WHAT ROLE CAN SOIL CONSERVATION PLAY IN IMPROVING CROP PRODUCTION IN SEKHUKHUNE DISTRICT?

Mulibana Elvis
Malinga Lawrence
Nemadodzi Edzisani
Zulu Sandile
Mkhulwane William
Mahlokoane Judas
Maribe Maoto

This report is the product of team work with equal contribution from the authors whose names are listed above

ACKNOWLEDGEMENTS

The 2007 ARD in-Service training team of Limpopo herewith express their gratitude to the following persons, institutions and organization whose valuable contributions and support made this study possible.

The Agricultural Technology Transfer Academy (ATTA) of the Agricultural Research Council for initiating and managing the in-service ARD training in South Africa.

International Centre for development-oriented Research in Agriculture (ICRA) for providing technical support for the delivery and coordination of this training programme.

The Limpopo Provincial Department of Agriculture for hosting the training at their facility in Tompi Seleka Farmer Development Centre and for logistical support to the team.

All the facilitators who shared their insights on various topics during the knowledge acquisition phase of this training.

All the stakeholders concerned with the Conservation Agriculture Theme and specifically those interacted with for their willingness to participate in this study.

THE ARD TEAM 2007 LIMPOPO SOUTH AFRICA

Name/ Title /Company	Postal Address	Phone/Fax/E-mail
Elvis Mulibana Researcher ARC-ISCW	Private Bag X 79 Pretoria 0001	Cell: 072 066 2625 Fax: 012 – 323 1157 E-mail: elvis@arc.agric.za
Lawrence Malinga Research Entomologist ARC-IIC	Private Bag X 82075 Rustenburg 0300	Cell: 084-900-9262 Fax: 014-536-3113 E-mail: lawrencem@arc.agric.za
Edzisani Nemadodzi Research Technician ARC-GCI	Private Bag X 1251 Potchefstroom 2520	Cell: 082-298-1194 Fax: 018-299-6390 E-mail: nemadodzie@arc.agric.za
Sandile Zulu Research Technician ARC-VOPI	Private Bag X 293 Pretoria 0001	Cell: 072-944-3334 Fax: 012 8080 844 E-mail: szulu@arc.agric.za
William Mkhulwane Extension Officer LDA	P. O. Box 19 Mbibani 0449	Cell: 072-326-3933 Fax: 0143-262-3010 Work: 013-262-3070
Judas Mahlokoane Extension Officer LDA	P. O. Box 681 Boleu 0474	Cell: 082-806-2304 Fax: 013-262-3010 Work: 013-262-3070
Maoto Maribe Extension Officer LDA	P. O. Box 69 Ga-Maraba 0705	Cell: 079-292-0970 Fax: 015-223-3441 Work: 015-223-7084/5

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ARC	-	Agricultural Research Council
ARD	-	Agricultural Research for Development
CA	-	Conservation Agriculture
LDA	-	Limpopo Department of Agriculture
TOR	-	Terms Of Reference
RQ	-	Research Question
ICRA	-	International Centre for development-oriented Research in Agriculture
GCI	-	Grain Crops Institute
ISCW	-	Institute for Soil Climate and Water
VOPI	-	Vegetable and Ornament Plants Institute
CASP	-	Comprehensive Agricultural Support Programme
NTK	-	Noord Transvaal Ko-operasie

EXECUTIVE SUMMARY

The study was conducted in partial fulfillment of the requirements of the Agricultural Research for Development training programme offered by the Agricultural Research Council and the International Centre for development oriented Research in Agriculture. The study was conducted at Leeukraal and Tafelkop villages in the Sekhukhune District of Limpopo Province. The purpose of the study was to identify soil conservation practices in the area and develop conservation agriculture strategies that can be implemented by the Limpopo Department of Agriculture in the district for sustainable crop production.

A partnership has been formed by Limpopo Provincial Department of Agriculture (LDA), Universities of Venda and Limpopo, Local Municipalities and ARC concerned about the low level of crop production in the area. Food security and scarce of resources by small-scale farmers are believed to be some of the challenges that are faced by farmers in Sekhukhune district. It is envisaged that, through the (ARD) programme, this partnership will assist in planning and implementation of future agricultural development projects in the province.

Participatory Rural Appraisal tools were used to collect the data. Stakeholders' perceptions were gathered and development strategies were proposed by the team. These strategies were validated, through a stakeholder workshop, with the all the relevant stakeholders including the farmers in both the targeted villages. Both villages were visited to observe the farming practices as well as natural resources that are available. Although the soils of these villages appear to be good, there is limited crop production due to a number of factors, which includes erratic rainfall, unavailability of relevant farming equipments and soil degradation.

The recommendations that were developed during this study can be employed provided that there is an appropriate partnership amongst the relevant stakeholders.

CHAPTER 1 INTRODUCTION

1.1 CONTEXT OF THE STUDY

This study is a result of a partnership between stakeholders in the Limpopo Province (Limpopo Provincial Department of Agriculture, University of Venda, University of Limpopo, Municipalities and the Agricultural Research Council), concerning crop production constraints. The resulting Limpopo ARD Hub was established in August 2006 as a mechanism for collaboration in research and development (R&D) in order to enhance service delivery. To achieve this, the hub jointly identified and prioritized certain R&D issues in the province, of which conservation agriculture became one.

1.2 CONSERVATION AGRICULTURE CONCEPT

Conservation Agriculture (CA) entails agricultural practices that aim to optimize sustainable natural resource use. This is in contrast with some modern forms of agriculture, which can sometimes be harmful to the environment. (http://www.betuco.be/index-eng.htm). Globally, CA is now being practiced on about 58 million hectares of land, from the tropics almost to the Arctic Circle. CA aims to conserve, improve and make more efficient use of natural resources through integrated management of available soil, water and biological resources combined with external inputs. It contributes to environmental conservation as well as to enhanced and sustained agricultural production (http://www.betuco.be/index-eng.htm).

Due to the visible decline of the natural resources in the study area; Leeukraal and Tafelkop villages, the aim was to investigate how to conserve these resources in order to improve food security. Another argument for CA is the continued rise in the price of inputs, machinery and energy. Reducing production costs and improving productivity through CA could be a viable alternative.

CA provides many advantages on global, regional, local and farm level (FAO, 2004):

- It provides a truly sustainable production system, not only conserving but also enhancing natural resources and increasing the variety of soil biota, fauna and flora in agricultural production systems without sacrificing yields on high production levels.
- CA fields act as a sink for CO_2 and applied on a global scale could contribute to control air pollution and global warming. Farmers applying this technique could eventually qualify for CO_2 bonus points.
- Soil tillage is among all farming operations the single most energy consuming and thus, in mechanized agriculture, air-polluting operation. By not tilling the soil, farmers can save between

30 and 40% of time, labour and, in mechanized agriculture, fossil fuels as compared to conventional cropping.

- Soils under conservation agriculture have higher water infiltration capacities reducing surface runoff and thus soil erosion significantly. This improves the quality of surface water, reducing pollution from soil erosion, and enhances groundwater resources. In many areas it has been observed after some years of conservation farming natural springs that had disappeared long time ago started to flow again. The potential effect of a massive adoption of CA on global water balances is not yet fully recognized.
- The system depends on biological processes to work and thus enhances biodiversity in an agricultural production system on a micro- as well as macro level.
- Although CA helps to reduce the use of external inputs, it is by no means low output agriculture and allows yields comparable with modern intensive agriculture in a sustainable way. Yields tend to increase over time with yield variations decreasing.
- For the farmer, conservation farming is attractive because it allows for a reduction in production costs, time and labour, particularly in peak times. It also reduces mechanisation costs (investment and maintenance) in the long term.

Disadvantages associated with the adoption of CA in the short term include the costs of specialized planting equipment and the dynamics of a CA system requiring specific management skills and a learning process. Long term experience with conservation farming all over the world has shown that it does present different problems to farmers, but that these can be solved. Particularly in Brazil the areas under CA is now growing exponentially and reaching 10 Million hectares. Also in North America, Canada and Australia the concept is widely adopted (FAO, 2004).

1.3 INSTITUTIONAL CONTEXT

The study was conducted by an interdisciplinary team of four researchers from the Agricultural Research Council (ARC) and three subject specialists from the Limpopo Provincial Department of Agriculture (LPDA). The study was hosted by the Limpopo Provincial Department of Agriculture (at its facility; the Tompi Seleka Farmer Development Centre), in collaboration with the ARC's Technology Transfer Academy-ATTA, the International Centre for development oriented Research in Agriculture (ICRA), the University of Venda, and the University of Limpopo. The research team underwent training in Agricultural Research for Development (ARD) and applied the concepts and skills gained to conduct the research.

1.4 BENEFICIARIES/PARTNERS

Beneficiaries of the findings include Sekhukhune crop and livestock farmers and those with an interest in CA as the proposed interventions could increase the production in their respective enterprises. Secondary beneficiaries include all the key stakeholders mentioned above. It is expected that as a result of the study, there will be improved interaction leading to more collaboration in future amongst these stakeholders. Recommendations will provide support services with an improved vision on developmental strategies for CA in the Sekhukhune district.

1.5 PROBLEM STATEMENT AND JUSTIFICATION OF THE STUDY

The ARD Limpopo Hub identified the soil conservation theme as a priority. The objective of establishing the ARD Hub was to leverage and facilitate collaborative efforts of the stakeholders in addressing R&D priorities in the Province. Focus on CA was based on their collective interest to explore water-use efficiency (water harvesting and conservation) challenges, poor access to inputs, low productivity, poor food security status, low quality of produce, insufficient appropriate implements and natural resource degradation as they relate to agricultural production. In fact, these were all considered to be factors impacting negatively on the sustainability of natural resource use.

