Present and Future Potentials of Agriculture in Pepela Village, Eastern Cape Province, South Africa

Project in Interdisciplinary Land Use and Natural Resource Management, April 2007

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Abstract

The present study was conducted in Eastern Cape Province of South Africa. The objective was to characterize and understand the present situation and future potentials of agriculture in Pepela, a village located in the former Transkei homeland. Several methods were applied in order to address the stated objective, such as questionnaires, semi-structured interviews, different participatory techniques and soil analysis.

On basis of the data gained in the village it was found out that most of the outfields are being abandoned and hence cultivation of homegardens is the major agricultural activity. It plays a considerable role in terms of food supply but still farmers are not self-sufficient. Most farmers are subsistence farmers and selling of crops is generally not the main source of income. Indeed, most of them rely on pensions and child support.

One of the major constraints is the lack of money to invest in agriculture, especially for buying fencing materials and inorganic fertilizers. The lack of working power is also a key issue which results from migration of adults to cities, lack of interest among young people and lack of motivation for involvement in crop production. Moreover, lack of support from extension service and weak infrastructure facilities make the development of agriculture difficult.
However, a few farmers are progressive and market oriented. The reasons for their success are mainly motivation, involvement and readiness to share and gain knowledge.

Preface

The present report is written in connection with the SLUSE course Interdisciplinary Land Use and Natural Resource Management at the University of Copenhagen. The report is based on data obtained during a 10 day fieldtrip in the village Pepela, South Africa. The aim of the report is to illustrate the major constraints in agriculture and potentials in future agricultural development in the village. The report applies to everyone with an interest in agriculture in a developmental context.

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April 2007

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Acknowledgements

A journey is easier when you travel together. Interdependence is certainly more valuable than independence. This report is a significant scientific accomplishment in our academic career and it would be impossible without people who supported us and believed in us. It is a pleasant aspect that we have now the opportunity to express our gratitude for all of them.

Most of all, we would like to thank our study supervisors, Dr. Andreas Neergaard and Dr. Torben Birch-Thomsen. Both of them are not only great scientists with deep vision but also and most importantly they are kind persons. Their trust and scientific excitement inspired us in the most important moments of making right decisions and we are glad to work with these two amazing personalities.

We would also like to thank Professor Trevor Hill from the Geography department of the University of Kwa-Zulu Natal, South Africa, who kept an eye on the progress of our study during our stay in South Africa and always was available when we needed his advises.

Special thanks go to Victor and Judith, our counterparts from the University of Kwa-Zulu Natal, for sharing their valuable knowledge and always cooperating during the entire study period.

We also express our deep gratitude to the Chiefness of Madlangala village, our two interpreters, Mr. Togojan and Mrs. Thandi and all the villagers for their help, hospitality and care which made our life easier in the field.

We thank you all!

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1. Introduction

The present study was conducted in Eastern Cape Province of South Africa. It focuses on agriculture in a village by the Pepela located in the former Transkei homeland, an area which was excluded from the development process South Africa was undergoing up to 1994 (Cousins 2005 and Binns & Nel 1999).

Today Eastern Cape Province is characterized by deep contrasts between its two former homelands (Ciskei and Transkei) and the mainly white-owned commercial districts in the rest of the province (Nel & Davis 1999). It is one of the few provinces in South Africa where the rural population exceeds the urban (Nel & Davis 1999). 70% of the rural population is estimated to live in poverty and to be food insecure (Nyondo & Nkwinti 2003).

The climate in Eastern Cape can be considered semi-arid with two seasons. October to March is the rainy season where rainfalls are usually unpredictable and intensive with a mean annual precipitation of 750mm. The dry, cold season with short frost from June to August, makes agricultural activities difficult (Nel & Davis 1999).
The soils are usually highly weathered, containing large amount of quartz and are dominated by low-activity clay as kaolinite. The available nutrients status of cultivated soils is generally low due to low soil organic matter content and low geological reserves of Phosphorus (P), Potassium (K) and Calcium (Ca). The pH of these soils is also often low (Mandiringana *et al*. 2005).

1.1 Small-scale farming in Eastern Cape

Eastern Cape has 5 million hectares of land under communal land ownership, which are mainly cultivated by small-scale farmers in the rural communities (Nyondo & Nkwinti 2003).

Generally two types of cropping systems are found: homegardens and outfields.
Homegardens are small fenced plot of land (0,1-0,5 ha), that are an integral part of the residential site. They are often cultivated with different grains and vegetables. Outfields are situated outside the villages and are generally ranging from 1 and 5 hectares in size. They are often not fenced and typically cultivated with maize and beans. Over the past 60 years many outfields have been abandoned or unutilised and the crop yields have declined. Many small-scale farmers own livestock such as cattle, goats and sheep (Mandiringana *et al*. 2005 and Roberts *et al*. 2003).

According to Mandiringana *et al*. (2005) and Roberts *et al*. (2003), homegardens are usually better managed than outfields and receive more inputs. Therefore the soils in outfields are more exhaust than in homegardens. Generally, nutrient supplies for crop productions depend on livestock manure because of poor access to inorganic fertilizers.
Another constraint for small-scale farmers is access to tractors for tillage in the sowing season (Neergaard, de, A. 2007). According to Dominy and Haynes (2002) conventional tillage decreases the organic matter status, microbial activity and aggregate stability in the soils. Non-tillage could therefore be an answer to some of the problems of poor soils and erosion, as low microbial activity and aggregate stability lead to nutrient and soil losses.

Many rural households are dependent on multiple livelihood strategies in order to sustain themselves. Most farmers are small-scale farmers, generally characterized by urban dependence and subsistence activities.

They often rely on earnings from migrant remittances and state welfare grants (Andrew & Fox 2004). In fact, crop production mainly contributes to food security, as most of the crops are used for household consumption and animal forage (Neergaard, de, A. 2007). The crops used for selling are mainly sold at the farm gate because of the low access to markets. This result in lower selling-price and thus lesser income compared to the resourceful commercial farmers who have better access to markets and therefore get better price from the crops (Bharwani *et al.* 2005).
Moreover, poor access to infrastructure and credit finance, in addition to world market pressure, makes it difficult to compete with outside markets. Hence it is hard to improve the present agricultural situation (Nyondo & Nkwinti 2003).

In 1994, the ANC stated that a *"vibrant and expanded agricultural sector is a critical component of a rural development and land reform programme"* (ANC 1994, section 4.5.2.1). Indeed, the development of agricultural sector is seen as one of the main aspect of rural development and improvement of rural livelihood (Nel & Davis 1999). This is the reason why, the Department of Agriculture in Eastern Cape has initiated several programmes to address the problems faced in the development of agriculture in the province. An example is the Massive food production scheme which aims for household food security and increase in food production (Nyondo & Nkwinti 2003).

Therefore, understanding the situation of agriculture and identifying the problems to be addressed seems to be of great importance as a starting point to improve the households' livelihood.

1.2 Objective and Research Questions

The primary objective of this study is to characterize and understand the present situation and future potentials of agriculture in Pepela village. This will be carried out by investigating the research questions using an interdisciplinary approach, including both socio-economic and agro-ecological aspects.

1. How is the agriculture contributing to the livelihood of the villagers?
-How many households in the village are cultivating crops?
-What are the common agricultural systems and practices?
-What are the major crops and what are their usages?
-What is the importance of incomes and expenditures from agricultural activities?
-How the household characteristics (age, gender, occupation) influence the agricultural activities?

2. What are the major constraints in the development of agriculture with reference to food security and income?
-Is there access to markets, agricultural inputs, extension service and to what extent?
-Is there enough labour and time for agriculture activities?
-How the climatic and soil conditions influence the agricultural activities?
-What are the differences in constraints between the men and women farmers, market oriented and subsistence farmers?

3. What are the future potentials of agricultural development in order to improve the livelihood?
- What are the advantages/disadvantages of zero tillage compared to conventional tillage?
- Which agricultural practice provides better benefits in terms of yields and income?
- What are the reasons that make some farmers "successful"?

1.3 Methods

The report is primarily based on results from a research fieldtrip to South Africa. The fieldwork was carried out in 10 days in the village of Pepela in Eastern Cape. Beforehand a synopsis was made which was the working tool in the field. The raw data obtained in the field has been analysed and interpreted and held together with a study of relevant literature to write this final report.

1.4 Definitions and Limitations

In this report, agriculture is defined as farming activity regardless of weather or not such activity is undertaken for profit. A farmer is any person who is engaged in agriculture. Livelihood is defined as the capabilities, assets and activities required for a means of living of an individual or a household.

The group only had 10 days in the field, which naturally gives the scope of the research some limitations. Therefore the focus was on agriculture in terms of crop production, and livestock was only integrated as a wealth parameter and a source of manure.

2. Methodology

In order to address the stated objective and answer the research questions, several methods were applied in the field. The social science methods included a questionnaire survey, semi-structured interviews, informal conversations and different participatory techniques. The natural science method was a soil analysis. The following section will describe how the individual methods were carried out, who the informants were and what information was aimed to obtain.

2.1 Questionnaire survey

The aim of the questionnaire survey was to obtain a general understanding of the different household characteristics and agricultural activities. The information expected was the size of the household, if it was male- or female headed, the distribution of persons into ages-groups and the number of people involved in agricultural activities. Furthermore, it was also to gain information on the incomes and expenditures of the household, the agricultural inputs, the major crops cultivated and the usage of the crops.
To get a description of a representative selection of the village and the agricultural situation in Pepela, 40 households were surveyed from the village. The aim was to make sure that all categories of households were represented, households cultivating a homegarden, cultivating outfields, cultivating both and without cultivation. The first 20 households were randomly selected by visiting every second house. As expected, almost everybody cultivated a homegarden, but not an outfield. Therefore, the next 20 households were selected by guidance from the interpreters, to make sure those households with outfields and without any cultivation were represented.
The questionnaire surveys were done by using a pre-made questionnaire. It was tested with the interpreters and adjusted during the survey process. The final questionnaire survey scheme is in appendix 1. Each household were marked by GPS points to locate the exact placement in the village and to ensure the possibility of returning to the household for further interviews.

2.2 Semi structured interviews

This method was used in two types of settings; with a selection of households from the questionnaire survey and with a series of key informants.
The interviews were structured by a list of keywords and questions, and the aim was to get a dialogue going to gain as much information as possible.

Surveyed households
The interviews were carried out in order to get more detailed information from the answers in the questionnaire survey, for example to identity some of the constraints in crop production and to get an idea of how money would be invested if funds were available.
On the basis of the questionnaire survey, 12 households were selected for semi structured interviews. Most of these represented average households from the different categories. But some of them represented exceptional interesting households, for example one cultivating without any use of inorganic fertilizers and one household where the only income came from agriculture.

Key informants
Several key informants were interviewed to obtain information from community residents who were in a position to know the community as a whole, or give alternative perspectives on agriculture.

The key informants selected were two extension service officers from different areas and the head of the extension office in Maluti.
They were interviewed in order to understand the role of extension service and its functioning in the village. A farmer practising non-tillage in the village, a progressive farmer running a big vegetable garden in Makomereng village and a farmer from a neighbouring village, Pontseng, who is involved in a governmental project, were also interviewed. These were carried out in order to give an insight to the criteria determining success in agricultural production. The aim of the interviews was to provide information on the advantages and disadvantages of non-tillage, the role of community gardens etc. These interviews served the purpose of understanding the present situation of the village and helped in identifying the key areas that need to be addressed in order to improve the rural livelihood. The information could furthermore be helpful in inspiring the marginal and subsistence farmers, thus answering the second and third research questions. A list of respondents is found in appendix 2.

2.3 Informal conversations

A conversation with a group of young guys from Pepela was done to get a perspective of the future potential in the youth for farming.
Also an informal conversation with a couple of elderly men in Pepela was carried out. The objective was to get a timeline of the development of agriculture in the village and to experience their point of view on the potential of agricultural development.
Finally the Chiefness of Madlangala village was also approached to obtain an overall perspective of the present situation of the agriculture in the village and the future potentials. Furthermore, the aim of the interview was to try to address some of the problems already identified and get the Cheifness' point of view on these and her suggestions to solve them.

2.4 Participatory techniques

Five different participatory activities were carried out, one with the children in the local primary school and the others in a community house with different selected farmers from the village. The participating farmers were selected from the questionnaire survey.

