3<sup>rd</sup> ed. Oxford University Press Southern Africa: Cape Town.
- Wen, Y-F. 2009: An effectiveness measurement model for knowledge management. *Knowledge-based System*, 22:363–367.
- Wigg, K.A. 1997: Integrating intellectual capital and knowledge management. *Long Range Planning*, 30(3):399–405.

- Wong, K. Y. and Aspinwall, E. 2004: A fundamental framework for knowledge Management implementation in SMEs. *Journal of Information & Knowledge Management*, 3(2):155–166.
- World Bank. 2004. *Monitoring and evaluation: Some tools, methods and approaches*. <http://www.Inweb90.worldbank.org/oed/oeddoelib.nsf> [Accessed 17 July 2010].
- Worth, S. 2002: *Sustainable extension: Not transformation, but renewal*. Proceedings of the 18<sup>th</sup> Annual Conference. AIAEE.
- Worth, S.H. 2006: Agriflection: A learning model for agricultural extension in South Africa. *The Journal of Agricultural Education and Extension*, 12(3):179–193.
- Xia, Y., Ke, F. and Sharma, P. 2008: The effect of peer feedback for blogging on college students' reflective learning process. *Internet and Higher Education*, 11:18–25.
- Zheng, W. 2009: The knowledge inducing culture: An integrative framework of cultural enablers of knowledge management. *Journal of Information and Knowledge Management*, 8(3):213–227.
- Zhou, A.Z. and Fink, D. 2003: The intellectual capital web: A systematic linking of intellectual capital and knowledge management. *Journal of Intellectual Capital*, 4(1): 34-48.

# APPENDICES

## Appendix A: Interview schedule for extension workers

### Information sheet and Informed consent form

My name is Jorine Ngoro I am Master of Agriculture student studying at the University of Kwa-Zulu Natal. I am working with the approval of the School of Science and Agriculture supervised by Dr. Marietjie van der Merwe. I am doing a study on extension officers and farmers.

**I would like to invite you to participate in this research.**

**If you decide to take part in this interview please note the following:**

Your participation is completely voluntary.

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

You have the right to withdraw from the study at any point without any penalty.

There is no direct risk of physical and legal harm in this study.

You are free not to answer any questions that make you uncomfortable. If you feel that some of the questions asked cause you tension and anxiety or any distress you will be provided with a referral to see a counselor from the University of Kwa-Zulu Natal (Pietermaritzburg).

I will be asking you to discuss to a few questions that will be asked in an interview that will take approximately an hour. The interview will be recorded for transcription purposes. The interviews will be used for the preparation of a report, conference presentations and academic publications. This means that your words will be quoted but as mentioned before nobody will be able to identify who was speaking. Furthermore all names that you may mention will be deleted.

### Participation agreement

I.....have read and understood the above document. I have been given an opportunity to ask questions about the research and they have been answered to my satisfaction. I agree to be interviewed.

Signature of the participant.....

Date.....

### Participant agreement for the use of the tape recorder

I.....agree to the use of the tape recorder for the interview.

Signature of the participant.....

**If you have any additional concerns or questions, please contact the supervisor, Dr. Marietjie van der Merwe , 033 260 5070 or [vandermerwem@ukzn.ac.za](mailto:vandermerwem@ukzn.ac.za)**

### Contact Summary Sheet

Interviewer :

Interviewee :

Site :

Contact Date :

Duration :

*Description of the interview atmosphere, pace and openness.*

*What were the main issues or themes that struck you in this contact?*

*Summarize the information you got (or failed to get).*

*Anything that struck you as salient, interesting, illuminating or important.*



## Extension worker Questionnaire

### Section A

Age

Gender

FEMALE	MALE
--------	------

1. What position do you hold in the department of Agriculture and Environmental Affairs?

.....

2. In which municipality do you work in?

.....

3. For how long have you been working with the Department of Agriculture and Environmental Affairs?

.....

4. What qualifications do you hold?

.....

5. Do you work with an assistant or you work on your own with the farmers?

.....

## Section B

1. Can you tell me about your work at the Department of Agriculture and Environmental Affairs?

- Who do you report to?
- What sort of relationship do you have with the person you report to?
- How is your relationship like with the other extension workers?

2. May you describe the duties which you are responsible for at the Department of Agriculture and Environmental Affairs?

- What do you usually spend your time on e.g. meetings, workshops, demonstrations?
- Do you carry out the same duties all year round?
- How are you assigned these duties e.g. based on experience, knowledge, area of specialisation?

3. Tell me about the meetings that you attend at the Department of Agriculture and Environmental Affairs?

- Who usually attends the meetings?
- What issues are generally discussed at the meetings?
- Is there someone who records the minutes of the meetings?

4. Is there any sharing of experience among the extension workers and the person you report to?

- What sort of experiences is shared?
- The issues that are shared do they help you in your daily work?
- In your opinion is it beneficial that extension workers are able to share their experiences?

5. Can you tell me what happens to the minutes of the meetings that you take part in?

- Where are the records of the meetings kept and are they easily accessible?
- Have you ever referred back to some of the records of past meetings?
- Is it important that all meetings are recorded?

6. Tell me about the work that you do with the farmers?

- How often do you visit the farmers?
- Do you visit them on the request of the farmers?
- What issues do the farmers usually raise with you?

7. Could you explain how you conduct the contact sessions with the farmers?

- How do you address issues that farmers may have?
- How do you introduce new technologies to the farmers?
- How do you involve the farmers in your work?
- How do you teach the farmers?