The Limpopo Province is considered one of the poorest provinces in South Africa with 89% of its population considered rural (Oni *et al*., 2003). The province covers an area of 12.46 million hectares and accounts for 10.2 % of the total area of the Republic of South Africa. The Limpopo Province has a population of 5.635 million of which 18.05% live in the Sekhukhune district (Water services ISRDP – Sanitation supply backlogs), a district identified as a priority nodal point.

The most limiting resource in the province is water. Irrigation is needed for about 137 000 hectares of which 58 000 hectares are in the hands of black small-scale farmers. The province has been subjected to frequent droughts. Though it has not been scientifically proven that the trend would continue this is a major concern. Crop production has decreased dramatically in the last decade (information obtained during household analysis).

The degradation of natural resources in the study areas, namely Tafelkop and Leeukraal has played a significant role in the decline of crop production. Crop production in these two areas relies on rainfall and there are no irrigation facilities. Sekhukhune district has diverse soils which vary in productivity. The soils are vulnerable to various forms of degradation (physical, chemical and biological) hence appropriate management strategies are critical if soil productivity is to be improved (www.lda.gov.za/index.php). CA was found to be a relevant technology in these conditions.

1.6 STUDY OBJECTIVES

1.6.1 Goal of the study

The goal of this study is to improve food security and sustain the natural resources of the farming community of the Sekhukhune district in Limpopo Province.

1.6.2 Purpose of the study

To encourage participation from relevant stakeholders in the implementation of conservation agriculture in the Sekhukhune district in the Limpopo Province.

1.6.3 Specific objectives

- To determine a CA plan, in collaboration with the community, suiting the socio-economic, physical and economic circumstances of the community, including strategies to improve crop production and as such food security
- To propose strategies for improved tillage management, rotation systems management, residue management and pest and disease management strategies

1.7 RESEARCH QUESTIONS

The identified problem was how to improve crop production through sustainable use of natural resources in two rural villages in Sekhukhune District. This central problem was turned into a central research question: ***'What role can soil conservation play in improving crop production in Sekhukhune district?***

To be able to answer this central research question, a set of secondary research questions were formulated and these were:

- What are the limiting factors for crop production?
- What cropping systems are currently in place?
- What are the tillage methods that are currently practiced?
- Which social factors are affecting the adoption of soil conservation?
- What are the input costs in relation with the outputs?
- How is the land controlled?
- Who are the stakeholders concerned with soil degradation?
- What are the perceptions of farmers on soil conservation?
- What practices are in place for moisture conservation?

A set of tertiary questions for each secondary question is given in the research plan (Appendix 1). From the point of view of Sekhukhune farming community, critical success factors for CA are relevant equipment, land demarcation, proper veld management, introduction of suitable cultivars, water harvesting techniques and capacity building in relation to all aspects of conservation agriculture. A motivating factor is that the provincial government together with the ARC have already started a CA project in one of the study areas, and provided the relevant minimum tillage equipment for trials.

CHAPTER 2 BACKGROUND OF THE STUDY AREA

2.1 GREATER SEKHUKHUNE: THE STUDY AREA

The greater Sekhukhune district is dominated by the ethnic group of the Pedi tribe. In 1976, the government of South Africa declared Sekhukhune as part of the Lebowa homeland. This move was not appreciated by Sekhukhune residents as it enhanced the disparities created by apartheid. Whilst the area was incorporated in SA during democratization, the land ownership structure in the District did not change. There is privately owned land mainly used for commercial farming purposes, state owned land mainly used for both farming and residential purposes and tribal owned land which is used for residential, cropping, and communal grazing purposes. The Sekhukhune district is mainly rural with 94.7% residing in rural and 5.3% in the urban area. Fifty six percent of the population is below the age of 19 and 38% is between 20-59 years (the economically active group) while 6% are older than 60 years. Women constitute the majority of the population with 52.2%. The majority of the population is unemployed and currently the unemployment rate is at 36%. Only 36.8% of the population has access to full electricity supply. Few households have landlines telephones and most uses mobile phones. Most families have access to drinking water (collected from central taps). Basic service structures such as schools, clinics, hospitals, municipal offices and tribal authorities are operational and have telecommunication, water and electricity facilities.

2.1.1 Geographical Location

The Sekhukhune area measures approximately 1 326 437 ha (Figure 1) and constitutes a cross boundary municipality between Limpopo and Mpumalanga (IDP, 2004). The Sekhukhune district municipality (SDM) was established in December 2000. It consists of five local municipalities (Elias Motsoaledi, Marble Hall, Tubatse, Fetakgomo and Makhuduthamaga). The two villages under this study: Leeukraal and Tafelkop, fall under Makhuduthamaga and Elias Motsoaledi respectively.

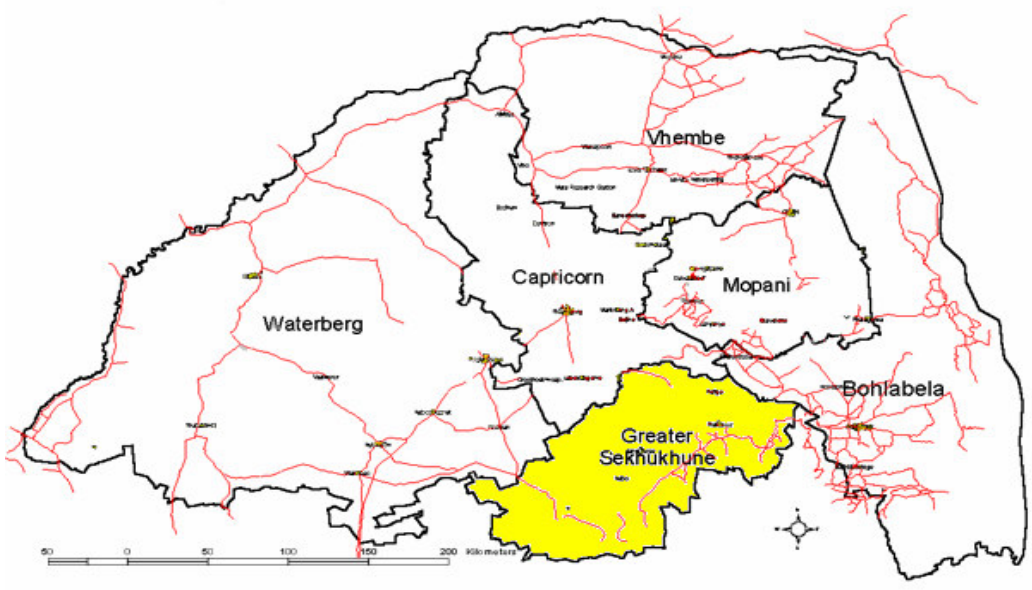

Figure 1: Map of Limpopo Districts with the Sekhukhune district (highlighted).

2.1.2 Climate

The district experiences temperatures between 7 and 38°C in summer and between 3 and 23°C in winter. Incidence of frost is rare. Average annual rainfall is between 500 and 650 mm, predominantly between October and March (Figure 2). Low rainfall is recorded between April and September.

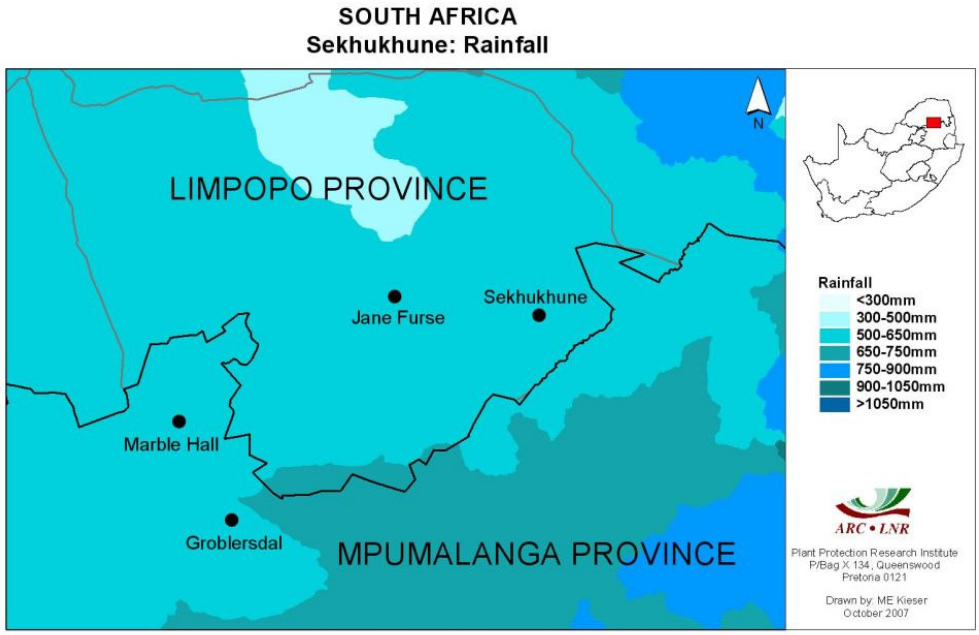

Figure 2: Sekhukhune Rainfall

2.1.3 Edaphic factors and vegetation

A wide range of soil occurs in Sekhukhune, ranging from deep to moderately deep red sandy loams (usually coarse grained) to heavier soils on slopes. On the slopes, C*ombretum apiculutum* and *Diplorhynchus condylocarpon* are dominant. Scarp slopes and pediments are occupied by *Kirkia wilmsii*, *Acacia nigrescens* and C*ommiphora* spp, *Catha transvaalensis, Combretum molle* and V*itex* species. The soil map indicates that soils in the district are characterized by mostly three soil groups; EB or green colour coded soils with minimal development. These are usually shallow on hard rock or weathering rock, with or without intermittent diverse soils. Lime is generally present in part of the landscape. These soils are considered to have little pedagogical development. The light brownish (DA) indicates black and red soils, which are strongly structured clayey soils with high base status, nutritious in nature. The last group is the (AC) light green colour indicative of red and yellow well drained sandy soils, lacking strong texture content. This group represents red massive, or weak structured soils with high base status.