School children workshop
The aim of the workshop with the school children was to gain information on the potential of the school children as future farmers. The children were asked about their future plans and which words they associated with crop production. These words were drawn on a flipchart and used for further discussion in the class.

Annual maize calendar
The aim of the activity was to identify differences on management practices and to understand constraints such as the availability of traction. The plan was to make the people from the village draw an annual calendar including annual weather conditions and the cropping activities such as ploughing, sowing, weeding, harvesting and selling. The idea was to do it for all the major crops grown in the village, but due to lack of time and unforeseen circumstances, only the calendar for maize was created.

Homegarden food supply calendar and calendar of expenditures
In this activity, farmers were gathered from the village to draw a simpler calendar of the major crops produced. This included the harvest and storage of these and the aim was to gain information on the extent of food supply the homegardens provided.
The villagers were also asked to quantify the household expenditures during the year to see if there was a correlation between months with low food supply and months with high expenditures on food.

Matrix ranking of constraints
The aim of this activity was to gain information on the different constraints in agriculture. The villagers were asked to identify the major constraints and rank them individually. Afterwards the ranking of constraints were drawn on a flipchart, a summarized ranking was made and discussed in the group.

Follow up group discussion
This activity was mainly a group discussion to follow up on the previous activities and get answers to some of the questions that had been raised during the fieldwork. The participants were confronted with several questions, which were then discussed among them.

2.5 Measuring soil properties

In order to triangulate information from the survey and interviews with soil conditions, soil sampling was done. The focus was the composition of the soils and the conditions of pH, organic carbon and macronutrients.
The sampling was done in connection with the semi structured interviews with the different households. Topsoil (0-15cm) was sampled from the homegardens and outfields. One sub sample was taking every second meter across the garden or field with a soil auger and five sub samples constituted a sample. The sub samples were mixed together in a bag and dried in the sun. Few duplicate samples were also made.

Phosphate, pH and electric conductivity
While in the village pH, conductivity and phosphor was measured. 10g of soil was dissolved in 25ml of distilled water, the solution was shaken for 30 min and the pH and conductivity was measured using a pH-meter and a conductivity-meter respectively. For the phosphorous (P) 5g of soil was dissolved in 25ml Olsen P (5M $NaHCO_3$) and shaken for 30 min. The samples were filtrated two times through filter paper and chemicals from a phosphorous-test-kit were added. The colours of the samples were estimated with reference to the colours given in the test-kit.

Soil texture analysis of soil
In the laboratory of Life Science, University of Copenhagen, the soil samples were tested for texture and the amount of sand, clay and silt were estimated. 50g of the soil samples were sieved to remove the large organic matter particles and then dissolved in 40ml of sodiumpyrophosphat solution and 200ml of distilled water. The samples were shaken for 16 hours. Then it was poured into 1000ml test tubes and distilled water was added to make it 1000ml. After stirring the samples, measurements were taken with a hydrometer at an interval of 4 min, 8 min, 2 hours and 16 hours for clay and clay + silt soil contents determination in g/l.

The samples were filtrated through a 0,210mm filter, the remaining coarse sand and organic matter was dried in an oven over night and weighed the next morning to determine the coarse sand content. An attempt to remove the organic matter from the coarse sand was tried, so the exact amount of sand could be measured, but this unfortunately failed.
The fine sand content was estimated by subtracting clay, silt and coarse sand weights from 50g.

Carbon and nitrogen contents
Soil samples were dried in an oven and afterwards grinded using mortar and pastle. 30 mg of each soil samples was weighed to analyse nitrogen and carbon content using mass spectroscopy (IR-MS).

3. Results and discussion

3.1 The study site

Pepela is one of the three sub-villages of Madlangala Village in the Maluti district in former Transkei. It is situated at the foot of the Drakensberg Mountains near Lesotho, at an altitude of 1700m (figure 1). The nearest towns, Matatiele in the neighboring province Kwazulu-Natal and Maluti in Eastern Cape, are located 35km away along a bumpy dirt road. There is one daily bus service connecting Pepela and Matatiele.

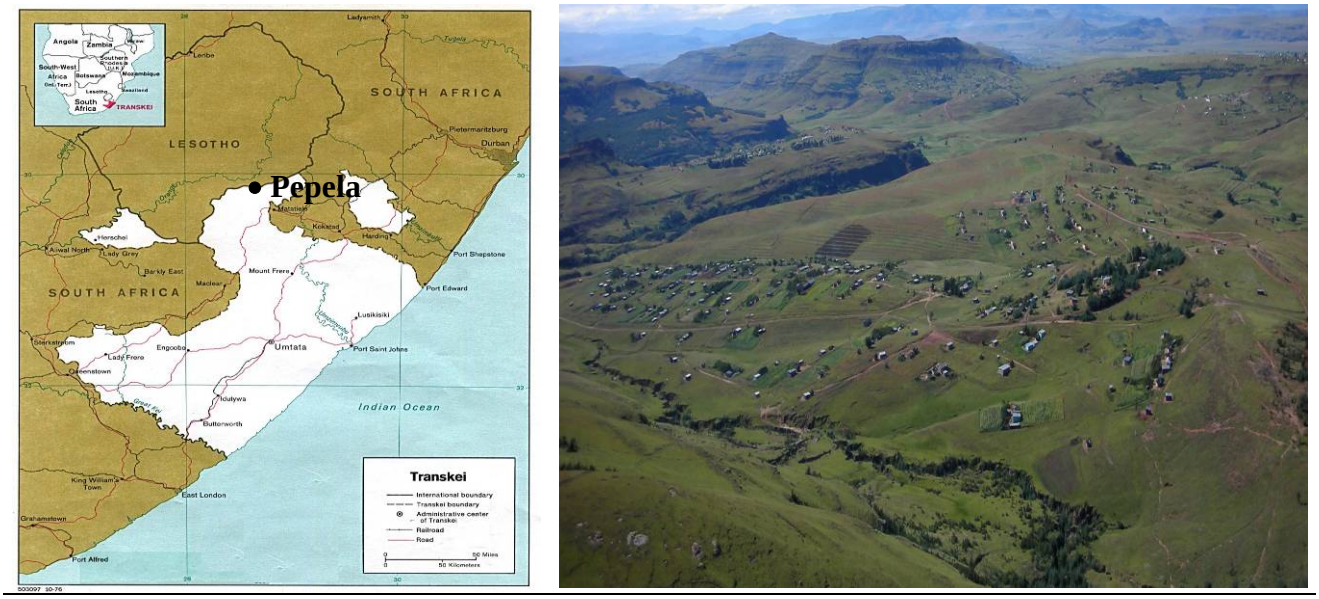


Figure 1: On the map to the left the white area indicates the former Transkei area and Pepela is situated in the northern part by the boarder to Lesotho. The picture to the right shows the village of Pepela.

Pepela encompasses around 100 households, each with a 50x50m plot of land at their disposal.
In 1999 the village was provided with taps and piped water from the mountains, though electricity and power supply has yet not been implemented. The village also has a new primary school under construction, but students wishing to attend high school must still leave the village. There are only few regular income generating jobs in the village, such as owning a shop, school teacher and working in community projects. Other jobs such as herding cattle or seasonal jobs are often paid with food and beer. The unemployment rate is 38,5% in Madlangala village and out-migration to the urban area is very common.

3.2 Characteristics of the village households

According to the questionnaire survey, the population in Pepela mainly constituted of young people. 50% of the people staying in the village were below 14 years and only 19% were above 50 years.

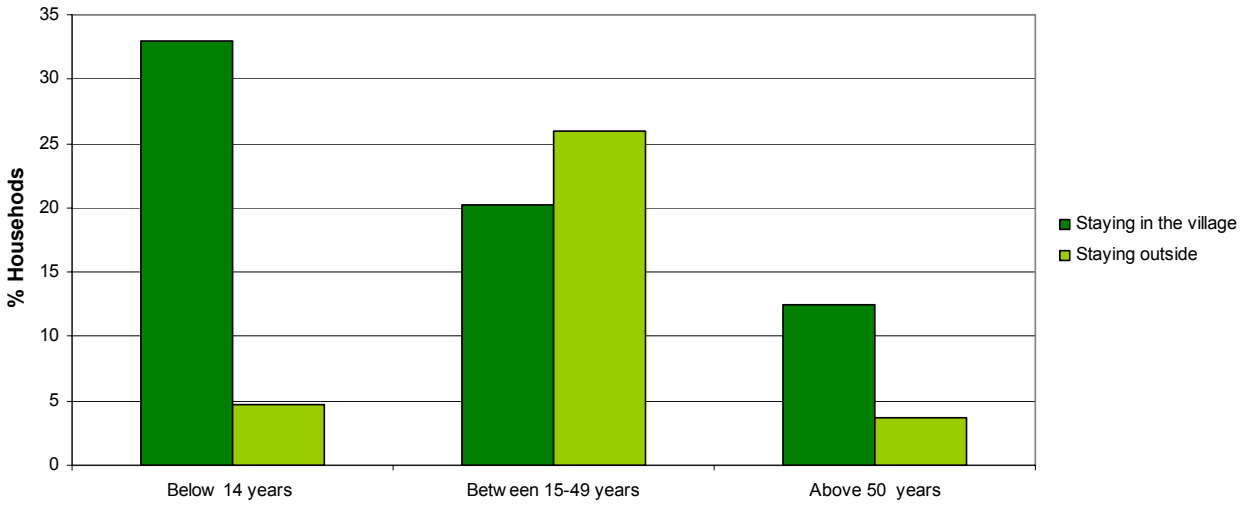


Figure 2: Household composition with people staying or not in the village in percentage of the total.

Moreover, more than half of the people between 15 and 49 years were staying outside the village to work (figure 2). This mainly concerned men but it was also becoming common for women.
Despite this migration, child support (R190 per month) and pension (R800 per month) together were considered as the most important source of income for 45% of the responding households while secondary jobs and agricultural activities had the same importance (27.5% considered it as the main source of income). Most of the secondary jobs were taking place in the cities but some respondents were also working in Pepela in shops or as sellers (milk, matches, cakes), construction workers.

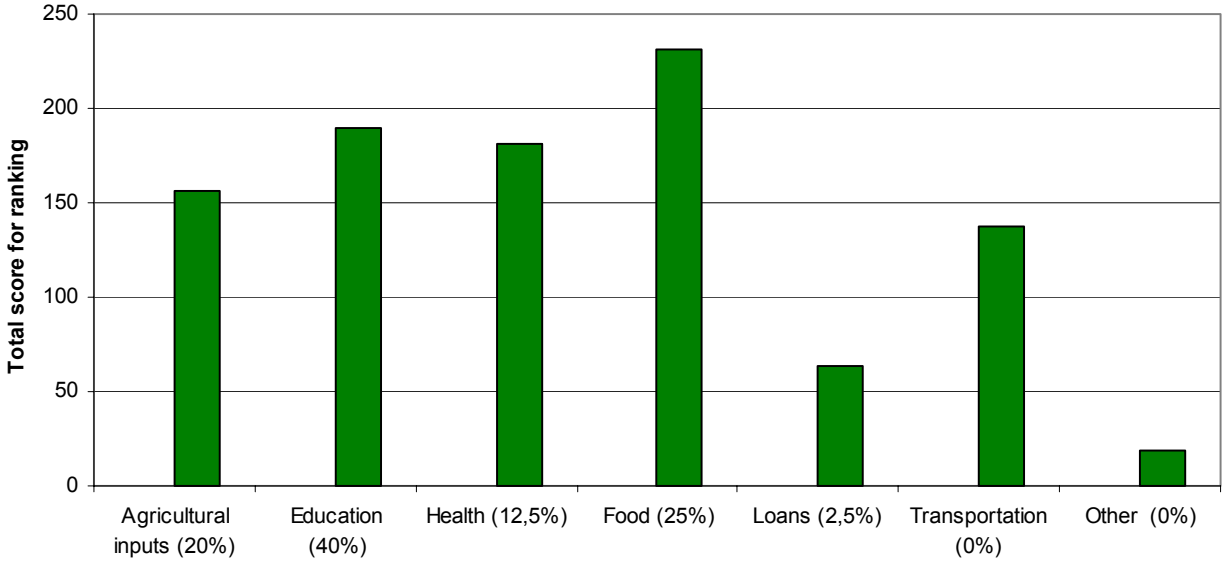


Figure 3: Scores for the ranking of major expenditures. The number in parenthesis represents the percentage of households which consider it as the main expenditure.