8. May you tell me about the relationship that you have with the farmers?

- Do the farmers share their experiences and knowledge with you?
- Have you ever had incidences where farmers shared experiences and knowledge which was different from your own as an extension worker?
- What do you do with the farmers' experiences or knowledge, e.g. do you record them and share with other extension workers?

9. Is there any value in the farmers' experiences or knowledge which may enhance your work?

- Have you ever shared farmers' experiences or knowledge to assist other farmers or fellow extension workers?
- Do you take into consideration the farmers experience and knowledge into your work with the farmers?
- Does the person that you report to encourage the sharing of farmers' experiences and knowledge among the extension workers to assist with issues that farmers may have?

10. May you tell how you think extension workers should work with farmers?

- How should the relationship be with the farmers?
- How often should extension workers visit the farmers?
- What should be done with the farmers' experience and knowledge? E.g. keep records, share it with other extension workers, encourage farmers to share with other farmers.

11. Can you tell me how efficient are extension workers with the management of farmer's experiences and knowledge?

- Do extension workers share farmers' knowledge and experiences with each other?
- Are there documents written specifically on the farmers' experiences and knowledge?
- How best do you think farmers' experiences may be captured for future use?

12. What sort of issues do you encounter with farmer working in community gardens?

- How do you usually address these issues?
- Do you ever consult other extension workers on issues involving farmers that you may not be clear or sure on how to address?
- Do you encourage farmers to discuss with you on how to best address a problem?

13. Is there any other issues that you may want to discuss?

**Thank you**

## **Appendix B: Interview schedule for supervisor**

### **Information sheet and Informed consent form**

My name is Jorine Ngoro I am Master of Agriculture student studying at the University of Kwa-Zulu Natal. I am working with the approval of the School of Science and Agriculture supervised by Dr. Marietjie van der Merwe. I am doing a study on extension officers and farmers.

**I would like to invite you to participate in this research.**

**If you decide to take part in this interview please note the following:**

Your participation is completely voluntary.

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

You have the right to withdraw from the study at any point without any penalty.

There is no direct risk of physical and legal harm in this study.

You are free not to answer any questions that make you uncomfortable. If you feel that some of the questions asked cause you tension and anxiety or any distress you will be provided with a referral to see a counselor from the University of Kwa-Zulu Natal (Pietermaritzburg).

I will be asking you to discuss to a few questions that will be asked in an interview that will take approximately an hour. The interview will be recorded for transcription purposes. The interviews will be used for the preparation of a report, conference presentations and academic publications. This means that your words will be quoted but as mentioned before nobody will be able to identify who was speaking. Furthermore all names that you may mention will be deleted.

### **Participation agreement**

I.....have read and understood the above document. I have been given an opportunity to ask questions about the research and they have been answered to my satisfaction. I agree to be interviewed.

Signature of the participant.....

Date.....

### **Participant agreement for the use of the tape recorder**

I.....agree to the use of the tape recorder for the interview.

Signature of the participant.....

**If you have any additional concerns or questions, please contact the supervisor, Dr. Marietjie van der Merwe , 033 260 5070 or [vandermerwem@ukzn.ac.za](mailto:vandermerwem@ukzn.ac.za)**

### Contact Summary Sheet

Interviewer :

Interviewee :

Site :

Contact Date :

Duration :

*Description of the interview atmosphere, pace and openness.*

*What were the main issues or themes that struck you in this contact?*

*Summarize the information you got (or failed to get).*

*Anything that struck you as salient, interesting, illuminating or important.*

## Extension Supervisor Questionnaire

### Section A

Gender

FEMALE	MALE
--------	------

1. What position do you hold in the department of Agriculture and Environmental Affairs?

.....

2. In which municipality do you work in?

.....

3. For how long have you been working with the Department of Agriculture and Environmental Affairs?

.....

4. What qualifications do you hold?

.....

## Section B

1. Can you tell me about your work at the Department of Agriculture and Environmental Affairs?

- Who do you report to?
- What sort of relationship do you have with the person you report to?
- How is your relationship like with your subordinates, the other extension workers?

2. May you describe the duties which you are responsible for at the Department of Agriculture and Environmental Affairs?

- What do you usually spend your time on e.g. meetings, workshops, demonstrations?
- Do you carry out the same duties all year round?
- How are you assigned these duties e.g. based on experience, knowledge, area of specialisation?

3. Tell me about the meetings that you attend at the Department of Agriculture and Environmental Affairs?

- Who usually attends the meetings?
- What issues are generally discussed at the meetings?
- Is there someone who records the minutes of the meetings?

4. Can you tell me what happens to the minutes of the meetings that you take part in?

- Where are the records of the meetings kept and are they easily accessible?
- Have you ever referred back to some of the records of past meetings?
- Have you encouraged extension workers to refer back to records?
- Is it important that all meetings are recorded?

5. Is there any sharing of experience among the extension workers and you?

- What sort of experiences is shared?
- The issues that are shared do they help you in your daily work and do you think they help the extension workers in their work?
- In your opinion is it beneficial that extension workers are able to share their experiences?



6. May you tell me about the relationship that you have with the extension workers?

- Do the extension workers share their experiences and knowledge with you?
- Have you ever had incidences where extension workers shared experiences and knowledge which was different from your own as supervisor?
- What do you do with the extension workers' experiences or knowledge, e.g. do you record them and share with other extension workers?

7. Tell me about the work that extension workers do with the farmers?

- How often do they visit the farmers?
- Do they visit them on the request of the farmers?
- What issues do the farmers usually raise with extension workers?