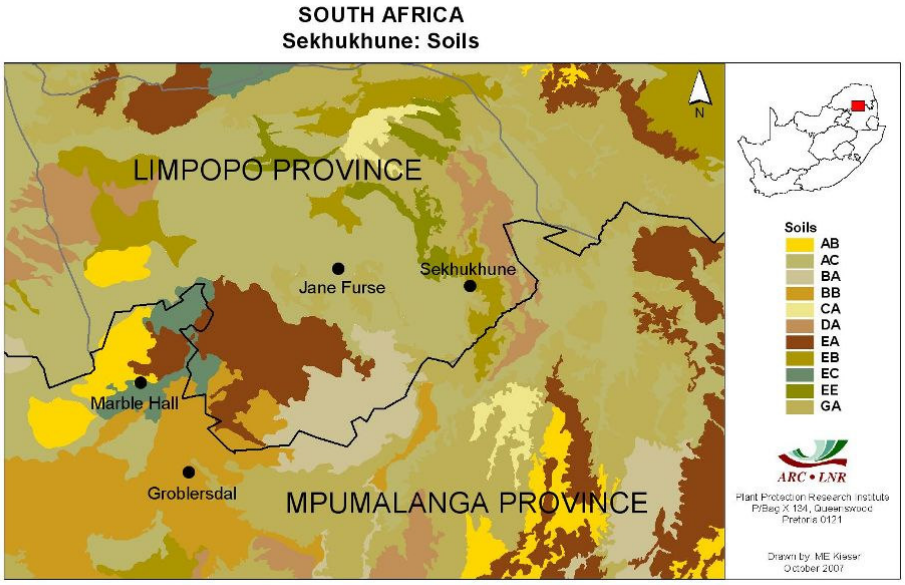

Figure 3: Soil map of the Sekhukhune District

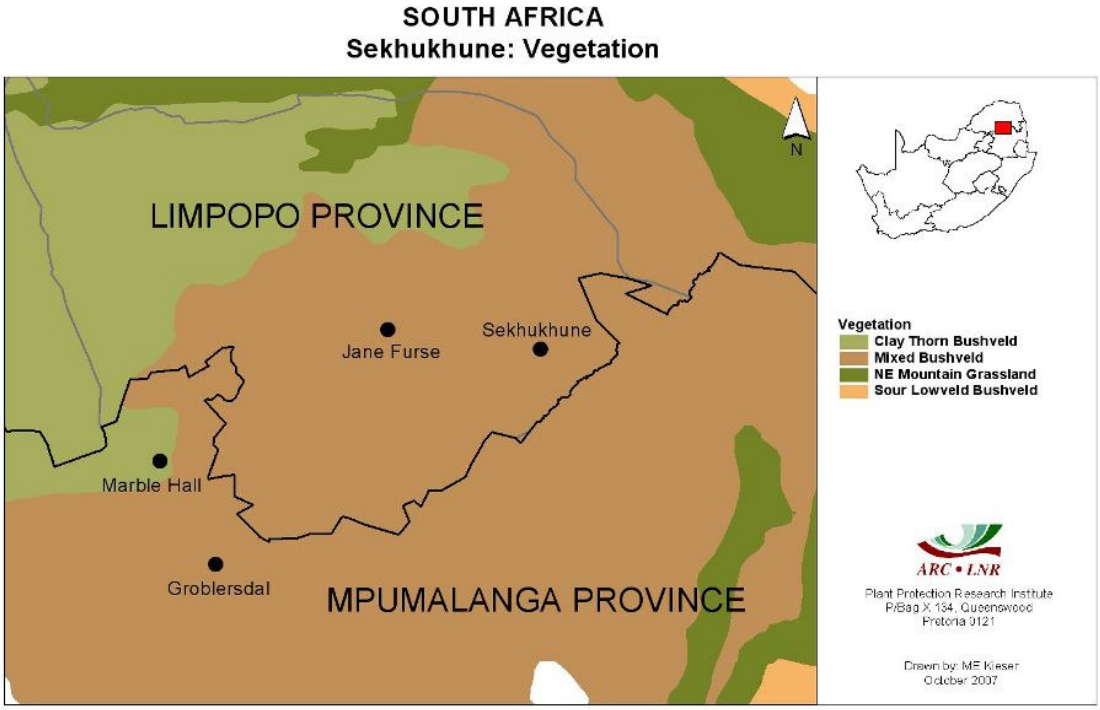

Figure 4: Vegetation Groups in the Sekhukhune District

2.1.4 Demography

According to Statistic South Africa, Sekhukhune has a population of 956 018 (Table 2.1). The population growth rate decreased by 1.2% between 2001-2006 (www.statssa.gov.za)

Table 1: Demographics of the Sekhukhune District

Municipality	**Male**	**Female**	**Total**
Fetakgomo	40 687	51 396	92 083
Elias Motsoaledi	98 689	121 133	219 822
Makhuduthamaga	113 614	148 392	262 006
Marble hall	55 764	65 560	121 324
Tubatse	118 501	142282	260 783
Total	**427 255**	**528 763**	**956 018**

CHAPTER 3 METHODOLOGY

3.1 Agricultural Research for Development

The Agricultural Research for development (ARD) methodology was employed in the study because it responds to the needs of clients and beneficiaries. The process starts with the identification of the problem. ARD involves an in-depth understanding of human behaviour and the reasons that govern human behaviour. ARD use participation and attempts to bring together all the institutions, individuals and stakeholders concerned with the problem so that they work together to address the issues. ARD uses a participatory systems process that facilitates and encourages collective rural innovation for sustainable development. ARD is flexible; dealing with the needs of the people involved. ARD allows for interdisciplinary analyses of the situation. It allows for a holistic view of the issue and deals with the factors, elements and perspectives held by the various concerned individuals and organizations.

ARD is iterative; and requires collective analysis and action. The methodology was divided into two phases. The first phase dealt with capacitating the team whilst the second phase entailed a field study designed to conduct field work using all relevant tools learned during knowledge acquisition.

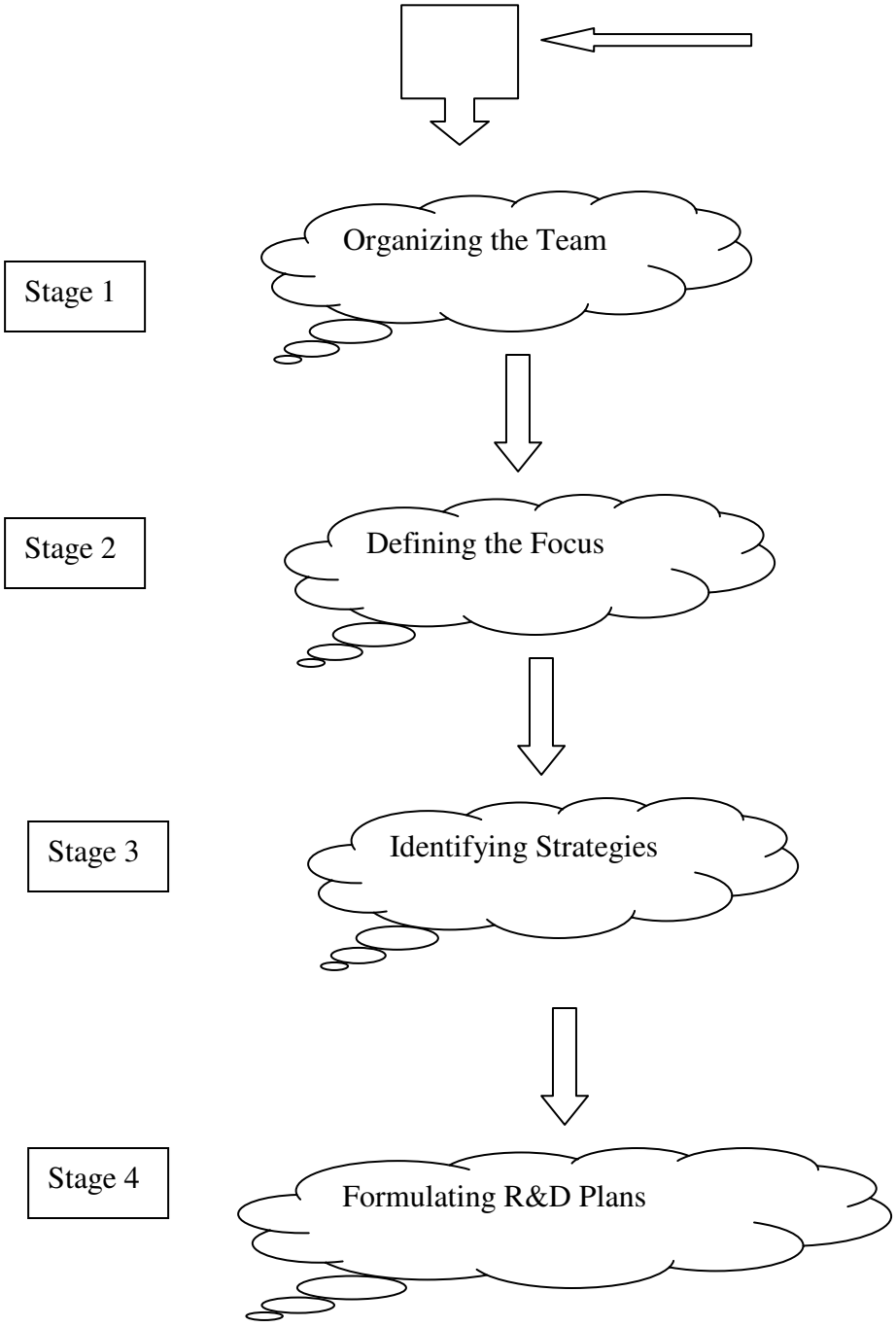

Figure 5: Illustration of the ARD procedure (adopted from ICRA, 2005)

3.2 PRELIMINARY PHASE

This phase took place during the last week of the first knowledge acquisition phase of the ARD training at Tompi Seleka on the 2nd and the 3rd of May 2007. In this phase the team created ground rules as a guideline on how the team members should conduct themselves throughout the field phase. This includes punctuality, personal behaviour and respect of age, sex and experience amongst members. A team contract was developed to establish team's values, norms and to create the procedures to achieve common goals. The contract comprises of rules of operation and personal conduct, conflict management and decision-making procedures. All members of the team were assigned different tasks to execute in line with the team contract.