Food was the major expenditure followed by education and health (figure 3). Food had been mentioned by 25% of the households as the main expense while Education was considered by 40% as the main expenditure. Education seems to be really important for people who had expenditures on it. Health also played an important role in the respondent's everyday life. Agricultural inputs were ranked as the fourth major expenditure but it should be considered that all households were not practicing agriculture.

Of the households involved in agriculture, either homegardens or outfields, more than 60% were male headed. Contrary, only 30% percent of the households not involved in any agricultural activity were male headed.

3.3 Agriculture and livelihood

This section addresses the contribution of agriculture to the villagers' livelihood by looking into issues such as to what extent people in the village were involved in agricultural practices and what benefits the practice provided.

3.3.1 Extend of cultivated homegardens and outfields

The questionnaire survey showed that 75% of the households were involved in crop production in the current season. Especially the cultivation of various crops within the household 50x50m plot was found to be a common practice. 72,5% of the respondents cultivated a homegarden while only 25% cultivated an outfield (figure 4).

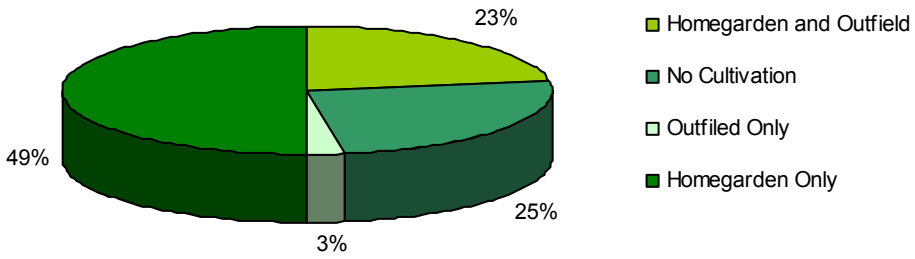


Figure 4: The percentage of households who cultivated homegardens and/or outfields and the non-cultivating, within the 40 surveyed households

According to the map marked with the GPS-point of households surveyed (appendix 3), no spatial distribution pattern among the four categories was identified.
Only one household cultivating an outfield did not have a homegarden, which indicate that people are more likely to cultivate an outfield if they already cultivate a homegarden. As much as 25% of the respondents were not cultivating in the current season, although the majority of these used to have a homegarden. The main reasons why they had stopped were lack of money for fencing and age induced lack of strength or sickness.

Few were in the process of preparing a homegarden for next year and one respondent had simply experienced germination failure due to late sowing and the serve drought. This could indicate that it is not only financial constraints that are the reasons for not cultivating.

3.3.2 Cropping systems and crop management

Within the homegardens, there were in most cases a 20x50m maize garden sometimes intercropped with bean or pumpkin and a smaller vegetable garden with mixed vegetable crops. Few only had either maize or vegetables in their homegarden. The lack of vegetable gardens was mainly because of limited fence to keep the household poultry out, while the reason why some households with vegetable gardens lacked a maize garden was not identified.

The majority of farmers with outfields had only one field, divided in two plots. Sorghum would be grown in one part and maize, often intercropped with beans and pumpkin, in the other. Few respondents were not growing maize in their outfields, while everyone was growing sorghum. This fact was in conflict with some points stated during the semi-structured interviews, where it was insisted that the cultivation of sorghum was scarce. It was found out that sorghum was important because it was used for brewing beers that could be sold or used for paying the people hired.

Every surveyed household used animal manure for fertilizing their fields in the homegarden and in the outfield (figure 5). 50% of all the households involved in crop production had either cattle or more than 10 goats, thus their self supply of manure was not limited. All households not owning livestock got their manure for free from their neighbors or family members who had livestock. This indicates that access to manure was not a limiting factor, as the transportation and application of it might be.
Since homegardens are smaller in size than outfields as well as closer to the source of manure, it was suggested that homegardens received more manure. This was supported by the higher content of organic carbon in the homegarden soil analysis (see section 3.3.3, General soils conditions). Animal manure was applied during the soil preparation or during the sowing in both homegardens and outfields. None of the surveyed farmers applied animal manure during the growing season.

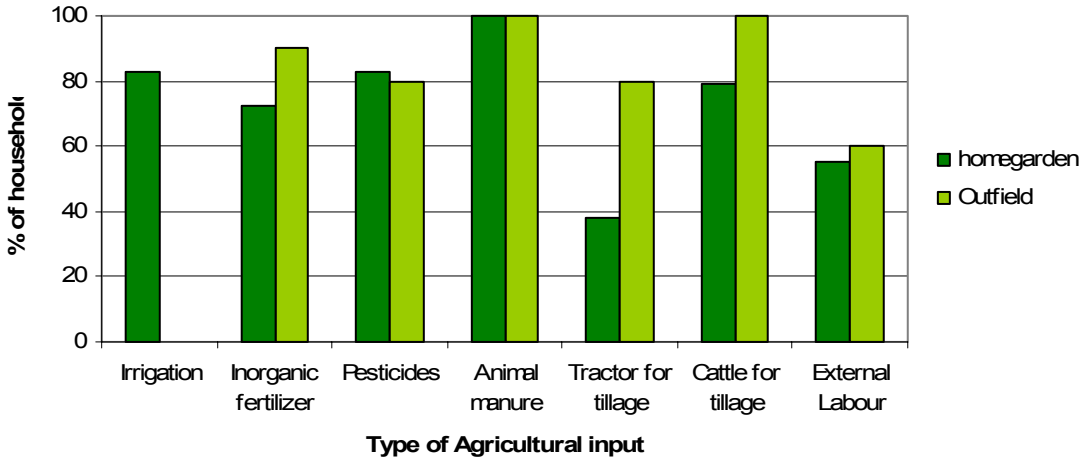


Figure 5: The percentage of households who applies either: irrigation, inorganic fertilizer, pesticides, animal manure, tractor or cattle for tillage or external labour, when cultivating their homegardens and outfields. The graph is from the 29 households surveyed who cultivated homegardens and the 10 households surveyed who cultivated outfields.

Inorganic fertilizer and pesticides were also used by the majority of the households on a need basis (figure 5). For the homegarden, more than 80% of the households would irrigate either with buckets or hoses, while nobody was irrigating their outfields. The usage of tractor or cattle for tillage was greater in the outfields than in the homegardens which primarily was due to the size difference.

In general the time invested in management of an outfield was concentrated in few, intensive and short periods; preparing and sowing, weeding and harvest (table 1). Contrary the time spent in management of a homegarden, especially the vegetable garden, was spread throughout the whole season. The time of sowing vegetable crops was variable for the different species and some would grow two or three times during the season. The weeding and harvesting was an everyday activity as the various vegetable crops would be at different developmental stages during the season.

Table 1: Annual calendar for maize production with 6 participants. + is cold, ++medium and +++warm. • means do not spend much, •• spend money, •••spend a lot of money, S means seeds, T traction, F fertilizers, P pesticides, L labor and H harvest. It is noticed that fertilizers is just applied when preparing soil and labor is needed for weeding and harvesting.

Months	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
Weather	.++	.++	.++	.+++	.+++	.+++	.+++	.++	.++	.+	.+	.+
Farming practice			Ploughing and cultivating			Weeding		Selective harvest		Final harvest		
Work load			4 days	3/4 days	2 days		5 days			5 days		
			2/3 days				14 days			3 days		
			3/4 days			7 days				5 days		
				1/2 days			4 days			4 days		
				3 days		8 days					3 days	
					2 days		1 day				3 days	
Agricultural expensesl		•S	••T	••F		•P	••L			••H		
		•S	••T		•••F		••L			••H		
		•S	•••T	•••F		••L	•P			•••H		
		•S	••F	••T			••L			••H		
		•S		••T		••F	•P				••H	
		•S			•••T	•••F	•••P				•H	

3.3.3 General soil conditions

Most cultivated surface soils in Pepela have a texture from moderately fine to fine (table 2). Fine texture soils are easily compacted, difficult to till after rain explaining the need for cattle or tractor. These soils also usually have a medium to slow organic matter (OM) decomposition but no clear relation with OM content is found. Moreover, clayey soils are often characterised by a high capacity for water and nutrients holding.

Table 2: Percentage of samples corresponding to different textural class determined with the triangular texture diagram (USDA classification system).

Textural class	Texture	Common name	% of samples
Fine Sandy loam	Moderatly coarse	Loamy soils	13
Sandy clay loam	Moderatly fine	Loamy soils	43,5
Clay loam	Moderatly fine	Loamy soils	13
Sandy clay	Fine	Clayey soils	13
Clay	Fine	Clayey soils	17,4

As shown in table 3 non-cultivated soils were low in N and C contents but still much higher than cultivated land where they are considered as very low (Landon 1991). P content was also clearly superior in non-cultivated land compared to homegardens and outfields but still very low. Thus, it seemed the manure and inorganic fertilizers applied in cultivated soils was not sufficient enough and soil was being depleted in macronutrients and organic matter. All soils were acidic and no important differences of pH were observed between cultivated and non-cultivated soils. This shows that agricultural practices do not lead to acidification but it also shows that liming was not practiced anywhere in Pepela. Electrical conductivity values revealed that salinity was not a problem.

Table 3: Average values for pH, electrical conductivity, nitrogen, phosphorous and carbon contents for homegardens , outfields and grassland of topsoils. The values indicates the average values ± standard error. P available is in µg/g of the topsoil. EC is electrical conductivity measured in mS/cm. Mineral nitrogen and organic carbon contents are expressed in percentage of the topsoil.
*Data from the Wattle group's studies, 2007.

	Samples nb	pH H_20	Nitrogen (%)	Carbon (%)	Pavailable (µg/l)	EC_{sat} (mS/cm)
Homegardens	20	5,82 ± 0,13	0,128 ± 0,111	1,630 ± 0,134	0,253 ± 0,029	0,183 ± 0,054
Outfields	3	5,90 ± 0,36	0,108 ± 0,009	1,344 ± 0,132	0,150 ± 0,022	0,108 ± 0,058
Grassland*	4	5,25 ± 0,17	0,210 ± 0,022	2,684 ± 0,299	0,375 ± 0,025	0,306 ± 0,101

In comparison with outfields, the nutrient content in homegardens was higher which correlates with the fact that usually more manure and inorganic fertilizers were applied here. This was especially the case for phosphorus.
However, these results should be interpreted carefully because of the small number of samples in outfields that may not be representative.

3.3.4 Major crops and their use

Cabbage, spinach, carrot and tomatoes were the most common vegetables cultivated in the vegetable gardens, though other species such as beetroot, turnip, potato and onion were also found. Many households had few peach and apple trees, but these were not considered a part of the homegardens.
The crops grown in the vegetable garden were mainly used for household consumption and farm gate sales. Few respondents also exchanged their vegetable crops.

The proportion of the crops that were used for either purpose varied among the households. Though, it seemed that tomatoes were used more as a cash crop as 64% of the households reported that most of the yield was sold rather than consumed in the household. Contrary, 72% of the households who cultivated carrots said a major part of them were used for household consumption. Concerning cabbage and spinach, no particular trends were observed. The different usages of crops indicated that there were different motives behind the selection of the vegetable crops cultivated.

79% of the farmers questioned were cultivating maize and all of them use it for household consumption. Only, few households claimed that the maize was primarily used for feeding their poultry. 31% of the respondents sold the maize from homegardens while 50% sold it from outfields. Indeed, harvest for household consumption during the growing season was very common for maize from homegarden.
Contrary to maize, sorghum was only cultivated in 13% of the homegardens. Regarding sorghum in outfields, half of the respondents used it mostly for household consumption, while the other half was selling it.
Thus, maize was considered as a staple crop while sorghum was cultivated mainly for the added-value it provided by local beer brewing.

3.3.5 Income and expenditures in relation to agriculture

The majority of the respondents involved in agriculture had an income from selling their crops. It seemed that more households cultivating a homegarden and an outfield had income from agricultural products compared to the households only cultivating a homegarden (figure 6). Half of the households selling agricultural products said that it was their major source of income.