8. Could you explain how extension workers conduct the contact sessions with the farmers?

- How do they address issues that farmers may have?
- How do they introduce new technologies to the farmers?
- How do they involve the farmers in your work?
- How do they teach the farmers?

9. May you tell me how you think extension workers should work with farmers?

- How should the relationship be with the farmers?
- How often should extension workers visit the farmers?
- What should be done with the farmers' experience and knowledge? E.g. keep records, share it with other extension workers, encourage farmers to share with other farmers.

10. Is there any value in the farmers' experiences or knowledge which may enhance your work?

- Have you ever shared farmers' experiences or knowledge to assist other farmers or fellow extension workers?
- Do you take into consideration the farmers experience and knowledge into your work with the farmers?

- Does the person that you report to encourage the sharing of farmers' experiences and knowledge among the extension workers to assist with issues that farmers may have?

11. Can you tell me how efficient are extension workers with the management of farmer's experiences and knowledge?

- Do extension workers share farmers' knowledge and experiences with each other?
- Are there documents written specifically on the farmers' experiences and knowledge?
- How best do you think farmers' experiences may be captured for future use?

12. What sort of issues do you encounter with extension workers working in community gardens?

- How do you usually address these issues?
- Do you ever consult other extension workers on issues that you may not be clear or sure on how to address?
- Do you encourage extension workers to discuss with you on how to best address a problem?

13. Is there any other issues that you may want to discuss?

**Thank you**

## **Appendix C: Focus group schedule for extension workers and their supervisor**

### **Information sheet and Informed consent form**

My name is Jorine Ngoro I am Master of Agriculture student studying at the University of Kwa-Zulu Natal. I am working with the approval of the School of Science and Agriculture supervised by Dr. Marietjie van der Merwe. I am doing a study on extension officers and farmers.

**I would like to invite you to participate in this research.**

**If you decide to take part in this interview please note the following:**

Your participation is completely voluntary.

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

You have the right to withdraw from the study at any point without any penalty.

There is no direct risk of physical and legal harm in this study.

You are free not to answer any questions that make you uncomfortable. If you feel that some of the questions asked cause you tension and anxiety or any distress you will be provided with a referral to see a counselor from the University of Kwa-Zulu Natal (Pietermaritzburg).

I will be asking you to discuss to a few questions that will be asked in an interview that will take approximately an hour. The interview will be recorded for transcription purposes. The interviews will be used for the preparation of a report, conference presentations and academic publications. This means that your words will be quoted but as mentioned before nobody will be able to identify who was speaking. Furthermore all names that you may mention will be deleted.

### **Participation agreement**

I.....have read and understood the above document. I have been given an opportunity to ask questions about the research and they have been answered to my satisfaction. I agree to be interviewed.

Signature of the participant.....

Date.....

### **Participant agreement for the use of the tape recorder**

I.....agree to the use of the tape recorder for the interview.

Signature of the participant.....

**If you have any additional concerns or questions, please contact the supervisor, Dr. Marietjie van der Merwe , 033 260 5070 or [vandermerwem@ukzn.ac.za](mailto:vandermerwem@ukzn.ac.za)**

### Contact Summary Sheet

Interviewer :

Interviewee :

Site :

Contact Date :

Duration :

*Description of the interview atmosphere, pace and openness.*

*What were the main issues or themes that struck you in this contact?*

*Summarize the information you got (or failed to get).*

*Anything that struck you as salient, interesting, illuminating or important.*

## Focus group Discussion Questionnaire

### Section B

1. May you describe the duties which extension workers are responsible for at the Department of Agriculture and Environmental Affairs?

- What do you usually spend your time on e.g. meetings, workshops, demonstrations?
- Do you carry out the same duties all year round?
- How are you assigned these duties e.g. based on experience, knowledge, area of specialisation?

2. Tell me about the meetings that you attend at the Department of Agriculture and Environmental Affairs?

- Who usually attends the meetings?
- What issues are generally discussed at the meetings?
- Is there someone who records the minutes of the meetings?

3. Is there any sharing of experience among the extension workers and the person they report to?

- What sort of experiences is shared?
- The issues that are shared do they help you in your daily work?
- In your opinion is it beneficial that extension workers are able to share their experiences?

4. Can you tell me what happens to the minutes of the meetings that you take part in?

- Where are the records of the meetings kept and are they easily accessible?
- Have you ever referred back to some of the records of past meetings?
- Is it important that all meetings are recorded?

5. May you tell how you think extension workers should work with farmers?

- How should the relationship be with the farmers?
- How often should extension workers visit the farmers?
- What should be done with the farmers' experience and knowledge? E.g. keep records, share it with other extension workers, encourage farmers to share with other farmers.

6. Can you tell me how efficient are extension workers with the management of farmer's experiences and knowledge?

- Do extension workers share farmers' knowledge and experiences with each other?
- Are there documents written specifically on the farmers' experiences and knowledge?
- How best do you think farmers' experiences may be captured for future use?

7. Is there any value in the farmers' experiences or knowledge which may enhance your work?

- Have you ever shared farmers' experiences or knowledge to assist other farmers or fellow extension workers?
- Do you take into consideration the farmers experience and knowledge into your work with the farmers?
- Does the person that you report to encourage the sharing of farmers' experiences and knowledge among the extension workers to assist with issues that farmers may have?