The "Terms of reference" (TOR) for the field study, given to the team during the first knowledge acquisition phase were reviewed by the team, who subsequently explored the secondary data provided and moved towards redefining the TOR (appendix 1). A research plan was then formulated to identify the central research question and secondary questions (appendix 2).

A 'Rich Picture' (figure 8) was outlined to identify relevant domains of main influencing factors and to understand the views of players within each domain. To describe the central theme of the study in the rich picture, the TOR was used. Later on the rich picture was used as an instrument for communication and understanding of problems with relevant stakeholders to identify the areas which the team needs to investigate.

A work plan was also drafted as a guideline for the activities that needs to be carried out throughout the field phase (appendix1). A set of questions to be answered by the stakeholders were developed to produce a questionnaire (appendix 3).

This preliminary phase therefore resulted in a refined research plan, field work plan and TOR.

3.3 FIELD STUDY PHASE

The implementation of the field study started with the identification of the problem and place where the study was to be conducted. The Limpopo Hub's CA theme group identified the problem and the area where the study was to be conducted. The TOR drafted by the theme group (K P Molahlegi, Gerry Trytsman, Hendrik Smith and Khathutshelo Neluheni) was revised by the team to determine the problem statement and research questions that attempted to answer the questions raised in the

TOR. The team arranged meetings with the key informants, identified by the hub members and organised the meetings with the Tribal Authority and all other subsequent meetings.

3.3.1 Meeting the key informants

Key informants interviewed included: Mr Modau, a farmer from Leeukraal, Mr Lekala a farmer from Tafelkop. These farmers were chosen due to their knowledge and involvement with all the other farmers, to help the team enrich their understanding of the problem.

3.3.2 Meeting with the Tribal Authorities

The meeting with the Tribal authorities at Tafelkop and Leeukraal was to introduce the ARD-CA team to the Tribal authorities and to seek permission to conduct the study in their villages. The team explained the purposes of the study and approaches to be used.

3.3.3 Focus groups meetings

Focus group meetings were conducted to further understand the way the villagers live. The check-list was prepared before the meetings to guide the discussion. The CA team had shared tasks of facilitation, note taking and verification. The process started with the discussion on the agro-ecological resources (natural resources) in the village. Participatory tools were then used to facilitate contributions from farmers.

3.3.4 PARTICIPATORY TOOLS

Many people, whilst having potentially valuable constructive contributions to make, find it difficult to express themselves at a meeting. The participatory tools used facilitate easier sharing of ideas and include visual methods so that being literate becomes less important. The tools often used for comparing (is it more or less?) and assessing (how many? how much?), making it easier for people to join-in and give their opinions.

To ensure that farmers understand the importance of participation, a role play entitled, Bus code exercise was also used. The purpose of the exercise was to make the people aware that if they work together they must always be at the same level so as to tackle the problem together and achieve the targeted goal. It also illustrates the importance of planning before starting a project.

For the CA team, every farmer's participation and contributions during the study was important. The participation and contributions was made possible by farmers themselves through the participatory tools that were well executed as for the task to be performed and knowledge to be acquired.

Time lines

Before conducting a study in the area, it is important to study the background information available: Farmer history and experiences that are related to the study are important. Time lines are the useful participatory tool in acquiring such information; to gather time related data, by linking the dates with historical events. Time lines are also good ice breakers, because people generally like to talk about historical events in their community. The construction of the time lines was planned to involve elders since they often know the most about the community's history. The community selected the elders who they believe know the area best.

TABLE 2: Time lines of Leeukraal

Time	Events
1970	Variation in crop yield due to changed cultivation practices
1992	Changes in natural resources, some degradation
1996	Major diseases outbreaks
1998	Introduction of modern technology in farming
2000	Development of infrastructure in the area

Resource map

The tool was used to identify the agro-ecological resources in the area e.g. arable land, water, grazing land and residential area. The map is also useful for establishing rapport with local people, as a starting point of entry into a community and as part of an analytical process of better understanding the community. The farmers used sticks to draw the resource maps on the ground. Objects such as stones, grasses and leaves were used to represent the resource available in the area.

Figure 6: Resource map of Tafelkop

Transect walk

Transect walks are systematic walks in which a research team are taken through the village by community representatives in order to observe. The farmers showed the team their resources and the negative impact of climatic conditions in the area. The team developed an observation guide with general themes to be explored during the walk. To capitalize on the multi-disciplinarity of the team, each member developed his own observation guide, according to discipline.

Gender analysis

Gender analysis is the tool used to examine the differences between the roles that woman and men play, the different levels of power, needs, constraints and opportunities and impact of these differences. This exercise gave the team better understanding of the communities, as it created a "gender looking glass" through which community is examined.

Seasonal calendar

Seasonal calendars are used to determine farmers' activities and involvement through-out the year. It is useful for exploring the temporal relationships between recurring events in the community. The tool was explained and community members then drew a calendar to indicate the intensity of events for each month. The calendar was organized in relation to agricultural activities, therefore starting in September, as it is the month in which land preparation takes place. Daily scheduling

was also done to map out all the activities listed in the seasonal calendars in a typical day of a man, woman or child and to compare the workloads of the different groups. This was done with a focus on domestic chores and tasks outside the home (e.g., factory work, farming, income generation). The seasonal calendars were mostly based on the activities performed by farmers in Tafelkop and Leeukraal for the production of maize and sugar beans.

Cropping patterns

Cropping pattern tool was used to acquire information on crops grown in the area and the order of preference. The cropping pattern was drawn on the ground to allow visibility to all members so that every farmer could participate fully. Stick of different sizes, different variety of leaves, stones of different sizes, and tins were used to represent the first and second preferred crops.

Stakeholder analysis matrices

A number of matrices for stakeholder analysis were used to determine stakeholder involvement. It provides a visual means of identifying stakeholder involvement and obtain thoughts on specific issues regarding the project and potential improvement. Stakeholders are individuals and institutions whose interest are affected by the issue or whose activities strongly affect the issue, who possesses information, resources and expertise needed for strategy formation and implementation, and who control relevant implementation, instruments. Clear understanding of potential roles and contributions of the many different stakeholders is a fundamental prerequisite for a participatory process and stakeholder analysis is a basic tool for achieving this understanding. The farmers as key stakeholders identified other stakeholders in their area.

Venn diagram

After stakeholders were identified, the link between them was illustrated through a Venn diagram. A Venn diagram uses circles to show relationship between the community and the institution concerned. Various size circles depict the importance of stakeholders, and the distance to the farmers representing their involvement. The bigger and closer the stakeholder circle is to farmer's circle (centre) the stronger the relationship and *visa versa*. Larger circles represented larger or more important components and smaller circles represent smaller or less important organizations. The exercise was useful as it clearly showed the relationships between the organizations; the level of communication among organizations; the role of project bodies; possible improvement of relationships and potential roles for new organizations.

3.3.5 MEETINGS WITH OTHER STAKEHOLDERS

Meetings between the CA team, focus groups and tribal authorities led to the identification of other stakeholders such as the municipality, livestock farmers, and the Land Bank. Meetings were arranged explore the perceptions of these stakeholders regarding the issue and possible solutions to improve the situation. Focus group perceptions were also highlighted during the meetings. The meetings helped identify their involvement in CA projects, their policies and services offered to farmers.

3.3.6 Stakeholder workshop

The stakeholder workshop was held on the 26th September 2007 at Tompi Seleka Training centre. The purpose of the meeting was to give feedback to the stakeholders, and to create a platform for relevant stakeholders to collectively develop a vision and strategies for CA.

3.3.7 Livelihood analysis

People residing in communal areas of South Africa are engaged in agricultural practices to earn a living. Hence it is important to identify the resources available to farmers, and how farmers use these. The ARD study aimed at ensuring that available resources are utilized effectively and efficiently. Specific elements of the life of the typical farmer of the two villages were analyzed; activities, strategies employed and risks associated with these. The livelihood analysis included farmer's perception on soil degradation, constraints to sustainable land use; and their vision for improving land management. As depicted by the figure 6 below, it identified key elements of a livelihood in the area as; strategies, resources, risks and etc an their bearing to household food security.

Figure 7: Livelihood analysis

The livelihood analysis also took into cognizance livelihood assets i.e. human, physical, social, natural and financial capital.

Human Capital

The analysis focused on farmer's skills in agricultural activities, their knowledge, labour and other assets in terms of their livelihood objectives. The farmers in both villages have a history of farming and are skilled in farming practice. The diagram below, figure 7 (with coloured cards) indicates the labour flow in the two communities, as well as resource use. Over and above labour, other resources mentioned include financial resources as well; where it is sourced and how it is used.