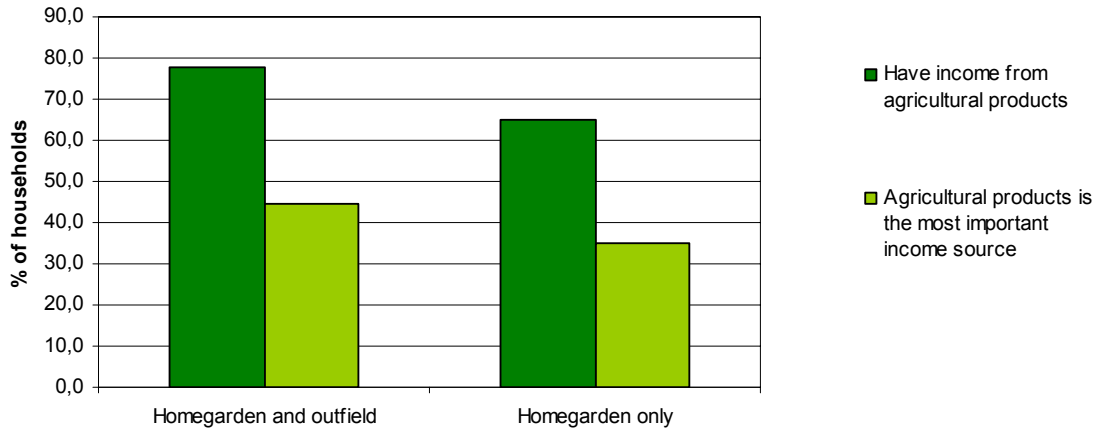


Figure 6: The percentage of households who have an income from agricultural products next to the percentage of households where agricultural products are the largest income source. The values are shown for households with homegardens and outfields and for households with a homegarden only.

The various households generally use between R 250 and R 750 per year in relation to agricultural production. This amount was primarily used for hiring traction and inorganic fertilizer (see table 1). Indeed, the ranking of expenditures related to agriculture revealed that rental of traction was the most expensive followed by inorganic fertilizers for outfields and seeds for homegardens.
It was the general opinion from the respondents that outfields were more expensive to cultivate, but there was no correlation found between the yearly spending, and the cultivation of an outfield.

In Pepela, wealth and agricultural activities seemed to be linked. Considering cattle owning as a wealth criteria, the questionnaire revealed that 80% of respondents cultivating an outfield own cattle while it is the case for 55% of ones cultivating only homegarden. None of the respondents who do not cultivate own cattle. This indicates that households cultivating an outfield were wealthier than households not cultivating one.

3.3.6 The livelihood contribution from agriculture

It is clear that the cultivation of crops is contributing to the livelihood in terms of income generation and food security but the trends vary for each category.
As described before, respondents cultivating homegardens and outfields generated more income from crop production than others. However, even if it is not quantifiable, food security remained the major contribution from crop production for both category (HG and HG+OF) as no market oriented farmers were met in Pepela. However, the participatory activity on food supplies from homegardens (table 4) revealed the maize production was not sufficient enough to last all year and that it was necessary to buy from December to April. It was moreover important information that the months of December and January were considered the most expensive because of Christmas and school fees expenses. Even though 60% of households involved in crop production produce more than they buy, they did not seem self sufficient.

Table 4: Participatory activities on the 5 major crop's food supplies. X means storage while ● means harvest. Spinach and turnip are produced all year round

	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
Maize	**x**	**x**									●	**x**
	x	**x**	**x**									●
	x	**x**	**x**	**x**						**x** ●	**x**	**x**
Cabbage						●	●			●	●	
	●	●					●	●	●			
						●	●			●	●	
Spinach	●	●	●	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●	●	●	●
Potato	**x**			●	●	x	x			●	x ●	**x** ●
	x			●	●	●	x	x		●	x ●	x ●
	x			●	x ●	x ●	x			●	**x** ●	**x** ●
Turnip	●	●	●	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●	●	●	●
	●	●	●	●	●	●	●	●	●	●	●	●

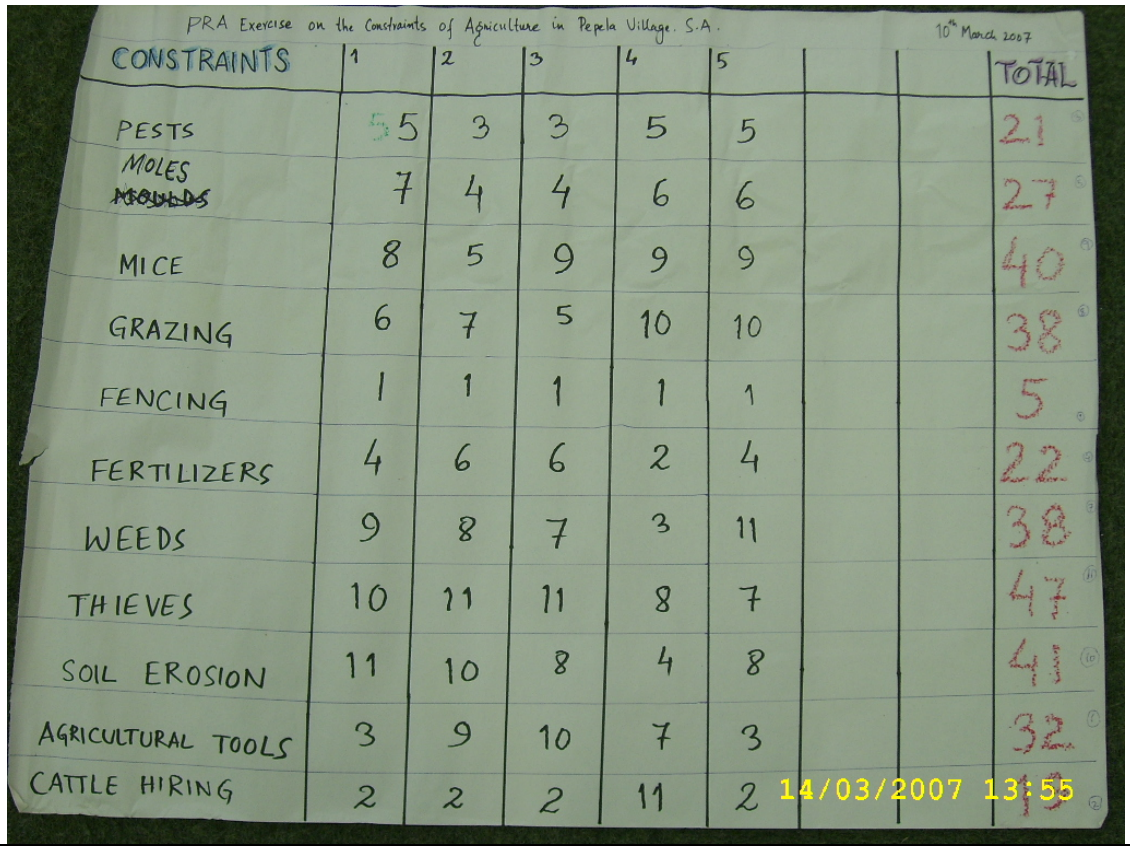
3.4 Constraints in agriculture

This section focuses on major constraints in the present agricultural practices in Pepela and the constraint in the future development. The constraints faced by the farmers were identified through the questionnaire survey, semi-structured interviews and the different participatory activities and can be grouped into three categories: economic -, agro-ecological - and social and institutional related constraints. Indeed, different problems were related to the homegardens and outfields respectively.

3.4.1 Economic constraints

Various constraints identified by the villagers fall under this category, such as fencing, seeds, fertilizers and traction.

During a group ranking exercise with five farmers, the most important constraint identified was fencing (figure 8). The cost of purchasing a combined barbwire and mesh fence for a homegarden reaches R 1000, while barbwire only is R 400. These were expensive investments for many households, thus the majority only had barbwire fence around their residential site. Fencing was a necessity to cultivate a homegarden because there were problems with browsing livestock and poultry in the village. This was also emphasized by the villagers as they explained that even if there was barbed wire fencing, small animals and poultry could still get into the homegarden and eat away the crops. Several examples of browsing livestock within a residential plot with only barbwire fence, was observed during the fieldwork. Lack of fencing was also a problem in the outfields, though some areas were more prone to browsing livestock than others. Only the few resourceful farmers could afford to fence their outfields.


PRA Exercise on the Constraints of Agriculture in Pepela Village. S.A. 10th March 2007

CONSTRAINTS	1	2	3	4	5	TOTAL
PESTS	5	3	3	5	5	21
MOLES	7	4	4	6	6	27
MICE	8	5	9	9	9	40
GRAZING	6	7	5	10	10	38
FENCING	1	1	1	1	1	5
FERTILIZERS	4	6	6	2	4	22
WEEDS	9	8	7	3	11	38
THIEVES	10	11	11	8	7	47
SOIL EROSION	11	10	8	4	8	41
AGRICULTURAL TOOLS	3	9	10	7	3	32
CATTLE HIRING	2	2	2	11	2	19

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Figure 7: Group ranking exercise on the constraints in crop production. The lowest rank (1) was the most important constraint identified, while the highest rank (11) was considered the least important constraint.

Another economically related issue was hiring of traction and ploughing, which was identified as the second major constraint in the group ranking exercise (figure 7). Traction and ploughing was necessary for tilling and sowing the crops especially in the outfields. Many households did not own enough cattle to provide themselves with traction and only one farmer in the village owned a tractor.

Around 40% of the surveyed households involved in crop cultivation said that their major expense was the hiring of traction (figure 8). There was no obvious difference between the respondents with homegarden and those with outfields. In the homegardens cattle traction or manpower was the primary way of ploughing, but in the outfields it was often necessary to use both tractor and cattle. To have an outfield ploughed with a tractor cost between R 200-300, depending on the size of the field. Contrary hiring cattle to plough cost R 100-200. Thus, the costs involved in hiring cattle and tractor are quite high. Interestingly, 70% of the farmers cultivating outfields could provide themselves with cattle traction, which indicate a link between cultivation of outfields and owning cattle. As only one tractor was owned in the village, waiting time to hire it could occur during the cropping season. This could result in delayed sowing of the crops and hence potential failure later on.

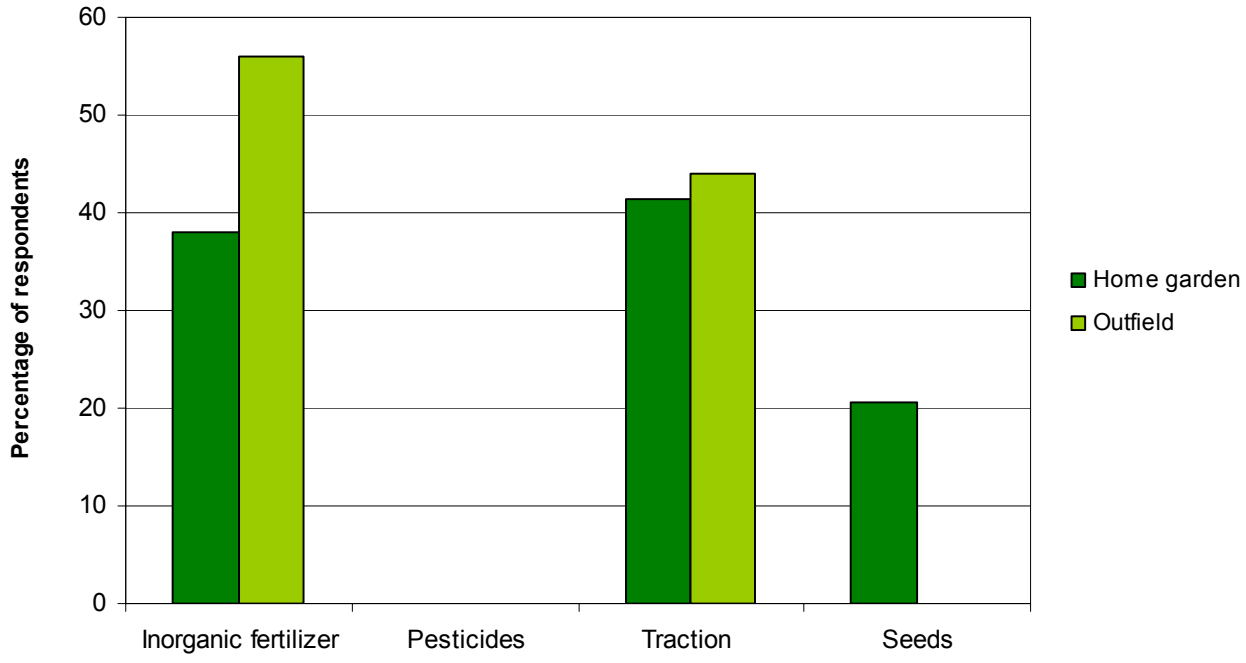

Figure 8: The percentage of households involved in crop production that ranked either inorganic fertilizer, pesticides, traction or seeds as the major agriculture expenditure in homegardens and outfields.