8. What sort of issues do you encounter with farmers working in community gardens?

- How do you usually address these issues?
- Do you ever consult other extension workers on issues involving farmers that you may not be clear or sure on how to address?
- Do you encourage farmers to discuss with you on how to best address a problem?

9. Is there any other issues that you may want to discuss?

**Thank you**

## **Appendix D: Interview schedule for farmers**

### **Information sheet and Informed consent form**

My name is Jorine Ngoro I am Master of Agriculture student studying at the University of Kwa-Zulu Natal. I am working with the approval of the School of Science and Agriculture supervised by Dr. Marietjie van der Merwe. I am doing a study on extension officers and farmers.

**I would like to invite you to participate in this research.**

**If you decide to take part in this interview please note the following:**

Your participation is completely voluntary.

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

You have the right to withdraw from the study at any point without any penalty.

There is no direct risk of physical and legal harm in this study.

You are free not to answer any questions that make you uncomfortable. If you feel that some of the questions asked cause you tension and anxiety or any distress you will be provided with a referral to see a counselor from the University of Kwa-Zulu Natal (Pietermaritzburg).

We are asking you to discuss to a few questions that will be asked in an interview that will take approximately an hour. The interview will be recorded for transcription purposes. The interviews will be used for the preparation of a report, conference presentations and academic publications. This means that your words will be quoted but as mentioned before nobody will be able to identify who was speaking. Furthermore all names that you may mention will be deleted.

### **Participation agreement**

I.....have read and understood the above document. I have been given an opportunity to ask questions about the research and they have been answered to my satisfaction. I agree to be interviewed.

Signature of the participant.....

Date.....

**Participant agreement for the use of the tape recorder**

I.....agree to the use of the tape recorder for the interview.

Signature of the participant.....

**If you have any additional concerns or questions, please contact the supervisor, Dr. Marietjie van der Merwe , 033 260 5348 or [vandermerwem@ukzn.ac.za](mailto:vandermerwem@ukzn.ac.za)**

Contact Summary Sheet

Interviewer :

Interviewee :

Site :

Contact Date :

Duration :

*Description of the interview atmosphere, pace and openness.*

*What were the main issues or themes that struck you in this contact?*



*Summarize the information you got (or failed to get).*

*Anything that struck you as salient, interesting, illuminating or important.*

## **FARMERS' QUESTIONNAIRE**

1. Can you tell me about your community garden start?
  - What was the purpose of starting the community garden?
  - How many members does the community garden have?
  - Is there a selection procedure to become a member?
2. Can you tell me what crops you usually grow in the garden?
  - Who decided what crops to grow?
  - How do you manage the crops?
  - Are the crops for your own consumption or selling?
3. May you describe to me your relationship with the extension worker that you have
  - Did you go to the department to seek for their assistance or they were assigned to the community by the department?
  - How often does the extension officer/s visit your community garden?
  - Do you think the visits are adequate to address your problems?
  - What do you think is the purpose of having extension officers?
  - Are they serving that purpose for you?
4. May you tell me any issues that you have encountered with the gardening?
  - Are the extension officers able to assist you overcome some of your problems?
  - Do you think you would be able to solve some of your problems without the help of extension officers?
  - Do you work together with the extension officers when solving some of the problems?
  - Do you think sharing knowledge together with the extension officers can help solve some of your problems?

4. Can you tell me of any situations where you used your own solutions to solve a problem instead of the solutions from the extension workers?

- Where did you get this knowledge from?
- Did the solution solve the problem?
- As members of a community garden do you share ideas or knowledge in trying to solve a problem or you wait for the extension officer to come?
- Do you share your own experience and knowledge with extension workers
- How do the extension workers respond to your experience and knowledge, do you think they consider it.

5. Can you tell me what you me what extension workers should do with your knowledge and experiences that they gain from you?

- Should they be stored and written in books?
- Must they share it with other farmers and extension officers?

6. Can you tell me how you usually address an issue or problem that you might have as a group and also with the extension worker?

7. Before we finish, is there anything else you would like to add to what we have discussed?

**THANK YOU**

## **Appendix E: Example of transcribed data of interview with extension workers**

### Transcription A

Researcher: Can you tell me about your work at the Department of Agriculture and Environmental Affairs, Who do you report to, What sort of relationship do you have with the person you report to, How is your relationship like with the other extension workers?

Participant: basically my job is all about providing extension services to emerging rural farmers. By that I mean we provide all the support that they need in order to support or start their new projects where they will be generating income or for subsistence purposes where the attention is on food security. I normally or with the structure or as a local extension officer we do report to the assistance manager within the district and my one is Mr X. The relationship that we have with this supervisor is on daily basis we meet every day. We discuss on the challenges facing either myself as an advisor to the people and comments or problems that clients do bring into the office and at times all the consultation within the department. And we also lease together with the supervisor as to, see to it whether people do get funding not only from the department but also from other stakeholders that are available within our country.

Researcher: Ok. So when you meet with your supervisor do you meet as a group with other extension workers or your meet on an individual one to one?

Participant: It's a two way scenario because I will meet with a supervisor on an individual basis if there is a concern or an issue that I want to discuss with him directly. But we normally we have a staff meetings that we normally have twice a month where we all come with all the extension worker including officers and their assistants. Were we then collate all the reports and then compile one thing that represents the whole district.

Researcher: So during your meetings there will be someone who will be taking down the minutes?

Participant: Off course we have a scribe on all the meetings and the minutes are being submitted to the supervisor for records.