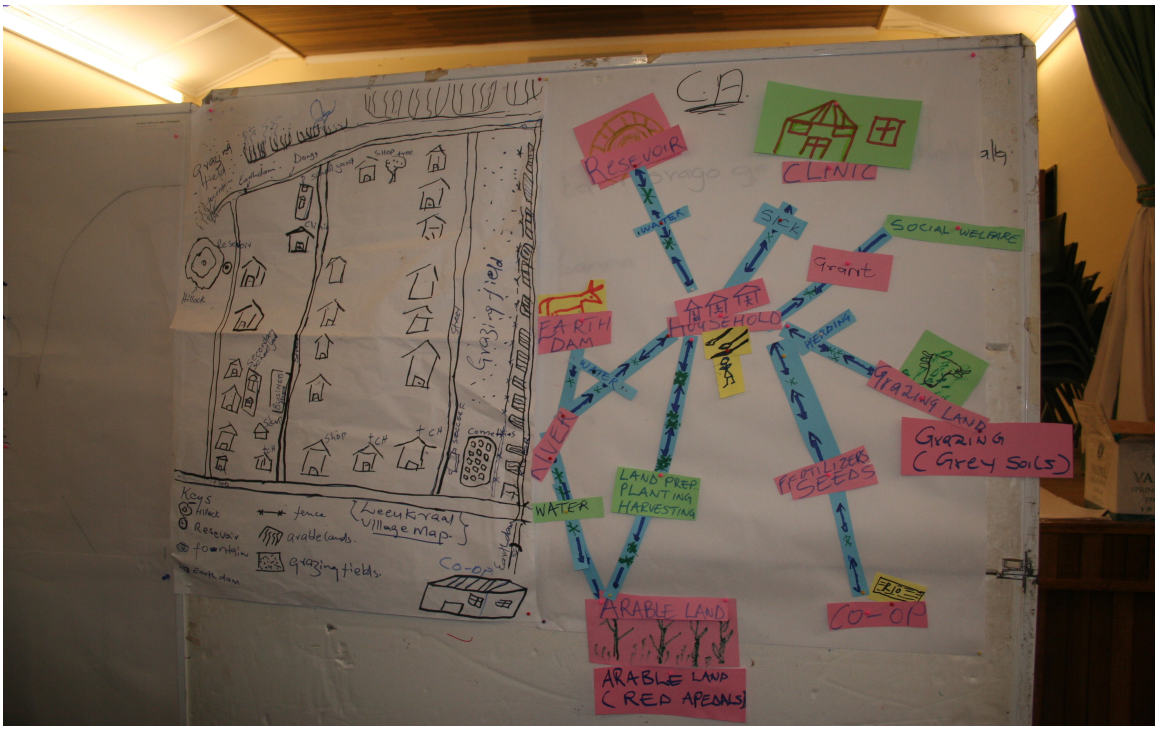

Figure 8: Labour & other resource flow diagram

Physical capital

The analysis was based on basic infrastructure and producer goods needed to support livelihoods. The analysis looked at infrastructural resources such as; access to transport, housing, water supply, sanitation and energy. The type of implements currently available to support their livelihood was also analyzed. The diagram on the left of Figure 8 indicates the above mentioned physical resources.

Social capital

This looked at sources people draw upon to pursue livelihood strategies including networking and linkages between individuals with shared interests. The local farming community belongs to formal groupings which often entails adherence to agreed upon rules, values and standards.

Natural Capital

This analysis included land ownership (private or communal) and its use. It was mostly based on access to land, water and etc for resource based activities such as farming, gathering in forests (firewood collection), grasslands (thatch) and access to water.

Financial Capital

Financial assets owned were assessed, which can be converted into other types of assets, for purchase, etc. It also looked at the farmers' savings and liabilities. The impact of pensions, remittance and transfers from the state was also determined (Figure 8).

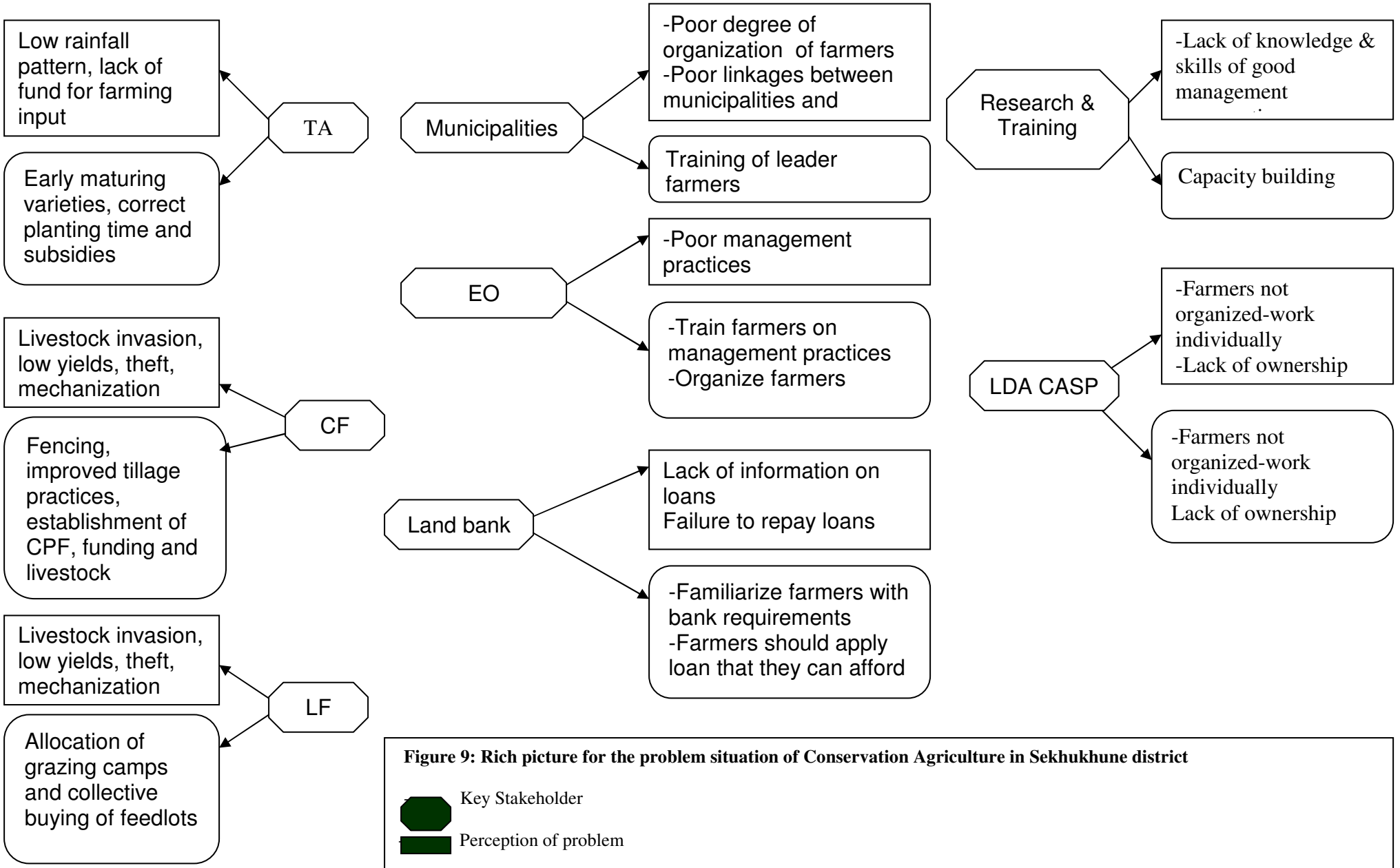

Figure 9: Rich picture for the problem situation of Conservation Agriculture in Sekhukhune district

CHAPTER 4 FINDINGS AND DISCUSSIONS

The data collected during the field study was analysed to answer the research questions formulated during the ARD training at Tompi. Different stakeholders had different perceptions on the problem; causes and proposed solutions and these are discussed. The rich picture (figure 8) provides an overview of the problems encountered as perceived by the various stakeholders, whilst stakeholder matrices were used to explore diverse views on the problem.

4.1 Limiting factors of crop production

Most of the farmers in Sekhukhune district practice dryland farming. In recent years the district experienced low levels of rainfall, which had a negative effect on crop production. The household interviews revealed that on average 10-15 bags of grain was harvested per hectare. Increases in the production costs make it difficult for farmers to buy suitable inputs. As a result farmers use cheaper varieties, which are not adapted to local conditions, e.g. late maturing cultivars. This has also contributed to the low level of crop production. These low yields led some farmers to stop farming. The study also revealed that most of the farmers are between the ages of 55 and 65, are prone to ill-health and find it difficult to cope with the farming workload.

Figure 10: Visible land degradation at Leeukraal

A key informant, (Figure 10) indicates his arable land and its borders. The land also serves as grazing area during winter. The degradation of the land is visible from the picture and a large area of this land is not utilized as it is not fenced. This contributes to late planting due to animal invading the arable land. This was identified as one of the major problem encountered by crop farmers. Livestock farmers on the other hand, mentioned shortages of grazing land which led them to allow their animals to graze on arable land. This problem has also contributed to low yields.

4.2 Tillage methods in use

Through the transect walk the C.A. team observed that both villages are practicing conventional tillage methods; where soil is completely disturbed/ turned before planting as opposed to conservation tillage where minimal disturbance to the soil is practised. Conventional tillage leads to soil moisture loss, the soil becoming prone to erosion and nutrient leaching. The conventional tillage method is also more expensive, with farmers using contractors to prepare the land.