A third important constraint identified was the lack of purchasing power for inorganic fertilizers and seeds as well as pesticides, agricultural tools and implements. Inorganic fertilizer was ranked by close to 40% of the households, as their major expenditure in the homegardens, while 55% of the households ranked it highest for cultivating an outfield (figure 8). The majority of households who were not depending on hiring livestock for traction, ranked inorganic fertilizer as the highest expenditure. Furthermore, the majority of households depending on hiring traction ranked inorganic fertilizer as the second greatest expenditure. Thus, the lack of means to purchase fertilizer was definitely a problem faced by many farmers. This was further emphasized by many households explaining that they only purchased a bag of inorganic fertilizer every second year and that they would only apply it during the sowing period. Therefore the amount of inorganic fertilizer applied was generally quite low compared to the recommended dose and no remarkable increase in yield was obtained.

It was clear the greatest problem with lack of inorganic fertilizer was seen in the maize plots, especially in the outfields. As an example a field of 0,25ha yielded only 160kg of maize, which is very low.

Vegetable seeds were also identified as a major expenditure by 20% of the households cultivating a homegarden (figure 8). For maize, most of the farmers used traditional varieties of seeds which were a part of their own harvest.
One progressive farmer suggested using improved and high yielding variety of maize and then the yield would be increased. But, he also pointed out that these high yielding varieties of maize were expensive and that problems, such as more vulnerability to pests, diseases and droughts, were associated with these. So under low input conditions, the traditional varieties seem the most preferable.
Pest and diseases were also identified as major problems in crop production (see following section 3.4.2), though the cost of pesticides were not expensive to any of the farmers surveyed.
Even though lack of buying power was a major issue, very few were indebted with loans which could indicate that the access to micro credit was limited. But unfortunately this was not further investigated. Also limited transportation and markets for agricultural crops nearby the village, was seen as a constraint for many farmers who would like to sell their crops. Therefore the small scale or subsistence farmers would only sell their produce to other villagers on a request basis. Only progressive and resourceful farmers who produced crops in large quantities were able sell their produce in Matatiele or Maluti.
Many of the constraints discussed above are related to extension and improvement of already existing cropping systems, such as limited traction and inputs but issues such as fencing, was also critical in relation to getting started with cultivating crops.

3.4.2 Agro-ecological constraints

Constraints identified in this category include both the abiotic and biotic factors that affect the crop production. The most important abiotic factors are the weather condition and soil conditions of the agricultural plots.

During a semi structured interview with a farmer having a well managed homegarden, it was explained that the weather condition was quite unpredictable and there was a lack of weather forecast information centre. Because of this, farmers were unaware and unprepared for the weather calamities. Early frost, frost during winter time and excessive rain during rainy season have been reported to hamper crop production. Drought during raining season has also been devastating for the crop production, especially in the outfields where there was no possibility of irrigation. Therefore irrigation in the outfield has also been identified as a problem.

Previously (section 3.3.3) it was shown that soils in Pepela has a fine texture, which can generate problems of soils getting too hard and compacted. Indeed, this was experienced by some respondents that had to rent a tractor because the soil was too hard to plough with their cattle. Fine textured soils can also have problems with infiltration during heavy rains and create run-off. This was visually observed in several fields.

Concerning the macronutrients, nitrogen (N) and phosphorous (P) and organic carbon (C) content of the soils, shown in table 3, uncultivated grassland soils had a generally low organic C content and medium available N content.

This indicates that the initial soils condition in Pepela may be not optimal. However, it was seen that cultivated soils were even lower in N, P and C content. This observation illustrates that farming practices in Pepela may lead to soil depletion in macronutrients and organic carbon, especially in outfields. Thus, low soil nutrient status could be a constraint as it may reduce the production potential.

Some of the farmers indicated that the initial soil conditions were varying among the different agricultural plots in the village, which had a great influence on the crop yields. It was also observed during the 10 days in the field, that some agricultural sites were located better than others. On the contrary, one of the most resourceful farmers in the village noted that some of the fields located in poor sites were the ones with the largest yield. This comment is difficult to explain without any comparisons of the soils and without any detailed knowledge of the management in the two different sites.

As mentioned earlier, farmers reported various pests and diseases that destroy their crops, as being a major constraint, especially in the vegetable gardens. This was because they had a limited knowledge about the different pests and diseases and the control strategies. The major pests identified were moles, stem borers and potato blight. During a workshop with the school children, snails were also identified as a problem during raining season as they would eat away the vegetables. Pesticides were applied in both homegardens and outfields on a need basis by majority of the farmers.

Weeds were also seen as a problem, especially after the rainy season. More weeds often bring more pest and diseases, and also compete with the crops for nutrients and light. Generally the control of weeds was easier in the homegardens compared to the outfields. This was because the homegardens were often smaller plots within the residential site which facilitated a thorough weed management.

3.4.3 Social and institutional constraints

Youth migrating to cities and urban areas in search of job was one of the important social related causes for the decline of agricultural activity in the village. As shown in figure 2 (section 3.2), more than 75% of the people staying out of the village belong to the working-age group, 15-49 years.
The young people living in the village were not interested in agriculture and do not help much in the agricultural activities. This was in fact stated by the young people themselves, but also by the older generations. The general point of view was that agriculture demands hard work, especially cultivation of outfields.

Furthermore 50% of the people staying in the village were below 14 years and hence were too young to be engaged in the agricultural activities. During the workshop with the school children, it was clear that agricultural activities were not on the top of their priority list of future occupations; hence this was a big constraint for the future agricultural production in the village.

The questionnaire survey showed on average that more females than males were involved in agriculture in each household (figure 9). This was especially emphasized in the households only cultivating a homegarden, while the ones cultivating an outfield had a greater proportion of males involved. This indicates that males to a greater extent were involved in cultivation of outfields while females were more involved in the homegardens. Thus, for a household to cultivate an outfield it was likely that there would be a need for a man to take care of it.

For the female headed households or the many households where the males were not staying in the village this could be a constraint to cultivate an outfield. Presently, a staggering 75 % of the household surveyed did not cultivate outfields (figure 4, section 3.3). However, 50% of these households used to cultivate outfields but had abandoned it because of health problems, lack of manpower or traction problems.
In addition, incomes from people working outside the village were also used for buying food instead of cultivating.

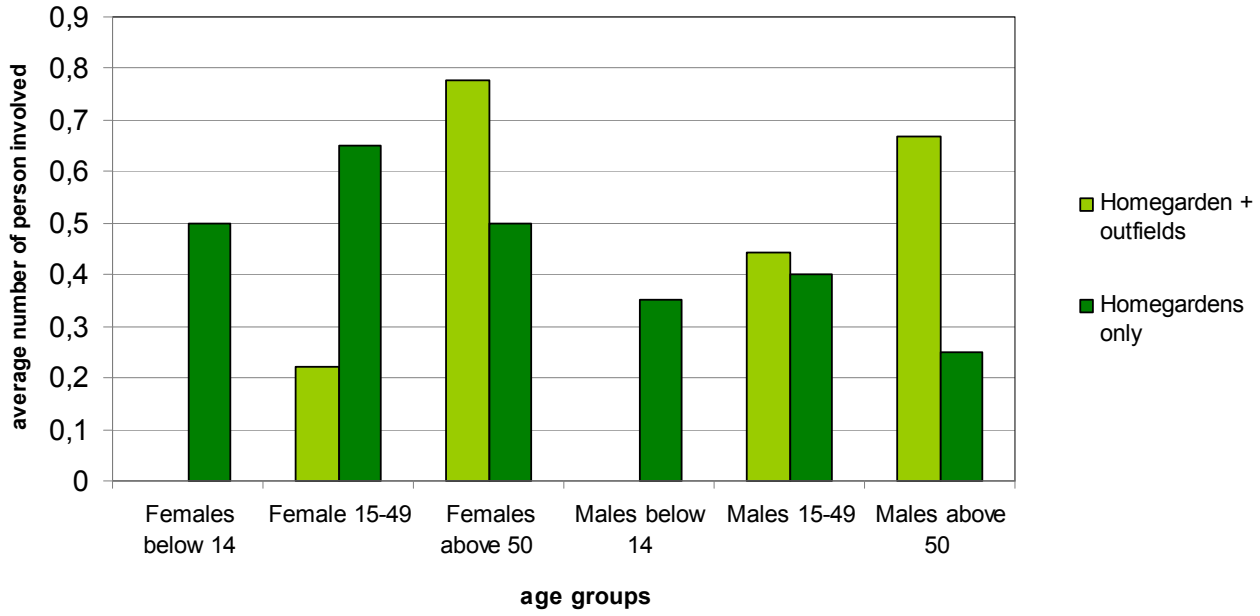

Figure 9: Average number of household member involved in agricultural activity from a survey of 30 households.

Stealing of cattle was identified as a major constraint by different extension officers. Because the cattle were being stolen by people from other villages, the farmers do not have means for traction and this caused abandoning of outfields. On the contrary very few farmers stated this as a present constraint, but as an issue 10 years ago. Therefore stealing of cattle might have caused a general decrease in wealth in the village and caused abandoning of some outfields years ago, but not seen as a constraint presently.

According to Mr. Marareni, the head of the extension office in Maluti, there used to be a community garden in Pepela. But because of lack of cooperation and conflicts among the villagers, the community garden was stopped. He also highlighted that if the villagers were united and worked together as a community, there would be several possibilities and projects which they could benefit from. The common problem was that in order to join one of the governmental projects on agriculture, it required a united community and therefore there were few possibilities for single farmers for getting supports.
It was a general constraint in Pepela that the extension service and governmental help on crop production was poor. Excepting one farmer who was interviewed, all the other farmers in the village stated that they were not aware of the extension service personnel in the village and had not received any help from any governmental agencies since the last 3 or 4 years.

The assigned extension officer was located far from the village and had to pay personally for the transportation. The transportation expenditure and the time required may explain the absence of the extension officer in the village.

3.5 Potentials in the development of agriculture

This section focuses into the present and future potentials of agriculture in Pepela. It looks into the motives for cultivation and what criteria made some farmers more successful than others.

3.5.1 The willingness to cultivate and land access

From the interview with the villagers, the importance of homegarden was highlighted. All respondents who did not cultivate a homegarden were willing to cultivate one, mainly for food security reasons and also, for some of them, to improve their income. People cultivating a homegarden shared the same reasons for being willing to cultivate. According to the group exercise on importance of agricultural activities (table 5), "Food supply" and "For selling" were ranked the first and second reasons respectively for cultivating a homegarden. Little difference was observed between the individual rankings, showing a strong agreement among participants.

Table 5: Results of the group exercise identifying and ranking the importance of agriculture. The figure represents each participant's individual rank and the final rank, 1 being the most important.

Importance	Farmer 1	Farmer 2	Farmer 3	Farmer 4	Farmer 5	***Rank***
Food supply	1	1	1	1	1	**1**
For selling	2	2	2	3	2	**2**
Saving money	3	3	4	2	3	**3**
Fodder	4	4	6	5	4	**4**
No hunger	5	5	5	4	5	**5**
Beautifies landscape	6	6	3	6	6	**6**

The participants, especially women, were aware that homegardens contributes to their livelihood. Furthermore it seemed that they wanted to continue the cultivation and they were motivated and willing to improve it. When asked where they would invest R 1000 if they had to, most of them would spend at least a part of it on agricultural inputs. Commonly the ones who did not cultivate a homegarden, would invest in a fence and the ones already cultivating, would invest in agricultural inputs such as fertilizers and seeds. Some farmers would also increase the size of their homegarden. Moreover, many female farmers liked the agricultural activities, the hours spent weeding in the homegarden and picking fresh vegetables were important in their everyday life.

It was the general point of view that homegarden cultivation in Pepela is not likely to decline in the future. Furthermore, there are governmental projects running in the province to promote homegardens (box 1.). In a historical perspective, it would have been interesting to have an idea of the importance of homegardens in the past decades. Unfortunately this was not looked into in the present study.

However, the potential of homegardens mainly applies to elderly people who want to insure their food security. For the children in Pepela, agriculture was seen as a survival strategy they would only use if they had no other choice. It seems that the future potentials of agriculture were dim concerning the youth because it was not seen as a source of income and young people did not want to involve themselves in agricultural activities.