Researcher :Ok. Can you describe to me the nature of like the meetings that you have do you share experiences, do you exchange ideas with other extensioners on issues that you might be facing in the field

Participant: On mainly, mainly in the meetings, it's were we actually exchange ideas as to how are we going to attend to the challenges within the society. And is where we even prioritize as to what are we going to target on as per report that are being submitted. Because you will find that one extension officer has got an issue and the other one also does and its where we prioritize as to when or which project to start with when it comes to funding.

So I will say with the meetings, workshops and demonstrations its good for us with the extension officers that we meet on these meetings because its where we share a lot of ideas.

Researcher: Ok so can you say that through these meetings you are able to improve on your daily work with the farmers.

Participant: We improve a lot because we are not the same and our qualifications are not the same. You would find that one is good or majored in plant production and one majored maybe in animal production and you will find that one I would say specializes on some certain subjects within agriculture because agriculture is a huge name, it's a science.

So in the meetings it's were its easy then to get somebody that can assist you, maybe it's not your field of study, you see

Researcher: Can you tell me what happens to the minutes of the meetings that you take part in. Can you sometimes go back to them and let's say you have encountered a problem can you go back to them to try and find some answers which can help you with the work that you are doing.

Participant: All minutes are being kept by the supervisor for references in fact they are a record of what the district is doing. And for that then every minute every meeting before it starts there is an item of reading of minutes where we even approve these minutes To say they are correct we know about them, we were on the meeting we were on that particular meeting. So I would say that these minutes serve as a record or bible were we refer to as what was agreed.

Researcher: So have you ever referred so some of these past meetings?

Participant: Mainly if there are projects that are being facilitated in terms of funding with the department we normally use these minutes to refer were did we start and which direction are we going. In other words these minutes act as a scale to say how we go forward.

Researcher: So can I safely say that these meetings, the recording of meetings is quiet an important thing that needs to be taken seriously?

Participant: I will agree with you because a meeting without a scriber is not a meeting generally speaking.

Researcher: Ok. Can you tell me about the work that you do with the farmers, like how often you visit the farmers and what project are the farmers working on.

Participant: The approach that I use with my farmers is we have a consultation. Where the farmers will call me to come to their sights where projects are being done, people will consult me where they want to start new projects, they want me assess their land to see if their land is suitable for a particular function. And also there is an approach were by I train and visit, so as to monitor the technology that was transferred to them whether are they doing as per training. So the visit will be gradually maybe once a week it depends on the particular type of the project.

Researcher: Ok.

Participant: Yes

Researcher: So what issues do the farmers usually raise with you once they have started a project.

Participant: Mainly, the issue that is facing I will say the society, is how can they sustain their project to generate income continuously. In other words their issues is mainly about making money as we see our economy is not stable. And most of our clients are the people whom have got no source of income, so it makes me say the main issue that you normally find with them is that they want a way to make their projects sustainable and make or generate income.

Researcher: OK. And how do you try and assist the farmers in addressing this issue?

Participant: I normally advice them never to start a project without identifying the market for the particular produce or product that will be made by that project. So with the assessment or the survey that we do when they want to propose a project is one of my concerns that I ask them as to where this produce will be sold to. If the question there is not guaranteed then I will them advice them to start another project or accept that this particular project will be on subsistence level. In other words they will be just consuming the product which is of course food security they will be using it to maintain themselves.

Researcher: Ok.

Participant: Yeah

Researcher: So do you like encourage the farmers to first research and look for their own markets before starting on a project.

Participant: I always interact or invite other stakeholders like the municipality, other departments of the state. Where then we will say off course we will need to make them see income coming to their projects. That will make them leave because I mean I won't not be an advisor if I allow them or promote them to do projects that are not making money for them.

Researcher: And on the issue of introducing new technologies to the farmers, how do you usually go about it

Participant: That is normally attained through research, going to Google and see what are other places maybe or even aboard, other countries how do they do whatever practices in agriculture. And some of the information is being attained from scientists within the department. And some are form the ministry offices where they promote a particular practice in agriculture then my duty as a facilitator or extension officer will be to cascade this particular information down to the client level. Its like promoting mushrooms, its like promoting rice, its like promoting whatever the country have seen necessary and making money off course. It's like livestock, we introduce to them some different breeds that can do well in particular seasons, you see. So as to try and promote prevention which is better than

cure. So also in plant production we introduce varieties that can sustain or do well within the given society temperature and all.

Researcher: Ok, So your teaching method can we say it's a training and visit, the teaching method with the farmers.

Participant: I will agree with you because we normally use training modules and we also refer to pamphlets, we also invite other specialist, other Ngos to train the people and also the municipality people also train the clients as per request. Because its then they say they want training on a certain particular subject. You know everyone can practice agriculture but once then they request a particular training on a particular subject we then do it. Which is always free because its state aided. They don't pay anything their contribution is only attending the particular training

Researcher: Can you tell me the nature of the relationship that you have with the farmers that you work with. Are the farmers able to share their own experience and indigenous knowledge that they have with you.

Participant: Mainly when we do demonstrations for a particular technology that we want to introduce to them, I will normally allocate land or a space to them to do it their own way. Then I will have an opposite side so that we compare the new technology to the indigenous one. And this is normally seen when people are saying, its good to use fertilizer and one is saying no we will do it the old way were we will use composite and kraal manure. Its were then you see people changing their vision when you do the harvesting then you compare then they see the yield from what they have been doing and what you have produce. So That has been seen for a long time when people where doing conventional tillage and now people are doing planting without a plough which is zero tillage . And they adopted that particular technology form demonstrations. So With the demonstrations we introduce a lot technologies within the people. Other than that its not easy to make them take whatever idea that you come, with no comparison. They always want to compare.