4.3 Cropping systems currently in place

Farmers in the two villages practice monoculture, growing maize year after year. Farmers also have little knowledge of alternative crops, with could complement maize. Monoculture encourages the build-up of diseases and pests; affecting the condition of the soil and reducing yields. Legumes are attacked by different pests and diseases and when included in a rotation system, help with pests and disease control, easing the dependence on chemicals.

Table 3a: Seasonal calendar of Leeukraal

ACTIVITIES	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
1. Land preparation	Prepare Land											
2. Planting		Early & late planting										
3. Fertilization		Plant Fertilization										
4. Weeding			Weed control									
5. Pest control			Pest control									
6. Harvesting					Harvesting							
7. Thrashing						Thrashing						

Table 3b: Seasonal calendar of Tafelkop

ACTIVITIES	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
1. Land preparation	Prepare Land											
2. Planting		Early & late planting										
3. Fertilization		Plant Fertilization										
4. Weeding			Weed control									
5. Pest control			Pest control									
6. Harvesting					Harvesting							
7. Thrashing						Thrashing						

Information obtained from the seasonal calendars (Table 3a and Table 3b) indicated that fields are only grazed in winter. There is a potential to produce vegetables during this period, on fenced areas. Vegetable production is often incorporated in CA as a mechanism to ensure permanent ground cover. When CA is introduced, attention should be given to the conversion of the current conventional implements to special CA implements. Such a system would also encourage the use of indigenous and adaptable seeds, integrated pest management, crop residue and integrated soil fertility management. Crops that can complement maize could include sugar beans (leafy-pod), favoured for its nitrogen fixing properties, potatoes (root crop), and pumpkins (leafy) grown as a groundcover. Identifying indigenous systems of conserving soil complementing the demonstration of modern CA technologies would have significant benefit.

4.3.1 Cropping patterns

Table 4a: Crop preferences at Leeukraal

CROPS PLANTED	1ST PREFERENCE	2ND PREFERENCE
Maize	70%	-
Sugar Beans	20%	-
Sunflower	-	10%
Groundnuts	-	15%
Bambara nuts	-	10%
Cowpeas	10%	-
Watermelons	-	20%
S/Sorghum	-	5%
Pumpkins	-	20%
Sweet Potatoes	-	20%

Table 4b: Crop preferences at Tafelkop

CROPS PLANTED	1ST PREFERENCE	2ND PREFERENCE
Maize	40%	-
Sugar Beans	30%	-
Sunflower	10%	15%
Groundnuts	10%	15%

Bambara	10%	10%
Cowpeas	-	35%
Watermelon	-	-
S/Sorghum	-	5%
Pumpkin	-	10%
Melon	-	10%

The above tables (4a and 4b) highlight the preference for maize in comparison with alternative crops. Farmers have more knowledge of maize than of other crops. With regard to sugar beans, Bambara nut, groundnuts and cowpeas farmers state that although they have planted these in the past, a lack of sound production knowledge and lack of seed led to reduced interest. Interest in groundnuts is now revived due to trials being conducted by the ARC, with farmers' participation. A market has also been secured by the NTK for producing sugar beans; the reason why it follows maize in terms of preference. Interest in sunflower production is due to bio-fuels promoted by the PDA. Farmers are provided with inputs i.e. seeds, fertilizers and money for labour.

There is a lack of most relevant inputs (seed, fertilizers, chemicals, mechanisation and labour). Some of these constraints can be offset through the adoption of CA practices, particularly when considering the crops preferred. Leguminous crops (dry beans, groundnuts, cowpeas and Bambara) do not need chemical fertilizers and other inorganic chemicals. Another important aspect is that these crops will leave nitrogen in the soil after harvesting which can be used by maize and other grain crops unable to produce their own nitrogen. Crops such as cowpeas can also be used as cover crops when intercropped with maize. This means the crop can help in conserving moisture, reducing the danger of erosion and suppressing weed infestation. It can also be used for animal fodder.

4.4 Social factors affecting the adoption of soil conservation

Social factors affecting adoption were obtained through the livelihood analysis. It emerged that some households receive social grants (old age, child support and disability grants). As a result the incentives for farming are limited. As indicated in figure 7, the social grants are used for most of the household needs. Most farmers depend heavily on government grants for their livelihood, while some depend on remittance.

4.5 Input costs in relation with the outputs

Interviews at both villages established that farmers do not keep farming records and therefore could not say if a profit or loss is realized. All respondents only produce for household consumption, and do not market. During summer they enjoy green mealies, but they could not elaborate on how much they were benefiting from every harvest. A thorough cost benefit analysis is required to establish the economic implications of the farming enterprise.

4.6 Stakeholders concerned with soil degradation

In the participatory research process, it was crucial to engage with stakeholders on the degraded nature of the resources in the study area. The stakeholder analysis was also conducted to gain insight into stakeholders' interest, objectives, power and relationships as a way of understanding the situation. The stakeholder analysis helped in showing existing patterns of interaction between stakeholders. It highlighted conflicts and helped finding ways to resolve them. Farmers identified stakeholders currently operating in the areas, as well as those concerned with soil conservation. The ARC was identified as a stakeholder concerned with soil conservation, conducting trials attempting to address soil degradation. The LDA was also identified as a key stakeholder, as they are responsible for financing relevant equipments for minimum tillage for both villages. The table below outlines the broader perspective on the stakeholders identified as playing a role in soil conservation.

Table 5: Stakeholder identification matrix

Stakeholder	Key stakeholder	Why (or why not?)
ARC	Yes	Conduct research projects/Promoting CA
Tompi Seleka	Yes	Provide agricultural training
CO-Op (NTK)	Yes	Selling farming inputs, market & store products
Tribal Authority	Yes	Provides and governs the land & assist in farmers disputes
LDA (Extension officers)	Yes	Provide extension service & support farmers
Social Welfare	Yes	Provide social grants to the resource poor farmers
Municipality	Yes	Provide agricultural support and infrastructure
Crop farmers association	Yes	Convening meetings and organising farmers
Youth	No	Currently not active in farming
LDA	Yes	Provide expertises/facilitation/strategy
Land bank	Yes	Provide loans to the farmers
Livestock Farmers	Yes	Interaction with the crop farmers, provide local knowledge, land beneficiaries

The above table provides a framework for identifying actors that will play a role during implementation of a project. The farmers were seen as the most important stakeholder because their livelihood largely depends on crop production and they are the beneficiaries of any proposed project. The Tribal Authority and Local Municipality are influential and important stakeholders as they are responsible for policy implementation. The Land Bank and the Cooperative (NTK) are important based on the services and support they provide but are less influential as they do not determine what farmers do.

4.7 Perceptions on soil conservation

The stakeholder perception matrix (Table 6) was developed to get a clear indication of the various stakeholders' perceptions on constraints and possible solutions concerning crop production in the two villages. The matrix was developed from the interviews conducted with stakeholders. Even though there were differences in the perceptions, all the stakeholders see these problems as obstacles to successful crop production, in that they all felt that an integrated approach to farming is required in the two villages. The matrix should be used to prompt dialogue between the stakeholders by dealing with misconceptions and to engage on possible ways for improving the situation.

Table 6: Stakeholders perceptions matrix

Stakeholder	Problems	Solutions
Tribal authority	Low rainfall patterns	Short season varieties and planting in time
	Lack of funds for farming inputs	Subsidies and loans
	Long season crop varieties	Short season varieties
Crop farmers	Land Bank charges high interest	Saving collectively to buy inputs
	Livestock invasion	Fencing the arable land
	Lack of interest in farming	Increase crop yield
	Theft of fresh crops	Safeguarding of fields
	Mechanization	Funds to buy equipments
	Late planting	Livestock removal in arable land and planting early
	Poor degree of farmer organisation & mobilisation	Training of leaders of farmer organisations
	Poor linkages between farmers & municipality	Strengthening interaction
Municipality	Soil degradation	CA study might solve the problem
Land bank	Security and insurance for the loan	Farmers should apply for smaller loans
	Lack of information on loans	Familiarize farmers with bank requirements
Livestock Farmers	No grazing camps	Department should provide camps

When diverse opinions on problems and proposed solutions existed, the process of creating a platform for stakeholders to jointly discuss these was useful. At the stakeholder workshop at Tompi Seleka on the 26th of September 2007, the team presented their findings and engaged stakeholders to

synthesize the problems and solutions. The table below provides prioritization of the problems and proposed sequencing of solutions to deal with them.

Table 7: Prioritized problems and possible solutions

PROBLEM	POSSIBLE SOLUTION
No grazing land	Proper veld management
Livestock invasion into arable lands Theft of crops	Additional grazing camps Fencing
Food insecurity	Establish home gardens
Unavailability of relevant equipment	Raise funds
Low rainfall	Introduce short-term and drought resistant varieties

The points in Table 7 were deliberated upon in great detail, in small groups and in plenary. It was understood and agreed that the various institutions represented will need to take responsibility for the implementation of the solutions proposed. For example, the TA will need to structure the communal management system, so that some land for grazing is made available. The LDA was identified as instrumental in providing fencing, assisting with CA implements, support in establishing gardens etc. The following chapter is to unpack the proposed solutions further in argument on strategies. These proposed solutions served as a basis for the development of strategies for improving the situation.

CHAPTER 5 DEVELOMENT STRATEGIES

The previous chapter discussed findings, relating diverse views on factors limiting crop production. This chapter aims to shift the focus to optimizing crop production. This could be achieved through adopting a more sustainable approach towards managing natural resources, through CA practices. A number of strategies are proposed in this chapter, to achieve the possible solutions, suggested by the stakeholders.