Box 1: The farmer support and development programme

This programme is part of a strategic plan launched by the department of agriculture of Eastern Cape Province. It encompasses a food security project, which among others, aim to increase the number of productive homegardens.
The social development office selects individual households on wealth criteria and the selected households are provided with agricultural starter packs with seeds, fertilizers, chemicals, spades, etc for 3 months.

It was observed that the outfields were not viewed as an important contributor to the livelihood of the villagers. It was not seen as a priority for achieving food security and people were less willing and determined to cultivate one. On the other hand, there were potentials in all unoccupied fields because it seemed easy to acquire land. All the surveyed households got their land by applying to the village Chief and land board. None of them had any problems in acquiring land. Also, from the progressive farmers' experiences, land access had not been an issue and they got their fields easily.

3.5.2 Motivation and involvement

The progressive farmers interviewed had several common views on agriculture and their motivation seems to be their main driving force for being successful.
Two of them, Mr. Marareni and Machai tried to learn more about agriculture from reading magazines such as New Farmer Magazine.
These progressive, or market oriented farmers, also had taken risks while looking for different opportunities and investments. One bought a tractor from his pension money, another tried different maize varieties and the non-tillage practice while everybody thought he was going to fail (box 2.). A third farmer produces a lot of different products including sheep wool.
According to these farmers, it is possible to earn money from agriculture despite the lack of extension service advices. It seemed that the progressive farmers communicate and share the knowledge and ideas, while the traditional farmers would not dare try new ideas and different practices. Hence, it would be difficult to change the traditional farming practices in the village.

It was noticed that the progressive farmers were men. This could be because they had more time and were the ones responsible for cultivating outfields.

Box 2: Non-tillage Practice: Machai's experience

Machai have been growing maize and cabbage with non-tillage practice for several years now. He is cultivating a field of 0.5 ha that represents 25% of his incomes. He reported to produce about 4 times the yield produced by conventional farmers.

Methods

Soil preparation: A hole is dug and fertilizer is applied in it. Then some soil is added to cover it and the seeds are put over it.

Weeding: The herbicide "round-up" is applied just prior to or immediately after planting so that all the weeds are killed and the crops are not affected. Later on, a dose of herbicide (paraquat) is applied in between rows. It kills all the weeds but also partially affects the maize plant.

Another problem in non-tillage is the pests and insects, as there are lots of weeds and these increases the pest problems.

Pests: use of pesticides Denzel NF.

Fertilization: a top dresser is applied when the maize plants reach the height of about 50cm.

Advantages

No need of traction for tillage.

The practice gives good yields.

Effective use of fertilizers, as only the right amount is applied.

Soil condition is improved throughout the years.

The soil nutrients are minimally washed down by run-off water during rainy season in the non-tillage plots compared to tilled and exposed plots.

Disadvantages

To control the problem of weeds, use of herbicides is required.

Many pests and insects are brought about by weeds.

Require a lot of labour for digging holes

3.5.3 Cooperation, community projects and government support

"Cooperation among people is a challenge for the community"

"Cooperation can only be achieved by serious, devoted, ambitious and committed persons"

"To orient agriculture on commercialisation the villages should relocate and use the land for mass agricultural practices"

"Community farming rather than individual farming"

Quotes from different extension officers

The quotations above are from extension service officers and they highlighted the importance and potentials of community projects. According to them, community projects could be a solution to facilitate market access and opportunities, to get access to extension service and governmental projects. Mutual aid, sharing of knowledge and workload were also seen as a major advantage for community projects.

In fact, the government was running projects to involve communities in agricultural activities such as the Oil and Fiber Industry Co-operative (box 3).

The involvement in such projects could be a great opportunity for communities to develop market oriented agriculture, as the major constraints such as cost of inputs, poor market access, lack of training and equipment would be considerably reduced. However, it seemed that in the case of the Oil and Fiber Industry Co-operative project, the community faced several problems in regard to equipment delivery, training for development of skills and follow-up actions.

Box 3: Oil and Fiber Industry Co-operative

In the nearby village Pontseng a community project called "The soil is a treasure" aimed to promote farming. In 1999, it joined the Oil and Fibre industry cooperative which partly takes place in the village. The community was chosen because it was already involved in a community project and it had good connections with the extension service.
The Oil and Fibre cooperative is a governmental initiative to involve farmers in high value crop production and processing. The community was mandated to produce sunflower and hemp. All the funding and materials were provided by the government and the community also got training, mainly in management. The oil produced is bought by the government and the community plans to keep the rest of the seeds for feeding animals.
Presently 10 hectares of land are cultivated. The project involves 20 directors and employs more than 50 people to work in the fields. In the following years, the aim is to cultivate 100 ha in the area and also to grow flax in winter.

3.5.4 Relation between wealth and soil conditions

The pH typically ranges from 5 to 7 for all homegarden samples. The samples with pH above 5,5 are suitable for crop production while acidic soils could be subjected to aluminium toxicity, phosphate precipitation, excess of micronutrients such as Cu, Fe, Mn and deficiency of macronutrients (table 6).
The measure of organic carbon content allowed the quantification of the soil organic matter content (OM). In Pepela, the organic matter mainly came from animal manure because the plant residues often were grazed during winter. There were noticeable differences between each of the respondents. Carbon content vary between 2,263% and 0,918%, which equals 3,89% and 1,58% of organic matter, respectively. These are typical values for topsoils in this area (Brady and Weil, 2002). It was noticed that there was a low organic carbon content in some homegardens (5 and 7) even though there were cattle in the household. This showed that the manure availability was not a problem but different management practices perhaps could explain these differences.

In general the nitrogen (N) content could be considered low (0,1% to 0,5%) to very low (<0,1%). Phosphorus (P) content was also very low ranging from 0,019 to 0,088 µg/g of soil even if there are variations between homegardens. No inorganic fertilisers were applied in some homegardens (7, 9 and 10), but there was no evidence to conclude that there was a correlation between N and P contents and inorganic fertilizer application. This confirmed that most of the nutrients came from animal manure and furthermore most farmers mentioned that they applied very little inorganic fertilizer. However, it was important to notice that the quantity of ammonia and nitrates varied with location and season, so it would be difficult to draw any precise conclusions.
The C:N ratio was almost the same for all homegardens sampled. It was about 12:1 which was a common value for arable surface horizons, as values normally range from 8:1 to 15:1 (Brady and Weil, 2002).

Table 6: An average of vegetable - and maize gardens is presented because little variation was observed between them For each respondent (see appendix). The letters a, b and c in parenthesis correspond to sample numbers 1, 2 and 4 respectively. Soils with pH coloured in yellow are considered acidic (pH<5,5). Mineral N and organic C contents are expressed in percentage of the topsoil. Figures in blue and red colours indicate that nitrogen and carbon contents are very low, respectively <0,1% and <2%. P available is in µg/l of the topsoil. Wealth indicators: outfields (OF), number of cattle and tractor ownership.

Homegarden	pH H_20	Nitrogen (%)	Carbon (%)	P available (µg/g)	Wealth indicator
1 (b)	5,80	0,197	2,145	0,188	OF/23Cattle/Tractor
2 (b)	6,85	0,151	2,263	0,113	OF/ 8 Cattle
3 (a)	5,40	0,099	1,278	0,300	
4 (b)	5,55	0,169	2,223	0,094	OF/ 8 Cattle
5 (a)	5,90	0,096	1,090	0,225	8 Cattle
6 (b)	6,70	0,148	1,819	0,094	
7 (b)	6,05	0,077	0,918	0,169	3 Cattle
8 (c)	5,23	0,089	1,128	0,350	7 Cattle
9 (b)	5,90	0,132	1,716	0,400	0F/ 2 Cattle
10 (b)	5,20	0,129	1,774	0,438	OF

As described in section 3.3.3, important differences were observed between different maize gardens and therefore yield variations were expected among them. The soil results on N and P contents mentioned above did not show evident differences among homegardens. Hence, it could be pH and organic matter contents that were the factors most influencing the maize yields. A relation could be established between households' wealth and organic matter content. The three homegardens with the highest organic matter content (1, 2 and 4) were cultivated by what was defined as wealthy households (owning cattle and cultivating an outfield)**.** To be able to draw further conclusions, it would be necessary to have a precise idea of yields in these homegardens. However, a reason for the difference could be that wealthy households had a better management of animal manure. This would generate better soil properties and better inorganic fertilizer responses. Another reason could also be that the wealthier households used more inorganic fertilizers but the soil N contents were all low because the samples were made at the end of the season when N already had been taken-up.

The knowledge on agricultural practices had also been considered as a criterion that could influence the management of the homegardens, but it was difficult to quantify except for the extension service access (see 4.3 Social and institutional constraints). However, the respondents interviewed showed variations in their farming practices in the manure utilisation notably, as some farmers made a difference between cattle and goats manure. For example, some preferred to use goat manure because it brought fewer weeds than cattle manure. Others made compost of the vegetable residues. An important potential could be to use more of the manure from cattle and sheep for fertilizing the fields and depending less on expensive inorganic fertilizers. It was observed from the questionnaire survey that access to manure was not a constraint, thus the manures could be a potential for increasing crop yield.

3.6 Discussion of methods

This section presents a reflection on the problems faced while using some of the methods and also suggests some critics and points to improve the quality of data gathered.
Concerning the sampling for questionnaire survey, the original aim was to start by mapping the village with GPS-points and categorize all the households into three categories, in order to carry out a stratified random sampling. It was quickly realized that it was very difficult and time demanding. Hence, the idea was cast aside and some households were selected randomly and some with suggestions from interpreters as explained in the methodology section. This was not a problem in the respect that all the different categories still were well represented to compare them but a problem did occur in terms of representativeness. Hence, the generalization made especially on the households characteristics parts, may not be accurate.
The questionnaire itself was made before the arrival to the field and this was an advantage in the respect that a lot of time and considerations were put into the questions. Hence, some of the questions had to be changed during the survey and the first households were not asked the improved questions. After analysing the results, it was realized that the ranking questions did not give a precise idea and information were missing. For example it would have been useful to quantify how much was sold, the yields, the amount of fertilizers applied and access to credits. However, this information was difficult to obtain considering that most of the time respondents could not quantify it. Different age groups in the questionnaire scheme could have improved the quality of data, in such as way that for example the potential agricultural workers and pensioners in the households could have been identified.

The semi structured interviews were also prepared before arrival to the field and it gave the same problems as the questionnaire survey. A lot of the questions had to be changed as more information of the present agricultural situation was obtained. Moreover, as a semi structured interview is carried out with the conversation and the answers of the respondent, it was found difficult to keep track of the necessary information and information gained. Sometimes after summing up the interview results, it was realized that some information were missing.
One farmer practicing non-tillage and only a few progressive farmers were interviewed because they were identified very lately and were not easily available. It would have been better to have more interviews to triangulate the data gathered and develop the understanding of potentials in agriculture.

The participatory activities were time consuming to prepare as the group dynamics of the participants, organizers and interpreters had to be considered. One problem faced was that it was hard to anticipate how participants were going to understand the activity, how long the activities would last and how long time participants were willing to stay. It was realized that the preparation had not been sufficient for the first activity on maize calendar. A lot of information expected was not gained because it was difficult to keep the focus during the process.

A problem concerning the soil samples was the sampling procedure. Due to breach in communication between group members, replicate soil samples were not always made and it was affecting the accuracy of the results.
The fact that some of the soil properties were measured in the field was also a potential source of error. This is mainly due to the simple laboratory facilities. An example was that the soil samples were dried in the sun instead of using an oven. This could be a problem because the soils may not be completely dry and could influence the weight of the soil.

A problem in connection with the measurement of sand was the fact that it was not possible to separate the sand from the organic matter so the weight of coarse sand included organic matter.
It also could have been relevant to do a deeper soil sample analysis. The soil analysis represented only the topsoil conditions and information on subsoil could have influenced some of the results. Moreover, it would have been interesting to test manure from the kraal to obtain information about its fertilizing properties.

Eventually, some reflections were made about the group and especially communication. It would have been valuable to share more on the different approaches on activities by the different sub-groups. Concerning interpreters, it would have been necessary to spend more time with them to prepare activities and make sure they understand. As an example, it was realized very lately that one of the interpreter did not know what "extension service" was while the term was used several times before.