Researcher: Have you ever experienced an incident where actually the farmers had a different way of doing things form you which was actually beneficial or which you thought was a good way but different from what you were know as an extension worker.

Participant: I have seen it, I have seen it, its common within the society mainly in production of potatoes, I will come to them and tell them this is how we measure fertilizer and this is how we plant them. I will put a module, train them and then will do their own way were they I use kraal manure; they mix kraal manure, their own. You will find that the yield at times is on their favor because the soil or the given space has been used to that particular practice. So as an extension officer then you need to accept such cases but have a period so as for them to see the change that its good you do it the indigenous way but let's look at it maybe three years down the line and look at the sustainability of the particular practice because indigenous Yes can do well but at times, there is a time factor. It takes long to give better yield. Whereas the technology we use, I will always call the fertilizers the boosters. We use chemicals, we use whatever herbicides that will make the particular plant to grow faster.

Which means that the time factor is being taken into consideration and that is then why you need to visit the people. And say though your practices are doing well but look at the time factor. For you to have a particular yield it was such a period, for the technology to have a particular yield it was such a period. So it's always trivial to make such a comparison.

Researcher: With such an incidence, the one you mentioned about the potatoes. Do you in your meetings share such experiences that you have seen the way farmers do things with the other extension workers.

Participant: We do share all that and we also organize tours were the other extension officers will go to different sights and see what the particular official is doing with his clients or with his farms. Then we promote this relationship were by people will compare and or compete to what they saw on the other side. We normally do that

Researcher: As the department of agriculture do you think you promote farmers to share their experiences like their own indigenous knowledge

Participant: I will say we do our best. But the problem is with the given state of affairs our government is spoon feeding people now and that has made a lot of our clients to go lazy. In the formal times I would say you will always I mean government changes every time, policies are being changed. In if you go back maybe 10 years back as you will see my experience with the department is about 12 years now. You will see that people were working very hard to produce their own food and have surplus to sell, But with the new developments that is taking place in our country people are no longer willing to work but they are willing to buy. So what they do they take their taxes, they take their buses and go to big cities and buy the product and come back. So that is why then you will find cases were a project was started by 30 people. But If I go with you today you will find that there are 2 people working on the very same project. So the lazy factor, I will say our government has got much contribution. And that has made people to starve because those who cannot afford to go and buy whatever product in the big cities they are living I will say on poverty because they are being lazy

Researcher: As a department do you think that there is something which can be done to overcome that problem that is now emerging

Participant: We cannot do it on singular basis in other words it's not a problem that can be overcome by my department. This is an issues that needs attention I will say nationally were then our leaders will look at the polices. I am not saying we must promote slavery but there were sometimes were people were made to work. So I know there are intellects within the country we need them to sit down and have a particular I will say a particular policy that will make people to work for themselves. And Then the government must open doors for the people to sell their products not that the market places are for certain people. I will say people must be exposed to exports they must known how are the exports are done not that they are only told of exports. And also these subsidies that are coming from the governments must sustain the project it must not only start the project and leave the project. I think it must sustain the project up until the people are really making the money. Because at the point in time most of the subsidies from the state they are not sustaining the projects, they just only

start the project. And the project is being launched and the minister come and launches the project. Then they go away with what? With the funding. And you the extension officer you are left with the crisis were you will advise the people to do A, B, C, and you know that A, B, C, requires capital. And if you go to other stakeholders like, banking institutions. People, we assist them to draw up business plans. But when they submit these particular business plans to the institutions they say the business plans must be bankable. And then one asks, a bankable business plans its a business plan that needs to show the sustainability I mentioned it before. Were we will see a particular capital injection will be coming from point A to Z. And then they take you out saying no we cannot fund you because your particular business plan is not bankable. And your back ground is not acceptable with the particular institution policy. So those are the real challenges that we facing with the people and that is why then people are leaving.

Researcher: So in your opinion how should the relationship be like between the farmers and the extension officer?

Participant: I would say the relationship between the two must be open and it must be fair. I would say we should not have cases were one is full of promises and not actual functions. And you know what promotes that, you will find that our minister is saying something else in the media and with the media its' about 30 million people listening to our minister. And you find that these clients when they come to us as extension officers we don't know about what minister was saying, we don't have pamphlets of what minister was saying. So then it's a point where there is no trust between the client and the extension officer. By the client I mean the farmer. Because the farmer will come to the extension officer and say I need 1, 2, 3. I was listening to the radio, the minister said I can get that from this office or he will phone you, please come to my sight let's talk. You go to him and when you sitting down with him. You find that what he is asking for you as an extension officer did not promise. Because you know for the fact that within the budget or whatever policy at that time there are no funds available for certain types of projects. So I will say the relationship between the farmer and the extension officer again it must be fair . No empty promises, but the two should encourage each other to work on their own. Meaning these subsidies must come but people should be working, people should not wait for the subsidy. People should start on their own and then the subsidy come on the way. Maybe I think it makes sense because you will find that people put in proposals to us and then wait for the funding, they don't do anything. They say no we waiting for the department as if the particular project is for the department but the project is for them. So I will honestly say to us here is. People must be taught to start on their own and then the subsidy should find them on their way. Thank you.