Simply put, strategies refer to a plan; how to realize the goals. A strategy refers to a complex web of thoughts, ideas, insights, experiences, goals, expertise, memories, perceptions, and expectations that provides general guidance for specific actions in pursuit of particulars ends. A strategy is a general framework that provides guidance for actions to be taken and at the same time is shaped by the actions taken, requiring clear understanding of the goal. (http://home.att.net/~nickols/strategy_is.htm).

An ARD study would refer to different possible development strategies (actions), as an integrated set of R&D actions that should result in a desirable outcome (changed situation). For agriculture to be sustainable, economically attractive and socially acceptable, it must successfully exploit the productive potential of those crop and animal genetic resources which are best adapted to the local environment. This is achieved by effectively and efficiently using available natural resources.

In determining a strategy in an ARD mode; constructing different scenarios to highlights different conditions that might exist in the future, is useful. These scenarios provide the future context (or environment) within which stakeholders will or might need to act. Stakeholders can then make strategic decisions about which actions are likely to produce an optimal outcome. (ICRA, 2007). The strategies in relation to conservation agriculture would focus on three aspects, namely economic, social and physical.

5.1 Strategies for conservation agriculture

The team came up with five development strategies to address problems that farmers are facing.

Table 8: Identifying strategies & actions required

STRATEGIES	POSSIBLE ACTION
Capacitate Local Institutions	Strengthening existing institutions & linkages; establishing new institutions required & offer training to address skills gaps
Improved Soil Conservation Models	Alley Cropping, Cover Cropping, Terracing & Contour Banks
Sustainable Grazing Management Systems	Grazing Camps, Pasture and Forage Crops
Integrated Soil Fertility Management	Crop rotation, Intercropping mulching & residue management
Improved Tillage Practice Methods	Zero Tillage, Minimum Tillage

5.1.1 Integrated soil fertility management

Integrated soil fertility management is the combination of various activities to improve the fertility of the soil. The introduction of crop rotation system improves soil fertility and control weeds, pest and disease. Crop rotation is a system where farmers rotate crops in which complementary traits result in improved pest and disease control. This involves (for instance) alternating a root crop with a broad leaved crop, followed by a leguminous crop, etc. This helps to break a particular pest cycle. Intercropping is practiced for optimal field space utilization e.g. maize with ground nuts and beans. Intercropping is a system whereby two crops or more are planted on the same land with the purpose of improving soil fertility status and to conserve soil moisture. This system reduces soil erosion as it accommodates permanent groundcover. The field for example could have maize and cowpeas or sweet potatoes, or pumpkin. Mulching is a practice that involves the use of crop residues which decompose and promote microbial activities and as a result improves soil health. Sound application of fertilizers is practiced in CA, although biological (organic) fertilization is preferred. This is done to improve soil fertility and allow for a system in which various soil improving techniques are integrated. To promote the systems and practices mentioned above the ARC and LPDA should take the lead in promoting integrated soil fertility management practices in the two villages.

5.1.2 Tillage practices/implements

Farmers around South Africa plough their land. The practice of turning the soil before planting is so universal that the plough has for centuries been a symbol of agriculture. The modern plough, or mouldboard, is however a root cause of land degradation – a major problem facing agriculture today (http:www.fao.org/NEWS). The introduction of more relevant tillage methods and implements that support conservation would improve soil conditions and crop yields would ultimately increase.

Conservation tillage refers to a tillage system which does not invert the soil and which retains crop residues on the surface (http:www.fao.org/ag/AGS/AGSE). Applying CA principles means that farmers drastically reduce tillage and keep a permanent protective soil cover. CA methods such as Planting without ploughing (Zero tillage), could effectively address land degradation. A jab planter is used for direct manual planting. Another method of conservation tillage is Strip tillage or Zonal tillage, which refers to a system whereby strips of 5 to 20 cm in width are prepared to receive the seeds whilst the soil along the intervening bands is not disturbed and remains covered with residues (http:www.fao.org/ag/AGS/AGSE). Implements are available for practicing minimum tillage; a ripper planter can be used and is being tested by the ARC. Presently most farmers are not aware of these developments. The ARC and LDA should involve more farmers in promoting this practice as this tillage method could save money, time and increase yields. Tined tillage or vertical tillage, refers to a

system where the land is prepared with implements which do not invert the soil and which cause little compaction. The most commonly used implements are the stubble mulch chisel plough and the stubble mulch cultivator. These options should also be promoted. Another method; reduced tillage refers to tilling the whole surface but eliminating one or more of the operations that would otherwise be done with conventional system. It refers to a wide range of system such as, for example disc harrowing followed by sowing; using a chisel plough followed by a cultivator, followed by sowing; or a rotary cultivator followed by sowing

The ARC and LDA should demonstrate the correct ways of using these implements to so that they could see the benefits and disadvantages of these practice. Farmers could then decide which tillage practices are better for them looking at their own environment and resources available.

5.1.3 Sustainable grazing management systems

Livestock pressure caused by overgrazing and poor veld management practices is increasing land degradation. Croplands are also affected by uncontrolled grazing. Both have a negative effect on the vegetative cover; leading to soil erosion. The relevant stakeholders including the ARC, LDA, tribal authorities, livestock farmers and crop farmers should collectively establish suitable grazing management practices. Planted pastures and forage crops could be introduced. Grazing camps should be established for improved veld management. Community structures should oversee camp management. Infrastructure (fencing, drinking points) is required and LDA through their CASP programme could be approached for funding. By establishing a fence, crop farmers would be able to plant on time and harvest timely. These interventions could increase the income of both crop and livestock farmers.

5.1.4 Building and strengthening local Institutions

A number of stakeholders suggested that poor organization and non-functioning of local structures are adding significantly to the agricultural problems in the area. Interventions, aimed at building management capacity were proposed by participants at the stakeholder workshop. This was deemed a crucial requirement for reaching sustainability of any development. Individual knowledge and skills do exist in the district, but need to be mobilized collectively in order to reach the development goals of the communities involved. Creating a platform for collaboration is necessary to enhance productivity and sustainability. Empowering people through training will assist people to take responsibility for their environment. The LDA should provide funds for training.

CHAPTER 6 RECOMMENDATIONS AND CONCLUSION

6.1 RECOMMENDATIONS

The study found that CA could reverse soil degradation and improve food security in the two villages. If CA is practiced correctly, it could address many of the challenges identified and specifically improve food security. The following aspects should be addressed in order to adopt a model for better managed natural resources:

- Changes in crop management, including rotation with legumes for improved soil fertility.
- Implements that can cut through crop residues should be used to conserve soil moisture and minimize soil disturbance. Farmers should be trained to convert existing implements to minimum tillage implements.
- Assistance in crop production management is required. This could entail providing training in appropriate application and handling of chemicals.
- An interactive, collective innovation approach to problem solving should be used by researchers, farmers, extension, also including the tribal authority and local municipality
- Grazing camps must be introduced to avoid conflict between crop and livestock farmers.
- The youth must be encouraged to practice agriculture to ensure sustainability.

6.2 CONCLUSION

From the information obtained during this study, it is evident that most of the farmers do not practice CA, due to lack of knowledge, capital, financing, fencing and appropriate implements. Securing funds for financing production - for input supply, fencing of cultivated and grazing land and increased access to appropriate minimum tillage practices and implements are all components of a system for sustained agricultural production as these were the most limiting factors identified. It is therefore recommended that more attention should be given to CA, and not only to minimum tillage as this would enable the farmers to utilize the available natural resources more productively and as such improve food security.

REFERENCES

1. Anon, 2007. Links conservation agriculture. http://www.betuco.be/index-eng.htm. Access date (19 June 2007).
2. Anon, 2007. Change management, (http://home.att.net/~nickols/strategy_is.htm
3. Access date (22 October 2007)
4. FAO, 2004. Intensity crop production with conservation agriculture (online). http //www.fao.org/ag/ca/. Date of access 22 June 2007
5. ICRA, 2005. What is ICRA. International Centre for Development-oriented Research in Agriculture.
6. ICRA 2007, Stakeholder Analysis-Key Concepts, Training Handout
7. ICRA 2007, Driving Forces, Scenarios & Strategies – Key concepts, Training Handout
8. ICRA. 2007, The ARD Learning Cycle, Training material on ARD. ICRA, Wageningen, the Netherlands.
9. (www.lda.gov.za/index.php). Date of access, 20 September 2007.
10. Sekhukhune Integrated Development Programme (IDP), 2004.

APPENDIX 1: TERMS OF REFERENCE FOR A STUDY ON CONSERVATION AGRICULTURE

1. Background

It is proposed that a study to investigate Conservation or low input crop production; including water harvesting techniques and appropriate equipment (i.e. ripper planter), and integrated pest management be conducted following an Agricultural Research for Development (ARD) approach. ARD is a multi-disciplinary and multi-stakeholder approach to research and aims to meet the goals of sustainable development..

2. Institutional Framework

The study is commissioned by the Limpopo ARD Hub, a partnership body comprising of:

- Limpopo Department of Agriculture
- ARC (RFI, SRL-ATTA,GCI, ISCW, VOPI, IAE)
- University of Venda and Limpopo
- Agricultural colleges (Tompi Seleka & Madzivhandila)

2.1 Hub's CA Theme group composition

- UL - Dr Shimelis & Dr Mudau
- UV - Mr. Nemakundani
- LDA - K Mudau (CF), Molahlagi (F)
- ARC - A Wanders, P Makwela, H Smith, G Trytsman, K Neluheni, R Gouws, & P du Toit

2.2 Other institutions to be involved

- Community structures and relevant farmers
- NGO's
- Donor organizations
- Municipality (extension)

2.3 Responsibilities

- CA ARD Research Team
  - Implement the approach, methodology, tools to investigate the problem and develop a work program for the study in order to compile a report in the end
- ARC-ATTA & LDA
  - Overall management of the programme
- Theme group
  - Clarification of the TOR and guiding the research process

3. Study period & process

The study will be undertaken by an inter-institutional, inter-disciplinary team being trained in ARD at Tompi Seleka Farmer Development Centre in three phases. Each phase will comprise of training workshops under the Knowledge Acquisition Phase-KAP, field application of concepts through investigating issues in the selected villages (Field Study phase-FSP) and evaluation of the activities undertaken in the field.