4. Conclusion

Several conclusions can be drawn from the analysis of the data gathered during the field trip in Pepela. Most of the agricultural activities in the village were in homegardens. It was mainly elderly women responsible for homegardens because homegardens were seen as less physically demanding to manage compared to outfields.
Outfields were only cultivated by few farmers and the number of fields being abandoned had been increasing over the years. It was found that the decline was caused by financial constraints such as hiring of traction and buying of inorganic fertilizers but also caused by limited working power availability. This was correlated with the fact that half of the people living in the village were children below 14 years and that more than 75% of people in the working age were staying outside the village.
Almost all the households involved in agriculture were subsistence farmers, cultivating crops for the household food security. However, the majority of households ranked food as their highest expenditures, revealing that the farmers in Pepela were not self-sufficient with crops.
Few households had a significant income from selling their agricultural products and pensions and/or child support were the main source of income for the villagers.
The study also highlighted that villagers were facing a lot of constraints in relation to their agricultural production. One of the major constraints identified was limited purchasing power for the needed agricultural inputs. Fencing was perceived as an important pre-requisite for starting crop production as grazing and browsing of crops by livestock and poultry was identified as a major problem.
Moreover, expenses on agricultural inputs were significant for farmers and it often exceeded the income generated from the crops production.
The study also revealed that farmers were reluctant to try new crop varieties or farming practices such as non-tillage. One of the reasons could be the poor extension service in the village. Another important constraint identified was the lack of interest in agriculture among the young people.

Despite the several constraints in the village, women in particular are aware of the importance of agriculture for their household's livelihood. Hence, they are willing to involve themselves in cultivating homegardens.
Land access was not seen as a problem and some farmers took this opportunity to start market-oriented crop production. Besides their motivation, the reasons for these progressive farmers' success were that they tried to improve their knowledge and share information among them.
Community projects could also be a way to share knowledge, reach extension service and get support from governmental projects.

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Appendix I

Survey on the importance of agriculture on the livelihood of Pepela villagers.
South Africa
Main Questionnaire, March 2007.

Name of respondent..... Name of "interviewer".....
Date:.....

A. Household description

1. Gender of the head of the household Male □ Female □

2. How many members in the household are:

	Females	Males	Sleeping in the house
Below 14 years old			
Between 15-49 years old			
Above 50 years old			

3. How many family members are involved in the agricultural activities of the household?

	Below 14	15-49	Above 50
Males			
Females			

4. The people not involved in agriculture, why are they not involved?
……..
5. Please rank from 0 to 4 the extent of different income sources contributing to the household, where 4 is the most important contribution while 0 is no contribution.

Agricultural products	
Secondary job	
Pensions/child support	
Others, specify:	

6. Please rank from 0 to 7 the extent of different household expenditures, where 6 is the highest expenditure while 0 represents no expenditure:

Agricultural inputs	
Education	
Health	
Food	
Transportation	
Loans	
Others, specify:	

7. How much money did you spend on agricultural inputs last year?
……

B. Cropping systems description and food production

8. Do you own livestock? Yes □ No □
If yes: How many:

	Number
Cattles	
Poultries	
Goats	
Sheep	
Pigs	
Horses/donkeys	

9. Do you have a homegarden? Yes □ No □
If no:
10. Have you ever cultivated a homegarden? Yes □ No □
If yes: Why did you stop?
……..
11. How many years have you been cultivating your homegarden?
□ 0 to 5 years
□ 6 to 20 years
□ More than 20

12. Do you apply any of the following inputs in your homegarden:

	If yes, mark (X)
Irrigation	
Inorganic fertilizer	
Pesticides	
Animal manure	
Tractor for tillage	
Cattle for tillage	
External labour	
Others, specify:	

If tillage, specify if the traction is rented:
……

13. Please rank from 0-4 the extent of expenditures on agricultural inputs for your homegarden, where 4 is the highest expenditure and 0 represent no expenditure:

Inorganic fertilizer	
Pesticides	
Traction for tillage	
Seeds	

14. Please identify 5 major crops you are cultivating in the homegarden and assign a utility value from 0 to 4 for each crop identified, where 4 is the maximum utility and 0 is no utilization:

Crops	**1**	**2**	**3**	**4**	**5**
Utilization					
Human Consumption					
Animal Fodder					
Sales					
Exchange					

15. Do you cultivate external fields? Yes □ No □

If no:

16. Have you ever cultivated an external field? Yes □ No □

If yes: Why did you stop?

……..

17. How many years have you been cultivating your field?

□ 0 to 5 years

□ 6 to 20 years

□ More than 20

18. Do you apply any of the following inputs in your field?

	If yes, mark (X)
Irrigation	
Inorganic fertilizer	
Pesticides	
Animal manure	
Green manure	
Tractor for tillage	
Cattle for tillage	
External labour	
Zero-tillage	
Others, specify:	

If tillage, specify if the traction is rented:

……

19. Please rank from 0-4 the extent of expenditures on agricultural inputs for your field, where 4 is the highest expenditure and 0 represent no expenditure:

Inorganic fertilizer	
Pesticides	
Traction for tillage	
Seeds	

20. Please identify 5 major crops you are cultivating in the field and assign a utility value from 0 to 4 for each crop identified, where 5 is the maximum utility and 0 is no utilization.

Crops	**1**	**2**	**3**	**4**	**5**
Utilization					
Human Consumption					
Animal Fodder					
Sales					
Exchange					

21. Which of these contribute more for your household food consumption?

Products from your own production □

Products bought □

Thank you for your cooperation. **Your answers will be kept strictly confidential**.

Appendix II

List of respondents

1. Villagers interviewed

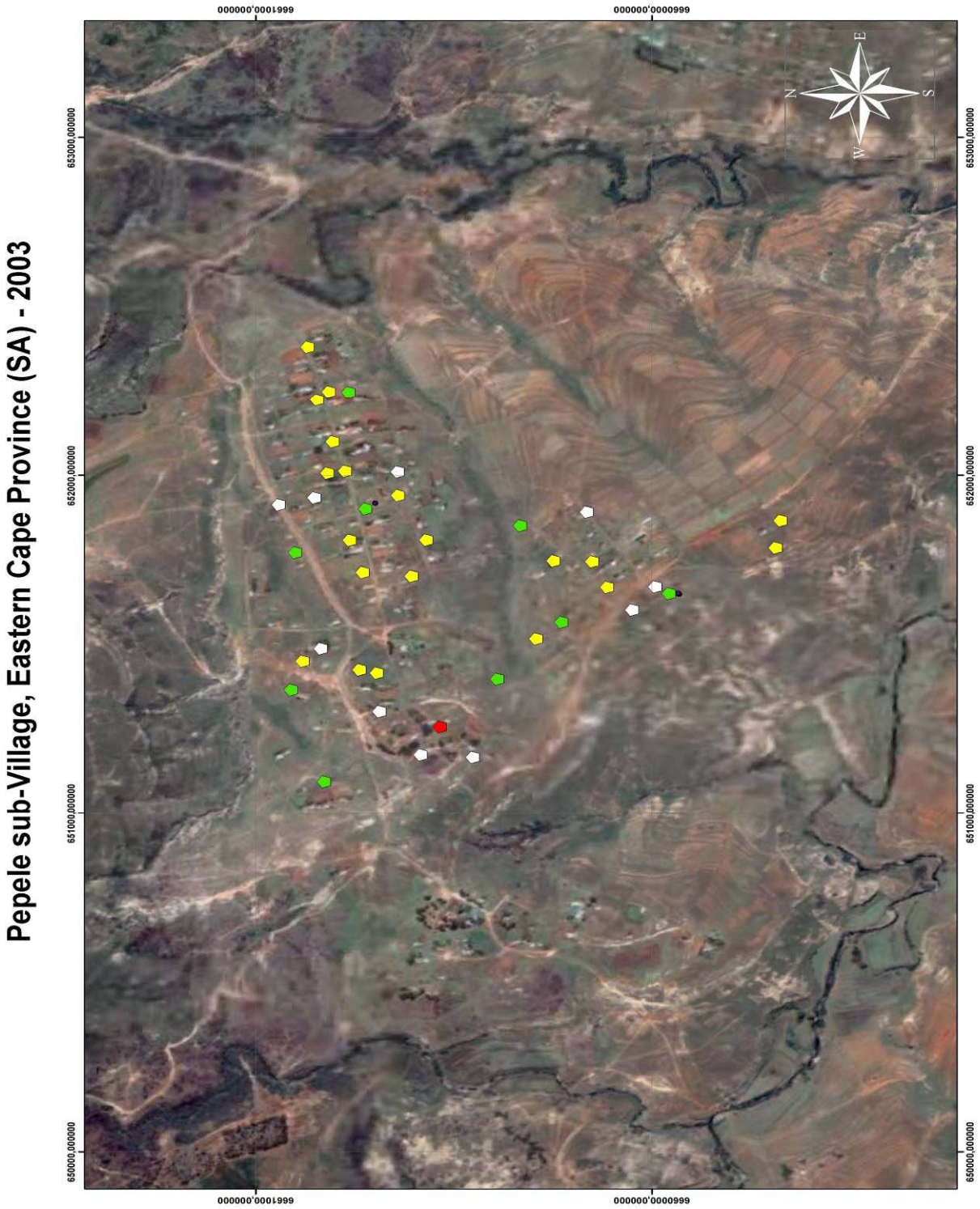
GPS number	Name	Age class	Activity
46	Auriane	> 50	Cultivating a homegarden
56	Ivy	> 50	No cultivation
54	Mbyiselo	> 50	Cultivating a homegarden, no inorganic fertilisers application
45	Nomzwandile	15-49	Cultivating a homegarden and an outfield
44	Norisa	15-49	Cultivating a homegarden
198	Ntombekhaya	15-49	No cultivation
197	Mozibelezakle	15-49	Cultivating an outfield but no homegarden
95	Nomthuthuzeli Mnyameni	> 50	Cultivating a homegarden
201	Noxolo Mxhosa	> 50	Cultivating homegarden and outfield
200	Nobantu Ntsosto	> 50	Cultivating homegarden and outfield (soil sample)
107	Khunjulwa Ntloko	15-49	No cultivation
38	Deborah	> 50	Cultivating homegarden and outfields. Agricultural activities are the only income for her and her husband
21	M. Kuboni	> 50	Cultivating homegarden and two outfields (soil sample). Owning a tractor.

2. Key informants

Name	Activity
M. Philemon Marareni	Market oriented vegetables gardener
M. Marareni	Manager at the agricultural service of Maluti
Mbovuwa	Extension service officer
Simon	Involved in the Oil and Fiber project
Machai	Market oriented farmers practicing non-tillage
Vuyo	Extension service officer living in Pepela

Appendix III

GPS points of the households surveyed



- Households cultivating a homegarden and an outfield
- Households cultivating only a homegarden
- Households without any cultivation
- Household with cultivation of only an outfield.

Appendix IV

Present and future potentials of agriculture in Madlangala village, Eastern Cape Province, South Africa

Synopsis for field studies

Interdisciplinary Land Use and Natural Resource Management

2007

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Background information:

Eastern Cape Province is one of the few provinces where rural population exceeds the urban. It is also one of the poorest provinces in South Africa. The province is characterized by deep contrasts between its two former black African Homelands (Ciskei and Transkei) and the extensive, mainly white-owned commercial districts in the rest of the province (Nel & Davis, 1999).

The study area:
Pepela is one of the three sub-villages of Madlangala in the Maluti district (in the former Transkei). It is situated at the foot of the Drakensberg Mountains at an altitude of 1700m.
The climate can be considered semi-arid (Nel. & Davis, 1999) with two seasons. October to March is the rainy season where rainfalls are usually unpredictable and intensive with a mean annual precipitation of 750mm.The dry, cold season with short frost from June to August makes agricultural activities difficult.

In the Eastern Cape Province, soils are usually highly weathered, containing large amount of quartz and are dominated by low-activity clay (kaolinite).
The available nutrients status of the cultivated soils is generally low to very low due to low soil organic matter content and low geological reserves of P, K and Ca. (Mandiringana *et al*.2005).
The pH of these soils is also often low.

Pepela sub-village encompasses around 100 households. Out-migration to the urban zones is very common and hence the household is mainly represented by elders and their grand children.
Farming is not the chief occupation; few farmers are regarded as full-time commercial farmers. The majority of the families are characterized by urban dependence and subsistence activities. Indeed, most of them rely on earnings from migrant remittances and state welfare grants.