Researcher: If farmers have to start on their own does it mean that, do you see value in the experiences and knowledge that they already have. So in a way do you encourage them to start using their own experiences and knowledge to start farming before they get any extra help from ;

Participant: I would say I do encourage them to start on their own because once they start something they will feel the sense of belonging. They will feel the degree of commitment



within that particular project and they will know all the risk factors involved in the project and that will also teach themselves as members to see to it that since there are a total of a certain figure does this project need the whole total or does project needs a plus total. So as they are starting it themselves when they come to us to request whatever assistance they will be motivating it to us to say the reason why we need A, B, C, is because we have seen it. We feel the need we saw and we need to change our direction. So I will say it's very paramount that the people will start the project on their own. So that they feel the project, they understand the project. It's not that they are being imposed to do the project it must be a down up exercise it must be an impose. Were we will say just start a mushroom project and then the people will say we don't know the mushroom project. And we come to them they will say we have been planting potatoes for 3 years Mr Y, what can we do to produce as much as potatoes then we come and request funding. Not only to the state, I want to repeat that, to whoever can inject funding for the project to be sustainable.

Researcher: How best do you think, when farmers start a project on their own, the experiences that they have and the knowledge that they are using. How best do you think it must be capture? So that they can also benefit from what they have done and also for you to know how they have been doing. Do you think it should be recorded, so that the farmers start recording what they do from day one so at least you have an idea and they can use it as a reference point.

Participant: With us as Africans and especially, am trying to find a word here because I don't want to be blamed next time. The illiterate will find no reason to keep records. Because they will say we know, they always claim that we know. And The reason they will claim that they know is because they know their date of birth. So that is common to all the farmers, when you encourage them to do the bookkeeping part of it they listen to you, they buy whatever stationary they must have. But each time you sit down with them on the meeting or on the workshops. You will find that the scribe that was elected by them is not there. The scribe that was elected by them is sick and they will say no we cannot write but talk to us we are listening. Also if you supply notes to them sorry my dear. Two days down the line you will find a shock, they don't use those notes. So then its somehow a tricky part because you cannot introduce them to the latest technology were we will say ok let's have a laptop maybe then I will then transfer information you look at it on other sites as we do with commercial farmers. Because on a commercial farm, we will say give me the email address and I will give you the information because the particular farmer is in bookkeeping and he knows the importance of keeping records. So that is the challenge that is among our clients. Such that we as extension officers, I will say we have failed. With my experience I will say its us that have failed to convince the people if it needs them to be convinced to see the importance of bookkeeping. And that is why if I can go back, once they have complied their business plan. For the institutions to say their business plan is very bankable is because they don't have records but you will find that on the business plan they will say they do have the constitution (Records). But when the particular bank says bring the constitution (record) they say its here it was here its lost. So we do train them on doing on the importance of bookkeeping. When it comes to the actual doing it they just disappear

Researcher: Do you have any suggestions on how that issue can be overcome. The issue of recording, That farmers start recording what they know or what have experienced so that it benefits everyone, even other farmers in other districts

Participant: I know that there are initiatives by the cabinet of our country, South Africa. Where people are being trained how to read and write. There are ABET exercises being done all over, I will say all over the country. And then slowly it's not gonna be a next week thing or next year thing it will take time for our society to learn the importance of keeping records. Because you will find that even us as the working class we are not used to keeping records on daily basis. So how do you then expect then an illiterate to be good? I mean I will say its gonna take some time. We are emphasizing it to the people and such that they are not getting any funding from the banks they don't have records and we also tell that commercial farmers are getting funding from the big institutions because they have records. And their records can give you a picture as to what is happening on that particular farm. So I will say some are coming slowly, slowly but its not easy. And that is why we have cases of fraud within our department were the farmers or vice versa they will be cooking the information so as to get these grants. So it's not easy its gonna take long, am sure because one will notice even in the parliament some documents are not there. Its because people were there in the seating but they were sleeping. Most of the scribes, I will say they must be maybe they should be a school for the scribes if one starts anything must go and employ a scribes, that you will be writing for me. And That is why most of the bosses in big companies they have PA's because even themselves as bosses or MEC's they cannot maintain their books. So that is all I can say in this matter.

Researcher: Ok, ok. Although there are no scribes for the farmer. But do you think farmers they do discuss on their own just share without even scribing just to let each other, do you think they inform each other.

Participant: They do inform each other. But the problem is they normally hide information among themselves again. And you know what does that, they normally undermine each other. They don't want to grow gradually. One wants to stand up and be a preacher to them and its then when you see them saying, oh that idea is from that one I won't take it even if its correct. It's like it's with the political leaders you will find that a leader from the opposition party will say something valuable but because he is from an opposition party the ruling party will not accept it. So with our clients, I love them the farmers you will found that they do share their ideas and they are very good. But a they always want to know who said it. So if it's that poor Mrs So-and-so or that poor Mr So-and -so they won't do it. So maybe if it's said by a councilor, an Induna in the area, an extension officer, you see then they will do it.

Researcher: Do you think, it's also an issue of trust among themselves.

Participant: I have said it, they don't have trust, they have seen enough. But they always say it's enough and they don't know how long are they still gonna leave. So They are in a stage where How must I put it. They are not leaving a positive life they always say that this is enough, this is enough. That is why that they don't tolerate each other. They don't want to try

their own ideas among themselves but if somebody else comes, they say lets listen to that one. Whereas within themselves somebody raised the very same idea. So we normally see that in everyday.

Researcher: Are there any other issues that you might want to discuss with us concerning the work that you do with the farmers.