- Training course – Field study
  - 30 April to 18 May 2007
  - 9 July to 3 August 2007
  - 17 – 28 September 2007
- Report back to the Focus Group after each field study phase
- Findings of the study will input and guide the implementation of a Conservation Agriculture Project proposed for October '07 to October 2010

4. Problem statement

- Water-use efficiency (water harvesting and conservational) challenges
- Poor access to inputs
- Low productivity
- Poor food security status
- Low quality of produce

- Lack (insufficient) of appropriate implements
- Natural resource degradation

5. Geographical consideration

- It is to be conducted in the Sekhukhune District at a suitable study area on a district ward size, still to be selected

6. Study objectives

Field Project (6 months- April to Oct 2007)

- To devise a conservation agriculture plan to suit the proposed community, consisting of:
  - Tillage management
  - Rotation systems management
  - Residue management
  - Pest and disease management strategies
- To develop the CA plan in accordance with the community members

Medium Term Objectives (3 years – Oct 2007 to Dec 2010)

- More efficient utilization of natural resources, e.g. soil and water
- Improved food security status
- Improved access to operational resources
- Improved human resource capacity
- Strengthened linkages between stakeholders
- Strengthened financial situation

Long Term Expected Outcomes

- Improved knowledge and skills
- Improved natural resources & infrastructure
- Improved financial/ economic status
- Improved social organization

7. Scope of the study

- IPM (strategies/ technologies)
- Low external inputs sustainable agric (LEISA)
- Appropriate implements
- Multiple cropping and crop rotations
- Mulching
- Integrated weed management
- Integrated soil fertility management
- Multi-stakeholder processes
- Training of trainers
- Local institutional development
- Mobilization (awareness)
- Experimentation, Farmer-to-farmer extension
- Monitoring and Evaluation (M&E)

8. Expected output

- Site specific report proposing implementation of the developed CA plan.
- Strategic action plan, or ARD plan

APPENDIX 2: RESEARCH PLAN

CENTRAL RESEARCH QUESTION: **What role can soil conservation play in improving crop production in Sekhukhune District?**					
Research Question	**Potential Outcomes**	**Information needs**	**Sources**	**Methods**	**Expected Outcomes**
Who are the stakeholders concerned about soil degradation	LDA, ARC, Univ of Limpopo, University of Venda, Local authorities, farmers associations	Percentage of stakeholders concerned Perception of stakeholders	Key informants Extension officers Hub	Semi-structured interviews Contacts Venn diagram	Formation of forums
What are the limiting factors for crop production	Unavailability of implements. Soil erosion, Low soil fertility, High infestation of pests and diseases	Information on the availability of implements Soil fertility status Level of pest diseases infestation	Farmers Extension officers specialists	Interviews Field visits Secondary data	Rotational systems IWM IPM implementation
What are the tillage methods that are currently practised	Conventional methods are being practised	Tillage practices Conservation structures	Farmers Extension officers Literature	Area Mapping Transect walk	
What are the perceptions of farmers on soil conservation	Different farmers have various views on soil conservation	Perception of different farmers about soil conservation	Farmers	Questionnaires Informal and semi-interviews Personal contacts	
Which social factors are affecting the adoption of soil conservation	Traditional custom practises. Males dominate the decision-making	Land availability Participation of women in decision-making	Farmers Key informants Tribal authorities	Interviews with key informants Personal interviews Area Mapping	

What practises are in place for moisture conservation	None	Soil types The use of cover crops	Extension officers Farmers Key informants	Questionnaires Informal and semi-interviews Personal contacts	
What cropping systems are currently in place	Mono cropping	Crop rotation Intercropping Trend lines	Extension officers Farmers Key informants	Questionnaires Informal interviews Personal contacts	
How is the land controlled	Tribal authority	Land accessibility Permission to occupy	Extension, Farmers Key informants Tribal authority	Informal and semi-interviews Personal contacts	
What are the input costs in relation with the outputs	More input as compared to the output	Information on yield	Farmers	Key informant interview	
What do farmers do with their production	Produce is mainly for consumption	Amount consumed Possibility to market	Key informants Farmers	Key informant interview Semi interview	
What farming practices are they using	Planting dry land maize, cowpeas and dry beans Using ripper-planters and matraceas	Different seasonal farming practices	Extension officers Farmers	Semi-structured interviews Cropping patterns Seasonal calendar	

APPENDIX 3: WORK PLAN

Task	Method	By whom	With whom	Date	Place	Output
Preparation for the field work	Presentations	ARD participants	Thembi & Khomotso	02/05/07	Tompi Seleka Main Hall	Clarity on things to do in the field
Research questions preparation	Group discussions	ARD participants	Thembi &Khomotso	03/05/07	Tompi Seleka Main Hall	Research questions were drafted
Reconnaissance survey and meeting the key informants	Team meeting Driving to the study area	CA team	Oom Piet Key informants	04/05/07	Tompi Seleka lecture hall Leeukraal	Met the key informants Study area known
Reflection on meeting with key informants	Team discussion	CA team	CA team	07/05/07	Tompi Seleka	Loopholes identified and rectified
Revisiting the TOR Finalize research plan	Brain storming and visualizing	CA team	CA team	08/05/07	Tompi Seleka	Happy with the TOR Research plan done
Plan program for meeting the Headman	Team discussion	CA team	Ca team	09/05/07	Tompi Seleka	Preparation completed
Meeting tribal authority- Introduction of the CA team	Tribal meeting	CA team	Headman, key informants	10/05/07	Leeukraal	Permission to meet with the farmers was granted
Reflection on meeting with the Headman	Team meeting	CA team	CA team	11/05/07	Tompi Seleka Main Hall	Minutes finalized
				14/05/07	Tompi Seleka Main Hall	
Draft program for the data capturing	Group discussion	CA team		15/05/07	Tompi Seleka Main Hall	Plans for the next day finalized
Data capturing	Semi-structured interview	CA team	Farmers group	16/05/07	Leeukraal	Data was captured using the PRA tools
Recording the data collected	Typing	Lawrence		18/05/07	Tompi Seleka Main Hall	Data compiled

BREAK!!!!!!!!! BREAK!!!!!!!!!! BREAK!!!!!!!!!!! BREAK!!!!!!!!!!						
Meeting key informant to arrange a meeting with the tribal authority	Personal contact	Judas, Sandile, Edzisani	Key informant	09/07/07	Tafelkop	Meeting with the Kgoshi and farmers was set for 11/07
Planning for the visit to Tafelkop	Team meeting	CA team	CA team	10/07/07	Tompi Seleka	Work plan for Tafelkop
Meeting the Kgoshi and Reconnaissance survey	Introduction Transect walk Informal interview	CA team	Key informant Kgoshi Farmers group	11/07/07	Tafelkop	Introduction to Kgoshi and farmers. Transect walk
Visit to Leeukraal	Transect walk	CA team	Key informants	12/07/07	Leeukraal	Transect walk was done
Compiling the weekly report for reviewers	Group discussion and write-up	CA team	CA team	13/07/07	Tompi Seleka	Report was compiled
Visit to Tafelkop to meet the farmers	Stakeholder analysis and seasonal calendar	CA team	Farmers groups	16/07/07	Tafelkop	PRA tools were implemented and data was captured
Arranging the meeting with the tribal authority at Tafelkop Designing the broader work plan	Personal contact Group discussion	Judas CA team	Tribal members CA team	17/07/07	Tafelkop Tompi Seleka	Appointment for 18/07/07 was made Broader plan was initiated
Meeting the tribal authority and request permission to meet farmers groups	Tribal meeting Group discussion	CA team	Tribal authority	18/07/07	Tafelkop	Permission to meet with farmers groups was granted for 20/07/07
Preparations for the meeting with farmers groups	Group reflection Programme planning	CA team	CA team	19/07/07	Tompi Seleka	Programme for 20/07/07 and reflection were done
Meeting with the tribal authority and the farmers groups	Farmers' meeting Semi-structured interview (SSI)	CA team	Tribal authority Farmers groups	20/07/07	Tafelkop	Concerns were documented and a youth meeting was set for 21/07/07
Youth meeting	SSIs	Elvis & Edzisani	Tafelkop youth	21/07/07	Tafelkop	The meeting did not take place
Preparation for the meeting with the	Group discussion	CA team	CA team	23/07/07	Tompi Seleka	Programme for the meeting with

Motswaledi municipality mgmt						the municipality
Meeting with the local municipality	Formal meeting	CA team	Elias Motswaledi municipality	24/07/07	Maleoskop	municipality management
Arranging meeting with the manager of Makhuduthamaga municipality office Preparation for the meeting	Personal contact Group discussion	Judas CA team	Municipality manager CA team	25/07/07	Makhuduthamaga municipality office Tompi Seleka	Meeting was set for 26/07/07 Things to do were finalized
Meeting with the Makhuduthamaga manager	Formal interview	CA team	Municipality manager	26/07/07	Makhuduthamaga municipality office	The meeting was a success and data was recorded
Meeting with the Landbank consultant	Formal interview	Lawrence	Landbank consultant	27/07/07	Middelburg	Data on farming loans was collected
BREAK!!!!!!!!! BREAK!!!!!!!!!! BREAK!!!!!!!!!!! BREAK!!!!!!!!!!						