Agricultural activities:
Over the past 60 years large parts of arable fields have been abandoned or unutilised and the crop yields are declining.
Most of the households own a homegarden which is part of the residential site (between 0.1 and 0.5 ha) and where different grains and vegetables are cultivated.
Some smallholders also cultivate agricultural fields ranging from 1 to 5 ha where maize and beans are cultivated. Some of the households also possess animals such as cattle, goats and sheep (Mandiringana *et al*.2005).

According to Mandiringana *et al*. 2005, homegardens are usually better managed than fields and received more inputs. Generally, nutrient supplies for crop productions depend on livestock manure because of poor access to inorganic fertilisers.

The development of agricultural sector is seen as one of the main aspect of rural development and improvement of rural livelihood. Therefore carrying out research in order to understand and improve agricultural productions is of great importance.

Objective and Research questions

Research question
What is the present situation and future potentials of agriculture in the Madlangala village, from a socio-economic and agro-ecological perspective?

Sub-questions
How is the agriculture contributing to the livelihood of the villagers?
What are the major constraints in the development of agriculture?
What are the future potentials of agricultural development in order to improve the livelihood?

Methodology

1- Mapping the village and identifying the households

1.1- Data needed
-Annual and seasonal (winter/summer) precipitation
-Seasonal mean temperatures
-Exposition
-Relief
-General land and village organization
-Soil class, Soil fertility

1.2- Methods
Mapping of the area will be the first step to carry out the study. This will be done with a local guide who could provide information of the different households and whether they have homegardens and fields. Household properties incl. fields will be marked with numbers to create an overview of the individual households.
To triangulate this information we can use satellite images printed from Google earth that also will provide details such as topography, orientation, rivers, footpaths, roads, fields and household boundaries.

This will give overview information of the village in order to categorize the households to be included in the study. The different categories will be:

1. Households which only cultivate a homegarden,
2. Households which cultivates both in homegarden and in agricultural field
3. Households which do not cultivate anything.

2- Questionnaire survey: household and cropping system description

2.1- Data needed
- Household size (number of members)
- Male/female headed
- Distribution of persons into ages-groups (children, adults and pensioners)
- Occupations (number of people involved in agricultural activities)

- Inputs:
  - Irrigation
  - Fertilizer
  - Manure (green/cattle)
  - Traction (cattle/tractor)
  - Labour hours
  - Tillage/no tillage
  - Others (machines, pesticides…)

- Livestock (yes/no)
- 5 major crops (homegarden +field)
- number of growing a season per year
- Ranking of crop destinies (consumption/exchange/sale)
- Income: Ranking the importance of different incomes (agricultural/others job/pension, remittances)
- Products produced vs. purchased
- Expenditures: Ranking the importance of different expenditures (agricultural inputs/education/health/ food/others)
- Consumption of individual crops: consumption during the season vs. final harvest

2.2- Sampling methods

The population: village of Pepela
Unit of analysis = individual household
A stratified random sampling will be carried out with the three identified household categories, *viz*;

- Farmers with homegarden
- Farmers with homegarden and field plots
- Non farmers

After analysing the results of the questionnaires, representative households for interviews and group discussion will be selected to obtain in-depth information on the crop management, cropping calendar, seasonal activities etc.

3- Interviews and PRA activities with selected households

3.1- Data needed

-Agricultural activities throughout the year
-Agricultural practices and people involved
-Inputs: planting material/fertilisers and other expenditures/workload and who/material used or hired
-Outputs: Products and processing Farmer support system (extension service access/credit facilities)
-Access to inputs (fertilisers….)
-Access to market, infrastructures
-Personal perception of constraints for agricultural productions (Land access constraints, traction constraints, extension quality, market/inputs access, low soil fertility, theft)
-Scenario answers to hypothetical situation (How would you spend, what would you do...)
-Expenditures

3.2- Methods

-Informal conversation with households, host families, etc.
-Semi-structured interview with households from each of the three strata, representing households with/without access to animal manure, commercialize/subsistence and male/female headed.
-PRA: Annual calendar of the activities
Identifying and ranking constraints with farmers

4- Measuring and observing soil conditions

4.1 Data needed

-pH
-N content
-P content
-SOM content
-Colour and texture
-Erosion indicators

4.2- Methods

Soil properties such as colour, layers, depth, penetration, infiltration rate and texture will be assessed in the field using simple "spade techniques".
Collected soil samples will also be analysed in the laboratory. Several replicates from cultivated as well as non-cultivated soils will be analysed. The results will be triangulated with the qualitative interviews and discussions

5- Interviews with key informants

5.1 Key informants

-Extension service Maluti
-Extension person in Pepela
-Community garden in a neighbouring village
-Vegetable garden in Makomereng
-Farmers practicing conservation tillage

5.2 Data needed

-Examples of "Successful story"
-Advantages/Drawbacks of conservation tillage
-Objectives and functioning of the extension service
-Historical aspects

5.3- Methods

-Semi structured interviews
-Informal talks

6- Other activities

-Visit the vegetable market of Matatiele
-Measuring size of some homegardens and agricultural fields

Time Schedule

Date	Activity
Tuesday 27/2 - Thursday 1/3	Preparation in Peitermaritsburg
Friday 2/3	Arrival to Madlangala at noon, placement with local family, introduction to key informants, screening of location, arrangements for Saturday activities
Saturday 3/3	Mapping of the area and brief characterization of households
Sunday 4/3	Preparation of questionnaires and preparation of practical approach
Monday 5/3	Questionnaires
Tuesday 6/3	Questionnaires
Wednesday 7/3	Interviews
Thursday 8/3	Interviews
Friday 9/3	Soil samples
Saturday 10/3	Visiting successful farmers
Sunday 11/3	Visiting successful farmers
Monday 12/3	Data analysis
Tuesday 13/3	Arrival in Peitermaritsburg in the afternoon
Wednesday 14/3	Preparation of results
Thursday 15/3	---,,------
Friday 16/3	Presentation of field data

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Appendix

Things to bring
-Gifts (pencils, candy, vegetable seeds, etc.)

Data collection matrix

Perspectives	Themes	Raw data	Source of data	Method	When	analysis
Agro-ecological	Climatic conditions and soil classification	-Annual precipitation distribution -Mean temperature day/night annually -Soil class	-Soil and climate databases	-Literature research	-Before Departing for south africa	-Make climatic chart -Evaluate soil potential
Agro-ecological	Geographical assessment of the location	-Spatial organization of houses, homegardens and field plots -Exposure -Relief -Size	-Homegardens -Cultivated fields -Fallow fields	-Group observations and measurement with help from key informant	-In the field	-Mapping of the observations
Agro-ecological	Soil fertility and nutrient status of cultivation sites	-pH -N content -P content -SOM content -colour and texture -Erosion indicators	-Homegardens -Cultivated fields -Non-cultivated land (control)	-Soil samples and analysis -visual assessment	-In the field -In the lab	Evaluation of soil fertility in relation to management practice
Agro-ecological	Background of cultivation sites	-How many years of cultivation -Previous use	-Households -Old farmer	-Questionnaires -Interviews	-In the field	
Agro-ecological	Cropping systems and management	-Crop types (Annual/perennial) -Number of seasons per year -Area size (cultivated/fallow) -Livestock - Irrigation - Fertilizer - Manure (green/animal) -Zero-tillage -Rotations -Intercropping	-Households -Farmers	-Questionnaires -Interviews -Participatory assessment of cultivation calender	-In the field	

		-Traction (tractor/cattle) Pesticides -Labour hours -Other				
Socio-economic	Description of household	-Male/female headed -Household size -Ages -Occupation (+/- agri. business) -Responsible for cultivation - Income (pension, work, farming, other) -Family expenditures (subsidies, loans, medical, agri. inputs, education) -Average time schedule for a day? (activities/needs)		-Questionnaires -Ranking exercises	-In the field	
Socio-economic	Description crop yield and usage	-Crop usage (fodder, commercial sale, own use, Interhousehold-product exchange) -Size of home produced vs. purchased agri. products -How long does the home produced supply last in a season -Product processing	-Households -Farmers -Non-cultivating household (control)	-Questionnaires -Interviews -Respondant group/discussions and ranking	-In the field	
Socio-economic	Description of village	-Extension service -Credit facilities -Access inputs (infrastructure, transport) -Local market -Market prices -Success stories/ role models	-Extension service office -Local market -Local commercial producers	-Interviews -Visit local market	-In the field	

AppendixV

Activity list

Date	Activity	Jenny	Charlotte	Raj	Sofie
Friday 2/3	**Afternoon:** Arrival to Madlangala, welcoming by the local community, placement with host family.	X	X	X	X
	Evening: Arrangement for Saturday's activities	X	X	X	X
Saturday 3/3	**Morning:** Village walk with our interpreters in Pepela I, Upper Pepela. Scetch map drawing of village with roads and households.	X	X	X	X
	Afternoon: Interview with Vuyo who is extension service officer in Umtata and who lives in Pepela.	X	X	X	X
	Evening: Test, evaluation and adjustment of questionnaire	X	X	X	X
Sunday 4/3	**Morning:** Continue village walk with our interpreters in Pepela II. Continue scetch map drawing of village with roads and households. Debrief interview with Vuyo	X	X	X	X
	Afternoon Group I: Questionnaire survey in 4 households	X		X	
	Afternoon Group II: Questionnaire survey in 4 households		X		X
	Evening: Debrief questionnaire procedure and results. Drawing of large map, marking surveyed households, making draft time scedule.	X	X	X	X
Monday 5/3	**Morning:** PRA activity with children in the school				
	Morning Group I: Questionnaire survey in 5 households	X		X	
	Morning Group II: Questionnaire survey in 5 households		X		X
	Afternoon Group I: Questionnaire survey in 4 households	X		X	
	Afternoon Group II: Questionnaire survey in 4 households		X		X
	Evening: Interview with Machai who practice non-tillage. Make a chart to overview questionnaire results	X	X	X	X
Tuesday 6/3	**Morning:** Hiking the ridge to the right of Pepela to get an overview of the village	X	X	X	X
	Afternoon Group I: Questionnaire survey in 7 households	X		X	
	Afternoon Group II: Questionnaire survey in 7 households		X		X
	Evening: Select households for semi-structured interviews	X	X	X	X
Wednesday 7/3	**Morning Group I:** Semi-structured interviews in 3 households and taking soil samples in the respondents homegardens	X		X	
	Morning Group II: Semi-structured interviews in 4 households and taking soil samples in the respondents homegardens		X		X
	Afternoon Group I: Semi-structured interviews in 4 households and taking soil samples in the respondents homegardens	X		X	
	Afternoon Group II: Semi-structured interviews in 3 households and taking soil samples in the respondents homegardens		X		X
	Evening: Preparation of PRA activity for Thursday	X	X	X	X
Thursday 8/3	**Morning Group I:** Excursion to Maluti to interview extension officers and visiting the market in Matatiele.		X	X	
	Morning Group II: Carry out PRA activity: Annual maize calender	X			X
	Afternoon Group I: Interviewing progressive farmer in Makomereng		X	X	
	Afternoon Group II: Finishing PRA activity and inviting people to PRA activities Friday and Saturday.	X			X

	Evening: Plan PRA activities for Friday and Saturday, and debrief on the interviews of the day	X	X	X	X
Friday 9/3	**Morning Group I:** Carry out PRA activity: Homegarden food supply calender and calender of expenditures		X	X	
	Morning Group II: Taking soil samples in outfields	X			X
	Afternoon: Invitation of people for PRA Saturday and prepare presentation for the evening		X	X	
	Evening: Midterm presentation in Makomereng	X	X	X	
Saturday 10/3	**Morning Group I:** Carry out PRA activity: Matrix ranking of constraints			X	X
	Morning Group II: Typing questionnaire results and preparing topics for informal talks with young and old guys	X	X		
	Afternoon: Debreifing of PRA activities	X	X	X	X
Sunday 11/3	**Morning Group I:** Excursion to Pontseng to interview Simon from the sunflower oil project and soil samples in Machai's no-tillage maize plot	X			X
	Morning Group II: Preparing soil samples for P-test and measure pH and EC		X	X	
	Afternoon Group I: PRA activity: follow up group discussion and informal talk with the chief			X	
	Afternoon Group II: Continue and finish soil testing	X	X		X
Monday 12/3	**Afternoon:** Prepare presentation and make presentation for the local people	X	X	X	X
Tuesday 13/3	**Morning:** Departure from Pepela	X	X	X	X