Participant: On my own I would love to see the situation where in which whereby people are given a chance or they have access to all the specialists of the operations within the department of agriculture. In other words if one wants to start a plant production project all the specialist within the department must assist that particular group or individual for him to have a prosperous project. But you will find that as an extension officer if you try and invite a specialist within the department you will find that they are not even there. You will find that posts are vacant, they are not filled. They say if you want a horticulturalist is not there. And there are gaps within the sections in the department were you will find that a particular section does not have employees. So there is a scarcity of specialist within the department. And most of the specialist within the department they are leaving the department because of some reasons. Some are under paid and some its because of the working environment they chose to go to Ngo's, I will say they are welcomed. And if you try and invite people from outside you will find that you need to go through a particular protocol that will then delay a farmer down there. You will find that the farmer wanted to start the project there in April but through extending the invitation to other people the particular project will start in November and next month is Christmas. Then you see, so those are the challenges that I think or I would have said if I was in power, the specialist should be accessible to the public. In other words we should have centers where a person will know a specialist in 1, 2, 3, this is his office. This is his contact number; this is how I can have access to that particular specialist. Because one will see one will see commercial farmers doing well. It's because they are using only and only specialist. They don't want to take chances with us. I will say myself as a technician I will go to a commercial farmer and advise him because once I am done with my advisory he will say what is your specialty. So if then our people can have access to the specialist and the specialists need to be paid well by the state so that they will not go out of the state. So you will find that an extension officer can find a scholarships to do his Honors, Master, Phd. But he will not come back here. Because he knows that he will be under paid or the working environment will not be suitable for him to do or make his practice accessible to the farmers or the community. So they will be kept in offices doing their research and not actually going out doing what they would have been learning in the institutions. So those are the challenges I will say if I was in power. I will say take these specialists to meet the relevant people. Not that we take a specialist on plant production and then leave him with animal people. No its wrong, he must go the relevant farmers. So the relevant farmers if they are out there in rural areas, the specialist must drive to these people. And not that they cascade the information through technicians. Thank you.

## **Appendix F: Example of transcribed data of interview with farmers**

Int: Would you like to explain to me your working relationship with you EW?

F7: Her visits are normally when we have just started planting. But they brought the tractors very late. In this area we should be farming by now. So it needs the tractors to come early. If they are late the harvest will not be good.

Int: Well, how would you explain the relationship you have with your EW concerning the work that she does with you?

F7: She comes here to see if we have planted anything and how we are normally doing in the cooperative and then she disappears then she comes back to check the harvest and how we would have harvested. Like this year we planted maize meal. They come with the machines to help with the harvesting. For us, it didn't go, it was burnt. We had to manually harvest it.

Int: How did you burn the field?

F7: It was burnt by someone who was smoking, we started off well, when he wanted to throw away his stub, it fell on the plant and then it got burnt.

Int: Aw. Say you have problems with your crops in the cooperatives, how do you solve them?

F7: Our problems, we try to solve them on our own. Where there is somewhere we need to use money- everyone contributes and cover up where there is need.

Int: For those problems that do not need money, how do you solve those?

F7: The problems that do not need money? That's when the machines come to help us and plough for us- the tractors.

Int: When you work with your EW, do you discuss certain things, exchanging information? As a farmer, I assume there are certain things that you may have learnt throughout your experience as a farmer, do you share these with your EW and does she listen to you?

F7: Yes we can talk to her about our concerns; explaining to her that we are worried about this and that- then he responds in her appropriate way.

Int: That means you can discuss about things?

F7: Yes

Int: Where she has something new she wants to introduce to you- how does she do that?

F7: Normally, she comes with teachers and Miss who will teach us about how we can send our harvest to the market. Even with banking, that if there is anything we would have sold we have to save. They explain all that to us.

Int: well I meant, in the fields (cooperatives) if she wants to teach you about anything- for example planting maize- how does she do that?

F7: No, she teaches us very well about how to plant. There were samples where we were meant to learn on how to plant the maize seed.

Int: Should I take that to mean she shows you to do all she teaches you?

F7: yes, she teaches us.

Int: Would you say that you are free to share what you know with her?

F7: Yes, No. We are free to do so

Int: Have you ever had a situation where you have told her about what you know?

F7: That as for me, I know this and that?

Int: Yes

F7: You cannot tell her what you know because she would have demonstrated to us.

Int: Well as a farmer, you know- there are certain things that you may gained from your farming experience- let me give you an example- most of the things that we learn in the books may be a bit different to what you know.

F7: It is that the modern day farming methods are a bit different from the old days. Back then we used to plough with a plough and these pesticides. As for us, back then we used to just plan like that without using pesticides.

Int: Well, from what you have said, should I take it to mean that you cannot actually exchange information because times have changed?

F7: Yes

Int: As you are working with your EW, are there any suggestions as to how you would suggest EWs to work with farmers?

F7: Yes, it is actually we don't have a mechanism where we can actually write or explain how we would wish things to work out. It is just that- they came with their own knowledge and then they tell us that this is how you will do everything. And then we would not know how to go beyond that.

Int: So you would like to have sort of like that chance where you can say out your concerns?

F7: Yes, we would like them to ask us too about what we might also want to grow here, instead of imposing crops on us. Even when we disagree they do not listen to that. It's the same with the timings here. You see it's different. Even when we tell them about it they don't listen because they would have arrived with their materials and then they just proceed with planting. It is just the same as the year before last year- we planted beans in the wrong month- it was all burnt and we did not even harvest anything. It was just the same as that the government's money went to waste.

Int: Thank you